Predictive, Preventive and Personalised Medicine as the Medicine of the Future: Anticipatory Scientific Innovation and Advanced Medical Services

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Abstract Depending on innovation in medical services and healthcare systems as a whole, two potential scenarios are considered. A pessimistic scenario considers the pandemic of type 2 diabetes mellitus and the dramatic increase of neurological disorders, CVD and cancer diseases, with severe economic consequences to the society. The optimistic scenario considers integrated concepts of early, so-called predictive diagnostics, targeted preventive measures, and treatments tailored to the person as the future of healthcare. Global research and implementation programs in bio-medicine, communication amongst scientific entities, healthcare providers, policy-makers, educators, and patient organisations, together with consolidation of professional groups in the field of personalised medicine, will play a decisive role in driving the situation towards one of the two scenarios. PPPM concepts aim to promote the optimistic scenario in Europe and worldwide. The long-term strategies of the European Association for Predictive, Preventive and Personalised Medicine towards scientific and technological innovation as well as advanced medical services are described.

Keywords Anticipation · Advanced healthcare · Predictive preventive personalised medicine (PPPM) · Scientific and technological innovation

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1 Introduction: Time for New Guidelines in Healthcare

As a consequence of the accumulating clinical data and knowledge about the epidemiology and pathological mechanisms of the most frequent causes of morbidity and mortality, medical practitioners are currently reconsidering their view regarding potential causality and progression of cardiovascular, oncologic and neurodegenerative diseases. The majority of these pathologies are chronic in nature: they progress from precursor lesions over one or even several decades of life until a diagnosis is made, which is often too late for effective therapeutic intervention. An excellent example is the epidemic scale of type 2 diabetes mellitus occurring in the European Union. In most industrialised countries and countries with large populations, the permanently growing cohort of people with diabetes creates a serious healthcare problem and a dramatic economic burden. Estimates for diabetes prevalence in the next very few years exceed half a billion patients worldwide [1]. Furthermore, the contemporary onset of the dominant type 2 diabetes has already been observed in the adolescent subpopulation [2]. The costs attached to severe complications secondary to early onset of diabetes mellitus, such as retinopathy, nephropathy, silent ischemia, dementia, and cancer, could lead to collapsing healthcare systems. New guidelines should create the robust juristic and economic platform for advanced medical services utilising the cost-effective models of risk assessment followed by tailored treatments focused on the precursor stages of chronic diseases [3].

2 Healthcare of the Future: Predictive, Preventive and Personalised Medicine

Predictive, preventive and personalised medicine (PPPM) offers great promise for the future practice of medicine. Essential components of this approach include well-organised population screening protocols utilising novel diagnostic biomarkers of disease states, targeted prevention of common human pathologies, optimal treatment planning and personalised medicine—thereby resulting in a substantial improvement in the quality of life. This approach also offers the contingent benefit of delivering care at potentially reduced costs to the population at large, since it addresses social and ethical issues related to access to and affordability of healthcare. A broad distribution and a routine clinical utilisation of advanced technological approaches could enable a significant portion of the population to reach and exceed 100 years of age, while remaining vibrant and in excellent physical and mental health as actively contributing members of the society. One of the central issues discussed is the screening for predisposition of healthy individuals to potential pathologies later in life. The groups at risk identified within the general

population can be given a fair chance of a focused diagnostics with multidisciplinary expertise and well-timed preventive measures. The reliability of the blood-tests proposed, potential application to clinical routines, enormous economic and social impacts of the new generation of molecular- and nanotechnology-based diagnostic approaches are all considered from the PPPM perspective [4].

3 Focus on the Patient: Promotion of the Concepts of *Participatory Medicine*

"Nothing about me without me" is the apt slogan of the Society of Participatory Medicine [5], which certainly should be broadly accepted by advanced medical services and society at large. A number of independent evidence-based studies have demonstrated that the efficacy of treatments strongly depends on the level of harmony in doctor-patient collaboration. However, the critical question remains: How can a common language that is understandable to patients and the professionals in the healthcare field and industry be created? The only solution is high-quality educational measures aiming at significant improvements in healthcare knowledge and health related language in the general population. Unfortunately, information retrieved from the Internet is frequently of poor professional quality, providing controversial data that confuse the understanding and slow down the learning process of laymen. People need to be advised of reliable information sources that are well adapted to a corresponding level of understanding (children, adolescents and individual groups of adults) and concrete interests of subpopulations (level of education, groups of professionals, patient cohorts). In the field of education, laboratory medicine may play a leading role in providing up-to-date information, accessible to the layperson, on laboratory tests and their interpretation for individual health and disease conditions. A professional version will provide detailed knowledge about bioactive molecules, enzymatic reactions, molecular and cellular processes underlying the pathomechanisms of individual predispositions and pathologies, as well as medical treatments. These innovations, along with the tight collaboration of organised patient groups, are one of the strongest instruments of more effective promotion of knowledge [6, 7].

4 The Integrated View of PPPM

In his book, *Too Big to Succeed: Profiteering in American Medicine*, Russell J. Andrews, the well-known scientist and neurosurgeon (NASA, USA), criticises currently existing medical services. Moreover, he considers PPPM concepts to be the most advanced for improving healthcare as a whole.

> A more comprehensive approach to the use of high-tech medicine for improved healthcare is provided by the European Association for Predictive, Preventive and Personalised Medicine (EPMA). The EPMA is a consortium of physicians and medical researchers with institutional, governmental, and industry participants […] One should be encouraged by the forward-looking electic, cross-disciplinary, and result-centered (rather then profit-centered) approach advocated by the EPMA […] By combining the resources of academia, industry, and public and private agencies in the EU countries and beyond (forty-four countries to date), the EPMA appears to be in a much stronger position to have a positive impact on healthcare than a fragmented, individualistic approach that relies upon the interests of for-profit companies…. [8].

Through an integrative view and emphasis on predictive, preventive and personalised medicine, the EPMA is the global leader in PPPM, innovative concepts and prioritised areas. The essential elements making the EPMA the worldwide PPPM leader are explained.

4.1 The Paradigm Shift from "unPPPM" to "PPPM"

How do we adopt such innovative approaches in healthcare systems, while promoting predictive diagnostics, targeted preventive measures, and individualised patient treatment on a global scale? As it is already well known, one size does not fit all. Each patient has the right to receive the best and most appropriate medical care. In contrast to "unPPPM," that is, reactive medicine (discussed in Nadin[1]), the paradigm of the advanced healthcare is to treat the person as an individual case and to provide the appropriate treatment; if medication is called for, to apply the right dose on the right schedule. In order to estimate the overall impact of personalised medicine, the EPMA has created a scientific forum for professionals to discuss this topic. The main objectives of these efforts are to mark stakeholders in the field, to consolidate professional groups, and to elaborate expert recommendations of how to optimise these approaches for the patient [4, 9].

5 Specific Areas of PPPM Application

5.1 Cancer: The Key Question Puzzling PPPM

Detailed autopsy findings reveal that the absolute majority of people are carriers of hardly detectable micro- and asymptomatic tumour lesions which do not necessarily progress into clinically manifested disease. Furthermore, in case of manifested oncologic diseases, less than 1 % of all disseminated and circulated tumour cells

[1]Nadin, M.: Medicine: The Decisive Test of Anticipation. In: Nadin, M.: (ed.) Anticipation and Medicine, pp. 1–25. Springer, Cham (2016).

have a potential to form secondary and distanced tumours (metastatic disease)—the phenomenon known as the "metastatic inefficiency" [10]. In this context, the key question puzzling modern predictive, preventive and personalised medicine is how to discriminate between those carriers who are predisposed to a disease manifestation and/or progression and "silent" carriers. Evidence shows that both initial tumours and secondary metastases need a "fertile" microenvironment that effectively supports their growth and progression [11]. What are the mechanisms "fertilising" the microenvironment for a particularly effective cancer advancement? All these questions are effectively addressed by innovative PPPM strategies in cancer [11–14].

5.2 *Cardiovascular Disease (CVD) as One of the Major Targets for PPPM*

There is a large body of evidence concerning cardiovascular risk factors and preventive strategies at both population and individual levels, but also chronic disease stages that are not adequately addressed because they do not follow the PPPM principles. The promotion of PPPM in CVD management is a global health issue, since the health burden from CVD is currently the most severe in developed countries and is rapidly increasing in most of the developing countries. It is, therefore, of the utmost importance to exchange, on a global scale, scientific insights, knowledge, and skills for risk prediction of cardiovascular disease, and to share and adopt various experiences for preventive measures and for the development of personalised treatment approaches [15, 16].

5.3 *Diabetes Pandemic: A 21st Century Disaster and PPPM Solutions*

The worldwide increase in the incidence and prevalence of diabetes mellitus (DM) continues to place an alarming burden on healthcare systems. The consequent cost impact poses a major challenge to both developed and developing countries and economies. These prevailing conditions provide the rationale for the concept of PPPM: the prediction of persons at risk should help devise strategies for treatments tailored to the individual and to prevent target organ complications of DM, thereby, reducing morbidity and mortality as well as associated costs. EPMA emphasises the need to address the integrative approach for diabetes care focused on benefits to the patient [17].

5.4 *Neurological, Neuropsychiatric and Neurodegenerative Diseases (NNND)*

NNND make up the majority of socially and economically devastating disorders and diseases, with multifactorial physical and cognitive disability. They result from individual interplay of epigenetic and environmental risk factors. Insights into molecular pathomechanisms will facilitate the creation of the most effective targeted protective strategies and individualised treatment before pathologies manifest. Multifunctional (multi-drug) therapies should be tailored to individual multi-aetiological aspects of the disorders, in order to advance the healthcare of corresponding patient cohorts. Particular emphasis should be placed on primary prevention by the identification of predisposed individuals early on in life, followed by treatments tailored to the person that altogether need regulations supported by innovative reimbursement programs. This strategy creates a robust platform for the cost-effective medicine of future NNND management [18–21].

5.5 *Rare Diseases (RDs):* Proof-of-Principles *for PPPP Concepts*

Although each individual RD is rare, altogether there are 5000–8000 distinct RDs affecting many millions of people worldwide. In Europe alone, there are at least 30 million RD patients. Almost 80 % of RDs have a genetic origin with symptoms appearing in prenatal and early postnatal periods. Currently, there are no appropriate treatment approaches for most of the RDs. The only reasonable approach seems to be a development of methods for early diagnosis of RDs that might lead to the creation of the optimal care management, saving lives and improving life quality within the patient cohort. How the emerging paradigm of PPPM may improve healthcare in RDs? Due to the molecular background of most RD pathologies, it is expected that the multimodal approach (*omics, pharmacogenetics, medical imaging, etc.) with high multidisciplinarity of professionals should be instrumental for “personalisation” in order to diagnose individual RDs, to create effective preventive measures and to develop targeted therapies—the integrative medical approach by PPPM [22].

5.6 *Traditional Medicine: Past or the Future?*

Traditional medicine (such as Chinese or Indian ones) is several thousands of years old. Does it belong to the past? PPPM provides a platform for innovative strategies in science and healthcare, demonstrating how traditional, complementary, and alternative medicine (TCAM) can enrich modern healthcare. Functionally linked

together, the PPPM-TCAM evidence-based approach demonstrates a great potential in person-centered and participatory medicine, predictive diagnostics, targeted prevention, and individualised treatments. It explores tailored care through investigation and treatment of the person as a physical, psychological, and spiritual unity living in dynamic interaction with nature and society. PPPM-TCAM creates a special form of preventive medicine that empowers communities and individuals [23–25].

5.7 *Pain Management: Multidisciplinarity and Benefits for All Medical Fields*

An integrated vision of PPPM here is a deep diagnostics followed by creating individualised treatment algorithms. This includes topics-relevant animal models, translation research, novel physiological, safe and personalised therapies developed for minimally interventional pain management and physiotherapy. Regenerative therapy, guided by advanced imaging techniques, 3D modeling, robotics, smart prosthetics, etc. are the focuses of innovation in pain management. A variety of syndromes, acute, chronic and systemic disorders are involved, such as acute and chronic pain, musculoskeletal disorders, rheumatologic, orthopaedic, and neurologic conditions, dysfunction of the peripheral nervous system, health conditions considered by rehabilitation and military medicine. Prediction and prevention of a wide spectrum of collateral diseases (NNND, diabetes, cancer) linked to pain management are considered in the context of improved healthcare policy and economic benefits of the societies [26].

5.8 *Oral/Dental Health Contributes to the Overall Health and Well-Being of Everybody*

A growing body of evidence demonstrates that the manifested dental and oral pathologies are linked to the increased risk of various diseases, including heart and lung disease, vascular pathologies, stroke, diabetes mellitus, neurological disorders, pre-term birth, and even some types of cancer, amongst others. Moreover, certain oral symptoms are considered as early indicators of a spectrum of the mental disorders, such as anorexia, bulimia, anxiety, and depression. On the other hand, dental diseases themselves may be caused by acute and chronic systemic disorders, such as diabetes mellitus. While an association between oral/dental diseases and systemic disorders is well established, the cause-and-effect relationships in these conditions are poorly understood. Investigation of this association is a prerequisite for predictive, preventive and personalised dental medicine [27–29].

5.9 Transplantation and Regenerative Medicine

Currently, very solid research on stem cells creates new perspectives in this area. An integration of the basic sciences at the molecular level and clinical science, together with technological advances, is crucial to progress the area and to satisfy patients' unmet needs in the field. Furthermore, medical ethics, appropriate political regulations and the economy have remarkable impacts on advances in transplantation and regenerative medicine in general. Prediction and personalisation in transplantation are essentials that require an identification of individual pre- and post-transplantation biomarker panels, allowing better donor/recipient matching and assessment of individual risks.

Long waiting lists of patients worldwide reflect major problems and current deficits, which require PPPM solutions. Altogether, improved donor-recipient matching, person-centered immunosuppressive regimens, individual risk assessment for chronic allograft damage, and prediction of graft accommodation may lead to substantially increased allograft survival and decreased patient morbidity, thus advancing this medical area on the global scale.

5.10 A Sensitive Balance Between Health and Disease: The Role of Environment and Clinical Nutrition

The main determinants of health and disease mainly are genetic, environmental, and behavioral; each component merges and interacts with the others. Environment is a still neglected topic in healthcare. Nonetheless, geography, climate, occupation, anthropic modification, urban and rural environments, agriculture and fishing are all subsets that should be considered, along with societal issues and political and economic involvement, for increasing the possibility of successful outcomes in health promotion. An integrative medical approach aims to create professional opinions and to enhance and develop knowledge and skills by taking into account evidence-based scientific achievements in the fields of epidemiology, healthy lifestyle, optimised nutrition, food science/technology/culture, medical ethics, in a framework of cost-effective healthcare and environmental and affordable strategies. Contextually, the goal of PPPM is to produce an evidence-based consensus for sustainable guidelines in predictive medicine together with targeted prevention in healthy individuals, at-risk persons, and stratified patient groups with manifest diseases, and to provide advice to stratified patient groups, institutions, food producers and marketing experts [30, 31].

5.11 PPPM in Body Culture and Sports Medicine (BCSP)

BCSP covers a wide spectrum of topics, ranging from but not limited to, exercise, healthy lifestyle, personalised sleep algorithms, homoeopathy, physical therapy, rehabilitation, amongst others. Anti-doping measures are an essential part of PPPM strategies in Sports Medicine. High-quality research based on measurable effects (including clinical criteria and multi-level biomarker panels) that are associated with modifiable (risk) factors (nutrients, physical activity, lifestyle, etc.) is promoted by PPPM in BCSP, with a particular focus on individually tailored interventions [32–34].

5.12 Translational Medicine Bridges Basic Science and Implementation of PPPM Concepts

With the increasingly complex relationship between basic research and clinical application, there is a pressing need to bridge the translational gap from bench to clinic using integrative methods. The goal is to translate knowledge from studies at the bench side to care at the bedside: from discovery to health application, to evidence-based guideline, to advanced healthcare services, and finally to health impacts for the patient [35, 36].

5.13 Information and Communication Technologies (ICT)

ICT-based holistic presentation of the individual patient and corresponding medical processes imply a redesign of healthcare activities within a given domain of medical discourse, such as cardiovascular, neurological, diabetic, and oncologic disorders. The ICT systems support provided by a medical information and model management system-like architecture, which includes a number of carefully selected diagnostic and therapeutic core functionalities, is the prerequisite for an effective PPPM. With a holistic presentation of a specific patient based on appropriate mathematical modeling methods, such as probabilistic relational models and process models, as well as advanced ICT-enabling tools, the practice of medicine will be substantially transformed towards model-based medical evidence, providing transparency of clinical situations, processes, and decisions for patient and physician. ICT approaches may result in profound and cost-effective modernisation of healthcare. The beneficiaries of these transforming methods and technologies will include patients, healthcare providers, and society at large [37, 38].

5.14 Innovative Technologies (IT)

The aim of PPPM related innovative technologies is to reach advanced healthcare services. The best example of IT is identification, characterisation, and validation of clinically relevant biomarkers. For example, medical imaging, sub-cellular imaging, multi-omics (genomics, transciptomics, proteomics, metabolomics, etc.), and developed hybrid technologies can be used to identify optimal biomarker panels for multi-level diagnostics. If they can detect pre-symptoms in a most timely manner, smart molecular alterations can optimise therapy outcome in thoroughly stratified therapeutic groups. Integrating this information allows selection of personalised targeted treatment regimes, saving unnecessary drug toxicity and decreasing morbidity [12, 39, 40].

5.15 Pharmacogenetics

Currently, the use of genetic information to treat patients is still in its early stages, with some clear successes mostly in the oncology and infectious disease therapy areas. Some successful examples include the targeting of tailored pharmaceuticals developed for the treatment of patients with a particular disease subtype or according to a specific genetic makeup pertaining to the drug's mode of action. In other examples, genetic information is being used to help determine the effective and safe dose of specific pharmaceuticals.

However, implementation of this pharmacogenetic knowledge to the clinic has proven to be challenging, and to require a tight collaboration amongst the various stakeholders throughout the discovery, development, and validation stages so as to ensure the utility of actionable genetic testing in a cost-effective manner. Targeted therapy and reliable prediction of expected outcomes offer patients access to better healthcare management by identifying the therapies effective for the stratified patient group, avoiding prescription of unnecessary treatment, and reducing the likelihood of developing adverse drug reactions [41].

6 The Role of the Laboratory Medicine

Current deficits in medical services, such as delayed intervention, untargeted medication, overdosed patients, and ineffective treatments require a more active and central role of laboratory medicine. Recommendations by the laboratory to assist clinical practice are highly requested. This assistance ranges from advising on the necessity for additional tests to the dynamic analysis of the targets. Novel tests should be considered from the viewpoint of their reasonability, in order to reach an accurate and realistic health-related data interpretation for the individual. The

analysis of dynamic changes of the target is essential to evaluate potential health impacts such as an individual predisposition to the disease and/or a predictive diagnosis before a clinical manifestation of symptoms. Laboratory value-added investigation and data interpretation is mandatory in creating an advanced functional relationship between laboratory medicine and clinicians acting hand-in-hand as the responsible decision-makers [7, 42, 43].

6.1 Biomarking and Biobanking

Internationally valid biobanking is currently an ongoing process in PPPM related trends. Considering individual types of biological material (tissue samples, saliva samples, blood samples, DNA, RNA, proteins, metabolites, etc.), the major challenge of this process is how to optimally collect, store, and retrieve samples for sharing and testing. The analytical quality of collections, storage conditions and donation of samples to a *biobank* require strict control both at national and international levels. Disease-focused collections demand that acquired samples be retrospectively valid for development of novel biomarkers and novel drugs/treatments. For disease-specific biobanking, immaculate record keeping regarding patients is vital in order to facilitate optimal clinical decisions. The functional link to reliable clinical data and their interpretation is crucial for the biobank utility [7, 44].

An ideal biomarker does not exist, thus the need for a multi-level biomarker panel is of utmost importance. If novel biomarkers are discovered, are they applicable solely to diagnostics or to the treatment targets and therapy monitoring as well? Are they highly speicific for corresponding pathology? Is the biomarker panel applicable to individuals at risk being useful for targeted prevention? Is a multi-level biomarker panel applicable/available to secure a precise diagnose and therapy targeting? All these questions are crucial to respond by corresponding PPPM related experimental and clinical approaches [45–47].

6.2 Medical Chemistry

Medical chemistry provides a multidisciplinary approach that ranges from the application of innovative active therapeutic medicines to advanced methods for controlled drug delivery. Different areas of interest within the topic include stem cells, rational drug design, new (co)polymers, creation of tailor-made drug delivery systems, incorporation of target molecules to the polymeric structures, encapsulation of approved drugs with the polymers, preparation and characterisation of nanoparticles for in vivo diagnostics and treatment, and evaluation and validation of new systems for in vitro and in vivo studies [48–51].

7 Towards an Effective PPPM Promotion

7.1 Design

Of primary importance is professional design of the PPPM related *Interactome*. The specific challenge for multidisciplinary communication is the design of media to facilitate effective interaction amongst professional groups in PPPM. These groups currently "speak different languages," which reinforces each group's professional perspective while frequently underestimating the added value of the transfer of products between disciplines. The specific output of this design activity is the so-called professional Interactome and the representation of complex networks of information. The Interactome represents the most optimal model of healthcare organisation designed specifically for the implementation of effective interaction amongst professional groups in PPPM [52].

7.2 Education

Education is at the core of PPPM top science and practical implementation. The ultimate goal is to support the creation of a new generation of professionals in medicine who will be able to implement a holistic approach to patient care that recognises the complexity and individuality of any organism, as opposed to treating the patient as a disaggregated "pool of organs" [53, 54]. This requires new training and educational measures, including e-learning tools, in order to ensure the sharing of information important for all PPPM professional groups (medical doctors, industry, students, nurses, etc.), as well as patients and their family members.

In order to promote innovative educational programs, the following worldwide pioneer initiatives have been developed:

The EPMA Journal. This open access, PubMed indexed publication regularly updates information about medical innovations and advanced healthcare providing expert recommendations in predictive diagnostics, targeted preventive measures and personalised treatments of patients [55].

Advances in Predictive, Preventive and Personalised Medicine. [54]. This book series, launched in 2012 [54], provides an overview of multidisciplinary aspects of advanced biomedical approaches and innovative technologies in innovative PPPM fields and healthcare as a whole. Topics focus on cost-effective management of health and disease tailored to professionals, and innovative strategies for standardisation of healthcare services. The book series also includes new guidelines for medical ethics, innovative approaches to early and predictive diagnostics, targeted prevention in healthy individuals, and healthcare economy and marketing. Innovative predictive, preventive, and personalised medicine is emerging as the focal point of efforts in healthcare aimed at curbing the prevalence of common (diabetes mellitus, cardiovascular diseases, chronic respiratory diseases

and cancer) and rare diseases. This new book series is intended to serve as a reference source for researchers and the healthcare industry with special emphasis on health promotion in the general population.

7.3 Advanced Business Models for Healthcare

Here the focus is on poor economy of current healthcare systems and delivery. Across Europe, there is a great diversity of systems, and payment and reimbursement schemes. This imposes a highly fragmented market (market access being governed by various public and private organizations), which considerably increases effort (seeking recognition, market authorisation and reimbursement in all different EU-countries and their respective bodies) and costs (each country has different bureaucratic schemes). On the one hand, there is a need for policy dialog in order to achieve some harmony of rules and delivery, but also of access to care and reimbursement to patients across Europe. On the other hand, there is also a great need for more advanced business models (What services are offered/covered? Who is the beneficiary? Who pays?) in order to motivate all stakeholders towards better scientific achievements, more effective implementation, improved medical services, and promotion of interest in the general population to follow the strategies of predictive and preventive medicine for cost-effective healthcare. In view of economic strain and the aging population, this innovation in healthcare systems is critical for keeping the high quality of healthcare in Europe affordable and sustainable [56, 57].

8 From "Passively Performing" to "Actively Advising"

PPPM Centres aim to become the nucleus for advanced healthcare. Successful PPPM implementation requires an unprecedented level of collaboration amongst all stakeholders, long-term multidisciplinary professional partnerships including public-private ones, a robust juristic platform, and intelligent political regulations. It is important that future developments do focus on the integration of all elements of PPPM. Innovative PPPM centres are focused on designing and conducting a new culture in healthcare: high level of multidisciplinarity, innovation, and professional education, well-met patient needs, cost-effective economy of healthcare, etc.

An optimistic versus pessimistic prognosis depends on diagnostics, prevention and treatment approaches that healthcare systems will preferably adopt in the near future. By the 3rd decade of the 21st century, neurodegenerative pathologies (Alzheimer's and Parkinson's diseases, glaucoma, macular degeneration, etc.) could amount to more than 30 % of the global disease burden. Without innovation in healthcare, such developments will pose a serious threat to health economies and

may lead to a collapsing healthcare system. By contrast, the effective utilisation of advanced early/predictive diagnostics, together with preventive and personalised medical approaches, could enable a significant portion of the population to reach their senior years in vibrant psychosocial health, with excellent physical and mental well-being, participating actively in society. Global research and implementation programs in bio/medicine, communication amongst scientific societies, healthcare providers, policy-makers, educators, and patient organisations together with a consolidation of professional groups in the branch of personalised medicine, will play a decisive role in driving the situation towards optimal development. PPPM strategies aim at promoting the optimistic scenario in Europe and worldwide [3]. The anticipatory perspective of medicine (See Nadin (see footnote 1) and [58]) and PPPM have several features in common. It was not our intention to compare them, but rather to advance a clear image of our own comprehensive methodology.

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