



The Role of Mobile Apps in Prehospital Emergency Care: A Literature Review

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Abstract: - This literature review examines the role of mobile applications in prehospital emergency care (PHC), highlighting their impact on service delivery and patient outcomes. As healthcare systems increasingly adopt technological innovations, mobile applications have emerged as critical tools in enhancing communication, accessibility, and decision-making for emergency medical services (EMS). The review synthesizes findings from various studies, revealing that mobile technologies significantly improve real-time access to clinical guidelines, patient data, and communication channels, particularly for individuals with disabilities. Notably, applications like SOSPhone provide alternative communication methods, bridging gaps for users who may struggle with traditional voice calls. Additionally, the review discusses the challenges and limitations of integrating mobile applications into existing EMS frameworks, emphasizing the need for user-centric design and collaboration among stakeholders. The findings underscore the importance of ongoing research to evaluate the long-term effects of mobile technologies on patient outcomes and service delivery in diverse populations. Ultimately, this review aims to inform healthcare professionals, policymakers, and app developers about best practices and future directions for the effective implementation of mobile applications in prehospital settings.

Keywords: Prehospital Emergency Care, Mobile Applications, Emergency Medical Services, Communication Technology, Patient Outcomes.

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1. Introduction

1.1 Background of Prehospital Emergency Care

Prehospital emergency care (PHC) plays a critical role in the healthcare system by providing immediate assistance to patients before they reach a hospital. This stage of care is vital for stabilizing patients, reducing morbidity, and improving survival rates (Huang et al., 2020). The effectiveness of PHC relies heavily on timely interventions, skilled personnel, and efficient communication between emergency medical services (EMS) and healthcare facilities (Kahn et al., 2016). As healthcare demands increase, so does the need for innovative solutions to enhance the quality and efficiency of prehospital care.

Prehospital care is inherently a high-risk endeavor. Emergency Medical Services (EMS) clinicians evaluate patients of various ages suffering from a wide range of medical issues, often with limited ability to communicate. Care is provided in challenging environments, available 24 hours a day and typically far from medical facilities (Hagiwara et al., 2013). This complex setting

presents numerous obstacles to conducting effective research (Jensen, et al., 2013). Additionally, prehospital organizations face difficulties in recognizing, reporting, and disclosing adverse events (Sayre, et al., 2002).

Prehospital emergency care encompasses a wide array of medical issues, ranging from minor injuries to life-threatening situations. As a result, the interventions needed to stabilize patients vary from basic first aid to advanced emergency procedures. The remote locations where care is provided further complicate these situations (IBTPHEM, 2012). Managing patient care in cases of high-energy trauma often necessitates the presence of highly trained ambulance nurses (Steinemann et al., 2011). These nurses must quickly assess both the patient and the situation upon arrival at an accident scene (Bredmose, et al., 2010). However, such patients constitute only a small fraction of the overall prehospital patient population; in the United Kingdom and Scandinavia, only 20–50 patients per 100,000 inhabitants experience high-energy trauma (Kristiansen, et al., 2010). With limited opportunities for regular interaction with high-energy trauma patients, ambulance nurses have restricted avenues

to practice and enhance their skills. Consequently, gaining knowledge and experience in managing high-energy trauma can be challenging (Abelsson, & Lindwall, 2012). Over time, this may lead to a decline in both knowledge and hands-on experience. The skills necessary for prehospital ambulance nurses caring for high-energy trauma patients have long been debated (Abelsson, et al., 2014), and this discussion continues. The World Health Organization (WHO) asserts that all member states of the European Union should establish and regulate specialized training in prehospital emergency care. Additionally, the WHO emphasizes the importance of monitoring and ensuring the quality of prehospital emergency services, advocating that all emergency care be delivered by qualified medical professionals, including ambulance nurses (Söderström, et al., 2014).

1.2 Importance of Technology in Healthcare

The integration of technology in healthcare has revolutionized patient care delivery, enabling more efficient processes and improved outcomes. Information and Communication Technologies (ICTs) have become essential tools for healthcare professionals, allowing for better data management, real-time communication, and enhanced decision-making capabilities (Bates et al., 2018). In particular, mobile technology has emerged as a powerful resource in various healthcare settings, facilitating immediate access to critical information and enabling healthcare providers to deliver high-quality care (Mosa et al., 2012).

Current investments in healthcare IT are primarily driven by payment issues rather than clinical needs. As a result, billing systems tend to be significantly more advanced than clinical systems. Estimates suggest that the healthcare sector allocates at least 50% less of its gross revenues to information technology compared to other information-intensive industries, such as banking (Huang et al., 2020; Raymond, et al., 2001). Additionally, while the banking industry has established international standards for data exchange, the medical field lacks such standards. This discrepancy means that one can easily withdraw money from an automated teller machine in cities like Tokyo or Moscow, while seeking medical assistance in the same locations would present a very different experience.

There are few comparable examples in healthcare. Although some organizations are recognized for having "best-of-breed" information systems—such as LDS Hospital and Intermountain Healthcare in Salt Lake City, Wishard Memorial Hospital in Indianapolis, and Brigham and Women's Hospital along with Partners HealthCare in Boston (Metricnet, et al., 2001). The reliability of these healthcare systems does not match that of companies outside the sector, like Federal Express (Sullivan et al., 2017). These organizations have generally performed well financially, giving them a competitive advantage in their local markets, though their aim has not been expansion. Moreover, their information systems are typically custom-built, making dissemination to smaller hospitals within their networks challenging. One notable exception is the information system used by the Veterans Administration, which serves as an important model for integration. The role of information technology in enhancing clinical quality in healthcare has not been as significant as in other industries for several reasons. One factor is that fee-for-service reimbursement does not incentivize efficiency. Additionally, care delivery is fragmented, often provided by non-profit organizations, and lacks a few dominant players found in

other sectors. Finally, in this unique market, healthcare IT vendors have strong motivations to maintain their customer base, which can hinder interoperability (Bates, 2002).

1.3 Overview of Mobile Applications in Emergency Services

Mobile applications have significantly transformed emergency services, enhancing communication, accessibility, and response times. As mobile device usage has surged globally, the ability to make emergency calls from virtually anywhere has become commonplace. However, challenges remain, particularly for individuals unable to communicate effectively through traditional voice calls, such as the deaf and elderly populations.

Mobile applications are increasingly being recognized as valuable assets in emergency services. These apps can assist EMS personnel in various tasks, including patient assessment, medication administration, triage, and communication with hospitals (Poon et al., 2019). By offering easy access to clinical guidelines, protocols, and patient data, mobile applications can significantly enhance the effectiveness of emergency care. Moreover, they can aid in improving situational awareness for EMS providers, ensuring they are better prepared to respond to emergencies (Sullivan et al., 2017).

One of the primary contributions of mobile applications in emergency services is their ability to provide accessible communication channels. Paredes et al. (2013) introduced ****SOSPhone****, which allows users to make emergency calls without audio communication. This application uses an iconographic interface, enabling users to select icons that represent various emergency situations, thus generating a text message (SMS) with essential information (Paredes et al., 2013). This approach is particularly beneficial for individuals with hearing impairments, who often struggle to articulate their needs during emergencies.

Moreover, the World Health Organization (2011) reports that over one billion people worldwide live with some form of disability, highlighting the urgent need for accessible services. Mobile applications can bridge this gap by providing intuitive interfaces and alternative communication methods, ensuring that everyone, regardless of their abilities, can access emergency services (WHO, 2011).

The design of mobile applications for emergency services must prioritize user experience to effectively meet diverse needs. Romano et al. (2016) emphasize the importance of involving users with disabilities in the design process, ensuring that applications are intuitive and cater to their specific requirements. Engaging users in the development phase helps identify potential barriers and leads to more effective solutions.

Furthermore, research by Spence et al. (2016) underscores the significance of usability in emergency applications, noting that applications must be designed for quick and easy interaction under stress. By focusing on user-centric design and conducting usability testing, developers can create applications that enhance usability and ensure that critical information is conveyed promptly during emergencies.

The effectiveness of mobile applications is further amplified when integrated with existing emergency service systems. Paredes et al. (2013) highlight the necessity for mobile applications to align with

the operational protocols of emergency services. By embedding emergency flow protocols within applications, users can provide detailed information about incidents, improving response times and resource allocation. This alignment is crucial for ensuring that emergency services can respond effectively and efficiently (Paredes et al., 2013). Additionally, the European Emergency Number Association (EENA) emphasizes that improvements in technology and integration with emergency service infrastructure can lead to better outcomes during emergencies (EENA, 2019). For instance, integrating location data and user profiles into emergency applications can facilitate quicker responses from emergency service providers. Communication barriers pose significant challenges in emergencies, especially for individuals with hearing impairments. Traditional emergency call systems are predominantly voice-centric, which inadequately serves the needs of deaf individuals (Romano et al., 2016). Mobile applications like SOSPhone offer alternative communication methods that can be more effective. By utilizing SMS and icon-driven interfaces, these applications allow users to communicate their needs without relying on spoken language, fostering greater inclusivity in emergency response (Paredes et al., 2013).

Furthermore, a study by Zafrulla et al. (2011) indicates that SMS and text-based communication are preferred by many deaf individuals during emergencies. This underscores the importance of mobile applications that utilize these modalities to enhance communication between users and emergency responders. Mobile applications have the potential to revolutionize emergency services by providing accessible, user-friendly, and efficient communication channels. As demonstrated by the development of SOSPhone and similar applications, incorporating user feedback and aligning with emergency service protocols are vital steps in creating effective solutions. By addressing the unique challenges faced by individuals with disabilities, mobile applications can enhance overall emergency response efforts, ensuring that all citizens can access the help they need in critical situations.

1.4 Significance of the Study

The purpose of this literature review is to explore the role of mobile applications in prehospital emergency care, analyzing their impact on service delivery and patient outcomes. By systematically reviewing existing studies, this research aims to identify the strengths and weaknesses of mobile technologies in PHC. Understanding the current landscape will provide valuable insights for healthcare professionals, policymakers, and app developers, ultimately contributing to the advancement of emergency medical services and improved patient care. The significance of this study lies in its potential to highlight best practices, inform future research, and encourage the adoption of effective mobile solutions in prehospital settings.

2. Methodology

2.1. Literature Review Approach

This study employs a systematic literature review approach to explore the role of mobile applications in prehospital emergency care (PHC). The aim is to analyze existing research and identify the impact of mobile technologies on service delivery and patient outcomes. This methodology ensures a comprehensive understanding of the subject by synthesizing findings from multiple studies.

2.2 Data Sources

Data for this literature review were sourced from various academic databases, including PubMed, Scopus, Web of Science, and Google Scholar. These databases were selected for their extensive collections of peer-reviewed articles and conference papers related to healthcare and emergency services. The search strategy included keywords and phrases such as “mobile applications,” “prehospital emergency care,” “emergency medical services,” and “mobile health technologies.” The search was limited to studies published in English to maintain consistency in data interpretation.

2.3 Inclusion and Exclusion Criteria

To ensure the relevance and quality of the studies included in the review, specific inclusion and exclusion criteria were established:

2.3.1 Inclusion Criteria:

- Studies published in peer-reviewed journals.
- Research focusing on mobile applications in the context of prehospital emergency care.
- Articles published within the last ten years to capture the latest advancements in technology.
- Studies that report on patient outcomes or service delivery improvements related to mobile applications.

2.3.2 Exclusion Criteria:

- Non-peer-reviewed articles, such as opinion pieces or editorials.
- Studies that do not focus specifically on emergency care or mobile applications.
- Articles published in languages other than English.
- Research that lacks empirical data or rigorous methodology.

2.4 Data Extraction Process

The data extraction process involved a systematic approach to identify and compile relevant information from the selected studies. Key details extracted included:

- Study design and methodology.
- Sample size and population characteristics.
- Types of mobile applications examined.
- Outcomes measured (e.g., response times, patient satisfaction, clinical effectiveness).
- Key findings related to the impact of mobile applications on prehospital care.

2.5 Data Analysis Techniques

2.5.1 Qualitative Synthesis

The data analysis involved a qualitative synthesis of the extracted information. This technique allowed for the integration of findings from diverse studies, highlighting common themes and discrepancies. By synthesizing qualitative data, the review aims to provide a holistic understanding of the role of mobile applications in PHC, emphasizing their contribution to enhancing service delivery and patient outcomes.

2.5.2 Thematic Analysis

Thematic analysis was employed to identify and analyze recurring themes within the literature. This process involved coding the extracted data to categorize findings into meaningful themes. Key themes included:

- Accessibility and usability of mobile applications.
- Communication improvements between emergency medical services and patients.
- Impact on clinical decision-making and patient outcomes.
- Barriers to implementation and use of mobile technologies in emergency settings.

3. Previous Studies

This section examines a selection of significant studies that investigate the role of mobile applications in prehospital emergency care (PHC). These studies provide valuable insights into how mobile technologies enhance various aspects of emergency medical services (EMS), including communication, medication safety, and overall patient outcomes. By analyzing diverse methodologies and findings, we can better understand the current landscape of mobile applications in emergency settings and identify key areas for future research and development. Each study contributes to a comprehensive understanding of the potential benefits and challenges associated with integrating mobile applications into prehospital care practices.

In their study, Kim et al. (2020) investigate the role of fifth-generation (5G) mobile technology in enhancing prehospital emergency care, focusing on the support it can provide to paramedics. The authors conducted a literature review to explore the capabilities of 5G technology, including its high-speed connectivity, low-latency communication, and improved security features. The study highlighted the current challenges faced by paramedics in emergency medical services (EMS) and outlined the potential applications of 5G technology to address these issues. The findings suggest that implementing 5G networks can facilitate real-time communication between paramedics and emergency room physicians, ultimately improving patient outcomes. However, the study also identifies several barriers to the effective adoption of 5G technology, including privacy concerns, regulatory limitations, and access issues in underserved areas.

In the study by Siebert et al. (2021), the authors aimed to assess the efficacy of a mobile app, designed to assist in pediatric drug preparation, in reducing medication errors during simulated out-of-hospital cardiac arrest scenarios. This open-label, multicenter, randomized clinical trial was conducted with 150 advanced paramedics across 14 emergency medical services centers in Switzerland from September 2019 to January 2020. Participants were assigned to either use the mobile app ($n = 74$) or follow conventional preparation methods ($n = 76$) while preparing four intravenous emergency drugs. The results demonstrated a significant reduction in medication errors, with 62.8% of drug preparations leading to errors in the conventional group compared to only 5.7% in the app group, representing a decrease of 66.5% in the rate of errors. This study highlights the potential of dedicated mobile applications to enhance medication safety and improve practices in pediatric emergency care.

Lacour et al. (2021), aimed to evaluate the effectiveness of a mobile application, the PedAMINES app, in reducing acute stress experienced by paramedics during simulated pediatric out-of-hospital cardiac arrest (OHCA) scenarios. The research utilized a multicenter, randomized controlled trial design involving 150 advanced paramedics from 14 emergency medical services in Switzerland, who were assigned to either the intervention group using the mobile app or a control group employing conventional preparation methods. The study found that paramedics using the app reported significantly lower perceived stress levels during drug preparation compared to those using traditional methods, demonstrating a 30.1% lower relative change in stress response, although physiological stress measured by heart rate did not differ significantly between the groups. These findings highlight the potential of mobile applications to enhance emergency care by mitigating stress in high-stakes situations.

Repanovici and Nedelcu (2021) examined the potential of mobile emergency notification applications to enhance global emergency management systems. The authors employed a Multi-Criteria Analysis (MCA) methodology to evaluate three communication methods—Voice Call, SMS, and Mobile Applications—by assessing their performance against various criteria such as utility, accuracy, and time of response. The study involved domain experts who provided insights into the effectiveness of these communication methods in emergency situations. The results indicated that mobile applications emerged as the most effective solution, outperforming SMS and voice calls in terms of delivering relevant information and facilitating faster emergency responses. This research highlights the significant role mobile applications can play in improving prehospital emergency care.

In their study, Romano et al. (2016) aimed to explore the design and effectiveness of mobile applications used for emergency notification, emphasizing the role of citizens as human sensors during crises. The authors employed a mixed-methods approach, combining both practical simulations of emergency scenarios and theoretical evaluations through expert interviews. The sample consisted of emergency experts and participants who simulated a traffic accident to test the application. The results demonstrated that mobile emergency notification applications significantly enhance communication between citizens and emergency organizations, providing valuable real-time information while highlighting usability issues that need to be addressed for improved user experience.

Gómez et al. (2013) conducted a comprehensive review of mobile applications designed for citizen emergency management, with the main aim of identifying current applications and areas for innovation in this field. The authors analyzed over 250 commercially available applications by examining their value propositions, operational features, and levels of context-awareness, using a systematic approach focused on applications listed in the Google Play store. The sample included a diverse range of applications categorized by their service goals, such as health emergencies and personal safety. The study revealed that most applications target victims, with a significant gap in tools designed for witnesses and volunteers, highlighting the need for an integrated mobile application that effectively connects citizens with emergency services and optimizes resource management during emergencies.

Paredes et al. (2013), aimed to develop a mobile application that facilitates emergency calls without requiring audio communication, specifically targeting individuals with disabilities such as deaf users and the elderly. The methodology involved creating a prototype of the SOSPhone application, which incorporated an iconographic touch interface to allow users to report emergencies through visual selections rather than voice calls. The sample included a diverse group of users, including individuals with disabilities, emergency services professionals, and the general public, who evaluated the application's usability. The main result indicated that the SOSPhone prototype successfully addressed the communication barriers faced by users in emergency situations, emphasizing the importance of integrating such technologies into existing emergency response systems to enhance accessibility and efficiency.

Pizzolato, et al. (2021), aimed to develop a mobile application that enables nurses in the Mobile Emergency Care Service (SAMU) to document the Nursing Process electronically. The methodology employed was applied research focused on technological development, structured in four phases: scope definition, planning, prototype creation, and development, with support from an application developer and a designer. The sample involved the iterative design process of the app, which targeted nursing professionals in emergency care settings. The main result was the creation of the "Nursing APHMóvel" application, which allows for the comprehensive recording of nursing assessments, interventions, and outcomes, including features such as offline functionality, automatic scoring of clinical scales, and data export capabilities. This innovation demonstrates significant potential for enhancing the documentation efficiency and accuracy of nursing care in prehospital environments.

In the study by Anantharaman and Han (2001), the primary aim was to evaluate the effectiveness of the Hospital & Emergency Ambulance Link (HEAL) system in enhancing pre-hospital emergency care through electronic data transmission from ambulances to emergency departments (EDs) in Singapore. The methodology involved a pilot project where data from three emergency ambulances was electronically captured and transmitted to the ED, with a focus on critical patient information such as vital signs and electrocardiograms (ECGs). The sample consisted of 1,694 HEAL ambulance runs over a three-month period. The main results indicated a significant reduction in data entry time, decreasing from an average of over 7 minutes to just 94 seconds, and a corresponding decrease in waiting times for critical patients from 35 to 17 minutes upon arrival at the ED. The study demonstrated that the HEAL system not only improved the efficiency of pre-hospital care but also enhanced patient outcomes through timely information sharing.

In their 2021 study, Siebert et al. investigated the efficacy of a mobile application designed to reduce medication errors during simulated pediatric resuscitation in prehospital emergency care. The study employed a multicenter, open-label, randomized clinical trial methodology conducted across 14 emergency medical service centers in Switzerland, involving 150 advanced paramedics who were randomized to either use the mobile app or follow conventional drug preparation methods. The main aim was to assess whether the app could significantly decrease the occurrence of medication errors compared to traditional methods during critical pediatric scenarios. Results indicated that the use of the

mobile app led to a remarkable 66.5% reduction in medication errors, with only 5.7% of preparations using the app associated with errors, compared to 62.8% in the conventional group. This study highlights the potential of mobile applications to enhance medication safety and improve practices in pediatric emergency medicine.

Montandon et al. (2024), aimed to develop and evaluate a mobile application prototype named e-SU, designed to facilitate communication for individuals with complex communication needs when calling pre-hospital emergency services. The research employed a methodological approach conducted in three phases: identifying the functional requirements of the target population, developing the prototype application for touchscreen smartphones, and assessing usability through expert evaluations and feedback from the intended users, which included individuals with hearing and visual impairments, as well as older adults. The sample comprised 21 participants representing these groups. The results indicated that the application achieved high usability scores (mean = 58.75) and garnered an excellent user satisfaction index (mean = 89.5), demonstrating its effectiveness in enhancing accessibility to emergency services for users with special communication needs.

In their 2024 integrative review, Pereira et al. aimed to analyze the scientific contributions of mobile applications developed for pre-hospital care. The study utilized an integrative literature review methodology, searching multiple databases including Scopus, Web of Science, and PubMed for relevant articles published between 2017 and 2022. The selection process initially identified 944 studies, from which seven were ultimately included in the final sample based on predefined eligibility criteria. The main findings highlighted that mobile applications significantly enhance various aspects of pre-hospital care, including triage, pediatric first aid, patient safety, and communication among emergency teams. These applications were found to improve the quality of care provided in emergencies, optimizing response times and contributing to better patient outcomes.

The study conducted by Wu et al. (2017), aimed to address the challenges in Emergency Medical Services (EMS) by developing a smart, real-time prehospital communication system, STREMS. The methodology involved implementing a wearable physiological sensing solution and a cloud-based data sharing platform, as well as a live video communication feature, to facilitate efficient data transmission from ambulances to hospitals. The sample included EMS operations within the city of Detroit, where the system was tested under various conditions. The main result demonstrated that STREMS successfully delivered 100% of emergency data to hospitals in under 1.5 seconds, significantly improving the efficiency of prehospital care and communication.

4. Findings

This literature review has highlighted the significant role of mobile applications in enhancing prehospital emergency care (PHC). Key findings indicate that mobile technologies improve communication, accessibility, and decision-making processes for emergency medical services (EMS). Applications like SOSPhone and others demonstrate that mobile solutions can effectively bridge communication gaps, especially for individuals with disabilities, thereby fostering inclusivity in emergency response (Paredes et al., 2013; WHO, 2011).

The implications of these findings for prehospital emergency care are profound. Enhanced access to clinical guidelines and patient data enables EMS personnel to deliver timely and effective care, ultimately improving patient outcomes (Mosa et al., 2012; Poon et al., 2019). Furthermore, the integration of mobile applications with existing emergency service protocols can streamline operations, ensuring that resources are allocated efficiently and effectively during critical situations (EENA, 2019).

Despite these advancements, there remain areas for future research. Further studies should explore the long-term effects of mobile applications on patient outcomes and service delivery, particularly in diverse and underserved populations (Kim et al., 2020). Additionally, research into the barriers to the adoption and implementation of these technologies in various EMS settings could provide insights into optimizing their use (Siebert et al., 2021). Investigating the potential of emerging technologies, such as artificial intelligence and machine learning, in enhancing mobile applications for emergency care also presents a promising avenue for future exploration (Montandon et al., 2024). By addressing these areas, we can continue to advance the effectiveness and accessibility of prehospital emergency care.

5. Discussion

The findings from this literature review underscore the transformative significance of mobile applications in prehospital emergency care (PHC). Mobile technologies enhance communication, improve response times, and streamline access to critical information. Applications such as SOSPhone exemplify how mobile tools can bridge communication gaps, particularly for individuals with disabilities, offering alternative methods for emergency reporting. This capability not only facilitates timely intervention but also fosters inclusivity, ensuring that all individuals can access emergency services effectively.

5.1 Significance of Mobile Applications

The integration of mobile applications into PHC can lead to substantial improvements in service delivery and patient outcomes. The ability of EMS personnel to access clinical guidelines and patient data in real-time enables more informed decision-making during emergencies (Poon et al., 2019). Additionally, mobile applications enhance situational awareness among EMS providers, allowing them to respond more effectively to diverse emergency scenarios (Sullivan et al., 2017). Furthermore, studies indicate that mobile tools can significantly reduce medication errors, as demonstrated in the research by Siebert et al. (2021), highlighting their potential to improve patient safety in high-stress situations.

5.2 Potential Limitations

Despite the promising findings, several potential limitations of the studies reviewed warrant consideration. Many studies were conducted in specific geographic locations or under controlled conditions, which may limit the generalizability of the results to broader populations. Additionally, there is often a reliance on self-reported data, which can introduce biases and affect the accuracy of outcomes measured. The diversity of mobile applications and the variability in their design and implementation also pose challenges in drawing definitive conclusions about their overall efficacy. Moreover, the rapid pace of technological advancement means that findings may quickly become outdated, necessitating

ongoing research and evaluation to keep pace with evolving mobile health technologies.

5.3 Alignment with Previous Research

The findings of this review largely align with previous research that emphasizes the role of technology in enhancing emergency medical services. Prior studies have consistently highlighted the need for improved communication and data management in EMS, underscoring the critical role of mobile applications in addressing these challenges (Bates et al., 2018; Mosa et al., 2012). However, this review also reveals contrasts with some earlier literature, particularly regarding the usability and accessibility of mobile applications. While previous studies have noted the difficulties faced by individuals with disabilities in accessing emergency services, the emergence of user-centric applications like SOSPhone demonstrates a shift toward more inclusive design approaches.

In conclusion, mobile applications represent a vital advancement in prehospital emergency care, offering innovative solutions to longstanding challenges in the field. Continued research is essential to address the limitations identified and to further explore the potential of mobile technologies in enhancing emergency response systems. By building on the strengths of existing studies and addressing their weaknesses, future research can contribute to a more comprehensive understanding of how mobile applications can optimize prehospital emergency care.

6. Recommendations

Based on the findings of this literature review, several practical recommendations can be made for stakeholders involved in prehospital emergency care, including healthcare providers, policymakers, and app developers. These recommendations aim to enhance the integration and effectiveness of mobile applications in emergency medical services (EMS).

6.1 Recommendations for Stakeholders

1. Healthcare Providers:

- Implement ongoing training programs for EMS personnel on mobile applications and their functionalities.
- Establish mechanisms for frontline EMS providers to provide feedback on mobile applications.

2. Policymakers:

- Develop and promote regulatory frameworks encouraging the adoption of mobile applications in PHC.
- Allocate funding for the development and implementation of mobile technologies in emergency services.

3. App Developers:

- Prioritize user-centric design by involving stakeholders in the development process.
- Ensure seamless integration of mobile applications with existing EMS systems and protocols.

6.2 Best Practices for Integration

- Foster collaboration between healthcare providers, technology developers, and emergency service organizations during the design and implementation phases. This interdisciplinary approach can facilitate the development of applications that are practical, efficient,

and tailored to the specific needs of emergency responders.

- Conduct pilot tests of mobile applications in real-world emergency scenarios to evaluate their effectiveness. Collect data on response times, patient outcomes, and user satisfaction to assess the impact of these tools and make necessary adjustments before widespread implementation.
- Establish a framework for continuous improvement of mobile applications based on user feedback and evolving healthcare needs. Regular updates and enhancements should be part of the lifecycle of mobile technologies in EMS.
- Engage communities in the development and promotion of mobile applications for emergency services. Raising awareness about available tools, such as SOSPhone, can empower individuals to utilize these resources effectively during emergencies.
- Encourage ongoing research into the effectiveness of mobile applications in PHC. Future studies should explore the long-term impacts of these technologies on patient care and identify best practices for their usage.

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