



Internationally Informed Consensus on Research Priorities in Paramedicine and Emergency Medical Services (EMS)

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To cite this article: Brett Williams, Christine King, Richard Armour, Abdullah Alobaid, Saeed Alqahtani, Talal AlShammari, Alan Batt, Yu-Tung Chang, Niamh Cummins, Enrico Dippenaar, Georgette Eaton, Eystein Grusd, Thomas Hofmann, Justin Hunter, Sarah Karim, Eihab Khasawneh, William Leggio, Siobhan Masterson, Abdulmajeed Mobrad, Marcus Ong, Alaa Oteir, Walt Stoy, Hidetana Tanaka, Walter Tavares, Julia Williams & Alex Olaussen (16 Jun 2026): Internationally Informed Consensus on Research Priorities in Paramedicine and Emergency Medical Services (EMS), *Prehospital Emergency Care*, DOI: [10.1080/10903127.2026.2687828](https://doi.org/10.1080/10903127.2026.2687828)

To link to this article: <https://doi.org/10.1080/10903127.2026.2687828>



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Internationally Informed Consensus on Research Priorities in Paramedicine and Emergency Medical Services (EMS)

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ABSTRACT

OBJECTIVES: Prehospital emergency care systems are expanding in scope and complexity, yet research agendas remain disjointed and often nationally focused. An internationally informed set of research priorities is needed to guide strategic investment and evidence generation across emergency medical services (EMS) and paramedicine contexts, while recognizing that local funding environments and needs will continue to shape national research decisions. The objective of this study was to identify and validate internationally informed research priorities for paramedicine and prehospital EMS using a multi-phase, stakeholder-informed consensus and analytic approach.

METHODS: An observational, three-phase mixed-methods study was conducted. Phase 1 involved an open-ended Delphi survey of international prehospital stakeholders to generate research priorities. Phase 2 asked participants to rate the importance of each priority using a 10-point scale; exploratory factor analysis (EFA) was performed to identify underlying factors. Phase 3 used confirmatory factor analysis (CFA) to test the factor structure. Participants included clinicians, educators, researchers, managers, students, and policy stakeholders from multiple countries to maximize breadth of stakeholder input.

RESULTS: Across the three phases, responses were obtained from 1,299, 717, and 954 participants, respectively, with 703 complete cases included in the final CFA. The final model comprised nine interrelated factors encompassing 40 research priorities. Factors reflected key areas of contemporary prehospital practice, including operations, clinical governance, evidence-based practice, health and well-being, special care

(community paramedicine), culture, education and training, trauma care, and clinical care. Confirmatory factor analysis demonstrated acceptable model fit, supporting the robustness of the identified structure.

CONCLUSIONS: This study presents an internationally informed framework of research priorities for prehospital emergency care. The findings provide a practical foundation for researchers, funders, EMS organizations, and policy stakeholders to align future research efforts, reduce duplication, and address high-impact gaps across diverse prehospital systems, while remaining responsive to local context.

Keywords: Emergency Medical Services; Consensus; Health Priorities; Health Services Research; Prehospital Care

INTRODUCTION

Research is the foundation of evidence-based practice, an approach to improve health service delivery, leading to better patient outcomes (1). Research informs and provides direction to professionals and policymakers by rigorously evaluating care quality and safety (2). Universities, governments, foundations, community organizations, and individuals annually fund research on a range of projects in health research. To guide investment, priority-setting processes identify the most important questions for future research, promote coordinated programs of research, and reduce avoidable duplication (3).

Research priority-setting is of particular importance where evidence needs exceed available resources (3). In this context, agenda-setting reports can assist researchers, emergency medical services (EMS) organizations, professional bodies, and funders by identifying areas where coordinated research is most likely to strengthen patient care, workforce sustainability, service design, education, and system performance (4,5).

Evidence-based practice is the foundation of practice in paramedicine and prehospital EMS; however, conducting research in this field is reported as being more problematic than in other professions. Difficulties reported include limited research skills and capacity, limited funding, poor relationships between EMS services and universities, contextually complex consent requirements in emergency care settings, limited collaborative research (i.e., between governments, hospitals, and universities), difficulties conducting randomized controlled trials, limitations in generalizing results,

and different perspectives on how to measure, collect, and analyze data (1,6,7).

Research not being seen as important as operations and service delivery, not linking research with patient outcomes, and not translating research findings into clinical practice have also been mentioned.⁸ Despite these challenges, over the past several decades, there has been much advocacy by national and international researchers, professionals, and stakeholders to provide high-quality research in EMS (1).

A substantial body of work has focused on developing research priorities and agendas in EMS and paramedicine across national and organizational contexts. For example, national agendas have identified priorities spanning workforce issues and education, evidence-based clinical practice, service delivery and economics, organizational data processes and performance indicators, and emergency preparedness (5). Other national initiatives have similarly emphasized clinical priorities alongside health services and systems research and education, including the development of methods for preparing prehospital clinicians and evaluating EMS system design and operations (1,7,9-11). More recent work has reinforced these themes while highlighting emerging issues such as workforce shortages, data sharing, and practitioner well-being (12,13). Recent national and sub-disciplinary priority-setting work has also continued to emerge, including an updated Dutch national EMS agenda (2), a paramedicine research agenda for Ireland (4), United Kingdom (U.K.) prehospital critical care research priorities (14), and United States (U.S.) EMS education research priorities (15).

Although these national and sub-disciplinary agendas are important, they are shaped by local service structures, funding pathways, and policy priorities. An international agenda therefore should not be interpreted as replacing national priorities. Rather, its significance lies in identifying shared priority issues across systems, supporting system-level comparison, and providing a framework that investigators can use when developing collaborative studies and grant applications (2).

Emergency medical services systems have significantly evolved, with substantial changes in the types of EMS systems, for example, from on-the-job training to university-led programs (16,17), and from an emergency response and transport role to multiple roles that also include injury prevention, public and community health and education (16,18,19), emergency preparedness, and providing clinical care (2,4,20). In fact, paramedicine and EMS are often described as the intersection between public health, public safety, and health care (21). Although clinical skills are the predominant priority areas that have emerged in these studies, over time, priority areas have expanded to include governance issues, emergency management, education management, staff health, management and operational issues, communication, evidence-based practice, patient management, and performance management. As Bowles et al.¹³ suggest, including a wide range of stakeholders will achieve more credible results and be more likely to see research translated and informing policy and practice.

This study aimed to identify internationally informed research priorities for current and emerging issues in paramedicine and EMS. A key aspect of taking an international multi-stakeholder approach is merging research priorities from multiple countries and professional roles to formulate a framework that can inform, but not replace, local and national agendas. The intended audience includes researchers, EMS organizations, educators, professional bodies, and policy stakeholders who require a framework for prioritizing and evaluating future EMS research activity. We agree with Maguire, O'Meara, and Newton (22), and more recent international agenda-setting studies, which emphasize the need for strong, coordinated research collaboration to support the ongoing professionalization of paramedicine and the sustainability of the research workforce (4).

METHODS

Study Design

We used an observational, three-phase consensus-based approach with the Delphi method and exploratory and confirmatory factor analysis. The Delphi method is a technique used to gather and consolidate the most reliable consensus of opinions from experts (23). Exploratory factor analysis (EFA) is a multivariate statistical approach that reduces the number of variables and thereby simplifies the interpretation and identification of latent factors, while confirmatory factor analysis (CFA) then tests these latent factors with data (24). Factor analysis was used to identify factors of priorities based on correlations among importance ratings. The study was designed to generate broad stakeholder-informed priorities rather than to produce statistically representative

regional comparisons. Ethics approval was provided by the Monash University Human Research Ethics Committee (ID: 15064), and all participants provided informed consent electronically before commencing each survey phase.

Participants and Procedures

Final-year paramedicine/EMS students, paramedics/emergency medical technicians (EMTs), graduate and research students, medical and research directors, and senior managers internationally were invited to take part in the study. Eligibility was based on current or recent involvement in prehospital emergency care practice, education, research, leadership, or policy. Participants were recruited using a non-probability sampling strategy combining purposive and snowball approaches (25,26). Initial invitations were distributed through established professional, academic, and research networks in paramedicine and EMS, and recipients were encouraged to share the survey link with colleagues. Recruitment also occurred through social media posts directed at paramedicine and EMS stakeholders. Eligibility was assessed by participant self-identification at survey entry before survey completion. Because invitations were redistributed through professional networks and social media, the total number of individuals who received the invitation could not be determined and a response rate could not be calculated. Participants self-selected and provided informed consent before commencing each survey phase. Across the three phases, the Qualtrics Insight Platform (Qualtrics, Provo, UT, USA) was used to collect data. Separate survey links were used for each phase. The three phases used independent open survey links;

therefore, participants in later phases were not restricted to those who had participated in earlier phases.

Phase 1 used an open-ended item-generation format. Participants were asked to provide up to five research priorities for paramedicine and EMS in free text. They were not provided with a pre-specified list of priorities. Phase 2 presented the 66 priorities generated from Phase 1 and asked participants to rate the importance of each priority using a 10-point scale ranging from 1 = not at all important to 10 = the most important. Phase 3 presented the refined priority set for confirmatory testing using the same importance rating approach.

Statistical Analysis

Item analysis was used to support the Delphi study priority reduction process. Phase 1 free-text responses were cleaned before analysis. Responses were excluded if they contained no interpretable research priority or were duplicate submissions. Exclusions included duplicate entries, non-interpretable responses, and submissions without identifiable research priorities. Partial responses were retained when at least one valid research priority was provided. Similar responses were standardized and merged where they were conceptually similar. Two members of the research team reviewed the cleaned items and retained priorities that appeared three or more times. The retained items were then reviewed against existing paramedicine and EMS research priority literature to reduce duplication and ensure conceptual clarity. Exploratory factor analysis was conducted using SPSS (version 30.0; IBM Corp., Chicago, IL, USA). An oblique

rotation (Oblimin) was specified as a priori, as underlying priority factors were expected to be correlated. Multiple criteria were used to guide factor retention, including Kaiser's criterion (eigenvalues >1) (27), visual inspection of the scree plot (28), cumulative percentage of variance explained, and parallel analysis (29). Items were retained only if they demonstrated a primary factor loading of ≥ 0.40 , consistent with recommended thresholds for applied factor analytic research (30).

To confirm the factor structure derived from the EFA, a CFA was performed using maximum likelihood estimation in AMOS (version 24.0; IBM SPSS AMOS, Meadville, PA, USA). Although items were rated using a 10-point Likert scale, maximum likelihood estimation was considered appropriate given the number of response categories and sample size. All latent factors were allowed to covary, reflecting the theoretical expectation that research priority factors within prehospital emergency care are interrelated. Model fit was evaluated using multiple indices, including the comparative fit index (CFI), adjusted goodness-of-fit index (AGFI), , root mean square error of approximation (RMSEA) with 90% confidence intervals, and standardized root mean square residual (SRMR), interpreted in accordance with established guidelines (29). Complete-case analysis was used for Phase 2 and Phase 3 factor analyses because factor extraction and CFA model estimation required a consistent item set across all included respondents (31).

Questionnaires were excluded from the relevant analysis when one or more variables required for that phase were missing.

RESULTS

Phase 1

In Phase 1 of the study, participants were asked to answer two demographic questions and list up to five research priorities for paramedicine and EMS using open-ended free-text responses. No pre-specified list of priorities was provided. A total of 1,299 questionnaires were completed or partially completed. After cleaning the data, a total of $n=466$ questionnaires were included in the analysis, producing over 2,000 individual responses. The largest proportion of participants were from North America ($n=223$; 48%) and worked as a paramedic/EMT ($n=278$). Research priorities were retained if they were duplicated three or more times ($n=77$). These were further reduced to $n=66$ after review by the research team and comparison with the literature on paramedic research priorities. The full list of Phase 1 retained priorities is provided in Supplementary Table S1. Available participant characteristics are summarized in Table 1.

Phase 2

In Phase 2, the top 66 priorities that emerged from Phase 1 were distributed back to participants, and participants were asked to rate these on a 10-point Likert rating scale (1=not at all important to 10=the most important). Phase 2 recruitment used the same open international recruitment strategy as Phase 1 and was not limited to Phase 1 respondents. A total of $n=717$ questionnaires were returned; $n=608$ questionnaires with no missing variables were used to analyze the data. The largest proportion of

participants were from North America (n=214) and worked as a paramedic/EMT (n=421). The results of the initial data screening supported an EFA with these data. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (0.952) and Bartlett's Test of Sphericity ($\chi^2 = 26877.73$, $df = 2145$, $p < .001$), the sample size to variable ratio, and inspection of the correlation matrix for loadings and communalities were all > 0.30 .

The 66 priorities produced a best-fit of 11 factors, which accounted for 64.91% of the total explained variance. Phase 2 ratings were used for factor analytic modeling of perceived importance; therefore, the results emphasize the latent structure of rated priorities rather than a simple rank-order list. Priority loadings ranged from approximately .40 to .74, with the top three loading priorities: 'response times', 'scene times', and 'outcome of clinical interventions.' The Cronbach alpha coefficients for the 11 factors ranged from .658 to .876, indicating acceptable internal consistency (30). A condensed factor loading table for the 40 priorities retained in the final framework is presented in Table 2, with the full EFA pattern matrix provided in Supplementary Table S2.

Phase 3

In Phase 3, a total of n=954 questionnaires were returned; n=703 questionnaires contained no missing values and were included in the CFA. Prior to CFA, the item set was reduced from 66 to 44 by removing redundant priorities and those showing poor psychometric performance during EFA (e.g., low communalities and/or substantial cross-loadings). Phase 3 recruitment used the same open international recruitment

strategy as Phases 1 and 2 and was not limited to respondents from earlier phases. Among respondents with demographic data available, the largest proportion of participants were from Europe (n=194) and worked as a paramedic/EMT (n=392). Data distributions were assessed, including examination of univariate outliers. Standardized regression weights on each item were $> .40$, and modification indices were used iteratively alongside theoretical interpretability. Following the EFA results, the 44 priorities were tested as an 11-factor model; however, these data did not fit the proposed 11-factor model. The chi-square value for the overall model was $\chi^2(df = 701) = 7204.87$, $p < .001$, highlighting a poor fit between the proposed 11-factor EFA model and model data ($p < .05$). Further examination of other indices still demonstrated a poor model fit with CFI = .691, AGFI = .863, RMSEA (90% CI) = .115 (.112, .117), and SRMR = .050.

A second iteration produced improved model fit following the removal of two factors and four priorities (Telemedicine/Secondary Triage, Data Linkage, Standardized Data Dictionary, and Knowledge Translation). The final nine-factor model demonstrated acceptable fit indices: CFI = .961, AGFI = .914, RMSEA (90% CI) = .048 (.036, .056), and SRMR = .036. The final framework comprised nine factors and 40 retained priorities. Table 2 presents the exploratory factor structure derived from Phase 2 EFA, whereas Table 3 presents the final CFA-informed framework following psychometric refinement and theoretical interpretation. The nine factors and individual priorities are presented in Table 3. Table 3 presents the final priority framework, while Figure 1 illustrates the underlying latent structure derived from CFA.

DISCUSSION

This study aimed to develop key internationally informed priority areas for research in paramedicine and EMS with paramedicine and EMS stakeholders across multiple world regions. Nine factors were identified as priority areas with 40 sub-priorities. Our study generally aligns with previous EMS studies that focused on national priorities, as well as other research priority studies in general, including recent national and regional Delphi-based agenda-setting work that has identified comparable priority factors across different EMS systems (2,4,5). Consistent with the Canadian National EMS Research Agenda (7), recent work by Ross et al.(8) shows that the longstanding barriers to paramedicine research, including limited time, funding, training, data access, and poorly supported research roles, continue to constrain the implementation of agreed research priorities across diverse EMS systems. O'Donnell and O'Reilly(32) in their Irish national priority study found four research themes: Clinical, Educational, System Design and Operation, and Improving Global Outcomes. This is consistent with more recent Irish agenda-setting work using Delphi methods to inform a national paramedicine research agenda (4).

Three of the factors from this study also aligned with the three research themes found by Sayre et al.(33) in a U.S. study, namely Clinical, Systems, and Educational, and with several factors reported in their 2005 study (9). Similarly, recent U.S. priority-setting work has applied Delphi approaches to identify EMS research priorities, including a specific focus on EMS education research priorities (15).

Evidence-based practice as a key research priority area globally is intuitive, given the sustained emphasis on evidence-based practice within paramedicine over the past decade (34). Simpson(34) explored the beliefs and expectations of paramedics towards evidence-based practice and research using survey responses from 892 frontline paramedic staff in New South Wales, Australia, and found that the vast majority of respondents held positive attitudes towards evidence-based practice and perceived paramedic participation in research as important. This focus on evidence-based practice has been reinforced in more recent national and international agenda-setting research, where evidence-based practice, knowledge translation, and research capability have continued to feature as dominant priority factors (4,5,19). However, a positive orientation does not necessarily translate into consistent capability or educational preparedness. Wilson et al.(35) explored the factors affecting paramedicine students' learning about evidence-based practice and found that there was variation in their understanding of the purpose of literature analysis, the nature of medical research, and its relationship to practice. The two main factors contributing to this variation were found to be epistemological stance and opportunities for metacognitive learning generated through peer interactions and self-reflection. Collectively, these results support the importance of evidence-based practice in the present international framework and reinforce the need to evaluate and implement teaching and sustaining evidence-based practice in paramedicine and EMS (36). The terms epistemological stance and metacognitive learning are used here as described by Wilson et al.(35) Epistemological stance refers to how students understand the nature, sources, and application of

evidence, while metacognitive learning relates to reflecting on and regulating one's own learning processes. Wilson et al.(35) identified these as key influences on how students engage with evidence-based practice. These factors influence whether evidence-based practice is perceived as an academic task or integrated into clinical reasoning, supporting the inclusion of evidence-based practice and research capacity as priorities in this agenda.

Another research priority area that emerged from our study was 'Health and Wellbeing'. Barrett et al.(37) note that cardiovascular disease, mental health problems, and musculoskeletal injuries are still prevalent among paramedics. This pattern has been consistently described in more recent syntheses examining occupational exposures and health outcomes in the EMS workforce (38). Moreover, these priorities closely mirror recent EMS research agendas and systematic reviews that emphasize the relationships between workload, organizational factors, and practitioner well-being (2,4).

As a result, there has been more research in the last decade focusing on improving the health and well-being of paramedics, including, exercise(39), diet(37), working with compassion rather than empathy(40), meditation(41), post-traumatic stress disorder (PTSD)(42) and trauma(43), and aerobic fitness and its impact on heart rate and respiratory rate during shifts (44). There has also been research carried out on the health and well-being of paramedic students (45-48). For example, Dahlmann et al.(17) showed that paramedic students who take part in workplace training were at an increased risk of developing mental health problems, particularly PTSD, compared to

the general population, and highlighted the need for more effective, evidence-informed interventions. This is consistent with more recent evidence identifying a high prevalence of anxiety, depression, and PTSD symptoms among paramedic students and describing the emotional impacts of clinical placement exposure to trauma (46,47).

Community paramedicine emerged as a main priority, reflecting its expanding role within contemporary EMS systems. In 2019, Rasku et al.(49) conducted a scoping review to identify the core components of community paramedicine, and from 803 initial articles, only 21 met the inclusion criteria and appraisal for quality. Four components of community paramedicine identified were community engagement, multi-agency collaboration, patient-centered prevention, and outcomes of programs (cost-effectiveness and patients' experiences). They concluded that community paramedicine research data are lacking and that further research is needed to determine whether community paramedicine reduces health care costs, enhances people's experiences, and improves health outcomes. Recently, international consensus research has helped clarify the definition of community paramedicine, supporting greater consistency in evaluation and implementation (19). In 2021, van Vuuren et al.(50) carried out a systematic review and found evidence that community paramedicine may have a positive impact on patient health and the wider community, while noting limited evidence in residential aged care facilities and in palliative and end-of-life care. Shannon et al.(19) reported gaps in evidence regarding education and scope of practice despite signals of reduced acute health care utilization and potential economic viability. Recent national agenda-setting work has continued to prioritize alternative clinical care within

EMS research priorities (4,5). These findings align with the present 'Special Care (Community Paramedicine)' priorities, including non-transport/non-conveyance, palliative care/end-of-life issues, geriatric care, autonomous practice, and medication prescribing.

Education and training are a research priority area where we found very limited research in terms of the 'how' we can improve education and training, as opposed to 'what' we should include in education and training. In this study, education-related priorities included simulation education, standardized qualifications/curriculum, standardized clinical practice (guidelines/protocols), and research training and capacity building. This pattern suggests that, alongside defining "what" should be taught, paramedicine research needs to address "how" best to teach, assess, and sustain competence for emerging roles and system demands (15). For example, in their article on educating paramedics for the future, O'Meara, Furness, and Gleeson(20) highlight the need to broaden the curricula from one that is emergency medicine-dominated to one that considers the broader role of the paramedic that includes primary care and public health topics as a response to changing demographics and health system reform. Dahlmann et al (17), concluded that more training is needed in evidence-based and patient-centered care and noted that community paramedics and telemedical support systems offer opportunities to strengthen competencies in patient care. More recently, Delphi-based EMS education agenda-setting in the U.S. has also highlighted priority questions for advancing EMS education research(15), supporting national EMS agendas that continue to emphasize education and training as priority areas (4,5).

Accordingly, education and training research should prioritize scalable pedagogies, assessment approaches, and implementation strategies that support competency development across diverse contexts.

We would also like to highlight several important aspects to consider while creating an international research agenda. First, our results show crossovers and synergies within and between research priority areas, highlighting opportunities for multi-stakeholder research and international research consortia. Second, the inclusion of Operations, Clinical Governance, and Clinical Care priorities underscores the continuing trend toward more systemic research as paramedicine evolves from delivery to broader governance and model-of-care concerns. These observations are consistent with longstanding calls to strengthen EMS research capacity and to better address the complexities of EMS systems (6,22). Recent Australasian work has also identified structural barriers and enablers that influence the feasibility of implementing agreed research agendas (8). Third, the prominence of research training and capacity building and competency measurement reinforces the need to focus on the 'how' as well as the 'what' in terms of paramedicine research. Tippet et al.(51) provide examples where lack of research training and support were impediments to paramedicine research, and Cooke and Wilson(52) called for a distinction between developing skills for appraising and using evidence and those required for undertaking research. Others have noted barriers to research participation such as patient benefit, professional identity and responsibility, and time (53). Together, the current international framework can support

funders, services, and researchers to design coordinated programs of work, align implementation efforts, and evaluate progress over time.

Finally, this internationally informed research agenda can be used as a planning/design tool, as well as an evaluation tool. Jensen et al.(7) pointed out that even though there has been considerable expansion in EMS operations and the scope of practice of EMS personnel, this expansion has been predominantly independent of any formal measurement and evaluation of outcome. Also, there is a need for iteration in the scale of research required, where an international research agenda provides collaborative learning but runs in parallel with local and national research agendas that allow for specificity and context. We would like to acknowledge, however, a point raised by Jensen et al (54). that while developing research agendas can be important, greater value comes from the changes that result from such an initiative, and the effect of those changes. We agree, but rather than viewing an international research agenda as distinct from the changes that eventuate from it, we see it as the guiding tool for these changes, from both a design and evaluation perspective, that can be continually reflected upon and adapted in response to changes and outcomes at different system levels. Therefore, the international research priorities that have emerged through our research can be seen as a starting point. In addition, evidence-based practice takes on a more holistic application in paramedicine, where it not only applies to paramedic practice but to the entire paramedicine profession and governance as a whole. This is what an international research agenda can offer.

The impact of this agenda should be evaluated using observable indicators rather than assumed influence. These may include citation in funding calls, grant applications, professional standards, and EMS research strategies, as well as the development of multicentre or international collaborations addressing these domains. Responsibility for monitoring impact is likely to be shared across academic groups, EMS organizations, and professional bodies rather than residing with any single entity.

Without an internationally informed research agenda, paramedicine and EMS research may remain fragmented and largely shaped by local funding priorities or individual investigator interests. This can limit progress in areas of shared importance, constrain opportunities for cross-system learning, and reduce the ability to advocate collectively for sustained research investment.

The priorities that were not retained in the final model should not be considered unimportant. Rather, they demonstrated weaker psychometric properties or did not load sufficiently onto the final factor structure. This distinction is important, as the purpose of the final framework is to identify coherent, higher-level domains to support coordinated research efforts, rather than to exclude other valid areas of EMS research.

LIMITATIONS

This study has a number of limitations. Recruitment relied on email distribution and social media snowball sampling, and therefore, the total number of individuals invited and the response rate cannot be precisely calculated; as a result, the sample may not

be representative of all EMS systems and roles. Therefore, this study should be interpreted as an internationally informed consensus exercise rather than a globally representative survey. Participation was concentrated in North America, Europe, and Australasia, with comparatively limited representation from low- and middle-income regions, including parts of Africa and Southeast Asia. This distribution may have influenced the priorities identified and may not fully reflect research needs in the Global South, where EMS systems, workforce models, and patterns of disease may differ. Data collection via online surveys and recruitment may have underrepresented stakeholders from non-English-speaking contexts and settings with limited digital access, potentially influencing the priorities generated and the resulting factor structure. Finally, priorities were derived in a fixed list format in Phases 2-3, which may have constrained the emergence of additional priorities outside the Phase 1 item set. Research priorities shift with time; the priorities identified in this study represent a snapshot in time and require periodic re-evaluation and updating. Independent samples were used across phases; consequently, within-participant consistency of priorities over time could not be assessed.

CONCLUSIONS

Paramedicine and EMS research underpins evidence-based practice and contributes to improved service delivery and patient outcomes. It also informs professionals and policymakers through rigorous evaluation of care quality and safety. An internationally informed research agenda offers significant value by enabling learning and collaboration across paramedicine contexts. This study identified key international research priority

areas for paramedicine and EMS through engagement with stakeholders across multiple regions and roles. The findings are not intended to replace local or national research agendas, but to provide a complementary framework that can guide collaborative research, support funding justification, and inform evaluation of progress over time. The priorities demonstrate synergies within and between research areas and reflect the systemic nature of contemporary paramedic practice and governance, while highlighting opportunities for multi-stakeholder research and international research consortia. Used alongside local and national agendas, this international framework can guide research design and evaluation globally and should be iteratively reviewed and refined as new evidence emerges.

ACKNOWLEDGEMENTS: We thank all participants for contributing their time and expertise to inform the development of this international paramedicine and EMS research agenda.

FUNDING SOURCES: None.

DECLARATION OF INTEREST STATEMENT: The authors report there are no competing interests to declare.

DECLARATION OF GENERATIVE AI IN SCIENTIFIC WRITING: During the preparation of this manuscript, the authors used Grammarly in Microsoft Word for final proofreading, spelling, grammar, and language refinement only. No generative artificial

intelligence tool was used to generate research content, analyse data, create or manipulate tables or figures, produce references, or replace author interpretation. The authors reviewed all suggested edits, verified the accuracy and originality of the manuscript, checked the references, and take full responsibility for the integrity and content of the published work.

DATA SHARING STATEMENT: Data are available upon reasonable request and permission from the corresponding author.

AUTHORSHIP STATEMENT: Brett Williams, and Alex Olausson contributed to study conception and design. Brett Williams, Christine King, Richard Armour, Abdullah Alobaid, Saeed Alqahtani, Talal AlShammari, Alan Batt, Yu-Tung Chang, Niamh Cummins, Enrico Dippenaar, Georgette Eaton, Eystein Grusd, Thomas Hofmann, Justin Hunter, Sarah Karim, Eihab Khasawneh, William Leggio, Siobhan Masterson, Abdulmajeed Mobrad, Marcus Ong, Alaa Oteir, Walt Stoy, Hidetana Tanaka, Walter Tavares, Julia Williams, and Alex Olausson contributed to participant recruitment, item development, interpretation of findings, and critical review of the manuscript. Brett Williams drafted the manuscript. All authors reviewed and approved the final manuscript and agree to be accountable for the integrity of the work.

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Table 1. Participant characteristics by study phase

Characteristic	Phase 1 (n = 466)	Phase 2 (EFA sample; n = 608)	Phase 3 (CFA sample; demographic n = 631)
Questionnaires returned (total)	1,299 completed or partially completed	717 returned	954 returned
Analyzed sample	466 questionnaires included after data cleaning	608 complete questionnaires included in EFA	703 complete cases included in CFA
Regional distribution			
North America	223 (47.9%)	214 (35.2%)	115 (18.2%)
Europe	132 (28.3%)	182 (29.9%)	194 (30.7%)
Asia	63 (13.5%)	86 (14.1%)	141 (22.3%)
Oceania	33 (7.1%)	74 (12.2%)	129 (20.4%)
South America	8 (1.7%)	29 (4.8%)	19 (3.0%)
Africa	7 (1.5%)	23 (3.8%)	33 (5.2%)
Professional background*			
Paramedic/EMT	278 (59.7%)	421 (69.2%)	392 (62.1%)
Academic/researcher	120 (25.8%)	133 (21.9%)	139 (22.0%)
Senior leadership/management	56 (12.0%)	69 (11.3%)	Not available
Graduate coursework/research student	30 (6.4%)	58 (9.5%)	41 (6.5%)
Final-year paramedicine student	26 (5.6%)	34 (5.6%)	46 (7.3%)
Medical director	19 (4.1%)	17 (2.8%)	16 (2.5%)
Research director	8 (1.7%)	12 (2.0%)	9 (1.4%)
Other	42 (9.0%)	21 (3.5%)	45 (7.1%)

Note. Percentages for regional distribution are based on the available demographic denominator for each phase. Professional background categories were multiple-response items; therefore, totals may exceed 100%.

Table 2. Condensed factor loadings for priorities retained in the final framework (n=608)

Factor	Priority item	Primary loading
Operations	Response Times	.735
Operations	Scene Times	.711
Operations	Dispatch Triage	.438
Operations	Spinal Immobilization	.416
Clinical Governance	Continuing Professional Development (CPD)	.480
Clinical Governance	Career Pathways/Promotions	.479
Clinical Governance	Clinical Governance	.473
Clinical Governance	Measurement of Core Competencies	.407
Evidence-Based Practice	Outcome of Clinical Interventions	.696
Evidence-Based Practice	Clinical Feedback	.552
Evidence-Based Practice	Evidence-Based Practice (EBP)	.448
Evidence-Based Practice	Paramedic Decision-Making	.432
Evidence-Based Practice	Clinical Supervision/Mentorship	.404
Health and Well-being	Paramedic Sleep Deprivation/Fatigue	.650
Health and Well-being	Paramedic Turnover/Burnout	.639
Health and Well-being	Shift Work/Hours	.613
Health and Well-being	Staff Health and Well-being	.602
Health and Well-being	Staff Recruitment and Retention	.505
Health and Well-being	Paramedic Salary	.458
Health and Well-being	Critical Incident Stress Management (CISM)	.397
Special Care (Community Paramedicine)	Non-Transportation/Non-Conveyance	.642
Special Care (Community Paramedicine)	Palliative Care/End-of-Life Issues	.513
Special Care (Community Paramedicine)	Geriatric/Older Persons Care	.506
Special Care (Community Paramedicine)	Autonomous Paramedic Practice	.439
Special Care (Community Paramedicine)	Medication Prescribing	.433
Culture	Diversity, equality, and inclusivity in patient care	.612
Culture	Cultural Safety	.553
Culture	Workplace Discrimination	.507
Education and Training	Simulation Education	.600
Education and Training	Standardized Paramedic Qualifications/Education/Curriculum	.581
Education and Training	Standardized Clinical Practice (Guidelines/Protocols)	.522
Education and Training	Research Training and Capacity Building	.397
Trauma Care	Chest Thoracotomy	.587

Trauma Care	Blood Transfusion	.575
Trauma Care	Fluid Resuscitation	.410
Clinical Care	Pediatric Care	.631
Clinical Care	Sepsis	.528
Clinical Care	Obstetric and Maternal Care	.511
Clinical Care	Stroke Care	.499
Clinical Care	Cardiac Arrest	.420

Note. Factor loading indicates how strongly each research priority was associated with a specific factor in the exploratory factor analysis. Higher values indicate a stronger relationship. Negative values reflect the statistical direction of the rotated solution and do not indicate lower importance.

Table 3. Final nine-factor framework of paramedicine and EMS research priorities (n = 703).

Factor	Priority domain	Included priorities
1	Operations	Response times; scene times; dispatch triage; spinal immobilization
2	Clinical Governance	Continuing professional development (CPD); career pathways/promotion; clinical feedback; clinical governance; measurement of core competencies
3	Evidence-Based Practice	Evidence-based practice (EBP); paramedic decision-making; clinical supervision/mentorship; outcome of clinical interventions
4	Health and Well-being	Paramedic sleep deprivation/fatigue; paramedic turnover/burnout; shift work/hours; staff health and well-being; staff recruitment and retention; paramedic salary; critical incident stress management (CISM)
5	Special Care (Community Paramedicine)	Non-transportation/non-conveyance; palliative care/end-of-life issues; geriatric/older person care; autonomous paramedic practice; medication prescribing
6	Culture	Diversity, equity, and inclusion in patient care; cultural safety; workplace discrimination
7	Education and Training	Simulation education; standardized paramedic qualifications/curriculum; standardized clinical practice (guidelines/protocols); research training and capacity building
8	Trauma Care	Chest thoracotomy; blood transfusion; fluid resuscitation
9	Clinical Care	Pediatric care; sepsis; obstetric and maternal care; stroke care; cardiac arrest

Table 3 footnote. The final framework reflects the confirmatory factor analysis-informed model after removal of priorities and factors that demonstrated poorer psychometric performance or weaker theoretical fit.

Figure 1. Final nine-factor model of the research priorities (n=703).

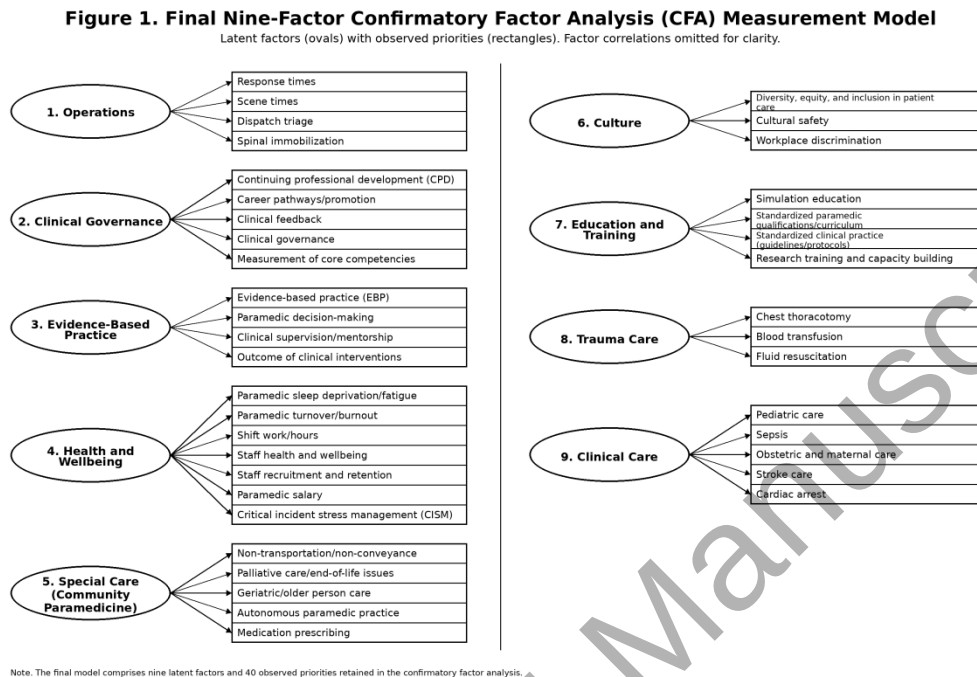


Figure 1 footnote. Ovals represent latent factors and rectangles represent retained research priorities. Arrows indicate the specified relationship between each latent factor and its observed priority items in the final confirmatory factor analysis model.