

O.R. Applications

Developing a platform for comparison of hospital admission systems: An illustration

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Received 29 October 2003; accepted 7 April 2006

Available online 7 July 2006

Abstract

There is an increasing need to develop a platform for comparing hospital admission planning systems due to a shift in the service paradigm in the health sector. The current service concept of hospital admission planning aims at optimising the use of scarce hospital resources without paying much attention to the level of service offered to patients. As patients nowadays do not accept long waiting times for hospital admission, it becomes necessary to consider alternative admission service concepts. Waiting lists have also become a political issue, and alternative concepts have been advocated such as giving all patients an appointment for admission. A simulation model was built to examine the impacts of extreme admission service concepts in a simplified hospital setting. The alternative concepts considered are based on the ‘zero waiting time’ principle (immediate treatment), and the ‘booked admissions’ principle (using an appointment for admission). The results of these admission service concepts are compared with the results of the current concept, based on the ‘maximising resource use’ principle. The paper deals with the development of a framework and tool that allows evaluating different, somehow conflicting, hospital admission planning concepts and the usefulness of such framework and tool for more refined/real-life approaches to hospital admission planning.

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Keywords: Health services; Admission policy; Admission planning; Waiting lists; Simulation

1. Introduction

Hospital admission planning refers to the operational planning of patients who need to be admitted as inpatients to a hospital [6]. Patients can be classified as elective, urgent or emergency. Elective patients do not have to be treated immediately and can therefore be put on a waiting list, to be called when it is their turn, with just a vague notion

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of the actual admission moment. Alternatively, elective patients can be given an appointment for admission. Urgent patients need to be admitted at short notice, which is usually as soon as a bed becomes available. Emergency patients need to be admitted immediately.

The available literature on admission planning and waiting lists is rather extensive; see, e.g., Gemmel and van Dierdonck [4] for a recent state of the art on admission planning and Mullen [8] for a review on waiting lists and waiting list management. Many of the studies reported in [4] are concerned with improving the scheduling of admissions and resources. For instance, Smith-Daniels et al. [13] present an extensive literature review on capacity management in hospitals and they conclude that most admission scheduling systems only consider bed capacity. This may lead to sub-optimal use of other resources such as nursing staff and operating theatre rooms. Fetter and Thompson [2] introduced a patient classification system Diagnosis Related Groups (DRG's) that allows for taking into account different resource requirements for patient groups when scheduling patients for admission. Roth and van Dierdonck [11] developed a Hospital Resource Planning system (HRP), based on a master admission schedule (borrowed from the theory on Materials Requirements Planning) that can be 'exploded' into plans for capacity requirements, while making use of the DRG system of patient classification. One other important issue in admission planning is how to deal with urgent and emergency admissions. In the HRP system [11] capacity for urgent and emergency patients is reserved, based on a prediction of demand. Groot [5] uses a planning model for admissions that forecasts resource requirements, taking into account the occurrence of emergency patients. The focus of these studies is to improve the technique of scheduling patients for admission, by taking into account all resources involved, different resource requirements of different patient groups, and ways of dealing with urgent and emergency admissions. All the studies reported regard the level of scheduling of admissions, and do not address the service concept behind the scheduling technique, which is the focus of our study. Mullen [8] gives a state of the art overview on waiting lists and waiting list management. Many of the studies reported deal with prioritisation, i.e., the order in which patients are selected from the waiting list. This is an important issue in waiting list management, but it is not the topic of this research.

Worthington [15] illustrates in his approach the impact of mechanisms in planning a specialty practice, for instance an extra clinic session, on waiting lists. Bowers and Mould [1] investigate the effect of concentration and variability of orthopaedic demand on the performance.

In this study we do not aim at a contribution to improve the technique of scheduling admissions, but we aim at a contribution to the service concept that governs the technique of planning. The literature reports not many studies with a focus on the service concept used for planning. Some studies investigate policies for a well-defined category of patients such as patients waiting for liver transplantation [9], or cardiac surgery [16] or a hip replacement [12]. The focus of these disease specific studies is often more on the rules of prioritisation and resource allocation, and not so much on the principles driving the admission planning. In this study, we focus on generic and extreme service concepts rather than disease specific admission policies.

The current principle, that drives admission planning in hospitals, is to utilise the available resources to the maximum, i.e., to treat as many patients as possible within the constraints of available resources. The waiting lists for elective patients are used as buffers for variations in the level of demand. Elective patients are scheduled by picking them from the waiting list in some priority order. This concept of 'maximum resource use' is increasingly viewed as unacceptable. In the current situation priority is given to optimisation of resource use without considering the consequences for the service level. As patients are increasingly aware of what is acceptable as waiting time, it becomes necessary to reconsider the trade-off between service level and resource use.

Balancing service level with resource use is a key issue in a production control approach. Our previous work in hospital planning concentrated on translation of production control principles to a health care setting. This has resulted in a framework for production control in hospitals [14]. In the framework we consider the decisions that can be taken to balance patient flows and resources at different levels of planning, ranging from strategic planning to operational control. At the strategic level of planning, one of the decisions taken is the service concept used for planning. This is the link between our previous work and this research.

One of these alternative concepts for admission planning, currently in focus, can be labelled as

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