Computers & Operations Research ■ (■■■■) ■■■–■■■

Contents lists available at ScienceDirect

Computers & Operations Research

journal homepage: www.elsevier.com/locate/caor

A survey of healthcare facility location

Amir Ahmadi-Javid [a,*], Pardis Seyedi [a], Siddhartha S. Syam [b]

[a] Department of Industrial Engineering, Amirkabir University of Technology, Tehran, Iran
[b] Department of Management, Marquette University, Milwaukee, WI, USA

ARTICLE INFO

Article history:
Received 12 March 2015
Received in revised form
2 April 2016
Accepted 30 May 2016

Keywords:
Healthcare facility location
Health systems
Emergency medical services
Optimization methods
Operations research
Discrete location problems

ABSTRACT

Healthcare facility (HCF) location has attracted considerable attention from the operations research community over nearly four decades as one of the most important strategic issues in healthcare systems, disaster management and humanitarian logistics. However, the lack of a comprehensive review in the last decade is a serious shortcoming in the literature of HCF location. This survey presents a framework to classify different types of non-emergency and emergency HCFs in terms of location management, and reviews the literature based on the framework. The papers on HCF location problems are classified in detailed tables along ten descriptive dimensions, which are consideration of uncertainty, multi-period setting, particular input/setting, objective function, decision variable, constraint, basic discrete location problem, mathematical modeling approach, solution method, and case study inclusion. For each HCF types, research gaps and possible future directions are identified. Moreover, the literature and future possibilities are analyzed in terms of modeling approach and solution method.

Contents

* Corresponding author.
E-mail address: ahmadi_javid@aut.ac.ir (A. Ahmadi-Javid).

http://dx.doi.org/10.1016/j.cor.2016.05.018
0305-0548/

Please cite this article as: Ahmadi-Javid A, et al. A survey of healthcare facility location. Computers and Operations Research (2016), http://dx.doi.org/10.1016/j.cor.2016.05.018

1. Introduction

Facility location decisions play a critical role in the strategic design of systems for a wide range of private and public organizations (e.g., retail facilities, warehouses, airline hubs, police stations, hospitals, etc.). This is because poorly located facilities or an improper number of facilities can greatly increase capital and inventory costs and degrade customer services. The first theoretical study on the location of facilities began in 1909 when Alfred Weber [1] introduced a warehouse location problem to minimize the total distance between a warehouse and a set of customers. Thereafter, location theory and its applications were developed in different research areas along with a variety of models.

In healthcare, incorrect facility location decisions have a serious impact on the community beyond simple cost and service metrics; for instance, hard-to-access healthcare facilities are likely to be associated with increased morbidity and mortality. From this perspective, facility location modeling for healthcare is more critical than similar modeling for other areas. In addition, because of globally pervasive trends, such as decreasing birth rates, higher longevity and associated growth in elderly population, increasing environmental problems (e.g., sound and air pollution) healthcare and the associated healthcare facility (HCF) location problems have become noticeably more critical and important to society. Due to this, HCF location modeling continues to attract keen interest from the operations research (OR) community.

Perhaps the earliest location-allocation study in the field of healthcare facilities (HCFs) was presented by Gould and Lienbach [2]. In this study the problem of locating hospitals and determining their capacities was considered as a p-median problem in the western part of Guatemala. The transportation algorithm was used to solve the problem. From 2000 onwards, researchers reviewed different parts of the literature of HCF location from various perspectives (see [3–11]). The scopes of these review

Please cite this article as: Ahmadi-Javid A, et al. A survey of healthcare facility location. Computers and Operations Research (2016), http://dx.doi.org/10.1016/j.cor.2016.05.018