

Flexible operations research methods for health care

Elin Bjørk Bodvarsdottir, PhD project

Opportunities for improvement in health care planning

A hospital is a large and complex organization, with many different wards, thousands of employees and a constant flow of patients, both scheduled as well as urgent. This leads to complex planning problems that everyday health care professional need to solve. Poor solutions lead to in-efficient use of valuable resources, e.g. personnel or facilities, and can have a significant impact on both the operational cost of the hospital as well as the quality of service offered to patients. The planners may in some cases be supported by advanced OR methods to obtain better solutions to those complex problems.

Research question?

The following hypotheses will be addressed:

- It is possible to improve Danish health care planning using OR methods.
- It is possible to create OR solutions, i.e. software, which can handle similar, but not identical, planning problems on different hospitals.

Conceptual model/theory

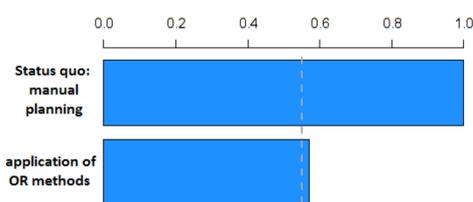
Different OR techniques have been applied to various aspects of health care around the world. In this project, some of the current operations in Region Sjælland will be analysed and planning problems that are likely to lead to efficiency improvements will be identified. One planning problem that will be analysed is the nurse rostering problem (NRP).

Method

The planning problems identified can be formulated as mathematical models and appropriate solution approaches derived based on the structure of the models. These approaches can include decomposition (e.g. Dantzig-Wolfe decomposition with delayed column generation for the NRP) or development of heuristics. The approaches should be specific enough to obtain good solution, but still they should remain flexible enough to be applicable for similar problems.

Expected results

The project aims to develop models and flexible solution approaches for common planning problems. The models, along with their solutions, should act as decision support for health care planners, with the overall goal of improving health care efficiency.



Results from master thesis for NRP minimization problem. Comparison of a manually generated solution from hospital (top), solution generated with a column generation heuristic (bottom) and a theoretical lower bound (grey line).



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Funded by:

Region Sjælland
DTU Management Engineering

Start and completion date:

1 September 2017 to 31 August 2020