

German-Dutch Health Care Management Meeting

Agenda

5th & 6th March 2026, University of Twente, TechMed Centre, Room: TL1133

Day 1 – Thursday, 5 March 2026

| | |
|---------------|---|
| 09:00 – 09:10 | Welcome & Opening Remarks by Jens Brunner |
| 09:10 – 09:20 | Institutional Greeting / Introductory Address by Richard Boucherie |
| 09:20 – 09:55 | Fabian Leuthold, Harold Tiemessen, Katrin Hügel: Data-Driven Planning Groups for Simulation-Based Hospital Bed Capacity Planning |
| 09:55 – 10:30 | Rob Vromans: Improving capacity management in healthcare |
| 10:30 – 11:00 | <i>Coffee Break</i> |
| 11:00 – 11:35 | Hossein Torkinezhadirani, Chris Petri, Nina Baumgartner CARE-FLOW: Intelligent data-driven tools for cross-border collaboration in healthcare |
| 11:35 – 12:10 | Henriette Thier Scheduling for Stability: Evaluating Proactive Strategies in Nurse Scheduling |
| 12:10 – 13:00 | <i>Lunch</i> |
| 13:00 – 14:15 | Tour - TechMed Center |
| 14:15 – 14:45 | <i>Coffee Break</i> |
| 14:45 – 15:20 | Sebastian Schiffels Explainability in Human-AI Collaboration under Information Asymmetry – The Case of Surgical Duration Planning |
| 15:20 – 15:55 | Andreas Fügener The Value of Human Input in Data-Driven Surgery Scheduling |
| 15:55 – 16:30 | Laura Maria Poreschack Managing the Effort-Value Tradeoff for Integrating Human Judgment into Surgery Duration Predictions |
| 16:30 | Working Group Meeting / Networking Session |
| 19:30 | <i>Dinner</i> |

Day 2 – Friday, 6 March 2026

| | |
|---------------|---|
| 09:00 – 09:10 | Opening Remarks |
| 09:10 – 09:45 | Giovanni Campuzano Hierarchical Distribution Networks for Vaccine Delivery: a SOAR Metaheuristic |
| 09:45 – 10:20 | Michael Römer Learning to Approximate Recourse Models in Personnel Scheduling under Uncertainty |
| 10:20 – 10:50 | <i>Coffee Break</i> |
| 10:50 – 11:25 | Isabel Wiemer Ensuring Fair Access in Emergency Medical Services: A Bi Objective Covering Location Model |
| 11:25 – 12:00 | Nina Baumgartner Reducing Helicopter EMS Cancellations: A Data-Driven Survival Modelling Approach |
| 12:00 – 12:35 | Pieter van den Berg Operational challenges in Emergency Service Platforms in Low- and Middle-Income Countries |
| 12:35 – 13:10 | Marieke Rikkert Cooperative solutions for capacity challenges in neonatal care: A case study in the region of Utrecht |
| 13:10 – 13:30 | Closing Remarks & Farewell |

Abstracts:

Thursday, 09:10 – 09:20:

Fabian Leuthold, Harold Tiemessen, Katrin Hügel (Institute for Modeling and Simulation, Ostschweizer Fachhochschule)

Data-Driven Planning Groups for Simulation-Based Hospital Bed Capacity Planning

Swiss hospitals are facing increasing financial pressure, persistent shortages of nursing and medical staff, and a steadily growing demand for hospital treatments. Under these conditions, hospital management is confronted with the challenge of determining the appropriate size and organization of bed capacity while maintaining high quality-of-care standards and sufficient robustness against variability in patient flows.

A central concept of the proposed approach is that of planning groups. A planning group is defined as a set of patient groups that share a common pool of resources, for example an entire nursing unit. Pooling patients into planning groups typically reduces required capacity due to risk pooling effects. In some cases, variability can be further reduced when patient groups exhibit different daily or seasonal admission patterns. However, not all combinations of patient groups are feasible or desirable in practice. Constraints related to physical hospital layout, nurse skills, telemetry requirements, clinical compatibility, and organizational preferences limit admissible pooling options and are difficult to model adequately.

To address this, we propose a structured, simulation-based workflow for bed capacity planning that combines data-driven analysis with expert judgment. The workflow comprises three steps: (i) preprocessing of historical patient pathway data; (ii) identification of promising candidate planning groups using data analysis, sampling, and clustering methods; and (iii) detailed evaluation of expert-selected planning groups using discrete event simulation. The simulation framework supports parametrized admission and scheduling policies and captures variability and operational constraints beyond classical queueing models. The workflow is currently being prototyped with four Swiss hospitals for selected use cases, with first capacity-related decisions expected by the end of the year.

Thursday, 09:20 – 09:55

Rob Vromans (CHOIR, University of Twente)

Improving capacity management in healthcare

Why is it so hard to improve healthcare planning? What can we do to increase the probability of lasting success? Can we estimate whether a project has potential, even before we start?

In this talk, we'll look at the practical obstacles that block better decision-making and performance. Drawing from real capacity management projects, we've determined a set of critical success factors for improving capacity management. We'll discuss how these success factors make a difference through examples of challenges faced and solutions found—so you leave with ideas to improve your impact on healthcare practice.

Thursday, 11:00 – 11:35

Hossein Torkinezhadiri, Chris Petri, Nina Baumgartner (CHOIR, University of Twente)

CARE-FLOW: Intelligent data-driven tools for cross-border collaboration in healthcare

Healthcare systems are under increasing pressure due to staff shortages, rising patient numbers, and inevitable peaks of patient demand. This became especially evident during the COVID-19 pandemic, though collaboration between healthcare providers, both within and across borders, helped to balance the load. In practice, however, healthcare providers still operate largely independently, leading to duplicated resources and uneven use of capacity.

The Interreg project CARE-FLOW aims to create efficient collaboration in the Dutch-German border region of EUREGIO by developing algorithms and software to support capacity planning, resource sharing, and patient flow steering. These tools will facilitate complex decision making for regional collaboration between emergency services, hospitals, and aftercare facilities. In our presentation, we follow a patient throughout their trajectory in the healthcare system and discuss key decisions along the way. Particularly, we show how our prediction and planning algorithms aim to support these decisions, e.g., where to reposition idle ambulances to maintain adequate coverage, how to schedule (flexible) staff to respond to demand surges or how to allocate patients and/or personnel in hospitals and aftercare.

Our approach lays the foundation for a well-coordinated system, where data-driven support tools can help to use capacity efficiently and maintain access to care, ultimately ensuring a smoother process for patients and healthcare practitioners.

Thursday 11:35 – 12:10

Henriette Thier (RWTH Aachen)

Scheduling for Stability: Evaluating Proactive Strategies in Nurse Scheduling

Understaffing in hospitals leads to overwhelmed nurses and inadequate patient care. In Germany, an increasing demand for hospital care is anticipated due to the aging of the population. The number of nurses is not expected to grow accordingly. To solely avoid understaffing by increasing the number of nurses is therefore becoming an increasingly unrealistic solution. Thus, other solutions need to be assessed. This master's thesis evaluates how proactive strategies might help prevent understaffing. We focus on buffer, intermediate shifts, and reserve shifts. The current state of the art is that hospitals use proactive strategies based on experience. Our aim is to equip hospitals with a guideline to decide which strategies might fit them best and how to incorporate them.

Thursday, 14:55 – 15:30

Sebastian Schiffels (University Augsburg)

Explainability in Human-AI Collaboration under Information Asymmetry – The Case of Surgical Duration Planning

As the integration of artificial intelligence (AI) into medical decision-making continues to expand, understanding its impact on decision-making performance is crucial. In the healthcare domain, inaccurate surgical duration forecasting poses challenges to optimal resource utilization. Although AI decision support capabilities are continually growing, humans typically remain responsible for final planning decisions – not only due to accountability and ethical concerns, but also because of information asymmetries, as physicians often possess contextual knowledge unavailable to the AI. Our study investigates how the integration of Explainable AI (XAI) affects acceptance and trust in AI-assisted decisions under symmetric and asymmetric information conditions. In a 2×2 experiment with healthcare professionals, participants received either AI predictions only or AI predictions accompanied by explanations (i.e., XAI) and each condition was tested in environments where either both the AI and the human had access to the same information (symmetric) or where the AI has access to less information than the human decision-maker (asymmetric). Results show that XAI significantly improves trust in both environments. However, under asymmetric information conditions, lower trust is associated with reduced forecasting accuracy, and improvements in trust appropriateness through XAI do not consistently translate into performance gains. Our findings highlight the importance of combining transparency-enhancing tools with strategies to reduce information asymmetries in human-AI collaboration.

Thursday, 15:30 – 16:05

Andreas Fügner (Universität zu Köln)

The Value of Human Input in Data-Driven Surgery Scheduling

Creating efficient surgery schedules is a critical problem due to uncertainty in surgery durations. Recent artificial intelligence (AI)-based approaches have demonstrated substantial efficiency gains by learning patient-centric Duration distributions from data. However, their performance critically depends on good data availability and quality, conditions which are often unmet in clinical practice. This paper examines whether human input can add value to AI-based surgery scheduling, especially under such data constraints. We propose a data-driven approach that integrates physicians' duration estimates into an AI-based conditional distribution model using quantile Regression forests. These distributions are embedded in a scenario-based stochastic optimization framework. Using a real-world dataset from a University hospital, we compare schedules generated by our human-AI approach with those based on a purely AI-based model and a naive procedure-type benchmark.

Our results show that human input significantly improves schedule quality, driven by more accurate conditional distribution estimates. Importantly, the benefits of human input are higher for surgeries characterized by limited data availability or poor data quality. These findings demonstrate how human input can complement AI and improve patient-centric surgery scheduling in data-constrained clinical environments.

Thursday, 16:05 – 16:40:

Laura Maria Poreschack (KU Leuven)

Managing the Effort-Value Tradeoff for Integrating Human Judgment into Surgery Duration Predictions

For surgery duration prediction, it has been shown that integrating human judgment into algorithmic prediction models results in a higher accuracy than machine learning based approaches can achieve alone. However, since humans are a scarce resource in healthcare, their involvement in surgery duration prediction has high opportunity costs as their time could be spent more effectively on patient care and other medical tasks. This raises the question of how these costs should influence human involvement in tasks where algorithms perform reasonably well at minimal cost. We introduce a framework for selectively integrating human judgment based on the costs of human involvement and prediction uncertainty, which is captured using algorithmic meta features. Our framework identifies instances in surgery duration prediction where human judgment should be integrated in algorithmic predictions and those where it should not. We evaluate our framework using a data set containing 70,610 surgeries from a large university hospital. We observe that while always integrating human judgment leads to an overall higher accuracy than never integrating human judgment, employing the framework can lead to an even higher accuracy with lower human workload. In our case study planning costs could be reduced by 27% compared to the current status quo. Our results indicate that a cost-sensitive allocation policy that excludes human judgment for task instances that are easy for the algorithm allows humans to focus on medical tasks.

Joint work with Andreas Fügener, Dominik Walzner, Ulrich Thonemann, Christof Denz.

Friday, 09:10 – 09:45:

Giovanni Campuzano (CHOIR, University of Twente)

Hierarchical Distribution Networks for Vaccine Delivery: a SOAR Metaheuristic

Distribution systems in public services often operate under rigid, government-defined hierarchies that impose multi-level transportation structures. Motivated by applications such as healthcare logistics, emergency response, and public resource distribution, this work introduces the Clustered-Generalized Median Tour Problem (CGMTP). In the CGMTP, demand nodes are partitioned into disjoint clusters, which are further subdivided into subclusters, and served through a two-level routing structure consisting of a primary tour, secondary tours, and assignment decisions. We formulate the CGMTP as a Mixed-Integer Linear Program and propose a novel metaheuristic, Strategic Oscillation with Adaptive Relinking (SOAR), specifically designed to exploit the hierarchical and clustered nature of the problem. SOAR combines strategic oscillation, adaptive iterated local search, and path relinking, allowing the search to effectively navigate infeasible regions and escape local optima induced by hierarchical constraints. Computational experiments show that SOAR consistently produces high-quality solutions, outperforming the MILP formulation in computational time for small instances and surpassing existing state-of-the-art methods on larger instances. Finally, we demonstrate the practical relevance of the approach through a real-world vaccine distribution case study in Chile, highlighting the value of explicitly modeling cluster and subcluster structures in hierarchical distribution networks.

Friday, 09:45 – 10:20:

Michael Römer (Universität Bielefeld)

Learning to Approximate Recourse Models in Personnel Scheduling under Uncertainty

(no abstract due to last minute change of program)

Friday, 10:50 – 11:25:

Isabel Wiemer (University Duisburg-Essen)

Ensuring Fair Access in Emergency Medical Services: A Bi Objective Covering Location Model

Emergency medical services (EMS) aim to provide rapid response across a service area, but heterogeneous demand often results in unequal coverage. To address these disparities, many EMS location planning approaches incorporate fairness as an objective. A common strategy focuses on the least-covered area by maximizing its expected coverage, which may leave broader inequalities unaddressed.

Therefore, we propose a novel fairness objective that explicitly considers not only the least-covered area but also additional poorly covered areas by maximizing the average coverage across a selected set of worst-covered areas. This fairness objective is integrated with overall expected coverage in a bi-objective model, solved using the epsilon-constraint method.

To assess the model's applicability, we conduct a case study for the city of Duisburg, Germany, with real-world emergency data from three consecutive years.

We analyze multiple sets of worst-covered areas and varying epsilon values to evaluate both individual area coverage and overall system performance. Preliminary results show that our approach improves the average coverage of the worst-covered areas while maintaining high overall efficiency, offering a practical tool for ensuring fair access in EMS systems.

Friday, 11:25 – 12:00:

Nina Baumgartner (CHOIR, University of Twente)

Reducing Helicopter EMS Cancellations: A Data-Driven Survival Modelling Approach

Helicopter emergency medical services (HEMS) constitute a significant part of the prehospital care system and can improve medical outcomes of the most critically injured patients. Due to the time-sensitive situation of helicopter dispatch, the service faces high cancellation rates, where helicopters are dispatched yet provide no patient assistance. These cancellations waste highly scarce resources, occupy specialized crews, and reduce availability for true emergencies, potentially delaying care for patients who would most benefit.

We propose a data-driven framework that strategically delays helicopter take-off based on dispatch characteristics to balance cancellation risk and patient outcomes. Using Cox proportional hazards models and real data from a Dutch HEMS, we estimated the probability of mission cancellation over time, while accounting for mission- and patientspecific factors. We conducted a study with HEMS physicians to create an expert opinion for patient outcomes under delayed specialized response. We then quantified the trade-off between postponement time, cancellation rate, and patient morbidity using Pareto optimality analysis. Our results indicate that modest delays can sharply reduce cancellations with minimal effect on patient outcomes. Based on these findings, we outline a scheme for integrating our approach into dispatch systems. This methodology, adaptable to various HEMS systems, establishes a foundation for more intelligent, data-driven HEMS operations, enhancing operational efficiency and conserving scarce resources.

Joint work with: Derya Demirtas, Geert-Jan van Geffen, Nico Hoogerwerf, Richard Boucherie

Friday, 12:00 – 12:35

Pieter van den Berg (Rotterdam School of Management, Erasmus University)

Operational challenges in Emergency Service Platforms in Low- and Middle-Income Countries

Emergency medical services (EMS) in many low- and middle-income countries utilize decentralized platforms coordinating independent ambulance providers. However, significant operational challenges arise from uncertainty in provider time availability and unpredictable idle locations. These uncertainties hinder reliable service coverage and negatively impact patient outcomes. Using data from our partner Flare in Nairobi, Kenya, we investigate the relative effectiveness of enhancing provider temporal commitment versus spatial commitment to improve system coverage.

Friday 12:35 – 13:10

Marieke Rikkert (CHOIR, University of Twente)

Cooperative solutions for capacity challenges in neonatal care: A case study in the region of Utrecht

Health care systems are under growing pressure, and in neonatology, the stakes are especially high since, when a baby is born at 24 weeks, every second matters. Managing capacity in these time-critical settings is essential. This study examines how cooperative strategies help ease pressure on neonatal units, where overcrowding may quickly lead to risks for both babies and staff.

Building on analytical models originally developed for intensive care units—rooted in overflow principles from telecommunication systems—we adapt and extend the three-patient-type model (TPTM) to the neonatal context. The model separates patients into three severity levels and focuses on reducing refusals while protecting access for the most urgent cases. Using this framework, we explore two cooperative policies: a virtual MC (VMC) approach, where hospitals reserve a portion of their beds for urgent transfers from nearby units, and a threshold-based policy that limits the number of local patients that can be admitted before reserving beds for critical arrivals from elsewhere. Even though hospitals face reduced capacity in their own region this still has benefits because the region's patients may be treated elsewhere, and vice versa, allowing you to absorb fluctuations in demand, which benefits both the entire network and the individual locations in terms of reduced refusals and fewer overbeds.

Overall, our study shows that sharing capacity and coordinating admissions across hospitals—especially through threshold reservation policies—can help improve access and reduce pressure on neonatal units. These ideas fit well in the scope of integrated care and collaboration between hospitals. When capacity is tight, avoiding delays or emergency transfers can make a crucial difference for these vulnerable babies, and cooperative policies offer a promising way to support safer care.