

Preface

Healthcare management is composed of management activities and functions involved in various departments of healthcare systems. The objective of healthcare management is to influence the growth, development, and operations of healthcare systems. In recent years, there has been a significant increase in the interest for designing healthcare systems in order to address complex healthcare problems.

Operations research (OR) aims at developing mathematical and computational support for the optimization of problems in industry, service, and business. OR techniques have been used in the solutions of various healthcare problems in the literature. These studies have been published in some journals, proceedings, and books whose focus area is not totally healthcare systems. The motivation for editing this book has been the need for collecting the OR techniques applied to healthcare systems in a single source.

Twenty-two chapters have been submitted from various countries, namely, Turkey, the UK, the USA, Belgium, Croatia, Portugal, the Netherlands, Canada, Iran, Singapore, and Italy. This book is composed of eight main sections and two or three chapters under each main section.

The first chapter presents the taxonomy of operations research methodology in healthcare management to provide a common terminology and a classification mechanism.

The second chapter summarizes quantitative and qualitative techniques used in healthcare management, including OR techniques, statistical techniques, multicriteria decision making techniques, and others and presents graphical analyses of the survey results.

The third chapter proposes online optimization approaches for real time management of operating rooms. Real time management is capable to deal with the elective and non-elective patient flows within a single surgical pathway and with the resource sharing among different surgical pathways of elective patients. The authors assess the effectiveness of the proposed solutions on simulated surgical clinical pathways under several scenarios.

The fourth chapter presents two novel approaches for the identification of Takagi-Sugeno fuzzy models with time variant and time invariant features. The mixed fuzzy

clustering algorithm is used for determining the parameters of Takagi-Sugeno fuzzy models in two different ways. The fuzzy modeling approaches are tested on four healthcare applications for the classification of critically ill patients.

The fifth chapter reviews OR literature applied to hospital wards. The authors distinguish intensive care, acute medical units, obstetric wards, weekday wards, and general wards. They aim at guiding both researchers and healthcare professionals in identifying which OR technique/model suits best for each specific hospital ward setting.

The sixth chapter monitors the impact of interrelations in the development of an efficient and proactive system of chronic care management through Social Network Analysis.

The seventh chapter evaluates healthcare system efficiency of 34 OECD member countries using Data Envelopment Analysis (DEA). The base model is an output-oriented Banker-Charnes-Cooper model that uses the number of physicians, nurses, beds per 1000 population as inputs, and life expectancy at birth, infant survival rate as outputs.

The eighth chapter aims at predicting the healthcare expenditure per capita. Accurate estimation of healthcare expenditure can guide efficient healthcare policy making and resource allocation. Three different strategies are proposed to improve the forecasting accuracy of gray forecasting models. Genetic algorithm is applied for training data size and parameter optimization.

The ninth chapter focuses on vaccination and investigates the vaccine supply chains. This chapter aims at classifying some problems of the vaccine supply management which can be solved by mathematical programming tools.

The tenth chapter discusses the challenges and research opportunities in the blood collection operations and explores the benefits of recent advances in the blood donation process.

The eleventh chapter aims at introducing the recent developments in organ transplantation network planning as well as presenting relevant case studies. It focuses on mathematical programming and computational models proposed in the recent literature for organ transplantation network planning.

The twelfth chapter investigates a fuzzy decision tree algorithm applied to the classification of gene expression data. The fuzzy decision tree algorithm is compared to a classical decision tree algorithm as well as other well-known data mining algorithms commonly applied to classification tasks.

The thirteenth chapter presents an overview of disease screening problems and operations research applications on different aspects of the problems. The authors first discuss operations research applications in evaluation and optimization of screening policies and then organization of screening services for reaching out to the population and improving the effectiveness of screening.

The fourteenth chapter presents an analysis of the efficiency of diabetes treatment in the UK healthcare facilities using TOPSIS and neural networks. The authors provide a rational framework for policy makers to rank the efficiency of diabetes care facilities and also highlight the most important contextual variables that impact on the efficiency as issues of interest for future policies.

The fifteenth chapter uses achievement scalarization to obtain efficient solutions for radiation treatment planning. The authors adapt the parameters of the achievement scalarization to address a solution in a rectangle that is defined by the bounds on the objective functions. They compare the proposed method with multiobjective solution algorithm from the literature and clinical plans.

The sixteenth chapter introduces and discusses the recent developments of OR techniques for emergency medicals service management. Two selected mathematical models from the relevant literature are also elaborated. In addition, a real emergency medicals service location problem is described as a case study.

The seventeenth chapter is on medical informatics. A review of medical informatics is presented and a multidisciplinary point of view is given based on different approaches.

The eighteenth chapter aims at identifying the prevalent challenges of pharmaceutical supply chains at three different decision levels, i.e., long-term (strategic), mid-term (tactical), and short-term (operational) decisions.

The nineteenth chapter proposes a categorical data envelopment analysis framework for evaluating medical tourism performance of top destinations. Research hypotheses are created to analyze the relationship between the countries' medical tourism performance and their political, regulatory environment, technology, and knowledge outputs.

The twentieth chapter discusses different analytical techniques used in healthcare human resource planning. Two case studies are presented to provide examples of real-world applications across different institutional contexts.

The twenty-first chapter discusses the lean management techniques, their applications in the healthcare systems and how they can improve the performance of these systems by providing better patient service, better utilization of assets, and better patient care.

The twenty-second chapter introduces the procurement management in healthcare systems and discusses the related challenges together with some optimization approaches on procurement management problems in healthcare systems.

This book will provide a useful resource of ideas, techniques, and methods for the research on the theory and applications of OR techniques in healthcare management. We thank all the authors whose contributions and efforts made the publication of this book possible. We are grateful to the referees for their invaluable and highly appreciated works contributed to select the high quality of chapters published in this book.

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