

J-BHI Special Issue on

“Biomedical Informatics across the Cancer Continuum”

Cancer is responsible for a lot of patient suffering and for the early deaths of millions of people worldwide each year. Because every patient is unique and every cancer is different, accurate patient stratification and the selection of the right treatment are very complex, leading to treatment outcomes that vary hugely from patient to patient. At the same time, societal pressures to control the cost of cancer care, the variety of treatment options, and the diversity of cancer population all combine to drive the pursuit of a more cost-effective, equitable, and sustainable learning health system. With the help of prospective and randomized clinical trials, significant advances in the outcome of patients with cancer have been achieved during the last decades. That notwithstanding, despite major improvements in cancer patient risk stratification many patients are still dying. In fact, for many cancer types we are achieving a plateau of survival that is difficult to overcome. Only by including new scientific achievements as described below can personalized medicine or precision medicine be realized, thus leading to better outcomes. This includes a novel fundamental understanding of cancer, changing from phenomenology to integrated profiling of the tumor, the tumor microenvironment, the host and the external environment, encompassing for comorbid conditions, lifestyle and medication.

Cancer research benefits from advances in many (bio)technological fields, including genomics and proteomics, mass spectrometry, medical imaging, computer science including machine learning and artificial intelligence, as well as medical informatics and bioinformatics. The centrality of computational biology in these synergies should be acknowledged. Continuously improving methods and strategies for diagnosis and treatment of cancer help clinicians to improve the quality of care. A propos of the latter, an essential role is played by informatics, particularly in (i) empowering patients and clinicians with information; (ii) engaging patients in the medical decision-making process; (iii) facilitating transition to care; and (iv) supporting the treatment selection of cancer patients and enhancing survivorship planning.

A pre-requisite for achieving the vision for more precise and personalized diagnostics and treatment and high-quality cancer care concerns the development of learning health information management systems that enable real-time analysis of data from cancer patients in a variety of care settings. In realizing this vision, significant unmet challenges do still exist. The most often cited challenges are related to the intrinsic complexity of the underlying biomedical and clinical data and the fact that information exists in both structured and unstructured formats. Inevitably, initiatives and advances in big data analytics are an important domain of discussion in our quest for understanding how the cancer genome changes in time, but also for discovering novel predictive/prognostic biomarkers and novel potential therapeutic targets. In addition, as cancer is more and more changing to a chronic disease, tools that would empower cancer patients in self-management are clearly needed.

This Special Issue will address current advances on various fronts, focusing on reporting bioinformatics, analysis of molecular, genetic and/or clinical data pertaining to human cancer risk, prevention, outcomes or treatment response. Also, the issue will seek contributions presenting current approaches for the development of oncology decision-support solutions that offer seamless data integration across specialties and locations, data-driven decision making, and tools for proactive patient involvement.

Topics include but are not limited to:

- How to better acquire, share, model, process and exploit big data to effectively monitor health status of individual patients, provide overall actionable insights at the point of care and improve cancer treatment.
- Emerging data driven analytics and advanced simulation methods to study causal mechanisms and improve the identification of disease trajectories and relapse.
- Mapped comprehensive big data in a manageable way by applying principles for sharing and reusability.
- Linking translational tools, heterogeneous data sources and biomedical texts for monitoring health status and quality of life after the cancer treatment.
- Approaches for harnessing and understanding the abundance and diversity of cancer related biomedical data to produce benefits tailored to the individual or stratified patient groups.
- Strategies and achievements for data integration and data-driven in-silico modelling.
- Technologies to allow the pooling, analysis and sharing of relevant data, including NGS.
- Innovative bio-informatics and modelling methodologies that enable risk modelling and assessment.
- Advances with respect to software tools and devices for diagnosis or treatment based on computational cancer modelling and simulation, in support of a more precise and personalized management of the disease.

- Development and validation of software tools for diagnosis or treatment based on computational modelling and simulation applied in biology and physiology.
- Better translation of big and multi-disciplinary data into predictors for medical outcome and personalized decision making.
- Reference architectures for data, models and process interoperability.
- Ethical, legal and societal aspects and tools for patient empowerment.

Guest Editors

Manolis Tsiknakis, Computational Biomedicine Lab, Foundation for Research and Technology – Hellas (FORTH) and TEI Crete, Crete, Greece
tsiknaki@ics.forth.gr

Norbert Graf, Director, Dept. for Pediatric Oncology and Hematology, University of Saarland, Germany
Norbert.Graf@uks.eu

Kostas Stamatopoulos, Institute of Applied Biosciences, Center for Research and Technology (CERTH), Greece
kostas.stamatopoulos@gmail.com

Anca Bucur, Senior Scientist, Philips Research, Eindhoven, Netherlands
anca.bucur@philips.com

Key Dates

Deadline for Submission: 30 June, 2018
First Reviews Due: 30 September, 2018
Revised Manuscript Due: 30 November, 2018
Final Decision: 30 January, 2019

