

Accepted Manuscript

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M. Heshmat, A. Eltawil

PII: S2211-6923(16)30127-8

DOI: <http://dx.doi.org/10.1016/j.orhc.2017.06.002>

Reference: ORHC 122

To appear in: *Operations Research for Health Care*

Received date: 30 October 2016 Accepted date: 29 June 2017

Please cite this article as: M. Heshmat, A. Eltawil, A new sequential approach for chemotherapy treatment and facility operations planning, *Operations Research for Health Care* (2017), <http://dx.doi.org/10.1016/j.orhc.2017.06.002>

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A new sequential approach for chemotherapy treatment and facility operations planning

M. Heshmat¹

Department of Industrial Engineering and Systems Management, Egypt-Japan University of Science and Technology, Alexandria, Egypt
mahmoud.heshmat@ejust.edu.eg

A. Eltawil

Department of Industrial Engineering and Systems Management, Egypt-Japan University of Science and Technology, Alexandria, Egypt
eltawil@ejust.edu.eg

Abstract

Chemotherapy is a drug infusion process used to eradicate cancerous cells while controlling chemotherapy complications at the same time. The chemotherapy management problem has two tributaries; drug management and operations management, namely; oncologists seek optimal treatment plans whereas; operations managers seek optimal operation performance inside the outpatient chemotherapy facility. In the literature, both, chemotherapy treatment planning and outpatient chemotherapy operations planning have been treated separately. This paper addresses the two aspects together by introducing two mathematical programming models to be solved sequentially. First, we study an optimal control model that determines the optimal drug schedules which result in a decreasing number of cancerous cells with time. Since the optimal control model has no analytical solution, it is transformed into a mixed integer nonlinear programming model. The second model is a mixed integer programming model developed for the purpose of finding the optimum starting days for new patients. The developed models can give a complete plan regarding both the optimum drug infusion doses and also the optimal treatment days for a set of new patients under resource and time constraints. The objective of the developed models is to minimize the number of cancerous

¹Corresponding author

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