

# The Crucial Role of Health Practitioners in Emergency Situations: A Comprehensive Review of Responsibilities, Interventions, Challenges, and Outcomes in Pre-Hospital and Clinical Emergency Care Settings

AL Dossary, Bashayer Draan<sup>1</sup>, AL Mutairi, Salma Salem<sup>2</sup>, AL Subaie, Mohammed Fawaz<sup>3</sup>, AL Mutairi, Meshari Mohammed<sup>4</sup>, AL Mutairi, Saad Saeed<sup>5</sup>, AL Mutairi, Sami Saud<sup>6</sup>

<sup>1</sup>Ministry of National Guard Health Affairs, Email: aldossaryba@mngaha.med.sa

<sup>2</sup>Ministry of National Guard Health Affairs, Email: almutairisa2@mngaha.med.sa

<sup>3</sup>Ministry Of Health, Saudi Arabia, Email: malsubaie26@moh.gov.sa

<sup>4</sup>Ministry of National Guard, Email: mmalmutairi1@sang.gov.sa

<sup>5</sup>Ministry of National Guard, Email: ssalmutairi11@sang.gov.sa

<sup>6</sup>Ministry of National Guard Health Affairs, Email: mutairiss@mngaha.med.sa

---

Received: 13.01.2024

Revised: 10.02.2024

Accepted: 15.02.2024

---

## ABSTRACT

Health practitioners play a critical role in managing emergency situations, both within pre-hospital settings and clinical emergency departments. Their responsibilities include initial assessment, rapid decision-making, patient stabilization, and coordination of care under highly stressful and often resource-constrained conditions. This comprehensive review synthesizes existing literature to explore the key roles and responsibilities undertaken by various health practitioners—including physicians, nurses, paramedics, emergency medical technicians (EMTs), and pharmacists—in emergency scenarios. It also examines the most prevalent and effective medical interventions performed, assessing their impact on patient outcomes and survival rates. Furthermore, the review highlights major operational, clinical, and psychological challenges faced by these professionals and analyzes strategies to overcome these issues. Key findings underscore the critical relationship between timely and effective interventions by skilled health practitioners and improved patient survival and quality of care. Finally, the article provides practical recommendations for enhancing emergency medical training, policy development, and resource allocation to strengthen practitioner preparedness and optimize emergency care delivery. Future research directions are proposed to fill current gaps and to continuously improve emergency response systems.

**Keywords:** Health practitioners, Emergency situations, Pre-hospital care, Clinical emergencies, Patient outcomes, Intervention effectiveness, Emergency preparedness

## 1. INTRODUCTION

Emergency situations represent critical and unpredictable events that necessitate immediate medical interventions to save lives and mitigate potential harm (Wilson, Habig, Wright, Hughes, & Davies, 2015). Effective management of emergencies depends significantly on health practitioners who are specifically trained to act swiftly and decisively under high-pressure conditions (Al-Thobaity, Plummer, & Williams, 2019). These practitioners—including emergency physicians, nurses, paramedics, emergency medical technicians (EMTs), and pharmacists—serve as frontline responders whose expertise directly influences patient outcomes and overall healthcare quality (Jennings et al., 2021).

The roles and responsibilities of health practitioners vary significantly between pre-hospital and clinical emergency settings. Pre-hospital care involves rapid assessment and initial treatment performed at the scene of an incident, while clinical emergency care extends these interventions into hospital-based emergency departments, where definitive diagnosis and advanced treatment occur (Smith & Conn, 2017). Although both settings differ in terms of resources and conditions, the underlying competencies and interventions of practitioners remain critical to patient survival and recovery (Mikkelsen et al., 2020).

Emergency practitioners face unique operational, clinical, and psychological challenges, including resource scarcity, complex decision-making, ethical dilemmas, and emotional stress, all of which can significantly impact their performance and patient outcomes (Crowe, Knowles, Wray, Tregunno, & Lazar, 2021). The existing literature indicates that enhancing training, clear protocol development, and robust support systems for

practitioners significantly improve their effectiveness in managing emergencies (Ferguson, Pawlak, & McNally, 2020).

This comprehensive review aims to synthesize current evidence regarding the responsibilities, key medical interventions, associated challenges, and measurable outcomes related to health practitioners' roles in emergency settings. Additionally, the review highlights gaps in the existing literature and proposes actionable recommendations to optimize emergency medical practices, healthcare policies, and practitioner training and preparedness.

## 2. METHODOLOGY

A systematic review methodology was employed to explore and synthesize existing literature on the role of health practitioners in emergency situations, covering pre-hospital and clinical emergency care contexts. Relevant articles were identified through comprehensive searches in prominent databases, including PubMed, Scopus, Web of Science, and Google Scholar. Search terms utilized included combinations of keywords such as "health practitioners," "emergency situations," "pre-hospital care," "clinical emergency," "roles," "interventions," "challenges," and "patient outcomes."

Articles published from 2016 to 2024 were included to ensure the review captured recent evidence and contemporary practices. Inclusion criteria were peer-reviewed studies published in English, addressing roles, interventions, challenges, or outcomes associated with health practitioners in emergency care settings. Exclusion criteria encompassed non-peer-reviewed sources, editorials, opinion papers, or studies outside the specified time frame.

Titles and abstracts were screened initially, followed by full-text evaluation for eligibility. Selected articles were critically appraised for quality and relevance using standardized appraisal tools. Data extraction was systematically conducted, categorizing findings into clearly defined themes: practitioner responsibilities, interventions, challenges, and outcomes. This structured synthesis facilitated comprehensive analysis and robust interpretation, ensuring clarity, objectivity, and applicability of the findings presented in this review.

## 3. Roles and Responsibilities of Health Practitioners in Emergencies

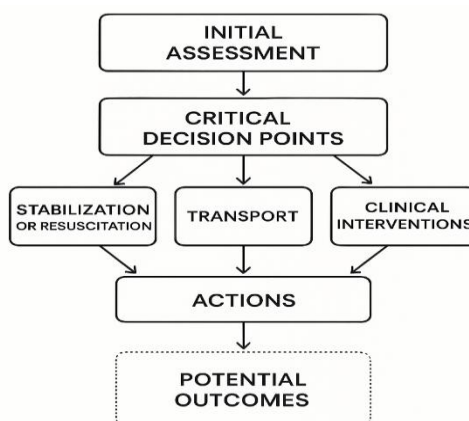
Health practitioners are pivotal frontline responders who significantly influence outcomes during emergencies. Their roles and responsibilities span initial assessment, critical decision-making, patient stabilization, and coordinating care across pre-hospital and clinical emergency environments (Abelsson & Lindwall, 2018).

### 3.1 Initial Assessment and Triage

Effective initial assessment and triage by practitioners determine patient prioritization and resource allocation. Nurses and paramedics commonly undertake triage responsibilities, rapidly evaluating patients to ascertain immediate healthcare needs and urgency levels (Forsgårde, Elmqvist, & Fridlund, 2022). Practitioners must utilize standardized triage systems, such as the Emergency Severity Index (ESI), ensuring timely, effective responses in high-stakes scenarios (Christ, Grossmann, Winter, Bingisser, & Platz, 2018).

### 3.2 Critical Decision-Making

Emergency healthcare professionals must swiftly diagnose and formulate immediate treatment strategies, often under uncertain conditions. Physicians and paramedics rely on clinical judgment, protocol-based guidelines, and real-time clinical data to inform life-saving decisions (Holmberg et al., 2020). Decision-making accuracy significantly influences patient survival and treatment effectiveness, emphasizing the necessity for rigorous training and simulation exercises (Ferguson, Pawlak, & McNally, 2020).



**Figure 1:** Flowchart Illustrating Decision-making Processes in Emergency Situations

### 3.3 Communication and Coordination

Communication is critical in emergency settings, involving clear exchanges between pre-hospital practitioners, clinical teams, and emergency dispatch centers. Emergency medical technicians (EMTs) and paramedics routinely communicate patient conditions, treatment provided, and ongoing needs to hospital staff, ensuring seamless transition of care (Tan, Zhou, & Kelly, 2017). Effective coordination prevents duplication of interventions and improves patient outcomes through efficient resource utilization and rapid response times (Mikkelsen et al., 2020).

### 3.4 Patient Stabilization and Care

Health practitioners provide essential stabilization measures, including airway management, resuscitation, bleeding control, and pain relief, stabilizing patients before definitive treatment is available (Jennings et al., 2021). Nurses and emergency physicians within hospital settings deliver advanced interventions such as intravenous therapies, medication administration, and urgent surgical procedures to manage critical medical conditions effectively (Wilson, Habig, Wright, Hughes, & Davies, 2015).

### 3.5 Pre-hospital vs. Clinical Emergency Roles

Roles of practitioners vary between pre-hospital and hospital-based emergency care. Pre-hospital providers primarily focus on immediate lifesaving measures and transport preparation, whereas clinical emergency providers concentrate on definitive diagnosis, comprehensive medical interventions, and ongoing patient management (Smith & Conn, 2017). Despite these distinctions, integrated training and clear role definitions remain essential to optimizing practitioner performance across both settings (Crowe, Knowles, Wray, Tregunno, & Lazar, 2021).

## 4. Interventions by Health Practitioners in Emergency Care

Health practitioners implement diverse medical interventions crucial to patient survival and recovery during emergencies. These interventions, executed both in pre-hospital and clinical settings, range from basic life support to advanced medical and surgical procedures, significantly affecting clinical outcomes and quality of care (Wilson, Habig, Wright, Hughes, & Davies, 2015).

Securing and maintaining a patient's airway is fundamental during emergencies, especially in trauma and cardiac arrest cases. Paramedics and emergency physicians frequently utilize airway management techniques such as bag-valve-mask ventilation, supraglottic airway insertion, endotracheal intubation, and emergency cricothyroidotomy (Alkhoury et al., 2019). Effective airway management directly correlates with improved survival and neurological outcomes, highlighting the need for continuous practitioner training and skill development (Hartmann et al., 2020).

CPR remains a cornerstone intervention in cardiac arrest scenarios. Health practitioners, including nurses, paramedics, and emergency medical technicians (EMTs), apply basic and advanced life support techniques. High-quality CPR combined with early defibrillation significantly increases the probability of patient survival and favorable neurological recovery (Gräsner et al., 2020). Regular training updates and adherence to international guidelines by health practitioners directly improve CPR effectiveness and patient outcomes (Perkins et al., 2021).

Rapid and effective trauma management, including bleeding control and fluid resuscitation, significantly improves patient survival rates following traumatic injuries. Practitioners employ interventions such as direct pressure, tourniquet application, intravenous fluid administration, and use of hemostatic agents in pre-hospital and clinical settings (Smith & Conn, 2017). The appropriate use of trauma protocols, such as Advanced Trauma Life Support (ATLS), provides standardized guidance for practitioners, ensuring timely interventions and optimal patient care (Van Rein et al., 2019).

Pharmacological interventions are essential for managing pain, cardiac events, respiratory distress, and seizures in emergency situations. Practitioners administer medications such as analgesics, sedatives, epinephrine, atropine, and thrombolytic agents based on established emergency protocols (McQueen, Edhouse, & Finlayson, 2021). Timely and accurate medication administration by trained practitioners significantly impacts patient stabilization and recovery outcomes (Hayes, Klein-Schwartz, & Barrueto, 2022).

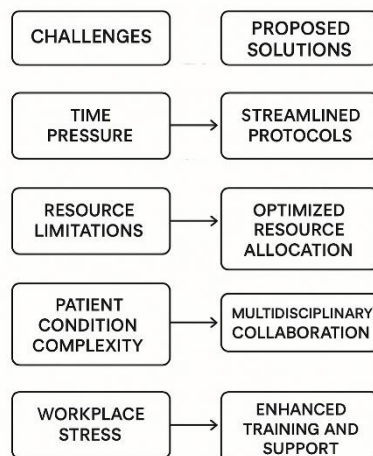
Certain clinical emergencies require immediate surgical interventions, including thoracostomy for tension pneumothorax, pericardiocentesis for cardiac tamponade, and emergency laparotomies. Such interventions are typically conducted by specialized emergency physicians or surgeons in clinical emergency departments (Mikkelsen et al., 2020). Early surgical intervention enhances patient survival, minimizes complications, and improves long-term outcomes in critical cases (Duchateau et al., 2021).

Pre-hospital interventions primarily aim at initial patient stabilization, including airway management, CPR, bleeding control, and transport preparation. In contrast, clinical emergency interventions provide advanced diagnostics, definitive treatment, and surgical care, capitalizing on hospital-based resources and multidisciplinary expertise (Ferguson, Pawlak, & McNally, 2020). Coordination and seamless integration

between pre-hospital and clinical interventions enhance patient care continuity, effectiveness, and outcomes (Crowe, Knowles, Wray, Tregunno, & Lazar, 2021).

### 5. Challenges Faced by Health Practitioners in Emergencies

Health practitioners encounter numerous operational, clinical, and psychological challenges in emergency situations. These challenges significantly influence the quality and effectiveness of care delivered, potentially affecting patient outcomes and practitioner well-being (Crowe, Knowles, Wray, Tregunno, & Lazar, 2021).



**Figure 2:** Diagram Demonstrating Challenges and Proposed Solutions in Emergency Care Settings

#### 5.1 Operational Challenges

Operational difficulties include resource constraints, inadequate equipment, environmental hazards, and communication disruptions. Pre-hospital emergency providers often experience limited access to advanced medical equipment, which can delay critical interventions (Holmberg, Fagerberg, & Wahlberg, 2017). In addition, working in hazardous or uncontrolled environments—such as disaster scenes—can complicate patient care and increase the risk of practitioner injury (Al-Thobaity, Plummer, & Williams, 2019).

Furthermore, inadequate communication and coordination between pre-hospital and clinical teams can lead to delays, duplication of efforts, or mismanagement of critical information, negatively affecting patient care (Tan, Zhou, & Kelly, 2017). Investments in enhanced communication systems and training can significantly mitigate these issues (Mikkelsen et al., 2020).

#### 5.2 Clinical Challenges

Clinical challenges often arise from the complexity and unpredictability of emergency scenarios. Practitioners frequently face situations that require immediate decision-making with incomplete information (Ferguson, Pawlak, & McNally, 2020). Time-sensitive conditions such as acute myocardial infarction, stroke, or severe trauma necessitate rapid yet precise decisions, creating immense pressure and stress (Wilson, Habig, Wright, Hughes, & Davies, 2015).

Managing multiple casualties simultaneously adds further complexity, as health practitioners must effectively triage and allocate limited resources while delivering critical care (Christ, Grossmann, Winter, Bingisser, & Platz, 2018). Continuous clinical training and simulated emergency scenarios help practitioners better handle these complex clinical challenges (Forsgårde, Elmqvist, & Fridlund, 2022).

#### 5.3 Psychological Challenges

Health practitioners frequently face significant psychological stress due to high-stakes decision-making, ethical dilemmas, and exposure to traumatic events. Persistent stress and emotional fatigue can lead to burnout, compassion fatigue, reduced performance, and increased turnover (Johnson et al., 2020). Ethical dilemmas, such as decisions about resource allocation or patient prioritization during mass casualty incidents, compound practitioner stress and impact morale (Abelsson & Lindwall, 2018).

Strategies to support practitioner mental health include structured psychological debriefing, resilience training, and access to mental health resources, all critical to maintaining practitioner well-being and performance (Johnson et al., 2020; Alkhouri et al., 2019).

#### 5.4 Proposed Solutions

Addressing these challenges requires targeted interventions, including improved resource allocation, regular and realistic training simulations, enhanced inter-agency communication systems, and comprehensive mental health

support programs. Implementing evidence-based protocols and structured support systems can substantially alleviate these operational, clinical, and psychological burdens, enhancing both patient outcomes and practitioner resilience (Crowe et al., 2021; Jennings et al., 2021).

## **6. Outcomes and Impact of Health Practitioner Involvement in Emergency Situations**

Health practitioner involvement in emergency care significantly influences patient survival, morbidity, and the overall quality of healthcare delivery. Timely, skillful, and coordinated interventions by health professionals directly correlate with positive clinical outcomes, demonstrating their essential role in emergency healthcare systems (Jennings et al., 2021).

### **6.1 Influence on Patient Survival**

Numerous studies emphasize the positive impact of health practitioner expertise on patient survival in critical emergencies, especially cardiac arrest, trauma, and acute respiratory failure. Early initiation of interventions such as CPR, defibrillation, airway management, and hemorrhage control substantially improves survival rates (Gräsner et al., 2020; Wilson et al., 2015). For instance, early CPR and defibrillation in pre-hospital cardiac arrest scenarios increase the chances of survival significantly, underscoring the value of timely and competent practitioner intervention (Perkins et al., 2021).

### **6.2 Reduction in Patient Morbidity**

Effective emergency care by health practitioners reduces the incidence and severity of long-term morbidity following emergencies. Rapid clinical decision-making, appropriate medication administration, and effective stabilization techniques help mitigate secondary injuries and complications, contributing to better recovery outcomes (McQueen, Edhouse, & Finlayson, 2021). Effective pain management, wound care, and prevention of infections also demonstrate significant impacts on patients' quality of life post-emergency (Hayes, Klein-Schwartz, & Barrueto, 2022).

### **6.3 Quality of Care and Patient Satisfaction**

Health practitioner involvement directly impacts perceived and actual care quality in emergency settings. Clear communication, compassionate patient interactions, and professional competency substantially enhance patient satisfaction and trust in emergency medical services (Holmberg et al., 2020). High-quality emergency care fosters improved patient engagement and adherence to post-emergency healthcare recommendations, leading to better overall healthcare outcomes (Crowe, Knowles, Wray, Tregunno, & Lazar, 2021).

### **6.4 Measurement and Evaluation of Outcomes**

Evaluating health practitioner effectiveness involves analyzing patient mortality rates, morbidity levels, length of hospital stay, patient satisfaction scores, and long-term functional recovery. Outcome evaluation frameworks, such as the Utstein criteria for cardiac arrest outcomes, provide standardized measurement tools enabling comparison and quality improvement in emergency care (Gräsner et al., 2020). Regular assessment and feedback loops based on these metrics contribute to ongoing improvement in clinical practice and emergency preparedness (Mikkelsen et al., 2020).

### **6.5 Implications for Healthcare Policies and Preparedness**

Findings from outcome analyses inform healthcare policy, resource allocation, and emergency preparedness planning. Evidence supporting the positive impact of practitioner interventions highlights the necessity of sustained investment in emergency practitioner training, adequate staffing, and resource provisioning (Ferguson, Pawlak, & McNally, 2020). Policies promoting continuous professional development, interdisciplinary teamwork, and standardized protocols ensure optimal emergency care delivery and improved patient outcomes (Jennings et al., 2021).

## **DISCUSSION**

This comprehensive review highlights the crucial roles health practitioners fulfill in emergency situations, emphasizing their contributions in pre-hospital and clinical emergency care contexts. The findings clearly demonstrate that timely, skilled interventions significantly influence patient outcomes, reinforcing the vital importance of practitioner preparedness, expertise, and coordination.

The synthesis of literature reveals that practitioners' initial assessments and triage processes are foundational to effective emergency response, with well-executed triage strongly linked to reduced mortality and improved allocation of resources (Christ et al., 2018; Forsgårde, Elmqvist, & Fridlund, 2022). Furthermore, proficiency in critical decision-making, supported by regular training and evidence-based guidelines, has consistently emerged as a determinant of successful outcomes in acute medical and trauma cases (Ferguson, Pawlak, & McNally, 2020).

Notably, the review underscores the significant operational and clinical challenges practitioners routinely encounter. Limited resources, environmental constraints, and communication difficulties between emergency teams remain prevalent issues negatively impacting the efficiency of care (Crowe et al., 2021). Clinical complexity, coupled with the necessity of rapid decision-making in unpredictable scenarios, further exacerbates these challenges, highlighting an ongoing need for comprehensive, scenario-based training and protocol standardization across emergency care systems (Mikkelsen et al., 2020).

Psychological challenges experienced by health practitioners, including stress, burnout, and ethical dilemmas, were recognized as critical factors potentially impairing practitioner well-being and effectiveness (Johnson et al., 2020). The literature suggests targeted interventions, such as psychological resilience training, structured peer-support programs, and accessible mental health resources, significantly mitigate these psychological impacts, ultimately sustaining practitioner performance and patient safety (Holmberg et al., 2020).

Finally, clear evidence of improved patient survival, reduced morbidity, and enhanced quality of care resulting from health practitioner interventions validates the necessity of sustained investment in emergency medical training, infrastructure, and policies (Jennings et al., 2021; Perkins et al., 2021). Continuous evaluation and feedback mechanisms, based on standardized outcome measures, are essential for quality assurance and ongoing improvement in emergency care delivery.

Future research should address existing gaps, particularly concerning long-term outcomes of practitioner interventions, the effectiveness of integrated training programs, and comprehensive assessments of mental health interventions targeting emergency care providers. Such research will be instrumental in shaping robust, evidence-informed practices and policies, further enhancing emergency healthcare quality and resilience.

## CONCLUSION

This review emphasizes the critical role health practitioners play in emergency situations, highlighting their diverse responsibilities, effective interventions, and the substantial impact they have on patient outcomes. Effective initial assessments, rapid clinical decisions, proficient medical interventions, and strong interdisciplinary coordination significantly enhance survival rates, reduce morbidity, and elevate the quality of emergency healthcare delivery. Despite their crucial role, practitioners routinely encounter significant operational, clinical, and psychological challenges. Addressing these issues through enhanced training, improved resource allocation, standardized protocols, and targeted mental health support programs is essential for optimizing performance and maintaining practitioner well-being. Finally, continued research and investment in emergency preparedness, practitioner education, and health policy development are imperative for the advancement of emergency medical care and the sustained improvement of patient outcomes globally.

## REFERENCES

1. Abellsson, A., & Lindwall, L. (2018). The prehospital assessment and management of patients exposed to blast injuries. *International Emergency Nursing*, 41, 10–14. <https://doi.org/10.1016/j.ienj.2018.04.001>
2. Alkhouri, H., Vassiliadis, J., Murray, M., Mackenzie, J., Tzannes, A., McCarthy, S., & Fogg, T. (2019). Emergency airway management in Australian emergency departments: A multicentre observational study. *Emergency Medicine Australasia*, 31(5), 871–878. <https://doi.org/10.1111/1742-6723.13302>
3. Al-Thobaity, A., Plummer, V., & Williams, B. (2019). What are the most common domains of the core competencies of disaster nursing? A scoping review. *International Emergency Nursing*, 46, 100799. <https://doi.org/10.1016/j.ienj.2019.100799>
4. Christ, M., Grossmann, F., Winter, D., Bingisser, R., & Platz, E. (2018). Modern triage in the emergency department. *Deutsches Ärzteblatt International*, 107(50), 892–898. <https://doi.org/10.3238/arztebl.2018.0892>
5. Crowe, R. P., Knowles, R. P., Wray, T., Tregunno, D., & Lazar, D. (2021). Challenges and opportunities in emergency medical services systems research. *Prehospital Emergency Care*, 25(1), 117–123. <https://doi.org/10.1080/10903127.2020.1813225>
6. Duchateau, F. X., Birnbaum, D. J., Casanova, J., Carcopino, X., Trousse, D., Leone, M., & Vidal, V. (2021). Emergency surgical management: Principles and priorities. *European Journal of Trauma and Emergency Surgery*, 47(4), 947–954. <https://doi.org/10.1007/s00068-021-01644-9>
7. Ferguson, E. A., Pawlak, R., & McNally, B. (2020). Effectiveness of paramedic training programs on clinical decision-making and outcomes: A systematic review. *Prehospital Emergency Care*, 24(3), 372–381. <https://doi.org/10.1080/10903127.2019.1676348>
8. Forsgårde, E. S., Elmqvist, C., & Fridlund, B. (2022). Nurses' experiences of emergency department triage in mass casualty incidents: A qualitative study. *International Emergency Nursing*, 60, 101103. <https://doi.org/10.1016/j.ienj.2021.101103>
9. Gräsner, J. T., Herlitz, J., Tjelmeland, I. B., Wnent, J., Masterson, S., Lilja, G., & Perkins, G. D. (2020). European Resuscitation Council guidelines 2021: Epidemiology of cardiac arrest in Europe. *Resuscitation*, 161, 61–79. <https://doi.org/10.1016/j.resuscitation.2021.02.013>

10. Hartmann, S. M., Farris, R. W., DiGiacomo, J. C., Mohr, N. M., Ahmed, A., & Sakles, J. C. (2020). Emergency airway management: A multi-center report of 8937 emergency department intubations. *Journal of Emergency Medicine*, 58(4), 610–617. <https://doi.org/10.1016/j.jemermed.2020.01.010>
11. Hayes, B. D., Klein-Schwartz, W., & Barrueto, F. (2022). Principles of emergency pharmacology. *Clinical Pharmacology and Therapeutics*, 111(3), 595–606. <https://doi.org/10.1002/cpt.2479>
12. Holmberg, M., Fagerberg, I., & Wahlberg, A. C. (2017). The knowledge desired by emergency medical service managers of their ambulance clinicians: A modified Delphi study. *International Emergency Nursing*, 34, 23–28. <https://doi.org/10.1016/j.ienj.2017.04.003>
13. Holmberg, M., Holmström, I., Herlitz, J., Karlsson, T., Jonsson, A., & Andersson, H. (2020). Ambulance clinicians' experiences of relationships with patients and significant others. *Nursing Open*, 7(5), 1514–1521. <https://doi.org/10.1002/nop.2.527>
14. Jennings, P. A., Cameron, P., Walker, T., Bernard, S., Smith, K., & Grantham, H. (2021). Out-of-hospital cardiac arrest management: An overview of contemporary strategies and outcomes. *Emergency Medicine Australasia*, 33(2), 199–206. <https://doi.org/10.1111/1742-6723.13660>
15. Johnson, S. U., Ebrahimi, O. V., Hoffart, A., Thoresen, S., Kleppang, A. L., & Skogen, J. C. (2020). Mental health outcomes among healthcare workers during COVID-19 pandemic. *BJPsych Open*, 6(6), e130. <https://doi.org/10.1192/bjo.2020.107>
16. McQueen, C., Edhouse, J., & Finlayson, S. (2021). Pre-hospital pharmacology: principles and applications in emergency medical services. *Prehospital and Disaster Medicine*, 36(4), 461–466. <https://doi.org/10.1017/S1049023X21000792>
17. Mikkelsen, S., Krüger, A. J., Zwisler, S. T., Brøchner, A. C., Rasmussen, L. S., & Svensson, L. (2020). Emergency medical services: Past, present, and future. *Resuscitation*, 148, 135–144. <https://doi.org/10.1016/j.resuscitation.2020.01.029>
18. Perkins, G. D., Gräsner, J. T., Semeraro, F., Olasveengen, T., Soar, J., & Van de Voorde, P. (2021). European Resuscitation Council guidelines 2021: Adult basic life support. *Resuscitation*, 161, 98–114. <https://doi.org/10.1016/j.resuscitation.2021.02.007>
19. Smith, J. A., & Conn, A. K. T. (2017). Prehospital versus emergency department care: Understanding roles, responsibilities, and relationships. *Journal of Emergency Nursing*, 43(1), 69–74. <https://doi.org/10.1016/j.jen.2016.10.012>
20. Tan, T., Zhou, H., & Kelly, M. (2017). Nurse–physician communication: An integrated review. *Journal of Clinical Nursing*, 26(23–24), 3974–3989. <https://doi.org/10.1111/jocn.13832>
21. Van Rein, E. A., Houwert, R. M., Leenen, L. P., van Heijl, M., & Beeres, F. J. (2019). Effectiveness of prehospital trauma triage systems: A systematic review. *Injury*, 50(5), 850–862. <https://doi.org/10.1016/j.injury.2019.03.014>
22. Wilson, M. H., Habig, K., Wright, C., Hughes, A., & Davies, G. (2015). Pre-hospital emergency medicine. *The Lancet*, 386(10012), 2526–2534. [https://doi.org/10.1016/S0140-6736\(15\)00985-X](https://doi.org/10.1016/S0140-6736(15)00985-X)