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# Integrated scheduling of tasks and gynecologists to improve patient appointment scheduling; a case study

N.M. van de Vrugt<sup>a,b,\*</sup>, S.T. Luen-English<sup>c</sup>, W.A.P. Bastiaansen<sup>b</sup>, S. Kleinluchtenbeld<sup>b</sup>,  
W.T.P. Lardinois<sup>b</sup>, M.H. Pots<sup>b</sup>, D.J. Schoonbergen<sup>b</sup>, E.W. Hans<sup>b</sup>, J.L. Hurink<sup>b</sup>,  
R.J. Boucherie<sup>b</sup>

<sup>a</sup>*Jeroen Bosch Hospital, 's Hertogenbosch, the Netherlands*

<sup>b</sup>*Center for Healthcare Operations Improvement and Research (CHOIR), University of Twente, Enschede, the Netherlands*

<sup>c</sup>*School of Mathematics, Cardiff University, Cardiff, Wales, United Kingdom*

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## Abstract

Like many hospital departments, the gynecology department of the Jeroen Bosch Hospital experienced difficulties with scheduling outpatient appointments at the medically preferred times. Despite the time invested in creating the schedule, the compliance of the achieved schedules with the preferences of gynecologists is low, and the number of scheduled outpatient clinic hours is unbalanced over the weeks. To overcome this unbalanced scheduling, we develop a scheduling methodology that, opposed to existing methods, simultaneously assigns task types and gynecologists to shifts. This enables us to (1) explore the complete solution space to obtain better schedules, and (2) take into account different specializations and working hours of the gynecologists. To this end, we first present a Mixed Integer Linear Programming (MIP) approach for this scheduling problem that has the objective to increase compliance of the soft constraints. Preliminary results achieved with this MIP model show the potential of the chosen approach and were the motivation to develop two heuristic approaches, which are better suited for practical purposes. Based on several realistic test instances, the scheduling approaches appear promising for the hospital to apply for gynecologist scheduling, as they improve patient access times, comply better with preferences of the gynecologists, significantly reduce the time spent on creating the schedules, and do not require MIP solvers.

*Keywords:* Physician scheduling, Integer programming, Heuristics, Health care

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## 1. Introduction

The gynecology department of the Jeroen Bosch Hospital (JBH) experienced difficulties with scheduling outpatients appointments at the medically preferred times. The problem is

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\*Corresponding author. Currently this author is employed by Leiden University Medical Centre, Leiden, the Netherlands.

*Email address:* n.m.vandevrugt@utwente.nl (N.M. van de Vrugt)

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