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WORKING PAPER

Integrating the Nurse Staffing Decision and the Shift Scheduling Decision: Case Study and Policy Analysis

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January 2008

2008/497

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ABSTRACT

The efficient and effective management of nursing personnel is of critical importance in a hospital's environment comprising a vast share of the hospital's operational costs. The nurse workforce management process highly affects the nurses' working conditions which are strongly related to the provided quality of care. Policy decisions on the staffing level have an impact on the outcome of the scheduling level and vice versa. Isolated reasoning typically leads to suboptimal decisions often resulting in ineffective outcomes of care, which endorses the need for an integrative nurse staffing and shift scheduling approach. In this paper we propose an exact branch-and-price procedure that simultaneously assigns nurses to a specific department or to the float unit in the hospital and constructs a roster over the planning horizon for each nurse. We aim to optimize not only the hospital's objectives (i.e., the effectiveness and efficiency of care) but also the nurses' objectives (i.e., social quality) to overcome motivation and retention problems. We test and validate our algorithm on a real-life situation in a Belgian university hospital. Moreover, we examine the impact of variable staffing and several shift scheduling policies on the nurse staffing decision.

Keywords: *Manpower planning; Resource allocation; Hospitals*