IntechOpen *Journals*

Digital Medicine and Healthcare Technology

EDITORIAL

New Technologies and Precision Medicine: The Perfect Match?

Pier Paolo Piccaluga[1,2,3,4,*]

1 Department of Experimental, Diagnostic, and Specialty Medicine, Biobank of Research, IRCCS - S.Orsola-Malpighi Academic Hospital, University of Bologna School of Medicine, Bologna, Italy
2 Institute of Hematology and Medical Oncology "L. and A. Seràgnoli", Via Massarenti, Bologna, Italy
3 Istituto Euro-Mediterraneo di Scienza e Tecnologia (IEMEST) Palermo, Italy
4 Department of Pathology, School of Medicine, Jomo Kenyatta University of Agriculture and Technology, Juja, Kenya
*Correspondence: Department of Experimental, Diagnostic, and Specialty Medicine, Biobank of Research, IRCCS - S.Orsola-Malpighi Academic Hospital, University of Bologna School of Medicine, Bologna, Italy; Institute of Hematology and Medical Oncology "L. and A. Seràgnoli", Via Massarenti, Bologna, Italy. E-mail: pierpaolo.piccaluga@unibo.it

Citation
Pier Paolo Piccaluga (2022), New Technologies and Precision Medicine: The Perfect Match?. *Digital Medicine and Healthcare Technology* 2022(0), 1–3.

DOI
https://doi.org/10.5772/dmht.06

Published
28 March 2022

Modern Medicine is somehow tending to evolve by providing more and more refined treatments to all patients based on their specific characteristics. This approach has been usually referred to as "personalized medicine". However, medicine has been personalized for as long as physicians have been practicing it. Historically, Hippocrates, the Greek physician considered to be the "Father of Western Medicine" and who practiced about 2,500 years ago, had probably been the first proponent (at least to our knowledge) of personalized approaches for different patients [1, 2]. He even wrote about the individuality of disease and the necessity of giving "different [drugs] to different patients, for the sweet ones do not benefit everyone, nor do the astringent ones, nor are all the patients able to drink the same things." [1, 2]. Similarly, the ancient traditional Asian medicines, mainly from China and India, patients had been always regarded as individuals with specific needs [3, 4].

In the previous century, by contrast, medicine did progress by adopting guidelines aimed to offer highly standardized protocols and avoid approaches not based on evidence. Despite prompted by valuable intentions, this somehow led to consider diseases rather than patients first, particularly in western medicine. In fact, it emerged that simple clinical parameters as age, constitution, etc. (as evaluated by Hippocrates for example) could not efficiently allow a 100% meaningful discrimination of patients. More recently, a new era has probably begun, the era of precision medicine, where personalized approach is reached through a more exact and profound knowledge of both patients and diseases. In this regard, genetics and genomics played the major role, allowing to identify germline well as somatic tracts, predictive of treatment response, and leading to the new science of pharmacogenetics and pharmacogenomics [5]. The former, in articular concentrates on the role of individual gene mutations [5, 6] and the latter on the simultaneous impact of multiple mutations that may determine the drug's efficacy and toxicity [7]. Pharmacogenetics is now specifically used to evaluate/predict drugs metabolism and ensure adequate therapeutic dosages and avoid toxicities [6, 8]. Conversely, pharmacogenomics is rather widely used in hematology/oncology, specifically studying predictive mutations on target molecules that can affect drug response [5, 7].

Brilliant examples of these developments are represented by SNPs detection in genes involved in drug metabolism, like methotrexate and 6-mercaptopurine in leukemias [9], as well as mutation in KRAS, EGFR, or BRAF in colon, lung, and other cancers, even assessed from peripheral blood with the so-called liquid biopsy [10]. Besides oncology, genetic testing is now widely used in various fields of medicine, including cardiology, for instance, the prescription of newest hypolipidemic drugs being restricted to familiar hypercholesterolemia.

Nonetheless, precision medicine is not all about genetics. Tremendous progresses have been made in all fields of medicine, building on improved technologies. Indeed, technology has allowed to dramatically increase diagnostic and therapeutic options, from robotic surgery to advanced imaging, from real time pathogens detection to hyperbaric chambers and hydrogen-based therapies.

In the first issue of Digital Medicine and Health Technology, a few different examples of how technology impact on precision medicine are presented. First, Navari et al. showed how extensive molecular profiling of a rare aggressive tumor, like peripheral T-cell lymphoma/NOS, led to the identification of novel prognostic markers (maybe useful to stratify patients needed or not more aggressive approaches such as stem cell transplants) as well as potential therapeutic targets, such as NF-kB [11]. This is followed by a discussion of the main as well as the potential applications of precision medicine in the field of emergency medicine, highlighting the role of technologies (such as advanced imaging and robotics) for improving patients' stratification and care [12]. In this regard, new advancements in imaging are welcome. As underlined by Jane Anastassopoulou and colleagues, infrared-based technologies may allow description of changes in composition and secondary structural changes of proteins and DNA within cells and tissues, due to the presence and/or progression of a given disease [13].

On the other hand, new technologies also present their dark side. First, despite precision medicine's basic aim to improve patients' care and reduce resources wasting, it carries the additional costs of advanced diagnostics (massive parallel sequencing, imaging and so on) which might affect public health systems as well as private or combined ones. Furthermore, new tools are not always well-accepted, especially in the elderly population in socially/culturally less advanced environments; a better understanding of patients' reasons will certainly help to overcome skepticisms and fears, as shown by *Precious Onyeachu* [14].

References

1 **Sykiotis G. P.**, **Kalliolias G. D.**, **Papavassiliou A. G.** Pharmacogenetic principles in the Hippocratic writings. ***J. Clin. Pharmacol.***, 2005; **45**: 1218–1220.

2 **Pray L.** Personalized medicine: Hope or hype?. ***Nature Educ.***, 2008; **1**(1): 72.

3 **Zhang A.**, **Sun H.**, **Wang P.**, **Han Y.**, **Wang X.** Future perspectives of personalized medicine in traditional Chinese medicine: A systems biology approach. ***Complement Ther. Med.***, 2012; **20**(1-2): 93–99.

4 **Saini A.** Physicians of ancient India. ***J. Fam. Med. Prim. Care.***, 2016; **5**(2): 254–258.

5 **Dere W. H.**, **Suto T. S.** The role of pharmacogenetics and pharmacogenomics in improving translational medicine. ***Clin. Cases Miner. Bone Metab.***, 2009; **6**(1): 13–16.

6 **Tomalik-Scharte D.**, **Lazar A.**, **Fuhr U.**, **Kirchheiner J.** The clinical role of genetic polymorphisms in drug-metabolizing enzymes. ***Pharmacogenomics J.***, 2008; **8**(1): 4–15.

7 **Barton C. L.** Translational Medicine in Biopharmaceutical R&D: Enabling R&D Optimization and Early Detection of Potential Failures. Business Insights Ltd., 2007.

8 **Mallal S.**, **Phillips E.**, **Carosi G. et al.** HLA-B*5701 screening for hypersensitivity to Abacavir. ***N. Engl. J. Med.***, 2008; **358**(6): 568–579.

9 **Lee S. H. R.**, **Yang J. J.** Pharmacogenomics in acute lymphoblastic leukemia. ***Best. Pract. Res. Clin. Haematol.***, 2017; **30**(3): 229–236.

10 **Crowley E.**, **Di Nicolantonio F.**, **Loupakis F.**, **Bardelli A.** Liquid biopsy: monitoring cancer-genetics in the blood. ***Nat. Rev. Clin. Oncol.***, 2013; **10**(8): 472–484.

11 **Navari M.**, **Etebari M.**, **Ricci F. et al.** T-cell receptor dependent and independent NF-kappa B activation is a prognostic marker and a therapeutic target in peripheral T-cell lymphoma not otherwise specified. Precision medicine in emergency medicine. ***Digit. Med. Health Technol.***, 2022; **VOLUME 1**.

12 **Aslanidis T.** Precision medicine in emergency medicine. ***Digit. Med. Health Technol.***, 2022; **VOLUME 1**.

13 **Anastassopoulou J.** Infrared Digital imaging and medical diagnostic. Precision medicine in emergency medicine. ***Digit. Med. Health Technol.***, 2022; **VOLUME 1**.

14 **Onyeachu P.** A Patient Technology Acceptance Model (PTAM) for Adoption of Telehealth. Precision medicine in emergency medicine. ***Digit. Med. Health Technol.***, 2022; **VOLUME 1**.