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Quality-driven efficiency in healthcare – Integrally redesigning inpatient care services

Abstract

Societal developments demand hospitals to increase quality of care, while on the other hand improved logistical efficiency is required. This entails a strong incentive to reconsider the design and operations of inpatient care services. The work presented in this talk shows that quantitative modeling can be of great help.

Effectively designing inpatient care services requires simultaneous consideration of several interrelated planning issues, such as case mix, care unit partitioning and size, and staffing decisions. The inpatient care facility is a downstream department of which the workload is mainly determined by the patient outflow of the operating theater and the emergency department. Therefore, coordination with surgical and emergency care services is essential. Workload on nursing wards depends highly on patient arrivals and patient lengths of stay, which are both inherently variable. Predicting this workload, and staffing nurses accordingly, is essential for guaranteeing quality of care in a cost effective manner.

First, we present a stochastic analytical model to predict bed census on nursing wards by hour as a function of the operating room schedule and a cyclic arrival pattern of emergency patients. The model enables the evaluation of alternative interventions with respect to both the design and the operations of inpatient care units.

Second, we introduce a method which takes the hourly census predictions as starting point to derive efficient nurse staffing policies. It particularly explores the potential of flexible staffing policies which allows hospitals to dynamically respond to their fluctuating patient population. The flexible policies involve the employment of so-called float nurses for who it is only at the start of a working shift decided in which specific care units they will work.

We demonstrate the effectiveness of our methodology by the application to a case study of the surgical inpatient clinic within the Academic Medical Center (AMC) Amsterdam. During the upcoming years the presented method will be applied in the AMC in supporting the intended complete redesign of the inpatient care facility.