International Journal of Applied Industrial Engineering
Volume 7 • Issue 1 • January-June 2020

An Analysis for the Use of Simulation Modeling in Reducing Patient Waiting Time in Emergency Departments (EDs) in Hospitals

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ABSTRACT

The emergency department (ED) plays crucial role in providing 24-hour healthcare services to the ill with speed, accuracy, and sympathy. ED faces the problem of patient waiting time, which leads to patient dissatisfaction and patient crowding. This paper presents a systematic literature review of simulation of ED in healthcare systems from 1970 to 2013. The objectives of this review are to highlight the importance and role of simulation studies to solve the problem of patient waiting time faced by the ED. It also discusses how simulation can be better applied as a tool to solve these problems. The authors found that these simulation studies focus important insights into ED problems, but they also had some limitations that should be addressed.

KEYWORDS

Emergency Department, Length of Patient Stay, Patient Waiting Time, Simulation

1. INTRODUCTION

The emergency department (ED) is a core clinical unit of a hospital. Patient satisfaction and the image of the hospital are significantly influenced by the experience of patients attending the emergency department. If the patients with serious ill health are not treated urgently, it can result in damage, permanent deformity and ultimately the death. The patients entering an ED can be saved only if they arrive at the right time, at the right place, receives the right treatment and right resources. The aspect of speed, accuracy and sympathy are important in the emergency department (HSHRC, n.d.). ED faces serious problem of patient waiting time at various stages which ultimately hampers the quality of health care and leads to patient dissatisfaction. To solve this problem of ED, simulation plays important role from last forty years. Simulation modeling helps not only to understand the present system but also to implement corrective measures and their results can be compared without disturbing the system. Simulation modeling has been used in various countries to improve the quality of health care specifically in the ED. These simulation studies are vigorously studied in this paper.

DOI: 10.4018/IJAIE.2020010103

2. METHODOLOGY

Literature review is carried out from 1970 to 2013. It is implemented as per plan shown in the Figure 1. We used a two-phase approach to identify simulation relevant to problem of waiting time in ED. In the first phase, we searched and analyzed the databases of PubMed, Proquest, ACM, IEEE, and simulation Conferences. These databases are the sources of literature in computer science, operations management, health care, and engineering fields. We applied the search phrases like 'simulation in emergency department', etc. Classification of research papers are carried out on the basis of different ED Simulation for problem solving purpose. In the second phase, we examined the references of these 66 research papers. After this phase, we had a total of 52 simulation studies. Most of these studies were conducted after 1990. Analysis of these papers are carried on basis of patient waiting in ED, simulation modeling, objectives, Modeling techniques, data sources, collection methods and study findings. Different research papers which are studied are shown in Figure 2 with reference to five year span and respective number of referenced papers in that span. The number of paper was obtained up to 2 during 1970 to 1980. It was reduced during span of 1981-1985. It was raised to 3 in span of 1986-1990. After 1991, number was increased drastically which was shown in Figure 2.

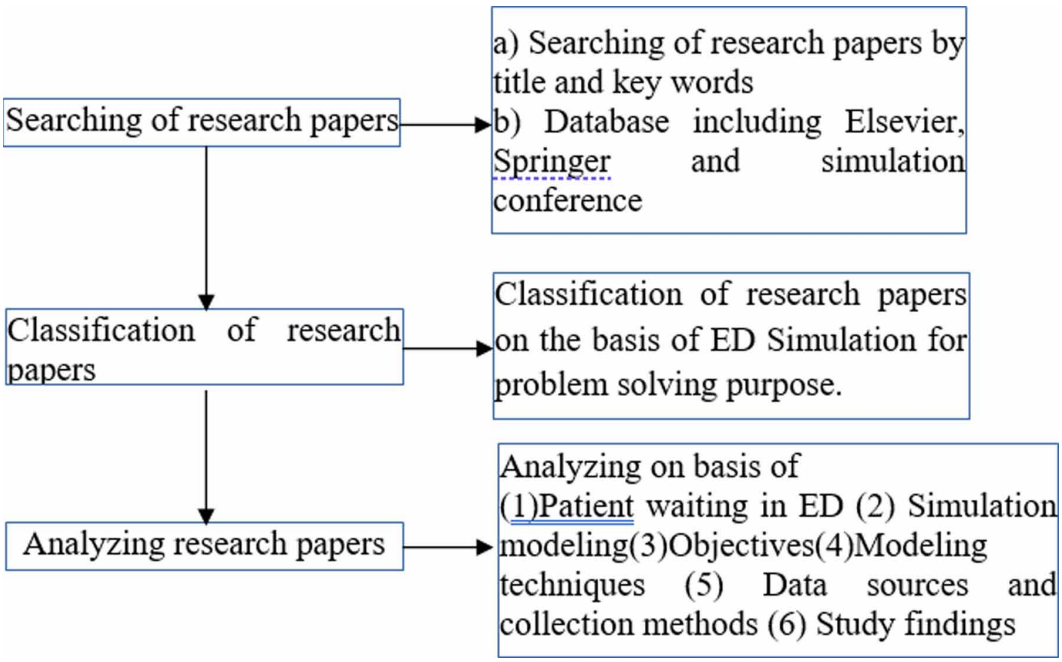
3. ANALYSIS OF SIMULATION STUDIES

Authors analyzed the simulation studies with respect to: (1)Patient waiting in ED (2)Simulation modeling (3) Objectives (4) Modeling techniques(5) Data sources and collection methods (6) Study findings

3.1 Patient Waiting in ED

Excessive patient waiting time in ED is the existing problem in worldwide. It reduces and hampers quality of health care and increases adverse effects on patients with serious illness (Diercks et al.,

Figure 1. Plan for literature review of simulation studies



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