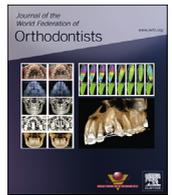


Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Journal of the World Federation of Orthodontists

journal homepage: www.jwfo.org

Editorial

Theranostics – revolutionizing conventional orthodontic care!



Patient centred care has always been a priority in the medical and dental professions, and most research in health care delivery is looking for a transition from its universal approach - “one treatment modality fits all.” Theranostics, the word combination derived from therapeutics and diagnostics coined by John Funkhouser, is an emerging area in science which establishes more specific and individualized therapies for various ailments. Otherwise known as ‘precision medicine’, theranostics combines recent developments made in medical imaging, bioinformatics and gene sequencing to provide efficient treatment protocols along with newer, more efficient pharmacological agents in the form of ‘right drug at the right dose’ [1]. By challenging the traditional work-flow in healthcare, patients will receive treatments based on experiences gained from similar patients and not on averages from controlled clinical trials. The main hurdle is the integration of knowledge and data in a smart and effective manner with the development of infrastructure to facilitate data capture, analysis and application. More importantly, this change will require a willingness to share secondary use of data as well as some laboratory follow-up. Because theranostics provides optimised, individually tailored therapies based on a biomarker profile of each patient, its incorporation in clinical practice requires knowledge of pharmacogenomics, proteomics and biomarker profiling. Proteomics helps identify and characterize all the proteins and its isoforms in an individual patient. Pharmacogenomics identifies individual variations in DNA and RNA sequences as well as proteins and responses to treatment interventions with a biomarker and help reach the appropriate customized treatment decision [1].

Improved accessibility to high throughput technologies, ease of obtaining and analysing or ‘mining’ through the volume of available data and combining or complementing these with other meta data such as geographical location, environment and behaviour has brought us to a period known as the ‘big-data’ era. With these advances, dental professionals, as part of an integrated health care team, should be ready to embrace genomics, inclusive of genome-wide association or sequencing as well as its state-of-the-art analyses with the ultimate goal of improving patient care as well as treatment outcomes. An example of this approach directed toward periodontal disease utilizes genomic information along with the typical phenotypic assessment of the patient. Currently, along with traditional diagnostic approaches (patient history, search for evidence of bacterial infection, inflammation,

radiographic survey, assessment of tooth mobility and search for specific strains of bacteria), some clinicians analyse body fluids (blood, saliva or crevicular fluid) to gain further insight into the patient’s phenotype. Although the fact remains such as phenotype results from expression of an organism’s gene and its interaction with micro and macro environments, an insight into the genome wide association analysis, helps to cater as well as alter the phenotype and control disease progression to a large extent. Phenomics, is the emerging trans discipline, dedicated to the study of such systematic study of phenotypes on a genome wide scale at both DNA and RNA levels and might become important when communicating with patients, counselling them or making peer referrals [2].

Orthodontics, due to its heavy reliance upon physical appliances which affect tooth movement, have deviated from the classic precision medicine to include customized appliances and force delivery systems. Orthodontics is currently experiencing a ‘digital workflow revolution’ with the rapid incorporation of 3D technology such as intraoral scanning, CBCT, and 3D printing as well as computer aided design and manufacture (CAD-CAM). The orthodontic speciality started the use of theranostics long ago with the incorporation of 3D technology to enable virtual treatment planning thereby defining clear treatment objectives and visualize treatment outcomes. In addition, CAD/CAM applications have evolved in a large manner leading to development of customized brackets with specific bracket torque, machine-milled indirect bonding jigs, robotically bend customized archwires, and yes, even clear aligners.

The need to evolve further in this area of orthodontic research is emphasized by a recently published randomized control clinical trial by Penning et al [3] which could not identify any advantage with customized systems over conventional systems in terms of treatment quality or duration. However, innovations in precision medicine and dentistry promises substantial benefits with a potential to the way the health care is delivered. With the incorporation of high throughput sequencing and ‘omics’ (genomics, metabolomics, pharmacogenomics and transcriptomics) along with the improved understanding of craniofacial biology and tooth movement, the utilization of advances in computational power and three-dimensional imaging might make precision orthodontics a reality soon. As biomarker discovery reaches its full potential along with emergence of artificial intelligence technologies, I am sure that orthodontic treatment will witness refinements in its methods and

processes leading to the delivery of better patient care directed towards identification of malocclusion susceptibility, diagnostic or prognostic information or treatment response.

References

- [1] Jeelani S, Reddy RC, Maheswaran T, Asokan GS, Dany A, Anand B. Theranostics: A treasured tailor for tomorrow. *J Pharm Bioallied Sci* 2014;6(Suppl 1):S6–8.
- [2] Slavkin HC. Special Report—Embracing Precision Dentistry and Medicine. *Decisions Dentistry* 2017;3(3). 12–14,16.
- [3] Penning EW, Peerlings RHJ, Govers JDM, et al. Orthodontics with Customized versus Noncustomized Appliances: A Randomized Controlled Clinical Trial. *J Dent Res* 2017;96(13):1498–504.

Vinod Krishnan, BDS, MDS, MOrth, RCS, FDS RCS, PhD
Editor-in-Chief

E-mail address: editorjwfo@wfo.org