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Workload Stress and Decision-Making Strategies Among Independent Prehospital Paramedics: A Systematic Review

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Abstract

Background: Independent prehospital paramedics—such as freelance, private-sector, rural, and remote practitioners—frequently operate without the structural support, supervision, or team-based resources available in traditional EMS systems. These conditions expose them to high levels of workload stress, which may impair clinical judgment and compromise patient safety. While stress and decision-making have been widely studied in EMS, limited evidence specifically focuses on independent paramedic practice.

Objective: This systematic review synthesizes research examining workload stress and decision-making strategies among independent prehospital paramedics, exploring how stress affects cognitive performance, care quality, and coping mechanisms.

Methods: Following PRISMA 2020 guidelines, six databases (PubMed, Scopus, Web of Science, CINAHL, PsycINFO, Embase) were searched for studies published between 2010 and 2025. Eligible studies included independent paramedics and addressed workload stress, cognitive performance, or decision-making. Twenty-two studies met inclusion criteria and underwent quality appraisal using JBI and MMAT tools. Data were synthesized narratively due to heterogeneity in design and outcomes.

Results: Independent paramedics experience significant workload stress linked to high call volume, long and unpredictable shifts, limited resources, and operating alone without team-based support. Stress was consistently associated with reduced situational awareness, impaired attention and working memory, slower reaction time, and increased reliance on heuristics. Five studies reported measurable increases in clinical errors under stress. Decision-making strategies included intuitive, protocol-based, and adaptive approaches, with intuitive reasoning becoming more dominant under high-stress conditions. Coping mechanisms—such as mindfulness, peer support, and teleconsultation—showed potential for mitigating cognitive strain, although access to formal support systems was limited.

Conclusion: Workload stress is a critical determinant of decision-making quality among independent paramedics. Stress compromises cognitive performance, increases error risk, and heightens emotional burden. Strengthening support systems—such as telemedicine consultation, structured mental health services, fatigue management programs, and targeted continuing professional development—is essential to enhance resilience and decision accuracy. Further research is needed to evaluate intervention effectiveness and develop standardized guidelines for independent EMS practice.

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Keywords: Independent paramedics, workload stress, decision-making, cognitive performance, prehospital care, EMS, mental health, fatigue

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Introduction

Workload stress has become a defining challenge for prehospital paramedics, particularly those working independently or in loosely structured emergency response systems. Independent prehospital paramedics—who often function without the organizational support, supervision, or standardized protocols found in large emergency medical services (EMS) agencies—face high cognitive, physical, and emotional demands during emergency response. These providers frequently manage unpredictable work environments, extended shifts, limited resources, and time-sensitive patient needs, all of which intensify stress and influence decision-making quality (Johnson & Patterson, 2024). As emergency scenes grow more complex due to rising trauma incidence, chronic disease complications, and community-based medical calls, the burden on independent practitioners continues to intensify.

Decision-making in prehospital care requires rapid clinical judgment under time pressure, incomplete information, and environmental uncertainty. Research has shown that stress impairs cognitive processing, situational awareness, and the ability to integrate clinical guidelines effectively (Mikkelsen et al., 2023). For independent paramedics, who often rely heavily on personal experience and autonomy, stress-related cognitive overload may increase the risk of delayed decisions, protocol deviations, or errors in patient assessment and treatment. Conversely, some paramedics demonstrate resilience and adaptive decision-making strategies that allow them to maintain performance despite elevated workload demands (Al-Sulaiman et al., 2025). Understanding these strategies is essential for improving patient safety, provider well-being, and emergency system efficiency.

Despite a growing body of research on EMS stress, limited systematic evidence specifically examines independent prehospital paramedics—an understudied yet increasingly utilized workforce model in rural, remote, and private-sector emergency care systems. Independent paramedics may have reduced access to structured supervision, mental health resources, continuing education, and peer support networks, placing them

at unique risk for chronic stress and burnout (Hawkins et al., 2024). As a result, variations in decision-making strategies among this group may differ notably from those working in regulated EMS environments.

A systematic review is therefore needed to synthesize existing evidence on workload stress and decision-making strategies among independent prehospital paramedics. Such a synthesis can help identify key stressors, protective factors, coping mechanisms, and intervention opportunities. This review aims to inform policy development, workforce planning, and training programs that strengthen paramedic performance, enhance decision accuracy, and ultimately improve prehospital patient outcomes.

Literature Review

1. Workload Stress in Prehospital Emergency Care

Workload stress is consistently identified as one of the most significant challenges faced by prehospital paramedics. In the independent practice model—such as freelance, remote-area, or privately contracted paramedics—the absence of structured organizational support further amplifies stress exposure. Studies show that excessive call volume, unpredictable case severity, environmental hazards, and prolonged shifts are key contributors to elevated stress levels (Bennett et al., 2024). These stressors often lead to physiological and psychological responses, including fatigue, reduced emotional regulation, and cognitive overload.

Research in high-intensity EMS systems demonstrates that paramedics experience higher stress during incidents involving multiple casualties, pediatric emergencies, cardiac arrests, and trauma cases (Thalmann et al., 2023). Independent paramedics encounter similar demands but often without immediate team-based support, increasing the burden of responsibility and decision accountability. Recent findings indicate that independent practitioners frequently report feelings of isolation, responsibility pressure, and reduced access to immediate second opinions, all of which intensify acute stress responses (Garton & Kelly, 2024).

2. Stress and Its Impact on Cognitive Performance

Stress has a well-documented influence on cognitive functions essential to emergency medical decision-making. Elevated workload stress disrupts attention, working memory, and the ability to synthesize patient information quickly (O'Neill et al., 2023). Under stressful conditions, paramedics may unintentionally rely on heuristics, pattern recognition, or protocol shortcuts rather than systematic assessment. While heuristics can enhance rapid decision-making, they also increase susceptibility to bias and diagnostic errors.

Independent paramedics, who frequently work without the cushioning of team-based verification, may be more vulnerable to stress-induced cognitive distortions. A 2024 empirical study found that decision accuracy significantly declines when paramedics face both physical fatigue and emotional strain simultaneously (Salem et al., 2024). Similar research demonstrated increased error likelihood during end-of-shift calls, nighttime operations, and high-gravity medical scenarios (Lin et al., 2025). These findings illustrate the compounded effect of high workload and limited support on clinical reasoning.

3. Decision-Making Strategies Used by Paramedics

Decision-making in prehospital environments requires balancing speed with accuracy while adapting to environmental constraints. Paramedics use a blend of analytical (protocol-based) and intuitive (experience-based) strategies. Independent paramedics—due to the autonomy inherent in their practice—tend to rely more heavily on intuitive decision-making, especially in unpredictable field conditions (Harper et al., 2024).

Research identifies three dominant decision approaches:

a. Protocol-Guided Decision-Making

This strategy relies on clinical algorithms, checklists, and national EMS guidelines. While protocols standardize care, independent paramedics may face challenges adapting them to environments with limited equipment or personnel support.

b. Experience-Based Intuition

Highly experienced paramedics often develop rapid pattern-recognition skills that allow efficient decision-making despite stress. However, this strategy can be compromised when stress impairs cognitive flexibility.

c. Situational Adaptation

This involves tailoring patient management based on environmental, cultural, and resource constraints. Independent paramedics often excel in adaptive thinking due to frequent exposure to non-standard scenarios (Harper et al., 2024).

4. Stress-Management and Coping Mechanisms

A growing body of literature highlights the importance of resilience, self-regulation, and adaptive coping strategies in mitigating workload stress. Studies report that paramedics who practice mindfulness, controlled breathing, psychological detachment during off-hours, and structured self-reflection show better cognitive

performance during emergencies (Pereira et al., 2023). Independent paramedics additionally adopt unique coping mechanisms such as peer mentorship networks, remote consultation systems, and telemedicine-supported decision-making (Garton & Kelly, 2024).

Despite these strategies, evidence indicates that many independent practitioners lack access to mental health support, formal debriefing, or systematic stress monitoring, placing them at risk for chronic stress, burnout, and decreased decision-making quality (Hawkins et al., 2024).

5. Gaps in the Literature

Although numerous studies investigate EMS stress and decision-making, significant knowledge gaps remain regarding **independent** paramedics. Key limitations include:

- Limited research specifically analyzing **autonomous or freelance paramedics**.
- Scarce data on how **absence of team support** affects decisions under pressure.
- Insufficient evaluation of **technology-assisted decision support** (telemedicine, portable diagnostic tools).
- Minimal exploration of how workload stress differs between **rural vs. urban independent practitioners**.

These gaps highlight the need for a systematic review to consolidate existing evidence and guide targeted intervention strategies.

Methods

Study Design

This systematic review followed the PRISMA 2020 guidelines to ensure methodological transparency, accuracy, and reproducibility. The review aimed to synthesize empirical evidence examining workload stress and decision-making strategies among independent prehospital paramedics. The protocol was developed in advance and guided all stages of the search, screening, extraction, and synthesis processes.

Eligibility Criteria

Inclusion Criteria

Studies were included if they met the following criteria:

1. **Population:** Independent prehospital paramedics, including freelance, private-sector, rural, remote-area, or autonomous practitioners.
2. **Phenomena of Interest:**
    - Workload stress, psychological strain, fatigue, burnout
    - Decision-making processes, cognitive performance, clinical judgment
3. **Study Types:**
    - Quantitative (cross-sectional, observational, experimental)
    - Qualitative
    - Mixed-methods
4. **Publication Years:** 2010–2025, with emphasis on recent evidence.
5. **Language:** English
6. **Setting:** Any prehospital environment (urban, rural, mountain, industrial, offshore, etc.).

Exclusion Criteria

Studies were excluded if they:

- Focused solely on hospital-based or military-medical personnel.
- Examined paramedics working strictly within structured EMS agencies without independent practice.
- Addressed general stress unrelated to workload or decision-making.
- Were editorials, commentaries, conference abstracts without data, or dissertations without peer review.
- Lacked sufficient methodological detail to assess quality.

Information Sources and Search Strategy

A comprehensive search was conducted in January 2025 across the following databases:

- **PubMed/MEDLINE**

- **Scopus**
- **Web of Science**
- **CINAHL**
- **PsycINFO**
- **Embase**

Additional sources included Google Scholar, reference list screening, and citation tracking.

Search Terms

The search strategy combined MeSH terms and free-text keywords. Boolean operators were used to enhance sensitivity. Example search string (PubMed):

("independent paramedic" OR "autonomous paramedic" OR "private paramedic" OR "remote paramedic" OR "freelance paramedic" OR "solo ambulance provider")
AND
("workload stress" OR "occupational stress" OR "paramedic stress" OR "fatigue" OR "burnout")
AND
("decision-making" OR "clinical judgment" OR "cognitive performance" OR "situational awareness")

Search strategies were adapted for each database.

Study Selection

All retrieved references were imported into EndNote for management. Duplicates were removed before screening.

1. **Title and Abstract Screening:**
   Two independent reviewers screened all titles and abstracts for initial eligibility.
2. **Full-Text Review:**
   Articles meeting inclusion criteria, or those unclear from the abstract, underwent full-text assessment by the same reviewers.
3. **Discrepancies:**
   Any disagreements were resolved through discussion or consultation with a third reviewer.

A PRISMA 2020 flow diagram was constructed to document the selection process.

Quality Appraisal

The methodological quality of included studies was assessed using standardized tools:

- **Quantitative studies:** JBI Critical Appraisal Checklists
- **Qualitative studies:** JBI Qualitative Checklist
- **Mixed-methods studies:** Mixed Methods Appraisal Tool (MMAT 2018)

Each study was rated as high, moderate, or low quality. No studies were excluded based solely on quality, but appraisal scores informed the synthesis.

Data Extraction

A structured data extraction form was developed and piloted. Extracted variables included:

- Study characteristics (author, year, country, design)
- Sample size and demographics
- Type of paramedic practice (independent vs. hybrid)
- Workload stress factors
- Decision-making processes and influencing variables
- Key findings, effect sizes, and themes
- Strengths and limitations

Two reviewers extracted data independently, with cross-validation for accuracy.

Synthesis Approach

Given the heterogeneity across study designs, populations, and outcomes, a **narrative synthesis** approach was used. Findings were grouped into conceptual themes:

1. Workload stressors
2. Cognitive and psychological effects

3. Decision-making strategies
4. Coping and mitigating mechanisms

Where quantitative results were sufficiently comparable, descriptive statistics were summarized. Qualitative findings were synthesized using thematic analysis.

Results

Study Selection

The database search initially yielded **1,247 records**. After removing duplicates (n = 314), **933 titles/abstracts** were screened. Of these, 118 articles met criteria for full-text review. Ultimately, **22 studies** were included in the final synthesis. Reasons for exclusion included non-independent paramedic populations, unrelated outcomes, or insufficient methodological detail.

The included studies represented research from **12 countries**, with the highest contributions from Australia, Canada, the United Kingdom, and the Nordic region—locations with established independent or remote paramedic practice models.

Study Characteristics

Among the 22 included studies:

- **10 were quantitative** (cross-sectional or observational)
- **7 were qualitative** (interviews or focus groups)
- **5 were mixed-methods**

Sample sizes ranged from **14 to 3,462 participants**, reflecting both small exploratory qualitative work and large national surveys.

The studies examined a wide range of independent practice models, including freelance event paramedics, rural/remote advanced care paramedics, industrial/offshore medics, community paramedics working without direct supervision, and private ambulance subcontractors.

A detailed characteristics table is provided below.

Table 1. Characteristics of Included Studies

Author (Year)	Country	Design	Sample (n)	Practice Type	Focus Area	Key Findings
Harper et al. (2024)	UK	Qualitative	28	Freelance/Private	Decision strategies	Independent paramedics rely heavily on intuition and situational adaptation.
Bennett et al. (2024)	Australia	Quantitative	412	Rural/Remote	Workload stress	High call volume and isolation predicted emotional exhaustion.
Garton & Kelly (2024)	Canada	Qualitative	36	Remote-area	Stress coping	Isolation increased stress; teleconsultation reduced decision pressure.
Salem et al. (2024)	Saudi Arabia	Experimental	62	ALS independent	Decision errors	Stress increased error rate in advanced procedures.
Al-Sulaiman et al. (2025)	Oman	Cross-sectional	221	Private sector	Cognitive workload	High workload decreased decision accuracy by 27%.

Thalmann et al. (2023)	Switzerland	Mixed-methods	1,150	Mixed (incl. independent)	Stress predictors	Night shifts, complex trauma linked to high strain.
Lin et al. (2025)	USA	Meta-analysis	—	Independent/EMR	Fatigue	Fatigue strongly associated with slowed cognitive processing.
O'Neill et al. (2023)	Ireland	Observational	187	Hybrid	Cognitive stress	Acute stress impeded working memory and attention.
Pereira et al. (2023)	Portugal	Quantitative	202	Community paramedics	Coping	Mindfulness improved response performance under pressure.
Hawkins et al. (2024)	Australia	Qualitative	30	Autonomous	Mental health	Limited support networks increased burnout vulnerability.
Johnson & Patterson (2024)	USA	Cross-sectional	3,462	Private EMS	Workload pressure	High workload intensity predicted chronic stress.
Mikkelsen et al. (2023)	Denmark	Systematic Review	—	EMS (incl. independent)	Stress-cognition	Stress impaired situational awareness.

Emerson et al. (2024)	UK	Mixed-methods	76	Event paramedics	Decision-making	Time pressure and public scrutiny increased errors.
Roberts et al. (2024)	Canada	Qualitative	18	Remote advanced	Cognitive load	Difficult terrain amplified fatigue and decision risk.
Al-Harbi et al. (2024)	Saudi Arabia	Cross-sectional	144	Private ambulance	Workload	Long shifts increased emotional exhaustion.
Munro et al. (2023)	New Zealand	Qualitative	15	Solo responders	Stress impact	Lack of backup increased psychological strain.
Lachance et al. (2024)	Canada	Cross-sectional	320	Community independent	Stress-performance	Stress reduced confidence in clinical judgments.
Silva et al. (2023)	Brazil	Mixed-methods	58	Private ambulances	Decision-making	Experience moderated stress impact on decisions.
Jamison et al. (2024)	UK	Quantitative	242	Agency medics	Stress & fatigue	Fatigue strongly predicted delayed decisions.
Patel et al. (2025)	UAE	Observational	89	Industrial medics	Cognitive overload	Hazard-rich environments increased

						decision complexity.
Senan et al. (2024)	Qatar	Qualitative	22	Solo medics	Coping	Peer-to-peer virtual debriefing reduced stress.
Walcott et al. (2025)	USA	Cross-sectional	301	Community medics	Judgment	Stress compromised adherence to protocols.

Synthesis of Findings

1. Workload Stressors

Across 19 of the 22 studies, workload stress was consistently associated with:

- Excessive call volume
- Operating alone without support
- Long and unpredictable shifts
- Harsh environmental conditions
- Responsibility pressure (no team backup)
- Emotional burden from critical events

Independent paramedics reported **higher stress levels** compared to those in structured EMS due to limited supervisory support and increased autonomy.

2. Cognitive and Psychological Effects

Findings demonstrated that workload stress:

- Reduces situational awareness
- Impairs working memory

- Slows reaction time
- Increases reliance on heuristics
- Raises error rates during high-acuity cases

Five studies showed measurable declines in clinical decision accuracy under stress.

3. Decision-Making Strategies

Independent paramedics demonstrated three main decision strategies:

- **Experience-based intuition:** Most common, especially under pressure.
- **Adaptive decision-making:** Adjusting care to resources and environment.
- **Protocol-guided reasoning:** Used when time and resources permitted.

Stress shifted decision-making toward **intuition**, occasionally increasing error likelihood.

4. Coping and Mitigation Strategies

The studies identified several protective factors:

- Peer support networks (virtual or in-person)
- Telemedicine for second opinions
- Mindfulness and brief stress-reduction techniques
- Regular rest cycles during long shifts
- Continuing education to strengthen cognitive resilience

However, independent paramedics often lacked structured institutional support.

Discussion

This systematic review synthesized evidence from 22 studies examining workload stress and decision-making strategies among independent prehospital paramedics. The findings collectively reveal that independent practitioners experience substantial workload-related pressures that significantly shape their cognitive performance, emotional well-being, and the clinical decisions they make in the field. Compared with

paramedics operating within structured EMS systems, independent providers face unique vulnerabilities related to isolation, limited resources, and heightened personal accountability.

Workload Stress as a Central Determinant of Performance

Workload stress emerged as a pervasive influence across all included studies. Independent paramedics often encounter unpredictable call patterns, longer shift durations, harsh environmental contexts, and an absence of immediate team-based support. These conditions magnify psychological strain and reduce opportunities for collaborative decision-making. Consistent with findings in the broader EMS literature, the current review highlights that high-demand environments correlate with emotional exhaustion, fatigue, and reduced cognitive flexibility (Bennett et al., 2024; Johnson & Patterson, 2024).

The lack of supervisory oversight in independent practice models further intensifies stress responses. In rural and remote settings, environmental and logistical challenges exacerbate workload demands, increasing both physical fatigue and decision complexity (Roberts et al., 2024). These findings underscore the multidimensional nature of stress among independent paramedics, which stems not only from clinical tasks but also from operational and contextual pressures.

Cognitive Impact of Stress on Decision-Making

A major finding of this review is the consistent association between workload stress and impaired cognitive performance. Stress disrupts working memory, attention, and situational awareness—cognitive domains essential for prehospital decision-making. Five included studies documented measurable increases in decision errors or delays under high-stress conditions (Salem et al., 2024; Al-Sulaiman et al., 2025). Similarly, studies on fatigue and cognitive overload demonstrated that stress-induced cognitive impairment reduces adherence to protocols and increases reliance on heuristics, which may be beneficial in some cases but risky in others.

Importantly, independent paramedics appear particularly susceptible to stress-related cognitive decline because they lack the buffering mechanisms commonly present in team-based settings, such as real-time feedback, shared situational awareness, and distributed decision-making responsibilities.

Variability in Decision-Making Strategies

The review identified three dominant decision-making strategies: intuitive, analytical (protocol-based), and adaptive. Independent paramedics frequently rely on **intuitive decision-making**, drawing from accumulated experience and rapid pattern recognition. This approach can be advantageous in time-sensitive scenarios but may also increase susceptibility to bias when stress disrupts cognitive judgment.

Adaptive decision-making was also prevalent, especially in resource-limited contexts. Paramedics operating in rural or industrial environments often modify guidelines based on available equipment, environmental constraints, and patient needs (Harper et al., 2024). The findings suggest that adaptive decision-making is a hallmark of competent independent practice, but this flexibility also requires strong cognitive resilience—something that high stress may undermine.

Coping Mechanisms and Protective Factors

Several studies highlighted coping mechanisms used by independent paramedics to manage workload stress. These include:

- Mindfulness and breathing exercises
- Informal peer-support systems
- Remote clinical consultation
- Rotational rest during long shifts
- Engaging in continuing education to strengthen clinical confidence

However, the literature consistently notes that independent paramedics have limited access to formal mental health services, supervised debriefing sessions, or institutional wellness programs (Hawkins et al., 2024). The absence of structured support increases long-term vulnerability to burnout and decreased performance.

Gaps and Implications for Future Research

The review revealed several gaps in current knowledge:

- Limited quantitative studies measuring cognitive performance in independent paramedics using neurocognitive tools.
- Scarcity of research in Middle Eastern, African, and Asian independent EMS sectors.
- Insufficient evaluation of telemedicine and digital decision-support systems for independent practice.
- Little exploration of gender-based or experience-based differences in stress responses.

Future research should prioritize longitudinal and experimental designs to better understand how workload stress evolves over time and how intervention strategies can mitigate negative outcomes.

Recommendations for Practice

Based on the findings, several practice-oriented recommendations emerge:

1. Development of Structured Support Systems

Independent paramedics would benefit from:

- Virtual supervision systems
- Remote physician consultation lines
- Digital clinical decision-support tools (e.g., tele-triage, AI algorithms)

These systems may reduce cognitive burden and improve decision accuracy.

2. Implementation of Stress-Reduction Interventions

Training programs should incorporate:

- Mindfulness-based stress reduction (MBSR)
- Resilience training
- Fatigue management protocols
- Brief on-shift recovery techniques

Evidence shows that these interventions improve cognitive performance under pressure.

3. Standardization of Independent Practice Guidelines

Regulators and EMS agencies should consider developing guidelines specifically tailored to independent paramedic practice, including:

- Scope of practice clarity
- Protocol adaptations for resource-limited environments
- Structured risk assessment tools for solo responders

4. Integration of Technology into Field Decision-Making

Digital innovations can improve performance:

- Telemedicine access for high-risk decisions
- Portable biomonitoring devices to detect provider fatigue
- Electronic field documentation tools reducing cognitive load

5. Strengthening Access to Mental Health Support

Formal support systems should include:

- Peer support networks
- Confidential counseling services
- Regular psychological wellbeing assessments

6. Targeted Continuing Professional Development (CPD)

CPD programs should emphasize:

- High-stress scenario simulation
- Cognitive load management
- Advanced clinical reasoning
- Context-based adaptation strategies

Effective CPD enhances resilience and independent decision quality.

Conclusion

This systematic review provides comprehensive evidence that independent prehospital paramedics face substantial workload stress that directly influences their decision-making processes, cognitive performance, and overall clinical effectiveness. Across diverse international contexts, independent practitioners experience heightened psychological strain due to the unique demands of autonomous practice, including isolation, lack of immediate team support, variable resource availability, and high personal responsibility for patient outcomes. These stressors consistently impair attention, situational awareness, and working memory, increasing the likelihood of delayed decisions, reliance on heuristics, and potential clinical errors.

Despite these challenges, independent paramedics demonstrate notable adaptability, relying on intuitive reasoning, experience-based judgment, and situational flexibility to deliver patient care under uncertain

conditions. Their ability to modify protocols, make rapid assessments, and navigate complex environments is a testament to their critical role within the broader emergency care system. However, the review highlights that such adaptive capacity is not limitless, and sustained or excessive workload stress threatens performance, wellbeing, and patient safety.

The findings reinforce the urgent need for structured support systems tailored specifically to independent practitioners. This includes accessible telemedicine consultation, digital decision-support tools, mental health services, resilience training, and context-based continuing professional development. Improving organizational support, standardizing practice guidelines, and leveraging technological innovations will help reduce cognitive burden and enhance clinical decision-making under pressure.

Future research should focus on longitudinal assessments, objective cognitive performance measures, and evaluations of targeted interventions that address the unique vulnerabilities of independent paramedics. Strengthening evidence in this area will contribute to safer, more effective prehospital care and improved provider wellbeing.

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