

PERSONALIZED MEDICINE – CHALLENGE FOR HEALTHCARE SYSTEM: A PERSPECTIVE PAPER

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ABSTRACT

Personalized Medicine is a challenge for healthcare systems in Central and Eastern Europe if they are to provide patients with personalized diagnosis and treatment. Personalized medicine (PM) is about tailoring a treatment as individualized as the disease. [1] Integrated care involves receiving care along a continuum of health promotion, disease prevention, diagnosis, treatment, disease-management, rehabilitation and palliative care services, coordinated across the different levels and sites of care within and beyond the health sector, and according to the needs of patients throughout the life course. [2]

Personalized Medicine and Integrated Care are among the most important concepts related to the management and organization of healthcare systems. This article intends to identify challenges to the adoption of personalized medicine and stimulate fruitful dialogue and debate about the evaluation of barriers and facilitators within the implementation of personalized medicine interventions, identify the barriers and take systematic actions to remove as many of them as possible to create a future where PM is fully integrated into real-life settings.

KEYWORDS: personalized medicine, integrated care, interregional cooperation, barriers, healthcare systems

CONTEXT AND AIM

Personalized medicine, which is also called precision or individualized medicine, is an evolving field in which physicians use diagnostic tests to determine which medical treatments will work best for each patient or use medical interventions to alter molecular mechanisms that impact health. By combining data from diagnostic tests with an individual's medical history, circumstances and values, health care providers can develop targeted treatment and prevention plans with their patients. [3] PM is the inverse of, and complement to, modern medicine. Traditional medicine is a top-down, population-based approach of randomized controlled trials (RTC) and evidence-based medicine (EBM). [4-5] PM is a bottom-up approach starting with the mechanisms of genetic or systemic disorders. Identifying the mechanisms of a disorder before it becomes an advanced, pathology-defined disease is needed for targeted, personalized

therapy. While the high-level concepts are becoming clear, many barriers remain in terms of information, integration, translation, logistics and acceptance, particularly in Central and Eastern Europe, that will need to be addressed by future, well-designed basic and clinical research projects. [6]

Integrated care is a part of PM and one of the most important concepts related to the management and organization of healthcare systems.

Integrated care entails the provision of seamless, effective and efficient care that reflects the whole of a person's health needs: from prevention through to end of life, across both physical and mental health, and in partnership with the individual, their carers and family. It necessitates greater focus on a person's needs; better communication and connectivity between healthcare providers in primary care, community and hospital settings; and better access to community-based services close to home. [7]

According to the Quadruple Aim, the outcomes of integrated care policies should improve the individual experience of care, the health of populations, reduce the per capita cost of healthcare and improve the experience of providing care (the importance of physicians, nurses and all employees finding joy and meaning in their work). [8] Integrated care, though increasingly recognized as a critical adjunct to healthcare delivery and patient management, may be seen as a step in the process of healthcare systems and healthcare delivery becoming complete and more comprehensive. [9] The role of the relationship between health and social care is being increasingly highlighted. [10]

Unfortunately, despite the steady increase in the number of clinically useful molecular diagnostic methods and targeted therapies, the healthcare system has been slow to integrate PM into clinical practice [11-13].

Evidence suggests that in most cases, PM is not even discussed at the point of care. A recent public survey has shown that only four out of ten patients are aware of PM, and only 11% of patients say their doctor has discussed or recommended PM treatment options to them [14]. Behind this lag in clinical adoption are novel challenges that healthcare delivery systems are encountering as they adapt to the new requirements, practices and standards associated with the field [15].

This paper discusses the importance of the evaluation of barriers and facilitators within the implementation of personalized medicine interventions in Central and Eastern Europe which will be one of the outcomes in the Horizon 2020 project Regions4PerMed: "Interregional Coordination for aFast and Deep Uptake of Personalised Health" (a platform for the exchange of experience of experts from five European regions).[16]

BRIEF DESCRIPTION OF TOPIC AT HAND

The goals of the Regions4PerMed project are to set up the first interregional cooperation on PM, align strategies and financial instruments and, most importantly, identify primary barriers in PM adoption in the healthcare system and take systematic actions to remove as many of these barriers as possible to create a future where PM is fully integrated into real-life settings.[17] PM is a challenge for healthcare systems in Central and Eastern Europe if they are to provide patients with personalized diagnostics and treatment.

The current population of patients with multimorbidities and co-morbidities requires a holistic, comprehensive approach with specialized and individualized treatment from different medical and

paramedical specialties, as well as a management approach that commonly stretches across the classic healthcare silos. The complexity of the causes of impaired health status, that is, the number and severity of treatable traits, should be prioritized when making choices regarding which care provider should provide intervention, and where, when, and to which patients the intervention should be provided. Interprofessional and trans-organizational patient-centric care with common treatment plans is the key.[18]

The concept of integrated care can be traced to the aging societies of developed countries, the criticism of current healthcare systems by experts and patients and the idea of patient empowerment in the treatment process. Attempts to introduce integrated healthcare are motivated by the intention both to increase the quality and to reduce the costs of care. [10] PM fits perfectly into this trend. PM is an evolving field in which physicians use diagnostic tests to identify specific biological, often genetic, markers that help determine which medical treatments and procedures will work best for each patient. By combining this information with an individual's medical records and circumstances, PM allows doctors and patients to develop targeted treatment and prevention plans [3,19].

Standardization of the quality of diagnostic processes, optimization of diagnostic and therapeutic processes, and the priorities of PM, are the topics currently faced mainly by Central and Eastern Europe. The coordination of regional policies and innovation programs in PM to accelerate the employment of PM for citizens and patients is, therefore, the most important problem at this moment. [20] The latest developments in PM technologies, PM, and integrative medicine enable advances in personalized prevention, diagnosis, treatment, and rehabilitation.

DISCUSSION AND REFLECTIONS BARRIERS IN PM INTERVENTIONS

There are several challenges facing PM implementation if its full potential is to be harnessed. Below, we discuss those that present opportunities to improve implementation of PM with an integrated care approach in Central and Eastern Europe.

The concept of PM

The term 'personalised medicine' is not yet in common use. Patients and even medical doctors are generally frequently unaware of the concept, they are often too traditional to open up to the

idea. When the concept is explained to patients, they tend to understand it, however, concerns are voiced about the privacy of data, the meaning of the relationship between patient and doctor, especially about an instrumentalized view of the human body as a functional entity in opposition to a holistic view of a person as an individual with health issues that go beyond the physical aspect and concern the whole person. Still, most important is that healthcare providers can provide direct contact with patients and better explain the benefits of a PM treatment to them. [21]

Data in PM and Integrated Care

There is frequently a perception that there is not enough room for communication between doctors and patients and at first glance, the concept of PM which implies algorithm-based integration of multi-source data seems to be a further development along these lines. The concept needs to be thoroughly explained to the public and healthcare systems need to take this patient demand for personal, and not only personalized, care into account. Among major problems are also medical secrecy, privacy and general transparency regarding the functioning of medical digital solutions. These must be increased to encourage patients to trust their healthcare professionals (HCPs). To get PM, patients will need to share a large amount of personal information with healthcare providers and the industry. GDPR and debates about privacy represent an obstacle. [21]

Healthcare is facing numerous challenges in an increasingly digital world. The availability of healthcare data is opening opportunities to improve, or fundamentally change, methods of healthcare delivery. Artificial Intelligence, PM and big data are all offering outstanding potential. However, all these potentialities are underpinned by good data, and by comprehensive data. Both are currently lacking. The path to good data relies on the efforts of clinicians to turn data traditionally recorded only in a human-readable format into a format that is also machine-readable. The next barrier are the attempts to merge the various levels of data held in disparate systems, across primary and secondary care, and across various institutions. [22]

Technical and digital barriers in PM

Implementing PM across Europe will remove technical and legal barriers by harmonizing the processing of medical data. It will also provide mutual recognition for medical digital solutions published in differ-

ent EU member states and a centralized evaluation system and transparency between reimbursement rates of national healthcare systems. Of utmost importance is the awareness of new opportunities, diffusion of patient-centered approaches, opportunities for rare disease treatment, availability of big data for real-world evidence methodologies and, most importantly, artificial intelligence technologies. [21]

Education about PM

The current medical structures, on a large scale (healthcare systems) and an individual scale (the patient-doctor relationship etc.) have evolved over a long period. Education and discussion on the concept of personal health are needed for a large forum of politicians and citizens. A change of system, which will be needed if PM is to be implemented extensively, takes an effort on many levels. These are currently being addressed, but it does take time and a long-time perspective. In Poland, in most of cases, people do not have access to PM in the public system. There is no education around the topic. Private healthcare systems will be the first movers here but there are no incentives from the public system to facilitate this process. [21]

PM funding

More evidence needs to be generated to lead to PM reimbursement. There is no strategy or coordination of administrations and, therefore, no money to implement it. [23] The pharmaceutical industry is geared to produce standard products in very large quantities. The move to PM will require writing off the existing production infrastructure and building a new one from scratch. Current healthcare funding is not designed to cater for PM. [21] At the industry level, evaluation/reimbursement poses a major problem. This should not be seen as a must for medical digital solutions for which a classic B2B arrangement between the publisher and HCPs may be a better option. [21]

A centralized evaluation system and transparency between reimbursement rates of national healthcare systems would remove one of the main problems currently seen in PM. [21]

PM is becoming one of the most debated topics on public and private health agendas worldwide. It has supporters in the industry, patient organizations, healthcare professionals, academics, funders, and politicians. Devoting energy and resources to pursue (and hopefully realize) the promises of person-centered healthcare would seem to be a win-win strategy for a few stakeholders. [24]

Table. Expected barriers for, and facilitators of implementing the Quadruple Aim [8] in Central and Eastern Europe [21]

Quadruple aim	Barriers for the implementation personalized medicine interventions	Facilitators of the implementation of personalized medicine interventions
Improving the individual experience of care	<ul style="list-style-type: none"> - lack of awareness of PM services - lack of skills of elderly people 	<ul style="list-style-type: none"> - increased number of training sessions/conferences showing the possibility of PM - communications and informing citizens of the benefits of PM
Improving the health of populations	<ul style="list-style-type: none"> - mainly specialized and service-centered rather than patient-centered - lack of a user-friendly technology - access to individual data at the same time guaranteeing their security - medical digital solutions are overly fragmented due to national legislations derogating GDPR / national evaluation - conflicts between regional and national competencies 	<ul style="list-style-type: none"> - diffusion of patient-centered approaches - availability of personalized data as the basis for decision for a personalized diagnosis and treatment
Reducing the per capita cost of healthcare	<ul style="list-style-type: none"> - lack of financial incentives provided to HCPs to experiment with such solutions - some of managed care executives feel that PM will increase the cost of prescription medicines 	<ul style="list-style-type: none"> - mutual recognition for medical digital solutions published in other EU member states - centralized evaluation system and transparency between reimbursement rates of national healthcare systems
Improving the experience of providing care (the importance of physicians, nurses and all employees finding joy and meaning in their work)	<ul style="list-style-type: none"> - lack of training for healthcare staff - lack of investments in healthcare 	<ul style="list-style-type: none"> - patient advocates and cooperation with researchers and open-minded physicians - healthcare providers that can provide direct contact with patients and explain better the benefits of a PM treatment to them

CONCLUSION AND RECOMMENDATIONS

To create an environment in which PM can thrive for the best outcomes for patients, there is an urgent need for systematic actions to remove barriers [25], and identify such barriers in the implementation of innovative interventions in the field of eHealth at the micro-, meso- and macro-regional levels. The identification of potential costs is also needed.

The barriers often involve knowledge gaps, system-wide process obstacles and resistance to the cultural changes necessary to move toward a more personalized care paradigm. Often, PM programs are operated in isolation and therefore are not benefiting from the experiences of other healthcare delivery organizations. [26]

The evolution of healthcare delivery toward PM requires making new knowledge available, placing a greater emphasis on patient perspectives, recognizing the value of molecular pathways in guiding care, building new infrastructure and information management processes and reshaping healthcare delivery to ensure access to PM technologies and services. Overcoming challenges in these areas will likely require short-term strategies to implement programs that are straightforward and can provide clear solutions. It will also require long-term strategies that can drive systemic and cultural change. However, with a clear understanding of the set of challenges and the best strategies for overcoming those challenges, a roadmap for healthcare systems to advance the PM paradigm can be built.[26]

The introduction of radically new ways of promoting health and treating disease requires time on the part of healthcare professionals and patients. The awareness of, and evidence about the benefits of PM are key to its adoption on a large-scale but, so far, there is little of both. The communication about the benefits of PM must be drastically improved by public authorities and the industry alike, as well as by health insurance companies. Bonus and benefit schemes should reward the use of PM. For that to happen, PM needs to be accessible to the public in the form of products and services. [21]

The main specific challenge for both PM and integrated care in Central and Eastern European countries is, most importantly, the digital exclusion of elderly people and those living in poorer regions. In these countries, preferences for the old, established (traditional) prevention, treatment, and rehabilitation methods persist because of the lack of education for physicians and lack of awareness and motivation in the population.

Both facilitators and barriers are related to the governance, organization and functioning of (public) healthcare systems. PM solutions should work in synergy with the system to increase the value of healthcare provided to patients. Too often PM forms specific/individual silos not streamlined with the system that only increase the fragmentation of the system. [21]

Conducting research will allow identifying the best practices observed in European countries, it is also necessary to analyze the available literature and

documents provided by local governments within the partner countries of the Regions4PerMed Project, analysis of the reports prepared in the framework of the strategic areas of the R4PM Project provided by the coordinator, project partners and speakers. The Regions4PerMed project covers such issues as medical big data and electronic medical records, health technology in connected and integrated care, health industry, facilitation of the innovation flow in healthcare, socio-economic aspects.

This will allow to develop recommendations for reducing barriers in the implementation of the solu-

tions in the above-mentioned strategic areas and to disseminate knowledge about the results of the research at the micro-, meso- and macro-regional level.

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