

Preface

This book initially was conceived, and gradually has evolved, to seek solutions to issues and tasks relating to Information Technology (IT) and Predictive, Preventive and Personalized Medicine (PPPM) as identified in the 2012 “EPMA White Paper” [Golubnitschaja O, Costigliola V and EPMA. “General Report & Recommendations in Predictive, Preventive and Personalised Medicine 2012: White Paper of the European Association of Predictive, Preventive and Personalised Medicine. EPMA J 2012, 3:14].

Our goal was to define a role and a roadmap for the development of an IT solution to facilitate clinical PPPM. IT is a broad field that already impacts many facets of PPPM, including the design and implementation of databases for biomarkers and genetic research, and the subsequent data-mining made possible by such databases. However, we have chosen to explore another role for IT, and have begun the process of developing an application that pertains to patient modeling—specifically, the creation of a multi-faceted IT System for PPPM (ITS-PM) that will incorporate a Digital Patient Model (DPM) and will introduce Model-Guided Therapy (MGT) into clinical practice. The initial goal for an ITS-PM is to provide the tools that are necessary for the generation of comprehensive, descriptive, computer-based models of specific patients, or DPMs. Subsequent goals involve tasks relating to disease prediction and prevention through enhanced screening, and to personalized health care, through patient-specific decision support. It is proposed that implementation of these IT solutions also may lead to an expansion of evidence-based medicine, derived from MGT, and may be designated as Model-Based Medical Evidence (MBME).

To avoid the pitfalls of developing an IT project in isolation, hepatocellular carcinoma (HCC) was selected as a use-case to ensure medical validity. The fact that HCC is the fifth most common form of cancer worldwide and the second leading cause of cancer death speaks to the virulence of this disease. Despite advances in the understanding, diagnosis, and treatment of HCC in the past several decades, HCC remains an international health problem. This book relies heavily on the enormous contributions relating to the basic science and clinical management of HCC by researchers, hepatologists, diagnostic and interventional radiologists, medical, surgical, and radiation oncologists, and others.

This book defines the general specifications of the IT structures required for patient-specific modeling and MGT, and then, through a review of the clinical aspects of HCC, extracts the patient attributes, or Information Entities (IEs), required for the construction of the requisite databases and DPMs. The concluding chapter provides an outlook for PPPM, based on the ITS-PM and provides expert recommendations relating to clinical applications that may be implemented currently.

We have presented a roadmap for the future, but much work remains to be done. Working examples of the complex IT infrastructure, databases, patient models, and decision support systems need to be created and validated. If this can be achieved, the benefits of a comprehensive ITS-PM can be generalized to virtually any disease or medical condition. It is hoped that through this IT solution, critical medical decisions can be made that are tailored to the specific needs and attributes of each patient, regardless of his or her underlying disease or comorbidities.

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A Use-Case with Hepatocellular Carcinoma

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