

A Summary of Constrained Optimization Methods in Health Services Research—An Introduction: Report 1 of the ISPOR Optimization Methods Emerging Good Practices Task Force

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The following summary complements the ISPOR Task Force Optimization Task Force Q&A with Co-Chairs William Crown and Kal Pasupathy, which appeared in the MARCH/APRIL 2017 issue of Value & Outcomes Spotlight.

In common vernacular, the term “optimal” is often used loosely in health care applications to refer to any demonstrated superiority among a set of alternatives in specific settings. Seldom is this term based on evidence that demonstrates such solutions are, indeed, optimal—in a mathematical sense. By “optimal” solution we mean the best possible solution for a given problem in view of the complexity of the system inputs, outputs/outcomes, and constraints (budget limits, staffing capacity, etc.). Failing to identify an “optimal” solution represents a missed opportunity to improve clinical outcomes for patients and economic efficiency in the delivery of care.

Constrained optimization methods are already widely used in health care in areas such as choosing the optimal location for new facilities, making the most efficient use of operating room capacity, etc. They can also be very useful in guiding clinical decision making in actual clinical practice where physicians and patients face constraints, such as proximity to treatment centers, health insurance benefit designs, and the limited availability of health resources. These methods have also been applied to disease diagnosis [1,2], the development of optimal treatment algorithms [3,4], and the optimal design of clinical trials [5]. Health technology assessment using tools from constrained optimization methods is also gaining popularity.

The objective of the task force was to develop guidance for health services researchers, knowledge users, and decision makers in the use of operations research methods to optimize health care delivery and value in the presence of constraints. In this first of two reports, the task force introduces the vocabulary of constrained optimization models and the steps in an optimization process and outlines a broad set of models available to analysts for a range of health care problems.

Constrained optimization methods are highly complementary to traditional health economic modeling methods and dynamic simulation modeling—providing a systematic and efficient method for selecting the best policy or clinical alternative in the face of large numbers of decision variables, constraints, and potential

solutions. As health care data continue to evolve rapidly in terms of volume, velocity, and complexity, we expect that machine learning techniques will also be used increasingly for the development of models that subsequently can be optimized.

In the second report, the task force identifies good practices for designing, populating, analyzing, testing, and reporting results from constrained optimization models through three case studies to illustrate the formulation, estimation, evaluation, and use of constrained optimization models in more complex applications. Publication is expected in Q1 2018.

References

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- [5] Bertsimas D, Farias VF, Trichakis N. Fairness, efficiency, and flexibility in organ allocation for kidney transplantation. *Oper Res* 2013;61:73-87. ■

Additional information:

You can access, “Constrained Optimization Methods in Health Services Research—An Introduction: Report 1 of the ISPOR Optimization Methods Emerging Good Practices Task Force,” in the March 2017 issue of *Value in Health* at: http://www.ispor.org/valueinhealth_index.asp

To read the Q&A with William Crown and Kal Pasupathy, go to www.ispor.org/Crown-Pasupathy-interview.pdf

To learn more about the task force, go to <https://www.ispor.org/constrained-optimization-methods-health-services-research-guideline.pdf>