

Queuing Theory Contributions and Applications in Health Service: A Study in the Field of Management Problems

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EXECUTIVE SUMMARY

This study analyzes the contributions and applications of queuing theory (QT) in the field of health service management problems. This review presents a classification system of healthcare examined with the aid of queuing models. The purpose of this is to analyze the contributions and applications of QT in the field of problem management in health services and to give indications of when and how to use QT in order to enhance daily management decisions. A literature review was carried out to investigate the health areas supported by queuing models, searching articles that described problem models and their topics or keywords related to QT and population health or health problems. The present study analyzed 314 articles that address the applications of QT in healthcare management between 2014 and 2020. This review demonstrates that QT can contribute to the improvement of health services and provide resource managers to achieve this improvement. A discussion of why, when, and requirements to apply QT is presented.

INTRODUCTION

The quality management processes of organizations providing health services, both in the public and private spheres, face great challenges and also great opportunities. Health is a field of social action that is constantly expanding, especially when considering the continuous increase in people's life expectancy, with increasing attention to their well-being.

Thus, in contemporary societies, improving the quality of health services has acquired increasing attention. Today, it is essential to identify the opportunities that arise, as well as the constant challenges in modern management processes.

As stated by Drucker (1997), it is considered unquestionable to observe that trying to change based on the prediction of the future is, at the very least, risky. The only things that can be said about the future is that it is uncertain and not known. However, it is also considered unquestionable, according to the same author, to be rational and to be constantly aware of the opportunities and challenges that the future may bring, as it is less risky than "continuing the trajectory with the comfortable conviction that nothing will change". (Drucker, 1994, p. 155).

Queuing theory (QT) is an immensely powerful tool because queuing models require little data and are simple and quick to use. Because of this simplicity and speed, they can be used to quickly evaluate and compare various service delivery alternatives. In addition to the more basic issue of determining how much capacity is needed to achieve a specified standard of service, queuing models can also be useful for gaining information about the appropriate degree of specialization or flexibility to use in organizing resources or the impact of several priority schemes to determine the order of work to be followed among admitted patients. With the increasing processing power of computers, there is an increasing scope of numerical methods and simulation models to be used alongside traditional queuing theory to help better understand real-life queuing systems.

This chapter aims to put some light to the QT application in healthcare, based on published work.

SETTING THE STAGE

Application of Queuing Theory in Healthcare

Many problems like these need to be addressed in health services and, Operations Research provides numerous methodologies and techniques to solve them. The operations research model offers a systematic approach to problem solving and allows characterization of activities in an existing system using mathematical modeling, which successfully addresses health system problems such as queuing.

The first analysis of QT was in the context of telephone facilities made by AK Erling in 1913. It is widely used in operations management in the industrial environment or in the retail sector, being part of the field of decision science.

The rising cost of health care can be attributed not only to an aging population and new, expensive, and modern methods of treatment, but also to inefficiencies in the delivery of health services. The use of QT to manage flow in health services is an attempt to reduce costs by minimizing system deficiencies and delays. There are many problems in the healthcare system that can be solved using this theory.

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