Scientific Knowledge Group

Review Article

Journal of Critical Care and Clinic Nursing

Personalized and Precision Medicine (PPM) as a Unique Healthcare Model to Secure the Human Healthcare and Wellness: Unlock the Secrets of Caring and How Nurseries Shape Healthcare Professionals of the Next-Step Generation

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Received: July 21, 2025;
Accepted: July 28, 2025;
Published: August 04, 2025

ABSTRACT

A new systems approach to diseased states and wellness result in a new branch in the healthcare services, namely, personalized and precision medicine (PPM). PPM has drastically changed and is keeping on changing the landscape of healthcare, and PPM-guided nursery practice as well, covering PPM-guided cardiology-, neurology-, gastroenterology-, oncology- and reproductive medicine-related nursery practice and care. Of great importance are becoming Personalized Health Plans addressing lifestyle, risk modification and disease management, and Personalized Health Management & Wellness Program, coordinated by nurses of the next-step generation. Nurses face increasing challenges and opportunities in communication, support, and advocacy for patients given the availability of advanced testing, care and treatment in PPM. Nurses need to be at the forefront of patient care with a multidisciplinary team to truly deliver PPM-based care. Advanced and PPM-guided nursing education, clinical decision support, and health systems changes will be necessary to provide personalized multidisciplinary care to patients, in which nursing personnel play an important role since they are consulting, educating, and providing care to patients and pre-illness persons-at-risk, whose needs often needs to be individualized (personalized) nursing care).

Keywords: Personalized and Precision Medicine (PPM), OMICS Technologies, Bioinformatics, Clinical Decision Support, Personalized Health Plans and Personalized Health Management & Wellness Program.

Introduction

A new systems approach to diseased states and wellness result in a new branch in the healthcare services, namely, **personalized and precision medicine (PPM)** [1-16].

Citation: Sergey Suchkov, Elena Antonova, Hiroyuki Abe, and Trisha Dunning (2025) Personalized and Precision Medicine (PPM) as a Unique Healthcare Model to Secure the Human Healthcare and Wellness: Unlock the Secrets of Caring and How Nurseries Shape Healthcare Professionals of the Next-Step Generation. J Critical Care Clin Nurs 1: 1-10.

The implementation of PPM requires major health systems changes, including the incorporation of OMICS and bioinformation technologies to handle the data and introduce support tools for clinical use of the information. However, it also brings important implications and simultaneously limitations for nursing to the forefront as nurses must have adequate preparation and knowledge of the ongoing evidence to care for patients using PPM-based strategies. As patient advocates, educators, and providers of direct care, nurses will be on the front lines of implementation of state of the science care.

However, it also brings important implications for nursing to the forefront as nurses must have adequate preparation and knowledge of the ongoing evidence to care for patients using PPM-based strategies. Building on prior applications of "PPM" and the use of Big Data to drive PPM-guided care and PPM-driven nursing, upgraded nursing trend is well-positioned for this paradigm shift to support data in nursing education and daily practice. As patient advocates, educators, and providers of direct care, nurses will be on the front lines of implementation of state of the science care [61-65].

At present clinical practice, it would be extremely useful to integrate data harvesting from different databanks for clinical applications to provide more tailored measures resulting in improved patient outcomes, reduced adverse events, and more cost-effective use of the latest health care resources including diagnostic (including companion and theragnostic ones), preventive and therapeutic (targeted molecular and cellular) etc. Improved patient (or pre-illness persons-at-risk) outcomes with the application of the biomarker tests must consider not only increased survival or quality of life, but also improved clinical decision support (CDS) & making leading to the avoidance of unnecessary therapy or toxicity captured within the rapid learning system. Therefore, bioinformatics, artificial intelligence (AI), machine learning (ML), blockchain and molecular (genomics-related) biostatistics will be crucial in translating those Big Data into useful applications, leading to improved diagnosis, prediction, prognostication and treatment [1-16,37-42,66-70].

PPM has drastically changed and is keeping on changing the landscape of healthcare. Therefore, it is becoming clear that further development of the unique triad, including:

(i) molecular technologies,
(ii) risk prediction algorithms and
(iii) clinical decision support (CDS)

is needed. In this context, nursery knowledge and education in areas of healthcare and medical fields change a lot, since upgraded nursery science is pervasive across all medical disciplines to suit the demands coming from PPM-guided care. The latter means that for nursing services of the near future to come, the main challenge is the incorporation of the OMICS-technologies and bioinformatics algorithms in training and professional practice, so that nurses can empower themselves to provide personalized care to individuals and families based on PPM-driven innovations [43,44,71,72].

Nurses need to be prepared to assist patients in interpreting the results of consumer-based testing, and/or referring to the targeted specialists as needed. Nurses need to assess clinical risk factors; discuss and clarify patient values and priorities; provide information to enhance decision making around screenings or risk-reducing treatments; and provide support for family notification and testing as indicated [28,32,33,43,44,46-48,72].

For instance, the implications in global PPM and in personalized and precision cancer nursing care include interpretation and clinical use of novel and personalized information including genetic testing; patient advocacy and support throughout testing, anticipation of results and treatment; ongoing chronic monitoring; and support for patient decision-making. Attention must also be given to the family and ethical implications of a personalized approach to care. In particular, cancer nurses are important touchpoints in contact and communication with patients, since nurses' complete comprehensive assessments, examine a patient's lifestyle, assess symptoms.

The implications in PPM-based cancer nursing care include interpretation and clinical use of novel and personalized information including support for patient decision-making mentioned above. Specific to oncology, there is an ever-increasing complexity to and utilization of genetic testing in clinical care. Nurses in oncology have witnessed increased utility of genomic analysis for individualized tumor analysis and the evolution of targeted drugs for blocking more specific biochemical pathways. Those advancements are also changing the scope of nursing care and practice as nurses address patient implications of PPM. In particular, cancer nurses are important touchpoints in contact and communication with patients, since nurses' complete comprehensive assessments, examine a patient's lifestyle, assess symptoms [2,29,31,36,55, 64,87-94].

As you might see from the above-mentioned, the implications in PPM-guided cancer nursing care include interpretation and clinical use of novel and personalized information including genetic testing; patient advocacy and support throughout testing, anticipation of results and treatment; ongoing chronic monitoring; and support for patient decision-making [86].

The necessary emphasis on the professional training in cancer practice of nurses based on cancer genomics will become an important requirement as the OMICS sciences will become part of routine care, no longer being exclusively an area of specialization. Achieving such competency will provide effectively integrating genomics into practice, will improve PPM-related experts' effectiveness in caring for patient current health concerns and will make experts the guides to lifelong health. For precision oncology and PPM-guided reproductive medicine, precision has always been a criterion in every procedure, including etiology-oriented examination and specific diagnosis.

Personalized aims and objectives exist at every stage of disease initiation and progression to develop a **Personalized Health Plan (PHP)** addressing lifestyle, risk modification and disease management, and later, **Personalized Health Management & Wellness Program (PHMaWP)**.

Although upgraded nurses have a responsibility to implement PHP at an individual patient level, nurse practitioners (NPs) as clinical leaders have additional responsibilities in leading and

collaborating with transdisciplinary teams to implement PHP and PHMaWP across patient groups and embed practice change into routine care. Those advancements are changing the scope of clinical care globally and nursing care and practice as well. Nurses need to be prepared to assist patients in interpreting the results of consumer-based testing, and/or referring to the targeted specialists as needed. Nurses need:

(i) to assess genomics-driven personalized clinical and subclinical (predictive and prognostic) (Figure 1A-C) risk factors – disease risk assessment could be defined as the systematic evaluation and identification of risk factors, responsible for a disease, estimation of risk levels and finding possible ways to counter the onset and

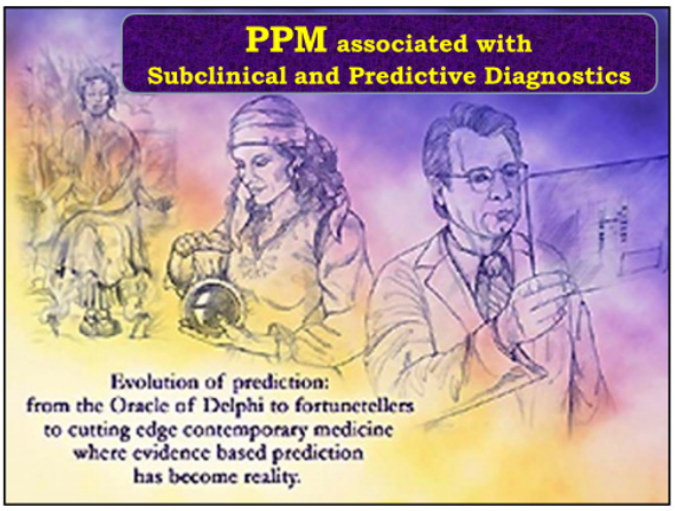

Figure 1A: PPM associated with Subclinical and Predictive Diagnostics

The aim of the application of predictive and prognostic biomarkers, which provide information on the overall outcome in patients and persons-at-risk, is to facilitate precise diagnosis. Predictive biomarkers help to optimize therapy decisions, as they provide information on the likelihood of response to the given targeted drugs. For instance, among predictive biomarkers serving as critical indicators for tailoring treatment strategies, specific genetic, epigenetic, or protein-based markers associated with treatment response have emerged to allow clinicians to select the most appropriate therapies for individual patients
Adapted from: **101**

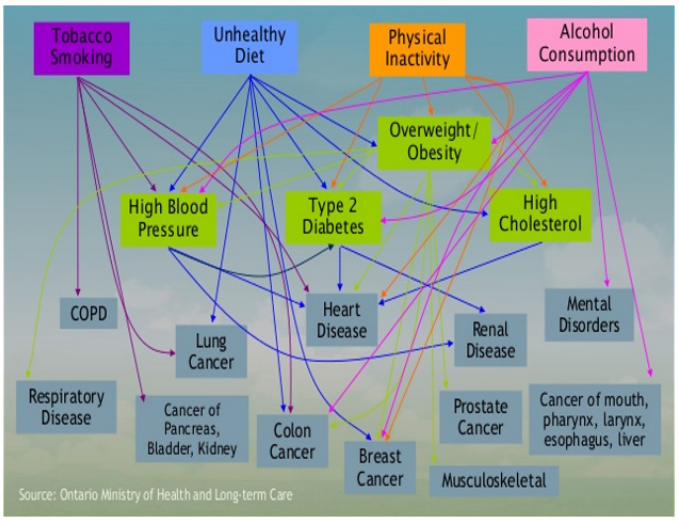

Figure 1B: Common Chronic Disease Risk Factors

A health risk factor includes any behavior, condition, or characteristic that increases the likelihood of developing a health problem. Some risk factors, like smoking, dietary choices, or excessive alcohol consumption, can be controlled and corrected. But others are related to genetic mutations, family history, or gender and cannot be improved with lifestyle changes.

The current burden of chronic diseases reflects the cumulative effects of unhealthy lifestyles and the resulting risk factors over the life span of people.
Adapted from: **52,58,102,103**

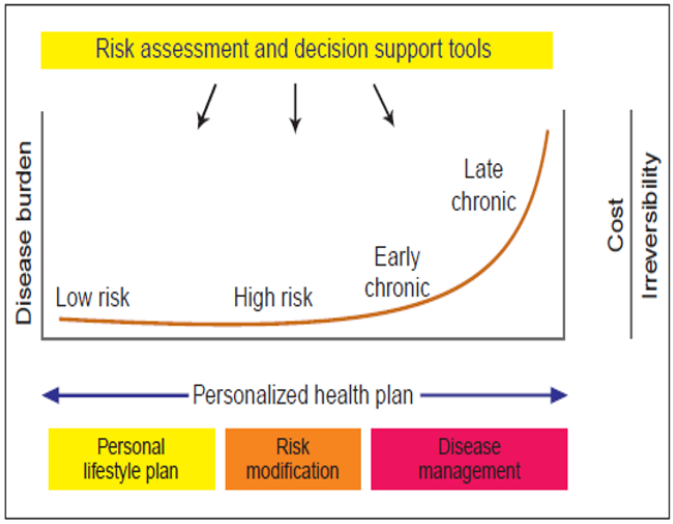

Figure 1C: Risk assessment and decision support tools

Managing health risks efficiently has never been more crucial in a world where humans face unpredictable challenges daily. Meanwhile, patient safety is a fundamental principle in healthcare, and risk assessment tools play a crucial role in bolstering it. These tools provide a snapshot of a patient's current health status, allowing healthcare providers to identify potential risks and implement measures to prevent safety events.

Risk assessment tools in healthcare are sophisticated instruments designed to evaluate and quantify potential risks associated with patient care. These tools utilize a combination of patient data, medical history, and other relevant information to identify vulnerabilities and predict adverse events. By employing statistical models and algorithms, healthcare professionals can assess the likelihood of specific risks occurring and tailor interventions accordingly. Healthcare risk assessment tools are used to understand and manage potential risks in the healthcare setting. These tools include decision tree risk assessment tools, which are used to select policies or action procedures. The risk matrix is a popular decision-support tool used in both public and private healthcare sectors.
Adapted from: **104**

(ii) progression of a disease within
(iii) the population.;
(iv) to discuss and clarify patient values and priorities;
(v) to provide information to enhance decision making around screenings or risk-reducing treatments; and
(vi) to provide support for family notification and testing as indicated.

This strategy mentioned would give a real opportunity to secure preventive measures whose personalization could have a significantly positive influence on demographics (Figure 2)!

Nurses decipher health communication for their patients. Designing tailored patient communication and education could potentially be a cost saving measure for hospitals by reducing length of stay and reducing readmissions. Health literacy training should be incorporated into nursing practice. In this connection, CDSSs have been hailed for their potential to reduce medical errors and increase health care quality and efficiency [95-100].

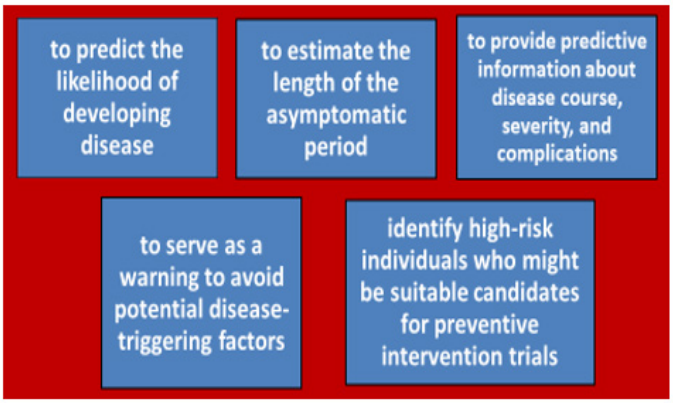

Figure 2: Impacts to be assumed for the practical implementation of innovative tools, methods and protocols into PPM-guided clinical practice

PPM as the big change to forecast, to predict and to prevent is rooted in a big and new science to be rooted from the achievements of OMICS- and bioinformatics-driven portfolio which are being implemented into the daily practice to secure visualizing of lesion foci that was previously unknown to clinicians (Figure 3A-C)

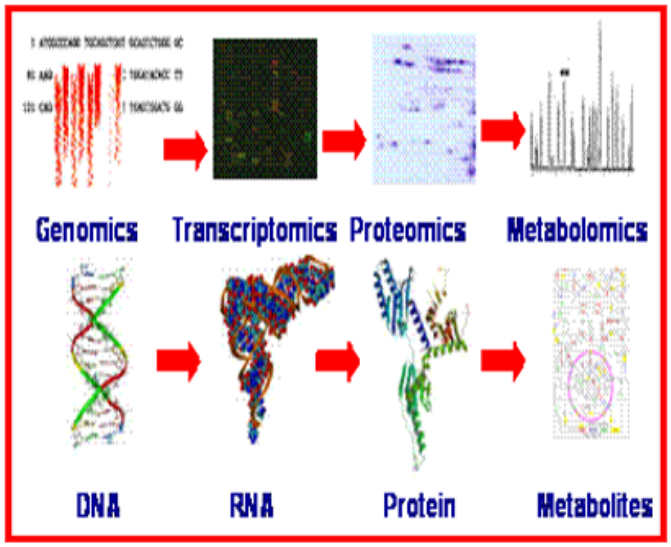

Figure 3A: OMICS-Portfolio

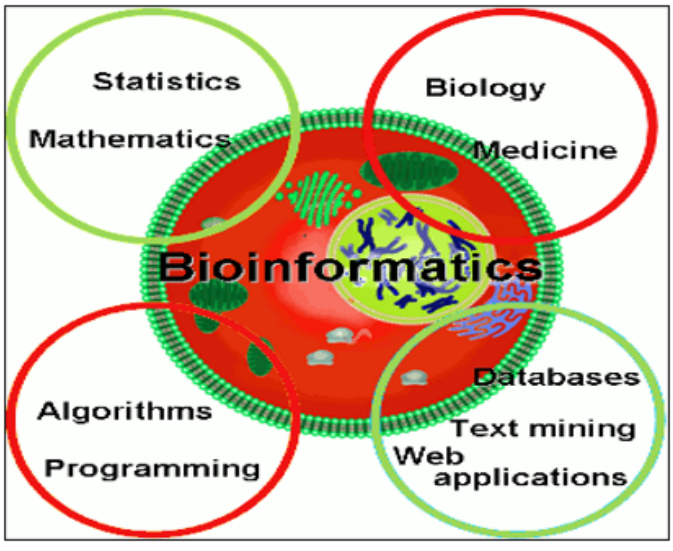

Figure 3B: Bioinformatics tools and resources

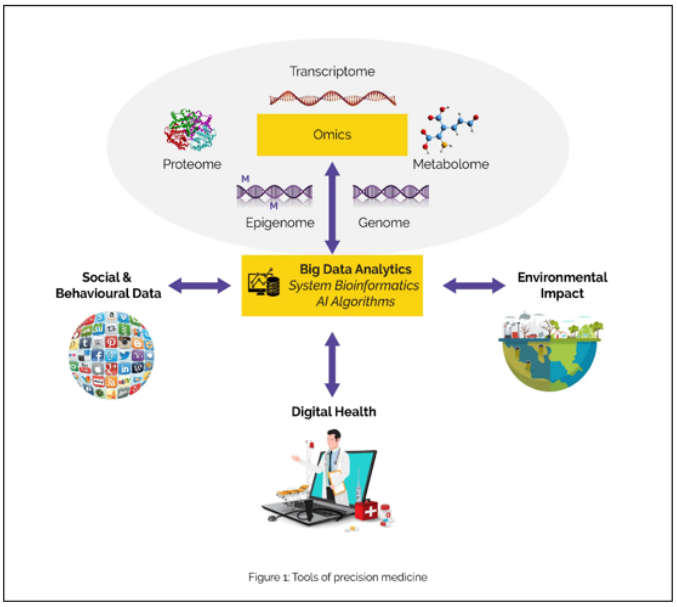

Figure 3C: Personalized & Precision Medicine (PPM) as a Model of Healthcare Services of the Next-Step Generation

PPM refers to an approach that aims to tailor medical treatments and interventions to individual patients based on their specific characteristics, including their genetic makeup, environmental factors, lifestyle, and other relevant data. It emphasizes the customization of healthcare to optimize effectiveness and diminish adverse effects.

PPM relies on advancements in OMICS-technologies, as well as bioinformatics and data analysis, to identify molecular and genetic markers that can help anticipate disease risk, diagnose conditions, and guide treatment decisions.
Adapted from: **79**

Tissue-derived information we would accumulate might be combined with the:

- individual's medical records;
- family history;
- data from imaging;
- instrumental and laboratory tests

to develop personalized and preventive treatments. Meanwhile, bioinformatics would secure constructing and maintaining unified biobanks and datasets necessary for personal health monitoring based on principles of genotyping and phenotyping. As a result, the patient becomes a data carrier, whilst learning about possible risks of a disease, and the physician can reasonably select a kind of preventive and personalized protocol rooting from the predictive assays made.

Nurses face increasing challenges and opportunities in communication, support, and advocacy for patients given the availability of advanced testing, care and treatment in PPM. By transcending across boundaries and different disciplines, nurses will be able work together to strengthen communication and discussion, thereby improving patient care and future health outcomes while building and shaping the next generation of nurse scientists.

Meanwhile, despite the surge of interest and attention to precision health, most nurses are not well-versed in PPM-guided healthcare and clinical services or its implications for the nursing profession. Based on expert opinions, we might provide a viewpoint of precision health and the importance of engaging the nursing profession for its implementation.

Nurses need to be at the forefront of patient care with a multidisciplinary team to truly deliver PPM-based care. Nurses need to be prepared to assist patients in interpreting the results of clinical genetic testing, as well as commercially available consumer-based testing, and/or referring to genetic specialists as needed. It is likely that these activities will be in concert with a genetic counselor; however, nurses are anticipated to fill the increasing gap in services related to genetic counseling that are consistent with the scope of nursing practice. Nurses need to assess other clinical risk factors; discuss and clarify patient values and priorities; provide information to enhance decision making around screenings or risk-reducing treatments; and provide support for family notification and testing as indicated.

PPM and PPM-guided clinical services need to be scaled to a more accessible and standardized level by combining patient-centered best practices, actionable precision diagnostics, and impactful precision therapy [80,82] (Figure 4).

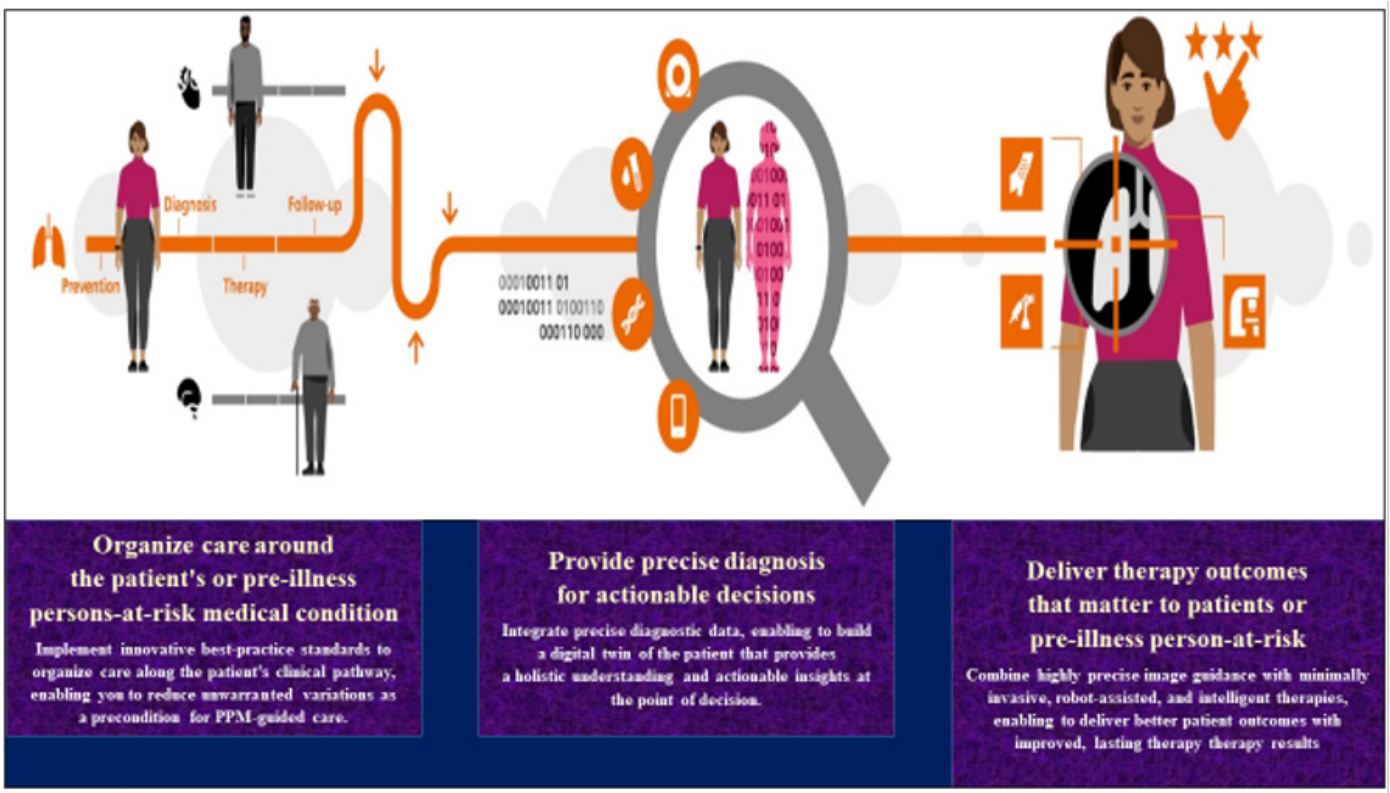

Figure 4: Innovative PPM-guided healthcare

Enable you to promote health for each patient by digitally connecting precise diagnoses with precise treatments.

One of the key elements to advancing nursing scholarship regarding the above-mentioned approaches, is the recognition of the critical role of the nurse science and scientists as the essential members of many diverse **transdisciplinary teams (Figuere 5).**

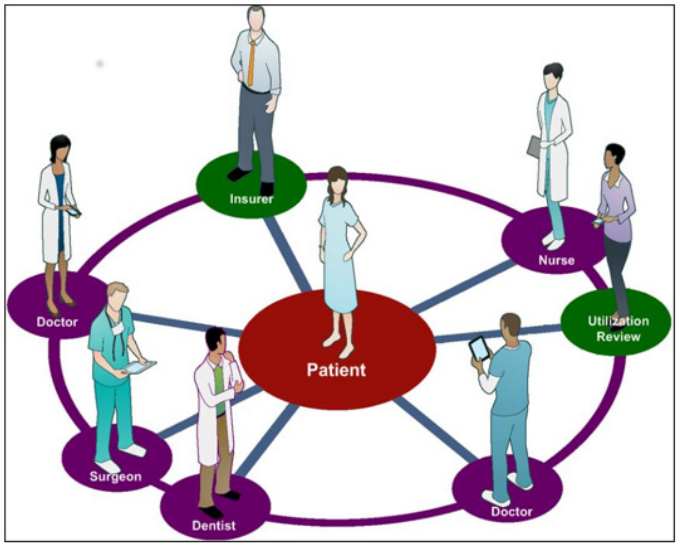

Figure 5: A concept of transdisciplinary healthcare team and the role of the nurse

The transdisciplinary approach (TA) of service integration bridges that gap by allowing professionals to share roles across disciplines in order to meet the needs of patients and their families. Examples of how nurse investigators have led these teams to reconcile the differences in theoretical, methodological, and/or analytic perspectives that inevitably exist are lacking. Although the process of developing TA teams is documented, the experiences and developmental processes of participants in TA teaming remain largely unexplored.
Adapted from: **8-84**

Successful implementation of PPM-guided health requires inter-professional collaboration, community outreach efforts, and coordination of care, a mission that nurses are well-positioned to lead. In this sense, due to our viewpoint, all healthcare professionals of the future should be educated to deliver patient-centric care as members of interdisciplinary teams, emphasizing evidence-based practice, quality improvement approaches and bioinformatics. It is important to remember that regardless of the diagnostic tools used, the patient-related treatment course will be decided by their physician (clinician). Therefore, greater collaboration between clinician and patient (or person-at-risk) would replace the traditional clinician-dominated dialogue with more effective patient-clinician and patient-nurse partnerships.

Despite the surge of interest and attention to precision health, most nurses are not well-versed in PPM or its implications for the

nursing profession. Although nurses have long engaged in transdisciplinary approaches (working with multiple disciplines yet maintaining boundaries), only more recently have they become part of transdisciplinary research teams. In this context, the transdisciplinary model of care was an essential service for patients requiring complex care. And nurses, and other health care providers, can look to this definition to understand transdisciplinary health care teams as opposed to the regular ones [85].

Putting PPM-tools in a public health perspective requires an apprehension of the current and future public health challenges. The principles of PPM and efforts to approaching the right health issues in a timely manner can be applied to population health. Doing so will, however, require a careful view and concerted effort to maintain the needs of population health at the forefront of all PPM discussions and investments.

In reality, a new buzzword has crept into the health sciences lexicon: PPM-based public health. The initial drive toward PPM-based public health is occurring, but much more work lies ahead to develop a robust evidentiary foundation for use. PPM and PPM-based Public Health calls for a transdisciplinary approach to support safe and effective deployment of the new enabling diagnostic and therapeutic technologies stressing: not to treat but to get cured! The latter would need for novel training since the society is in bad need of large-scale dissemination of novel systemic thinking and minding. And upon construction of the new educational platforms in the rational proportions, there would be not a primitive physician created but a medical artist to be able to enrich flow-through medical standards with creative elements to gift for a patient a genuine hope to survive but, in turn, for a person-at-risk – a trust for being no diseased. This is the reason for developing global scientific, clinical, social, and educational projects in the area of PPM to elicit the content of the new branch.

PPM and PPM-guided clinical practice represent a paradigm shift and a new reality for the health care system in the civilized world, with training being fundamental for its full implementation and application in advanced clinical practice. In this sense, healthcare professionals face educational challenges related to the acquisition of competencies to perform their professional practice optimally and efficiently in this new environment. The definition of competencies for health care professionals provides a clear guide on the level of knowledge, skills, and attitudes required to adequately carry out their professional practice [42-48,73-78].

In this context, the quality and diversity of nursing services and technical support can be improved from medical science advances, economic optimizing, clinical validation and updates. Patient's nursery service plays key roles in modern hospitals. To meet the new demands for care, these advances need to be incorporated into professional nursing practice and, above all, into nursing care. In order for patients and their families to fully benefit from the explosion of genomic knowledge, healthcare professionals, especially nurses, need to grasp the underlying principles of genomics that have been shaping all healthcare practice and care. Therefore, the necessary emphasis on the professional training of nurses based on genomics will become an important requirement as the OMICS sciences will become part of routine care, no longer being exclusively an area of specialization [72-78].

To meet the new demands for care, it is necessary that the OMICS sciences be integrated into daily nursing practice, especially in nursing care. Based on knowledge of genomics, it has been improved techniques that enabled the advancement of research related to functional genomics, which together comprising the OMICS sciences. The current challenge is to transform this expanded set of information into clinical benefits for patients, through more accurate diagnoses, treatments, and personalized care to the particularities of individuals and communities. For nursing, the main challenge is the incorporation of the omics sciences in training and professional practice, so that nurses can safely, scientifically, and autonomously empower themselves to provide personalized care to individuals and families based on PPM-driven Era [61,68].

Advanced classification and technical skills for nursery should be separately educated and practiced. In this sense, health care professionals, including medical nurses, face educational challenges related to the acquisition of competencies to perform their professional practice optimally and efficiently in this new environment. The definition of competencies for health care professionals provides a clear guide on the level of knowledge, skills, and attitudes required to adequately carry out their professional practice. In this context, this acquisition of competencies by health care professionals can be defined as a dynamic and longitudinal process by which they use knowledge, skills, attitudes, and good judgment associated with their profession to develop it effectively in all situations corresponding to their field of practice.

Meanwhile, a lack of medical guidelines has been identified by responders as the predominant barrier for adoption, indicating a need for the development of best nursing practices and guidelines to support the implementation of PPM! This is the reason for developing scientific, clinical, social, and educational projects in the area of PPM to elicit the content of the new branch. Therefore, nursing education and continuing education, clinical decision support (Figure 6), and health systems changes will be necessary to provide personalized multidisciplinary care to patients, in which nurses play a key role.

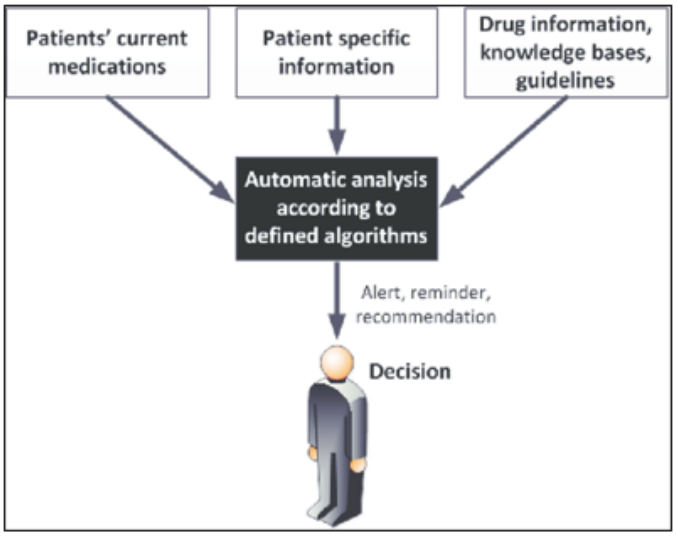

Figure 6: Clinical decision support (CDS) making

Clinical decision support (CDS) provides timely information, usually at the point of care, to help inform decisions about a patient's care. CDS tools and systems help clinical teams by taking over some routine tasks, warning of potential problems,

or providing suggestions for the clinical team and patient to consider. Clinical decision support (CDS) includes a variety of tools and interventions computerized as well as non- computerized. High-quality clinical decision support systems (CDSS), computerized CDS, are essential to achieve the full benefits of electronic health records and computerized physician order entry. A CDSS can take into account all data available in the EHR making it possible to notice changes outside the scope of the professional and notice changes specific for a certain patient, within normal limits
Adapted from: **104-107**

In the academic setting, nursing faculty have an opportunity to develop curricula that include stand-alone mandatory courses in genomic health, as well as threading genomics into the broader curriculum to ensure that students gain experience with applying this knowledge. Faculty who has the necessary expertise and training to develop curricula in both undergraduate and graduate nursing programs are needed. Faculty members can collaborate with institutional and community partners to champion clinical placements with a genetics and genomics focus, as well as create global opportunities for students to participate in research and policy development in this area. Additionally, interprofessional learning opportunities, such as collaborative partnerships between nursing and colleagues in the medical genetics field and genetic counsellors, can be fostered as part of clinical education. The evidence supports the need for early integration of genomics within nursing academic programs, with ongoing professional development opportunities within the workplace.

PPM is revolutionizing the healthcare landscape by tailoring medical treatment to the individual characteristics of each patient or pre-illness person-at-risk. By understanding the principles of PPM, nurses can tailor care plans to individual patient needs, use biomarkers for disease diagnosis and treatment, and integrate pharmacogenomics into medication management. As the field continues to evolve, it is essential to address the challenges and limitations associated with PPM and PPM-guided nursery practice, including ethical and regulatory considerations. Finally, in nursing, PPM is transforming evidence-based practice, enabling healthcare providers to deliver targeted care that enhances patient outcomes. The latter means that advanced and PPM-guided nursing education, clinical decision support, and health sys-tems changes will be necessary to provide personalized multidisciplinary care to patients, in which nursing personnel play an important role since they are consulting, educating, and providing care to patients and pre-illness persons-at-risk, whose needs often needs to be individualized (personalized nursing care).

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