Parallel Session

Cancer II

# PERSONALIZED CANCER TREATMENT SIMULATION: A MULTI-SCALE MODEL INFORMED BY MULTI-SOURCE CLINICAL DATA

Alvaro Köhn-Luque

a.k.luque@medisin.uio.no

Department of Biostatistics, Faculty of Medicine, University of Oslo (UiO)

Joint work with Xiaoran Lai (UiO), Oliver M Geier (Oslo University Hospital - OUS), Thomas Fleischer (OUS), Øystein Garred (OUS), Elin Borgen (OUS), Simon Wolfgang Funke (Simula Research Laboratory - SRL), Surendra Kumar (OUS), Manuela Zucknick (UiO), Marie Elisabeth Rognes (SRL), Therese Seierstad (OUS) Anne-Lise Børresen-Dale (OUS), Vessela N. Kristensen (OUS), Olav Engebråten (OUS) and Arnoldo Frigessi (UiO and OUS).

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The usefulness of multi-scale models to disentangle complex cancer processes such as treatment response has been widely acknowledged. However, a major barrier for multi-scale models to predict the outcomes of therapeutic regimens in a particular patient lies in their initialization and parameterization in order to reflect individual cancer characteristics accurately. In this study we use multi-source routinely acquired measurements on a single breast tumor, including histopathology, magnetic resonance imaging, and molecular profiling to personalize a complex multi-scale model of breast cancer treated with chemotherapeutic and anti-angiogenic agents. We model the dynamics of drugs in the tissue (pharmacokinetics) and the corresponding effects on their targets (pharmacodynamics). We implemented a computer programme that simulates cross-sections of tumors under a randomised 12-week therapy regime and demonstrated how the model was able to reproduce and explain the treatment outcome of patients from a clinical trial for both responders and non-responders. Our model-driven approach for the integration of multi-source clinical data helps to identify the most relevant tumor features differentiating treatment outcomes in each patient. Furthermore, it can be used to suggest alternative regimes for non-responders with improved outcomes, as we show by scenario simulations.

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