

Decision Support for Healthcare Processes and Services

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Since the end of the COVID pandemic, healthcare systems worldwide have continued to face increased pressure and ongoing challenges, including a shortage of staff, an increase in demand and budget cuts. The World Health Organization, for example, estimates a global workforce shortage in healthcare of around 10 million health workers by 2030, mostly in low- and lower-middle income countries Organization, 2024. The New Zealand healthcare system, for example, currently lacks 4,800 nurses and 1,700 physicians, while the need for additional workforce is expected to nearly double (8,000 nurses and 3,400 physicians) by 2032 Te Whatu Ora – Health New Zealand, 2023. Therefore, an efficient use of (staff) resources, offering attractive working conditions, and increasing digitization efforts are crucial. The need for decision support for healthcare processes and services based on optimization, simulation and information technology research is only increasing. In their review that was motivated by the short-term use but fast implementation of digital solutions during the COVID pandemic, Majcherek et al. concluded that there is still a need to build digital infrastructure for the healthcare industry in most European countries Majcherek et al., 2024.

Recent developments further emphasize the importance of integrated planning with a system's perspective, for interdisciplinary approaches bringing knowledge from different areas together and for a strong collaboration between research and practice.

Healthcare processes (e.g. patient pathways) and services are often very complex and can involve various parties within an organization or between organizations such as hospitals and other caregivers, as well as the patients. The design of services is often different from traditional service design - as for many healthcare services patients receive care,

but insurance companies pay for it. Implementing processes in this domain should result in providing faster, safer and more effective care, necessitating organizing and sharing information among all participants involved in patient care. While the need for well-defined healthcare processes is clear, there are many obstacles to and opportunities for research, including technical, behavioral, and organizational topics. Operational Research approaches, including mathematical programming and simulation modeling, can help address and solve logistical challenges in designing and managing healthcare processes and services. While mathematical programming can give the optimal locations of ambulances or shift schedules for hospital doctors, simulation approaches are a crucial tool to analyze different scenarios and model complex settings like emergency departments or operating rooms.

Decision support systems (DSS) play a crucial role in healthcare, not only in the form of clinical decision support systems to assist physicians and other health professionals with medical decision making, but also to support logistical and organizational processes. Holistic and interdisciplinary research on decision support systems is crucial for a successful application of DSS in healthcare practice. This includes not only the design of the underlying algorithms and methods, e.g. from the areas of Operational Research and Artificial Intelligence (AI), but also the overall design of the DSS and the design of the user interface, the interaction of users with a DSS and the integration of a DSS into the processes in practice.

This minitrack focuses on the analysis, design and optimization of healthcare systems, the use of IT to support and improve care processes as well as non-IT assets such as process changes, innovative IT artifacts,

and interoperability standards.

In its seventh year (with slight changes in title and minitrack chairs), the minitrack again received 22 high quality submissions, eight papers of which we were able to accept. These show the variety of potential applications and research questions around decision support for healthcare processes and services, providing different perspectives on the role of optimization, simulation and information technology. Covered topics include scheduling ICU admissions, resource allocation, hospital simulation, and AI applications in practice. The papers address also different countries with varying healthcare systems worldwide, including South Africa, New Zealand and Germany. The minitrack comprises the following eight papers:

1. *AI'll Be There: Challenges and Opportunities in the AI-Supported Doctor-Patient Relationship*
(Milad Mirbabaie, Marie Langer, Lennart Hofeditz and Janice Frowerk)
2. *Deep-learning-based Detection of Food Hypersensitivity from Confocal Laser Endomicroscopy Images of the Gastro-intestinal Tract*
(Md Abid Hasan, Frédéric Li, Vivian Tetzlaff-Lelleck, Franziska Schmelter, Greta Marie Ahlemann, Lennart Jablonski, Xinyu Huang, Christian Sina and Marcin Grzegorzek)
3. *From Manual to Automated: A multi-case study of utilizing Robotic Process Automation and Intelligent Automation in Healthcare Operational Processes*
(Jani Kaitosalmi, Milla Ratia and Paulus Torkki)
4. *Resilient Healthcare Systems through AI-Powered Cloud Computing: Perspectives on Resource Allocation*
(Tebogo Bokaba, Patrick Ndayizigamiye, Efosa Idemudia and Armindo Alexandre Junior)
5. *Discovering Careless Response Behavior in Psychometric Data*
(Rene Lehmann, Paul Bengart and Bodo Vogt)
6. *Clinical Handover at Hospital Night Shift: Review of Challenges and Impacts on Patient Safety and Staff Experiences*
(Samaneh Madanian, Phyto Phyto Lwin, Charlie Kwong, Kenneth Johnson, Angsana Techatassanasoontorn, Harminder Singh and William Wong)
7. *Supporting ICU Admission Scheduling under Uncertainty*

(Arne Witteborg, Rainer Borgstedt, Sebastian Rehberg, Daniel Wetzell and Michael Römer)

8. *Towards a Hospital-wide Simulation Framework*
(Melanie Reuter-Oppermann)

We thank all authors for submitting their valuable work to our minitrack and all reviewers for their ongoing support. We are delighted about the repeatedly high number of high quality submissions and look forward to meeting the authors, their talks and many interesting and fruitful discussions at the conference. We hope that we will be able to organize the minitrack again next year and then kindly invite all past, current and future authors to submit their work to our minitrack on "Decision Support for Healthcare Processes and Services".

References

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