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A Systematic Review on Developing Telemedicine-transforming Health Care Accessibility in Emergency Room

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Abstract

It is imperative to understand telemedicine's impact on reducing non-urgent cases in emergency rooms (ERs) through its use in healthcare. Studying the dynamic relationship between telemedicine utilization and ER visits, this study aims to uncover how telehealth can be used to break the traditional cycle of ER visits. In order to examine the awareness and utilization of telemedicine services in the broader population, the authors used a cross-sectional design based on convenience sampling. We collected data through PubMed, PMC, WOS, and Scopus. To extract and evaluate data items, each review was critically appraised by three authors. An analysis was conducted to determine the most highly recommended telemedicine technology, its feasibility, benefits, and challenges. An online survey was also self-administered by the authors consisting of three sections: demographic variables, ER visits, and awareness of non-urgent cases. There were close to 2000 participants in the study, 59% of whom were females and 41% of whom were males. The highest percentage of people were between the ages of 18 and 27 (46.8%). Among the participants, 70% held a bachelor's degree. The number of urgent visits was 65%. Most (69%) knew about alternatives to urgent care, such as outpatient clinics and telemedicine. Video consultations and prescription refills are perceived as effective ways to address non-urgent conditions by 85% of respondents. In addition, 92% of participants agreed that teaching patients' self-care and home remedies could help them manage symptoms and prevent unnecessary trips to the ER. The authors in this review conclude a high level of satisfaction among participants underscores the positive reception of telemedicine in redefining healthcare delivery. Telemedicine is positively associated with patient care, according to strong evidence. The implementation of telemedicine, however, may hinder or even compromise patient safety due to many challenges. The telemedicine systems in the ER have high potential, but there is still a need for better quality evidence to confirm their feasibility.

Keywords: Telemedicine, Emergency department, Patients

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Introduction

In a hospital, emergency departments (EDs) are one of the most vital and sensitive sections, and how they function can significantly affect other departments and patient satisfaction. Hospitals are evaluated in part based on the performance of their EDs [1, 2]. About 30 million critically ill patients seek urgent healthcare in the ED each year in the United States. A high number of admissions reduces the amount of time providers have to spend with each patient, which leads to a higher rate of medical errors [3-5]. Furthermore, it leads to ED overcrowding. The use of telemedicine for providing healthcare services has experienced rapid development in recent years as healthcare costs have increased and patient expectations have increased. In telemedicine, information and communication technologies are used to provide remote healthcare services, with great potential for use [6, 7]. According to recent studies on the application of telemedicine for the ED, these applications include providing specialized services to rural areas, reducing ED overcrowding, providing specialized services to paramedics, better crisis management, and reducing the time between accidents and patients' arrival at the hospital [8-13].

However, many studies in this area indicate that further research is needed, and the current evidence is inadequate [14]. There has been a lot of discussion regarding the benefits and challenges of applying telemedicine technology in the ED, but the usability of these systems seems to be uncertain, giving rise to serious concerns regarding their implementation [15-19]. The use of telemedicine in EDs has been investigated in numerous studies, and many reviews have evaluated their feasibility in emergency settings [2]. Many of these studies, however, result in conflicting results. The purpose of this review is to present an overview of the systematic reviews that have been conducted in order to reach a conclusion (Figure 1) [20].

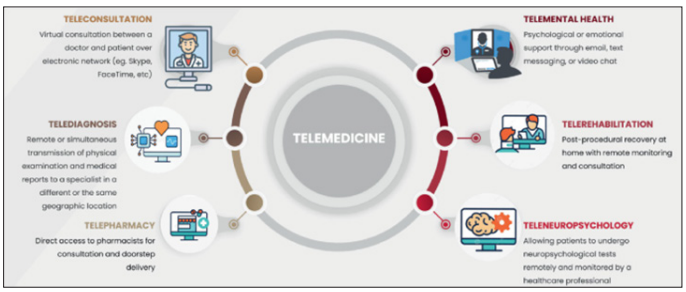

Figure 1: Types of telemedicine [22].

This study aims to provide an overview of systematic reviews pertaining to telemedicine in the ED. We need to address the following primary questions: Do you think telemedicine is feasible for the ED? How does telemedicine benefit the ED? When using this technology in emergency settings, what challenges arise?

Materials and Methods

Search strategy

Using PubMed, Scopus, Web of Science, and Google Scholar, a systematic search was conducted to evaluate the feasibility of telemedicine in the ED and provide an overview of research on the topic [2, 21-27]. The reference lists of the included studies were also manually searched. PRISMA guidelines were followed for this review. Using MeSH and the terms systematic review, telemedicine, and emergency, the review was conducted until 2023. In order to search each database, follow these steps:

Our study focused only on literature published between 2015 and 2023 since it was the most up-to-date evidence regarding this technology's feasibility, articles published in the English language, The papers that were systematic reviews provided an overview of the studies performed in recent years and provided a conclusion based on the disparities in results [28-31]. The authors excluded telemedicine applications in the ED which are not deeply emphasized [32].

Date extraction and synthesis

The characteristics of the research and the results were independently extracted by two authors. We then conducted a narrative review and presented its findings in a report [33].

Data items

Data items that were extracted from the articles include the following: research's main finding, main research questions, number of articles included in systematic review, the most recommended technology, telemedicine method, publication year, telemedicine method, benefits and challenges of telemedicine implementation [34-37].

Results

In this study, two main findings are presented: telemedicine's benefits in the ED and ED telemedicine challenges. Firstly, we discuss the impact of telemedicine on patient care and article journals. A total of 2000 articles were found in the initial search. Eight hundred and seventy articles were removed as duplicates from the study, leaving 1130 papers for screening. In the end, 75 studies remained, 1055 of which were excluded by exclusion criteria. As a result of the study, 75 articles were included [38-41].

Technologies in advancing telemedicine

The most feasible telemedicine technology was usually chosen in most of the papers [42]. In some articles, it was noted that usability differed depending on the environment and the situation. A study conducted in cardiovascular disease centers found that the store and forward method, as well as video conferencing (real-time video and audio), was the most effective method of supporting stroke patients before they arrived at the hospital, and that real-time audio consultation was the most effective for primary care [43]. In another review, it was determined that video conferencing with store-and-forward was the most cost-effective method. In total, nine papers mentioned real-time video conferencing, three papers mentioned store and forward, one paper discussed tele-monitoring, and one paper real-time audio conferencing as the most feasible technology [44-46]. Six papers did not mention anything concerning the issue. Through various approaches, telemedicine tends to be effective in many aspects, as shown above [2, 47]. This prevents unnecessary transfers from rural areas to central hospitals, for example. As telemedicine consultations can determine the severity of an injury, not every potential patient transfer will be necessary. An example of this is a 24 h consultation with a nurse or a video evaluation, usually coupled with radiology images (specifically for the diagnosis of minor fractures) [48, 49]. Additionally, the patient's treatment time appears to be significantly reduced due to telemedicine's high accuracy in an ambulance or on the scene (Figure 2) [50, 51].

Challenges due to telemedicine in the ED

In spite of the benefits of telemedicine in ED, each article included some challenges, ranging from technical and infrastructure issues to implementation costs. As crucial as identifying its benefits that meet each center's specific needs and goals is overcoming the challenges that face telemedicine programs [52-54]. Accordingly, this section outlines the challenges of implementing telemedicine systems in EDs, based on the included studies [55].

Feasibility

In general, telemedicine has shown great potential in emergency settings. Due to the weak study designs, most studies were unable to confirm the usability of telemedicine and concluded that more research is needed [56-58]. According to four papers, telemedicine is feasible and effective in emergency care [59]. Three of these studies, however, had a high risk of bias (RoB). Despite the potential, twelve papers found that further studies with better quality of evidence were still necessary to confirm their findings and the feasibility of this technology [60]. Seven of these studies were determined to have a high RoB in their investigation. One paper showed limited evidence supporting the feasibility of telemedicine, but the paper focused only on remote triage and did not assess all the methods involved in telemedicine. There was also no outcome regarding feasibility and effectiveness in one paper [61-65].

RoB

After the evaluation using ROBIS, there are four domains of questions used in this tool to assess the quality of systematic reviews: domain 1, study eligibility criteria; domain 2, identification and selection of studies; domain 3, data collection and study appraisal; and domain 4, synthesis and findings [66]. By answering these questions, the tool will then determine whether the studies are biased [67].

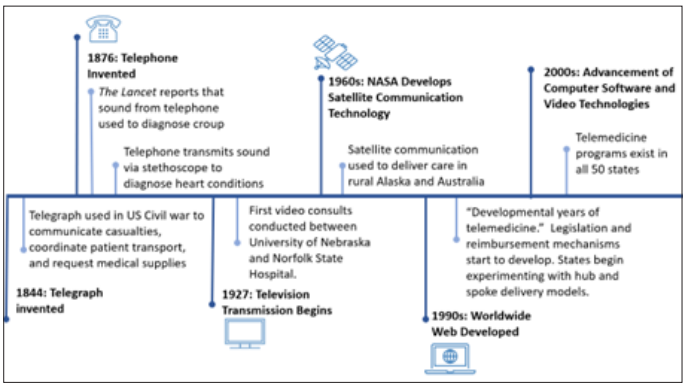

Figure 2: Evolution of telemedicine.

Discussion

Telemedicine in the ED is both convenient and practical, but it also presents its own challenges. This technology has high potential, but its feasibility is uncertain, according to most of the studies. There were six reviews included in the study. Researchers have recently developed an interest in this field, as evident in most of the articles published in 2023. As a result of the studies, real-time video conferencing was the most feasible technology in this area. Despite the fact that telemonitoring has been investigated in previous years for emergency situations, it was mentioned the least in the studies included in this review. In the ED, such systems have been reported to have produced many positive outcomes. Cost reduction, improved quality of care, decreased patient transfer rate, reduced mortality rate, and treatment time are only a few of these cases. Therefore, implementing this technology could be beneficial for both organizations and patients, since it could facilitate the monitoring of chronic diseases that require frequent visits to the ED [68-70].

The implementation of this technology, however, may result in unwanted results and pose some challenges for organizations and patients. The most common problems reported using this system, are technical. These systems may be resisted if they delay service delivery or endanger the health information of patients. In rural areas where specialist care and equipment are limited, this technology can be especially useful. The use of remote consultations can improve access to specialist care, reduce mortality, and facilitate transfers to larger hospitals, which can reduce costs and overcrowding. The use of these systems has also shown high potential in the treatment of trauma and strokes. A specialist clinic can provide on-site care, reduce severity and mortality, and decrease response and treatment times [71, 72]. Since the covid-19 global pandemic, telemedicine has been increasingly used to deliver non-urgent medical care throughout the world. In recent years, the practice of telemedicine has demonstrated that such technologies may be more readily available than previously thought, mainly due to the widespread adoption of smartphones. Telemedicine use has been temporarily halted in many governments. Security risks, confidentiality concerns, and unauthorized access remain a major concern [73]. In the future, telemedicine will be incorporated into routine clinical practice to manage chronic diseases such as diabetes, heart conditions, or asthma due to its demonstrated potential during the pandemic [74].

Limitations

The limitations of the study may have affected the results of our investigation. Since we wanted the most recent and up-to-date evidence regarding this issue, only English-language studies and publications between 2015 and 2023 were included in our review. The early research on telemedicine uses in EDs, especially trauma-related research, was therefore not included in our analysis. As a result, there likely were studies that should have been included but weren't, and similarly, there were studies that weren't relevant but were included. Our study also had the limitation of having a high RoB in most of the included papers. For a conclusion on telemedicine's feasibility for emergency care, further research with higher quality evidence is needed.

In light of the new simulation trial, results cannot be directly transferred to clinical practice. In addition to external factors, regional factors and individual factors influence a patient's therapy. However, the length of consultations was comparable with other results. It is therefore important to evaluate the implementation of such a system in an ED, as it might increase workload, reduce availability of physicians, and change processes. There are also differences in paramedic qualifications, and they depend mainly on the emergency medical system, which can lead to different treatment options. A number of technical performance indicators have been developed in telemedicine, but this field is understudied medically.

Conclusion

In the ED, telemedicine has a long way to go, and there are still many unknown factors to be explored. In this review, the benefits and challenges of telemedicine in the ED have been discussed. Overall, both hospital and patient costs were reduced in most reviews. In chronic disease management, where continuous follow-up is required, telemedicine can alleviate the issue by reducing costs and overcrowding. However, this system's effectiveness may not be realized if the necessary technical infrastructure is not available, which may result in a reduction in hospital productivity and even longer treatment times. As a whole, telemedicine for the ED has high potential to dramatically improve patient care; however, the low quality of studies and the lack of clinical trials regarding the issue prevent its feasibility from being established, and more studies with higher quality evidence are needed. Research in the future should focus on improving evidence quality and improving study design. A paucity of clinical trials has also been conducted regarding telemedicine in ED.

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None.

Conflict of Interest

None.

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