

Alternative Research Trends in Operating Room Planning

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June 15, 2018

Operating Rooms (ORs) are one of the higher cost drivers of hospital budget and one of the highest source of income. The challenge that hospital management has to face is achieving a better and optimised use of hospital shared resources, able to reduce costs and increase profits. The adoption of decision methods can provide tools able to address the complexity of OR planning and scheduling [9, 14, 15, 20, 22]. Such a complexity is given by different characteristics of the hospital organisation, where wards access to shared and limited resources such as ORs, ward beds, Intensive Care Unit (ICU) beds, Anaesthesiologists, Surgeons, Nurses. Other factors increase the complexity, such as the uncertainty of patient clinical conditions (e.g. the length of stay after the surgical intervention) and the patient surgery time in the OR session that can lead to cancellations or delays of surgery in the schedule.

OR scheduling and planning can be defined by three hierarchical decisions levels: strategic, tactical and operational that consider respectively the long, medium and short term objectives. The strategic level considers resource allocation problem, determining the number of surgeries, which staff to use for surgeries and defining the amount of the resources available. At tactical level the master surgical schedule, that is the assignment of OR blocks to surgical specialties, is defined together with the number of surgeons, the definition of ward and ICU use, and the need of equipment. At the operational decision level, the problem arising is also called “surgery process scheduling” of elective patients, which usually consists in (i) selecting patients from an usually long waiting list and assigning them to a specific OR session (i.e., an operating room on a specific day) over a planning horizon, and (ii) determining the precise sequence of surgical procedures and the allocation of resources for each OR session.

This talk is organized in three parts. The first part illustrates some new contributions recently appeared in the OR literature [1, 8, 17, 18, 19, 21]: such contributions are selected as representative of alternative approaches that can be used in this field of research. Several performance criteria have been reported to evaluate the OR planning decisions [9]: usually, the maximisation of the OR utilisation is the most adopted criterion, since ORs are the largest cost and revenue centre of hospitals [14]. The second part faces the problem of comparing different performance criteria [3, 5] also taking into account their impact over time [4]. The third and last part introduces the Real Time Management (RTM) of operating rooms [2, 11], which is the decision problem arising during the fulfilment of the surgery process scheduling, that is the problem of supervising the execution of such a schedule and, in case of delays, to take the more rational decision regarding the surgery cancellation or the overtime assignment. The RTM with also non-elective patients is studied by [12, 13] in which a competitive analysis of the online algorithms is discussed.

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