

Health emergency & care management

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AIRO (Associazione Italiana di Ricerca Operativa—Italian Association of Operation Research), funded in 1961, aims at developing Operations Research (OR) in Italy. It is made up of Associates both from Universities, National Research Council as well as private and public companies. Application fields of interest are quite general being addressed to problems in main different areas, mainly in transport and logistics. Recently, health care delivery has attracted interests of a growing group of OR researchers in collaboration with health economists. In particular, during the annual AIRO Conference organized in Genova, September 2007, one stream has been devoted to health services; more precisely, one semi-plenary session and two sessions of oral presentations with invited speakers coming from the Orah Group, the EURO Working Group on Operational Research Applied to Health Services, have been scheduled. Moreover, a tutorial course consisting of ten lectures has been settled down to provide medical doctors and health professionals a comprehensive view of how OR can support decisions in health care delivery. So far, the community of health researchers is, therefore, growing and research in OR applied to health services is becoming a topic of interest also in Italy.

This special issue contains four papers selected from several submissions. Each submitted paper was peer-reviewed by at least two reviewers and underwent at least two review rounds. The topics addressed are different.

Each paper is paradigmatic of a particular problem in current research about health care delivery and fits into one of the proposed three topics of particular interest: i) proposals of new fields where theoretical models should address; ii) how models should profit by interacting with health economics to take into account not only production requirement, but also individual and societal benefit; iii) classification effort of the rich literature which is growing with reference to specific topic such as hospitals.

The first two papers develop theoretical models which may constitute methodological innovation in facing problems, even if the presented examples studied are clearly “fictitious,” though preserving the salient features of the real situation, and more research is required on the topic.

In particular, the paper by *Villa and Patrone* approaches from a microeconomic point of view the problem of kidney exchange in transplantation to detect if efficient solutions can be achieved in presence of asymmetric information about the relevant characteristics of the players (patient and donor). They conclude that for the kidney exchange problem, a class of efficient mechanisms does not enjoy the incentive compatibility property and, therefore, it is subject to possible manipulations made by the players in order to profit by the misrepresentation of their private information. It is, therefore, essential to try to render the manipulations as difficult as possible, e.g. by limiting the release of information from the doctors to the patients.

The second theoretical paper by *Montefiori and Resta* faces the problem of market structure for health service in presence of a good whose quality cannot be verified even ex post, a consumer that does not pay directly for health care (either because of a public health care system or an insurance scheme) and producers with different objectives and constraints on the supply side and uncertainty about the cost as the payment system is prospective, determined by a

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regulator. To provide insights concerning the interactions among hospitals and patients, both of them have been modelled by a learning/adaptive process by means of unsupervised neural networks, namely with Self Organizing Maps (SOMs), where hospitals compete among themselves, and take into account and react to external signals expressed by a feedback with the patients layer. A fictitious environment including hospitals with various size and degrees of specialization and patients clustered according to different severity types was envisaged. The simulation results offer some interesting information, because they seem to incorporate either positive elements of a demand driven mechanism, or the negative ones, i.e. the risk that the market structure may induce hospitals to curb the medical quality level with a consequent social loss.

The third paper by *Testi and Tanfani* addresses the problem of OR planning and evaluates the impact of a 0–1 linear programming model on welfare implications taking a patient perspective. The innovation put forward is twofold: firstly, the model determines, for a given planning period, both the allocation of operating room block time to surgical sub-specialties, (Master Surgical Schedule Problem) as well as the subsets of patients to be operated on in each block time (Surgical Case Assignment Problem). Secondly, it includes a societal point of view by incorporating patient clinical prioritisation into the objective function. The model is applied to a real case study related to a Department of General Surgery with more than 400 patients to give solutions in the current operative scenario as well as to perform “what if” scenario analysis in case of increasing operating room availability.

The fourth paper by *Fletcher and Worthington* provides a valuable effort in giving interpretative insight about discreet event simulation models describing emergency patient flows through acute hospitals, i.e. emergency rooms, stay rooms, surgery, intensive care and diagnostics.

The survey is developed following an initial framework of two levels from specific models to generic ones, basing on the key dimensions of transportability and abstraction. Further classification is suggested giving a systematic comparison in terms of model design, validation and implementation. Similarities and differences are discussed also with regards to involvement of local expertise. The paper emphasizes that implementation is surprisingly rare, indicating that this is the hardest part of most models. There is no clear difference between generic and specific models in implementation rates. Increasing connectivity between single models should be achieved in view of a future development of a ‘generic’ hospital model for emergency patients, which is still lacking.

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