

Operations Research in the Red Zone



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The EURO Working Group on Operational Research Applied to Health Services (ORAHS¹) provides a network for researchers involved in the application of systematic and quantitative analysis in the planning and management of the health services sector. ORAHS was founded in 1975, as part of a program for the development of special interest groups within the European branch (EURO²) of the International

¹<http://orahs.di.unito.it/>.

²<https://www.euro-online.org/web/pages/103/working-groups>.

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Federation of Operational research Societies (IFORS). The ORAHS annual meeting is open to anyone with a quantitative background and to those who have interest in the subject area. At the moment, the group has hundreds of members from more than thirty countries, mainly in Europe but also from overseas (e.g., USA, Canada, Brazil, Australia). Membership is open to any person interested in applying systematic, quantitative analysis to planning and management problems in the health area.

When applied to health care, operational research provides a rich diversity both in addressed problems and in solution methods: it allows to tackle complex logistic problems, such as ambulance routing, operating rooms scheduling and optimal location of resources in humanitarian logistics, as well as decision problems that are closer to clinical practice, such as therapy optimization, clinical pathways and appointments scheduling for periodical treatments. A stream of research concerns home care services and their integration with hospital-based services. The main challenges are to model, analyze and optimize complex and heterogeneous health care systems, allocating limited available resources to provide the most suitable type and location of treatment to each patient. This also calls for the analysis of decision processes and the definition of suitable metrics and optimization criteria, reconciling efficiency with equity. Many contributions have been recently developed in response to the COVID-19 pandemic emergency. Several investigations at the borders of operational research with computer science and engineering are also significant.

This volume stems from the 48th annual meeting (ORAHS 2022) that was hosted at the University of Bergamo, Italy, from July 17th to 22nd, 2022, organized by Ettore Lanzarone and Giovanni Righini. Among the contributions presented at ORAHS 2022, the papers collected in this volume have been selected, after a formal blind peer review process, to reflect the rich variety of operational research methods and applications.

The paper “A comparison of fairness metrics for health care problems” by M. Doneda et al. addresses the maybe basic, but crucial task of deciding what should be optimized. Defining the objectives, potentially considering fairness besides efficiency, is a decision science step that must precede any effort in mathematical optimization and algorithm design.

In the same vein, the paper “An overview of benefits and limitations of the process model notation applied for modeling patient healthcare trajectory” by P. Landa et al. presents the results of an extensive investigation on the use of Business Process Model Notation to describe and analyze health care processes. This paper explores the borders between operational research and process engineering, paving the way for a much-needed interdisciplinary approach.

Inspired and stimulated by the COVID pandemic, the papers “Machine Learning based Classification Models for COVID-19 Patients” by F. Maggioni et al. and “Integrating decision support tools in the COD-19 platform” by M. Barbato et al. stay at the borders between operational research and computer science. The efficient and fair allocation of scarce resources puts pressure on decision-makers in normal everyday life. When an emergency occurs, this pressure is raised to levels that are

unmanageable without the support of mathematical models, optimization algorithms and an intelligent use of the available digital data.

The more classical operational research papers “A semi-online ambulance routing and scheduling problem with complex patient-vehicle relations” by J. Resch and “Towards a unified framework for routing and scheduling planning in an integrated continuous care unit” by M. Godinho and M. Lopes are devoted to patient transportation and home care. This shows a significantly increased interest in the optimization of the level of service provided to patients at the expense of the emphasis traditionally put on minimizing costs.

These selected contributions show how rich and promising operational research is, when applied to health care, in both its declinations as “decision science” to help decision-makers framing their problems and as “mathematical optimization” in a hard science setting, to design efficient algorithms and compute valuable solutions.