Accepted Manuscript

Home health-care network design: Location and configuration of home health-care centers

Carlos Rodriguez-Verjan, Vincent Augusto, Xiaolan Xie

PII: S2211-6923(17)30013-9
DOI: https://doi.org/10.1016/j.orhc.2017.09.001
Reference: ORHC 132

To appear in: *Operations Research for Health Care*

Received date : 31 January 2017
Accepted date : 11 September 2017

Please cite this article as: C. Rodriguez-Verjan, V. Augusto, X. Xie, Home health-care network design: Location and configuration of home health-care centers, *Operations Research for Health Care* (2017), https://doi.org/10.1016/j.orhc.2017.09.001

Home Health-Care Network Design: Location and Configuration of Home Health-Care Centers

Carlos Rodriguez-Verjan, Vincent Augusto and Xiaolan Xie

UMR CNRS 6158 LIMOS,
Center for Biomedical and Health-care Engineering,
École Nationale Supérieure des Mines de Saint-Étienne
158 cours Fauriel 42023 Saint-Étienne cedex 2, France

January 2017

Abstract

Home Health-Care (HHC) is a concept slowly expanding over time, introduced to reduce pressure on inpatient hospital beds by providing care to patients at home. Nowadays, HHC centers are able to undertake more technical complex care such as (but not limited to) end-of-life care, chemotherapy and rehabilitation. This article accomplishes two main objectives: (i) design a home health-care network by locating HHC centers across a territory, taking into account medical demand and costs of resources and facilities; (ii) optimally manage the activities of HHC centers by deciding on the outsourcing of critical processes for patient care. Two mixed-integer linear programs are proposed to solve these problems and propose strategic and tactical decisions. A practical case study is proposed on the Loire department (France) with various scenarios to test the robustness of the model depending on demand variation. The proposed method gives efficient plans for designing and managing HHC centers with cost-efficient solutions on both strategic and tactical level.

Keywords: Home health-care; location; allocation; cost analysis; resource management; strategic design; optimization

1 Introduction

Health-care systems efficiency optimization is beyond the scope of the hospital. The challenges of the twentieth century aim to connect health facilities in order to better understand and accompany patient's pathway throughout their care process on the long term. Health-care centers are now designed to collaborate within a network, and this requires a rigorous organization. Besides the quality of care provided to the patient, reducing costs remains a primary goal of health systems. Deficit of hospitals in most of European countries is an incentive to find new measures to cure "better" and "cheaper". Indeed, an ever aging population imposes health professionals a continuously increasing workload, even if resources are constant. Efficient health-care network organizations supported by modern information technology infrastructure can help solve this challenge.

Home Health-Care (HHC) is an important organization of health-care in developed countries, allowing patients to be treated at home when possible. Such approach is cost-efficient [Rodríguez-Verjan et al., 2012] if the HHC centers are wisely organized in a network, allowing traditional hospitals to free beds for acute care and avoid bed-blockers. Experiences of hospitalization at home are not so numerous. Technical care (such as chemotherapy, blood transfusion,