

The Effectiveness Of Triage Systems In Prioritizing Patient Care In The Emergency Department

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Abstract

Medical institutions have significant challenges, such as the increasing senior population and a shortage of physicians. Telemedicine and remote health monitoring system (RHMS) aim to address these issues by reducing hospital visits to some extent. The use of RHMS alleviates the workload on patients seeking primary care and enhances the exchange of information across various healthcare facilities, hence mitigating the strain on emergency rooms. Multiple healthcare studies have sought to substitute hospital visits with Remote Health Monitoring Systems (RHMS) to provide triage and prioritization for patients due to significant advancements in wireless information transfer and signal-processing technologies. Medical triage is the process of assessing the severity of a patient's condition, while prioritization is done to ensure that healthcare treatments are provided to patients in a timely manner to save their lives. A critical examination is necessary to emphasize the limitations of the existing state of diagnosis and prioritization in a telemedicine setting. This research presents a systematic evaluation of health care emergency triage as well as patient prioritization in a telemedicine setting, focusing on two important aspects. Initially, existing research on triage of patients and prioritization in a similar setting was gathered, examined, and classified. Furthermore, a comprehensive examination of several triage standards and recommendations, as well as various approaches and strategies of prioritization, was conducted. The following outcomes were achieved: (1) The

constraints and issues of current patient triage and prioritization strategies were introduced and highlighted. (2) The presentation did not include the process of triage and prioritization of individuals with chronic heart disease. (3) In the future, a framework that combines evidence theory with the incorporation of multilayer hierarchy analysis and approach for ranking choice by resemblance to ideal solution approaches can be employed to categorize chronic cardiac patients into various emergency levels and prioritize them for crisis and treatment-based services.

1. Introduction

Telemedicine is a worldwide phenomenon aimed at optimizing the availability of healthcare services [1-4]. Telemedicine is being used more often in healthcare due to its several advantages, including the provision of health-related data on patients [5-7] and the delivery of distant healthcare services [8-11]. The primary objective of all telemedicine applications is to enhance the welfare of patients and provide prompt and cost-effective medical knowledge to individuals, particularly those residing in underserved and distant regions [12-15].

Telemedicine has the potential to enhance the efficiency of healthcare access in countries where there are few doctors available for the number of patients [16-19]. The telemedicine system enables the use and interchange of diverse and long-lasting patient data, facilitating remote monitoring of patients by doctors [20-22]. A crucial concern in telemedicine is the ability to monitor patients remotely in real-time [3]. This may facilitate the advancement of network technologies and wireless communications, enabling healthcare to be delivered anytime and anywhere, known as 'connected healthcare' [4]. Remote patients are individuals who reside at a considerable distance from hospitals and rely on telemedicine for medical consultations [5, 6]. Every year, a multitude of individuals succumb to a variety of cardiovascular ailments. The elderly population is particularly vulnerable to these ailments, and a majority of them reside in distant healthcare facilities. Remote geriatric care facilities should be equipped with wireless communication devices capable of continually monitoring the health status of the elderly [7].

Triage is an emergency medical procedure that categorizes patients based on the severity of their condition and

establishes the priority for providing assistance [8]. Automating this procedure might greatly enhance the quality of patient care and hospitalization, hence potentially saving lives. Hospitals may become overburdened during catastrophes, leading to a shortage of paediatric experts who provide treatment for wounded children [9]. Emergency rooms (EDs) often see excessive numbers of patients, leading to overcrowding. To guarantee that patients with the most critical needs get prompt care, experienced personnel use triage procedures [10]. This technology also allows clinicians to perform triage and assist in prioritizing rescue efforts by attending to the most important patients [11]. Timely transmission of patient measurements is crucial for ensuring accurate data in emergency treatment. Significant incidents, such as train accidents, and catastrophic events, such as hurricanes and typhoons, have resulted in injury to many individuals. In such instances, triage offers a user-friendly, adaptable, and long-lasting system for gathering information. The triage procedure efficiently assesses patients impacted by catastrophes, determines the necessary response capabilities, and effectively manages resources upon their arrival at the site [13].

Patient prioritization is conducted to ensure that each patient receives healthcare treatments promptly. Rescuers assess the severity of patients' condition and their vital signs to identify the priorities for treatment and evacuation during the first phase of the operation. During the first stage, urgent life-saving interventions are provided to the individuals who are most severely impacted. Subsequently, patients are identified, labeled, and monitored for further care [14]. Patients in serious situations are given priority in local and emergency department lines [15].

In a separate research [23], patients are ranked and prioritized based on emergency and treatment services, with a focus on comparing each patient to a large number of other patients. Nevertheless, there is a significant limitation to this method, namely, the assessment of the diagnostic significance of triage level for patients relies on a precise triage system. This research focused on prioritizing patients rather than assessing the accuracy of triage, since the methodology relied on raw patient data. For instance, this research may provide much more importance to ill patients compared to those who are at risk. Therefore, there is a deficiency in the process of assigning priority and it is also not correct.

The examination of the literature and taxonomy analysis indicates that the combination of triage and prioritization of patients with chronic heart disease, using the same model, has not been reported in previous research. The following part delves further into chronic illnesses in RHMS, with chronic heart disease serving as a case study in this research to demonstrate its feasibility.

2. Chronic Illnesses in the RHMS

Remote monitoring is often introduced as a significant supplement to routine healthcare [24]. Remote monitoring is applicable to various patient populations, including those with specific chronic ailments like cardiovascular disease or diabetes, elderly individuals, frail patients, those with dementia, and seemingly healthy and active elderly individuals. Its purpose is to prevent the development of severe medical conditions in the future. Moreover, the remote monitoring of patients with chronic conditions offers several therapeutic benefits. Remote real-time health monitoring is crucial for patients residing in remote areas who may be at risk of falling or experiencing chronic conditions including heart disease, high blood pressure, and diabetes [23].

2.1. Chronic Cardiovascular Disorders

Chronic illness is the primary factor responsible for mortality worldwide. Chronic illnesses, such as diabetes, cancer, and cardiovascular diseases, have a significant impact on health services since they contribute to mortality, morbidity, and disability. Chronic illnesses have garnered worldwide attention in the field of public health, leading to significant financial burdens of billions of dollars in healthcare expenses each year and causing over 36 million deaths yearly [25]. The prevalence of chronic illnesses in e-health systems globally has emerged as a progressively significant concern [26]. As an example, the amount of money spent on treating long-term illnesses in the United States is expected to make up 80% of the overall healthcare spending. Additionally, it is estimated that there will be over 150 million documented cases of chronic diseases by the year 2020 [5]. Chronic illnesses impose a significant cost on individuals and healthcare systems due to frequent unscheduled visits to emergency departments and prolonged hospital stays [3].

Chronic cardiac disease encompasses several forms and presents with a range of symptoms. According to a 2010

medical study from the American cardiac Association, arrhythmia is responsible for the death of around 55% of patients with cardiac conditions [27]. Severe instances of arrhythmia include the occurrence of ventricular tachycardia or fibrillation in cardiac tissues, which are comparable to a vortex and are caused by electrical waves. Furthermore, in a triage situation, vital signs such as ECG and oxygen saturation sensor (SpO2) play a crucial role as they provide an objective measure that supports the triage decision-making process and ensures uniformity among those assessing the patients [28]. The four primary metrics used to evaluate the symptoms and severity of chronic heart disease are EKG, oxygen saturation sensor, blood pressure monitoring device, and a non-invasive measuring instrument known as a text frame [29-33].

2.2. Medical Sensor

Various medical instruments are used to assess the vital signs of patients. The quantity and variety of sensors are contingent upon the specific ailment being tracked. This study specifically examines chronic heart illness [34-40]. Therefore, this part assesses four pertinent medical sources that examine heart function and document patients' medical complaints [41-46]. Each source is evaluated based on certain medical characteristics, such as the presence of rhythm and ST elevation in an ECG signal .

3. Conclusion

This research examines two elements of triage and prioritization of patients in the telemedicine setting. The first part of the systematic review procedure was given, including the technique, sources of information, research selection, search process, eligibility criteria, and taxonomy analysis. The purpose of this step was to gather, analyze, categorize, and prioritize research related to triage and validate the limits of these studies. Based on the taxonomy analysis, none of these trials had a comprehensive triage and prioritization platform. In addition, the discussion revolved on the RHMS, with a specific focus on chronic heart disease as a case study.

The second component of the topic covers the detailed explanation of the triage standards and guidelines, as well as the methods and procedures used for prioritization. The concepts of triage and prioritization were thoroughly examined, including their respective contexts, methodologies, and obstacles. The potential for overcoming these constraints

was also highlighted. In order to address the limitations of current triage and prioritization studies, researchers should create a framework that incorporates evidence theory and integrates MLAHP-TOPSIS methodologies. An appropriate framework should use an evidence theory for the goal of triage, in order to categorize patients into five distinct groups: risk, urgent, ill, cold state, and normal. Subsequently, the amalgamation of MLAHP-TOPSIS techniques needs to be used to rank patients according to their emergency condition and display them in a queue inside each respective group.

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