

The healthcare sector needs more operational research

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Abstract. More efficient use of resources and improved quality of services is needed in the health care sector, in order to meet the challenges of aging populations coupled with rising quality expectations due to technological advances and desire to cap or reduce budgets. In healthcare, complex decisions at strategic, tactical, and operational levels are coupled across organizational boundaries, with interdependency between plans that share many of the same resources and infrastructure. Decision support tools from Operations Research have for decades been successfully applied to complex resource management problems in other industries. While such tools are needed in the health sector, they are no panacea but maybe one of the most promising approach to ease their strain. A wide-spread application of such tools will increased efficiency at hospitals and patients will experience more streamlined coordination of activities, improved predictability and regularity—getting a higher service levels and ultimately better quality of health care services.

Keywords: health care; operational research; optimization

Introduction

In developed countries, population ageing with the skewed demographic development results in a rapid increase of hospital patients (the rapidly growing absolute and relative numbers of older people mean that more and more people will develop age-related certain chronic and debilitating diseases, which will put a strain on hospitals. Also, older people stay longer in hospitals for the same illness). Due to technological advances, the public's expectation of quality treatment is increasing along with the government's desire to cut (or at least cap) their health expenditures. This induces a growing strain on the health care system. Health sector is resource intensive sector and normally stands for a substantial part of a governments budget (in Norway, 17.7% of the government expenditure is health expenditure (Index Mundi, 2011)). Increasing the healthcare sector by hiring is

no solution: Already every sixth pupil in Norway starts working in the health care sector. To handle the increased amount of patients with the current system, every fourth pupil need start working in the sector in 2025. And in 2035, every third pupil must work in the health care sector (Bovim, 2010). In Norway, reports like the Coordination Reform (Norwegian, 2009) suggest Electronic Patient Journals and Clinical pathways as a remedy. Even though these approaches have beneficial effects and should be implemented it is very unlikely they will improved efficiency sufficiently to tackle the ever increasing strain.

Planning processes in health care are very complex (e.g., surgery planning, personnel scheduling), often highly coupled across, as well as along, organizational levels (operational, tactical and strategic planning) while sharing limited resources (Burke *et al.*, 2010). Often, this time demanding planning processes ties up highly qualified personnel and is unlikely to find efficient solution due to the complexity involved. The complexity does not lend itself well to manual planning—Operations Research (OR) tools are needed. OR techniques have for decades been successfully to the industry. For example, a survey (Babulak & Ming, 2008) ordered by the Department of Trade and Industry of the UK showed that all levels of management in the 500 largest corporations in the United States used simulation for decision support—it's a quick method of analysing complex problems, reduces risk associated with decision making. Another technique like optimization have for decades been successfully applied to complex resource allocation problems in industry, often with huge improvements. In one sense, health care is a business like any other, trying to utilize resources (equipment, staff, etc.) efficiently involving multiple decision-makers with conflicting goals. However, it does differ on one major issue, the health care sector and municipalities lacks quantitative decision support tools for efficient management of resources.

We believe some of the reasons why quantitative methods have to little degree been put to use in the health sector are:

- Complexity and integration: The health care sector is in general notoriously complex. The integration and dependency of operations in different departments of hospitals create a very large network of interconnection. However, the industry has similar complex planning problems, for example: integrated operations framework in oil & gas sector, where planning of shared resources and activities is critical and OR techniques and tools make a large difference.
- Hierarchy/organization: The health care sector is hierarchical, from the political decisions and all the way down to day-to-day operations in different departments. Higher level decisions impose constraints on lower level decisions, whereas the latter provide necessary feedback to evaluate the higher level decisions. Traditionally, their focus has been on providing healthcare for the public and less attention has been given to the financial side. With the government's desire to cap or cut health cost more focus is given to handling costly resources more efficiently. For example in Norway 5 to 10 % of the planned major surgical procedure are cancelled and with an average cost of € 15.000 for a major surgical procedure and presently. Also health care managers have to a less extent been exposed to OR previously job or during their education. In Norway, it's common that managers have a medical background than financial or engineering.
- Uncertainty: Decisions in health care must often be taken in the face of the unknown. The consequences of such decisions cannot be fully determined until

a later time, but there may be several possibilities to make do corrections as more information becomes available. You do have the same challenges in industry.

We need to pave the road for innovation in the health care related software industry, and contribute to more efficient use of resources in the health care sector. We need to study areas of the health sector and identify challenging problems, that share similarities with the industry and where OR have helped industry. The strain on the health system resources will continue to increase. Using OR techniques will ease the strain by ensuring more efficient use of resources through better planning, scheduling, and coordination of activities. Patients will experience more streamlined coordination of activities, improved predictability and regularity, and therefore higher service levels and ultimately better quality of health care services.

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