



The Oncosimulator - Combining Clinically Driven and Clinically Oriented Multiscale Cancer Modeling with Information Technology in the In Silico Oncology Context

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Abstract:

In silico medicine, an emergent scientific and technological discipline based on clinically driven and oriented multiscale biomodeling, appears to be one of the latest trends regarding the translation of mathematical and computational biological science to clinical practice through massive exploitation of information technology. In silico (i.e. on the computer) experimentation for each individual patient using their own multiscale biomedical data (molecular, histological, imaging etc.) is expected to significantly improve the effectiveness of treatment since reliable computer predictions could suggest the optimal treatment scheme(s) and schedules(s) for each separate case. The Oncosimulator is an information technology system simulating in vivo tumor response to therapeutic modalities within the clinical

trial context. The major components, the mathematical approaches and techniques and the function of the technologically Integrated Oncosimulator (IOS) and the Hypermodel based Oncosimulator (HOS) developed within then the framework of several large scale European Commission co-funded projects including ACGT, p-medicine and the EU-US project CHIC are outlined. The technology modules include inter alia multiscale data handling, image processing, execution of the code on the grid/cloud and visualization of the predictions. IOS and HOS appear to be the first worldwide efforts of their kind. In the pediatric oncology context a nephroblastoma, a glioblastoma and an acute lymphocyte leukemia oncosimulators are currently undergoing clinical validation within the framework of real clinical trials. Indicative results demonstrating various aspects of the clinical adaptation and validation process are presented. Completion of these processes is expected to pave the way for the ultimate clinical translation of the systems.

Biography:

Georgios Stamatakos is a Research Professor of Analysis and Simulation of Biological Systems at ICCS, National Technical University of Athens. He is the Founder and Director of the In Silico Oncology and In Silico Medicine Group. He has proposed the term and the concept of in silico oncology denoting a new clinical trial driven scientific and technological discipline. He has proposed the concept and pioneered the development of the Oncosimulator. Dr Stamatakos is the coordinator of the EU-US large scale integrating research project "CHIC: Computational Horizons in Cancer: Developing Meta- and Hyper-Multiscale Models and Repositories for In Silico Oncology" FP7-ICT-2011-9(600841)