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Review Article

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Personalized and Precision Medicine (PPM) as a Unique Healthcare Model of the Next Step Generation: The role of a Nurses and Nursing Practice in Transdisciplinary Care Team: The Future of Nursing Services

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The field of medicine and thus the healthcare services have witnessed incredible advancements in recent years, leading to a shift from a one-size-fits-all approach to a more personalized and pre-cise approach [1]. Healthcare professionals have strived to enhance their practices and ensure greater effectiveness and safety for their patients and persons-at-risk, building upon the achieve-ments of previous generations. With the aid of IT algorithms and software, big data analytics, and genetic testing, fundamental researchers, biodesigners and biotechnologists, and physicians are now able to take this mission far. These approaches take into account an individual's unique genetic makeup, environmental, and lifestyle factors to offer tailored medical interventions. [2].

A new systems approach to diseased states and wellness result in a new branch in the healthcare services, namely, personalized and precision medicine (PPM) (Figure 1A,B).

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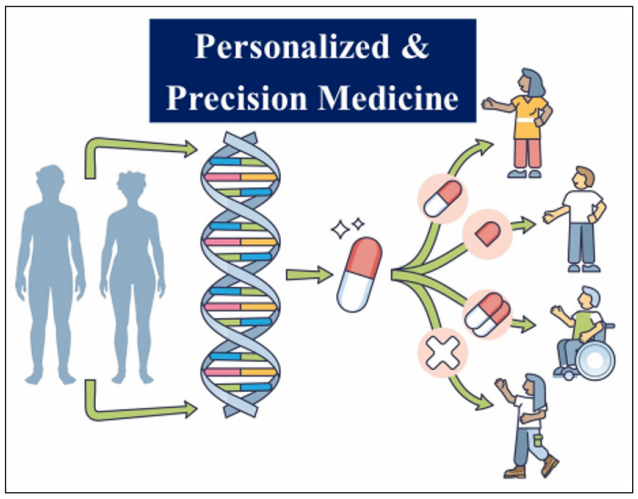


Figure 1A: Personalized and precision medicine (PPM) Precision medicine identifies differences in individuals, categorizing based on environmental, biological, and psychosocial factors. Personalized medicine takes these differences and implements preventions/treatments tailored to the individual

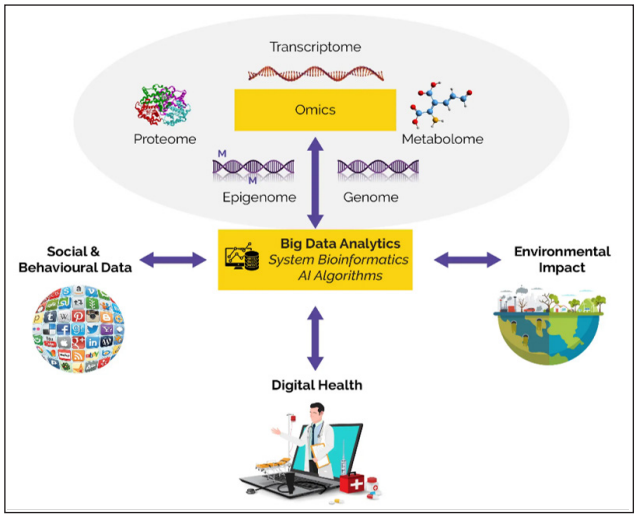


Figure 1B: Personalized and Precision Medicine (PPM) through the Armamentarium of Tools

These approaches take into account an individual's unique genetic makeup, environmental, and lifestyle factors to offer tailored medical interventions. Personalized medicine encompasses an approach to patient care that takes into account not only their genetic characteristics but also fac-tors such as preferences, beliefs, attitudes, knowledge, and social context. On the other hand, precision medicine refers to the healthcare delivery model that heavily relies on data, analytics, and information to yield targeted and accurate treatments.

By leveraging the patient's genetic characteristics, PPM as a global approach holds the potential to provide tailored drugs at precise dosages and optimal timings, thus boosting efficiency in med-ical practice and reducing healthcare expenses. PPM adopts a more nuanced strategy, taking both genotypic and phenotypic differences into account, in order to create a therapy or preventative method that may be used to benefit both populations and individuals.

The progress in PPM is leading to tangible advantages, including the ability to detect illnesses at an early stage and create personalized treatment plans. PPM as a Model of Healthcare Services of the Next Step Generation is considered today as the Science and ART illustrating application of sets of the different Tools of the Model at the Population, Communities and Individuals (Figure 2).

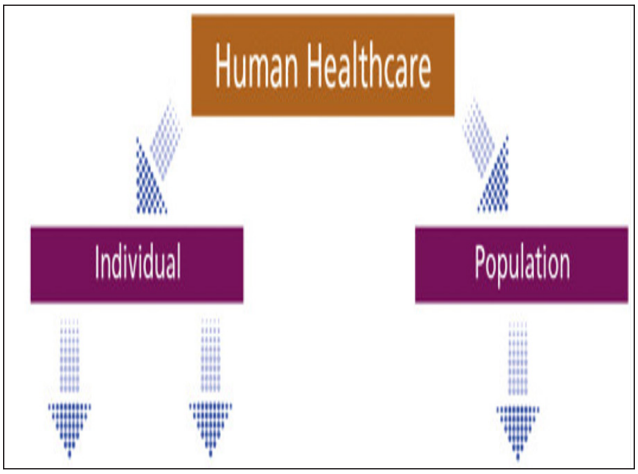


Figure 2: Individual and population-based medicine through the View of Personalized & Precision Healthcare Services

And thus exerting reliable control over morbidity, mortality and disabling rates as well as signifi-cantly optimizing the cost and efficacy of treatment for those who had fallen ill (patients) and for persons-at-risk.

Knowing the chronic diseases prevalent among your family members, such as T1D/T2D, obesity, heart disease, high blood pressure, or cancer, can provide insights into your own risk factors. Sharing this information with your experienced and PPM-driven doctor enables proactive steps to prevent diseases or detect them at the pre-early (subclinical) stages. In certain cases, your doc-tor might recommend genetic counseling and testing to assess your susceptibility to diseases run-ning in your family.

The other example and specific cases are newborn screening that involves testing (including ge-nomic profiling) infants for specific medical conditions shortly post-birth. Early identification of these conditions allows for prompt preventive treatment, reducing the risk of disability or death.

Certain individuals have inherited conditions that increase their susceptibility to specific diseases, predominantly, cancer-related ones, and, for example, individuals with BRCA1 or BRCA2 gene mutations have a higher risk of breast or ovarian cancer. Recognizing these conditions empowers individuals to take preventive measures, such as earlier or more frequent screenings, medication usage, or even surgical interventions, to reduce their disease risks.

By leveraging individual variability and tailoring interventions to specific patient needs, these approaches offer more precise diagnoses, targeted therapies, and improved patient outcomes. Their integration into routine clinical practice has the potential to revolutionize healthcare deliv-ery and improve population

health. PPM has transformative potential in healthcare and would give a real opportunity to secure preventive, prophylactic, therapeutic and rehabilitative measures whose personalization could have a significantly positive influence on demographics [3-18].

PPM is a goal of healthcare, in which diagnostic and treatment decisions are informed by each person's unique clinical, basics ("OMICS") (Figure 3A,B)

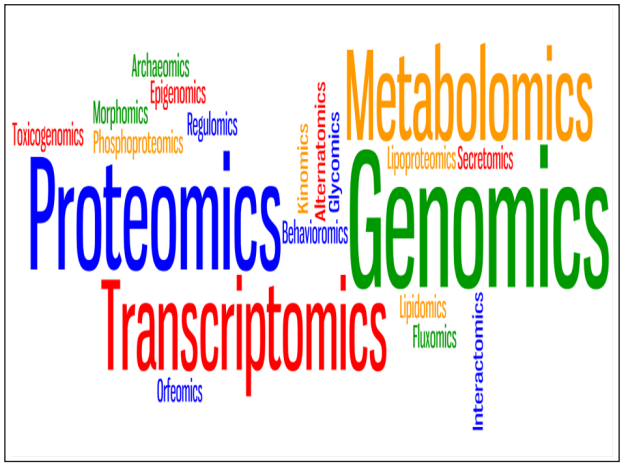


Figure 3A: OMICS-Portfolio

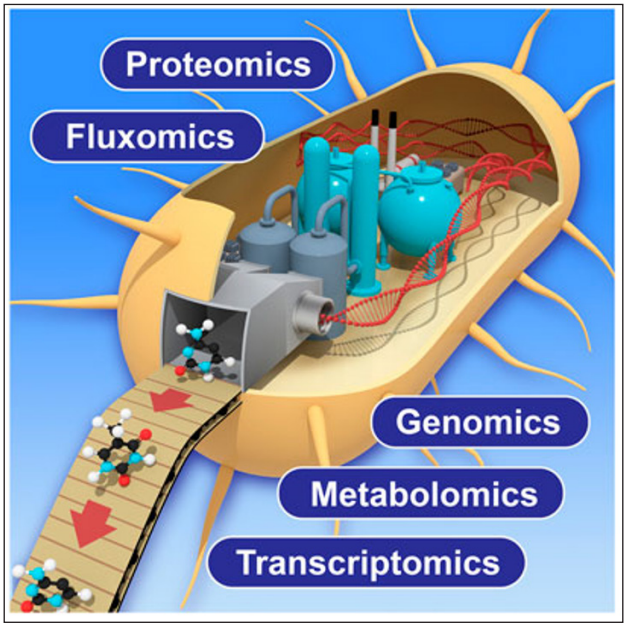


Figure 3B: OMICS-technologies

and environmental (exposomics-related) (Figure 4) information [3,4,12,19-32].

Each decision-maker values the impact of their decision to use PPM on their own budget and well-being, which may not necessarily be optimal for society as a whole. To really understand PPM, we would have to understand the various fields of translational applications that provide the tools to exploit and practice PPM, and genomics-related tools, in particular [2,3,19-24,33-35].

Having access to the deepest genomic information via unique genomic technologies and genomic testing and profiling, will become increasingly important as physicians are progressively receptive to incorporating genomics into clinical practice. So, genomics is considered to be a set of the unique biomarkers and thus the molecular tools to probe genome for its quality and now even be tested for Predictive and Prognostic biomarkers (Figure 5A-C).

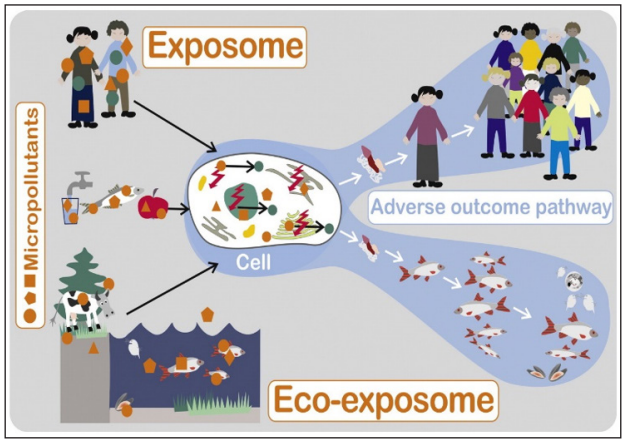


Figure 4: Microenvironment and the influence of exposomic-related factors on the popula-tion

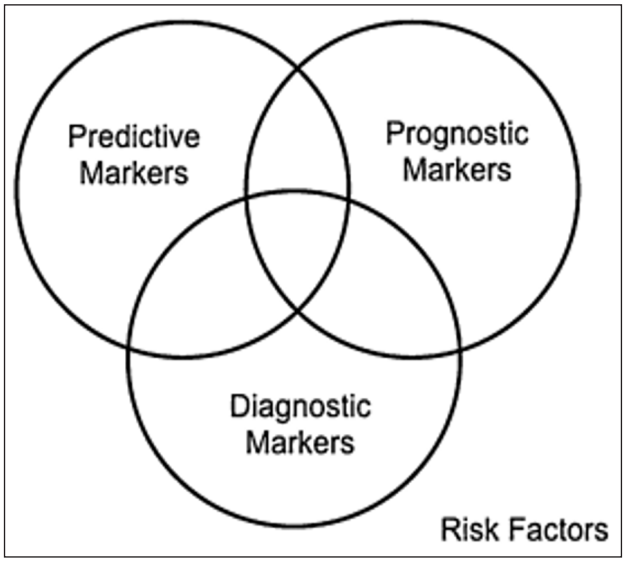


Figure 5A: Predictive and prognostic biomarkers using to assess the risks, in personalized and precision clinical practice

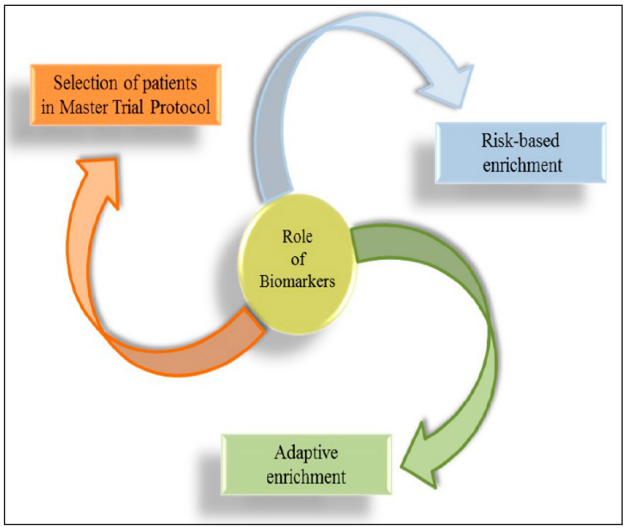


Figure 5B: Biomarker-based approaches for patient selection in clinical trials

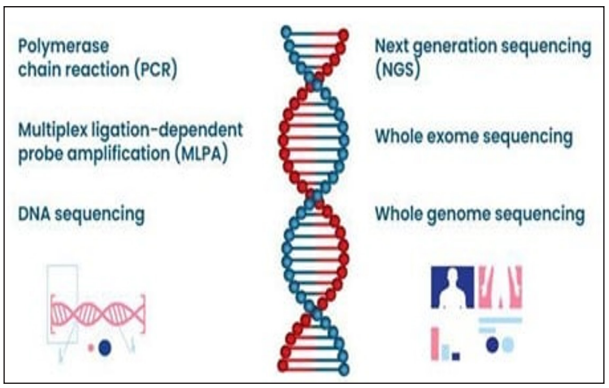


Figure 5C: Molecular testing tools and Techniques

Biomarkers are increasingly useful tools to predict prognosis and response to therapy in patients with chronic diseases. A biomarker is defined as "a characteristic that is measured as an indicator of normal biological processes, pathogenic processes, or responses to an exposure or intervention, including therapeutic interventions". Indeed, an "ideal" biomarker is defined with the presence of some analytic features: (1) it should be measured and readily available in biosamples; (2) it should be reproducible, non-invasive, and not expensive. Furthermore, biomarkers allow us to improve our understanding of mechanisms of action and resistance to treatment.

Prognostic biomarkers enable identification of patients with a more aggressive more aggressive disease progression (e.g., in tumor evolution, whilst providing information about the patient over-all cancer outcome, regardless of therapy), whilst a predictive biomarker gives information about the effect of a therapeutic intervention and can thus be a target for therapy, whilst permitting the identification of patients with a higher probability of responding or not to a specific treatment.

In oncology, the aim of the application of prognostic biomarkers, which provide information on the overall cancer outcome in patients, is to facilitate cancer diagnosis, usually with no need for putting invasive methods into use. Predictive biomarkers help to optimize therapy decisions, as they provide information on the likelihood of response to a given chemotherapeutic.

In clinical trials, prognostic biomarkers are used to identify patients more likely to develop a clin-ical event or disease progression, allowing to identify populations at higher risk. In this context, prognostic biomarkers are used as inclusion or exclusion criteria.

Genetic assessment has become an essential aspect of medicine, and professionals need to know when genetic evaluation is indispensable. Genetic testing is the laboratory analysis of human ge-netic material including chromosomes, deoxyribonucleic acid (DNA) or ribonucleic acid (RNA) to detect genetic material and/or identify genetic changes. Genetic changes are referred to as "variations" or "variants" (sometimes called "mutations"). and they can have many different ef-fects on the body. While most genetic variations do not affect a person's health, they are some-times related to disease.

PPM is thus understood as a medical approach in which patients and/or persons-at-risk are strati-fied based on their disease subtype, risk, prognosis, or treatment response using biomarker-based and specialized diagnostic, predictive, prognostic and monitoring tests. The key idea is to base medical decisions on individual patient characteristics, including molecular and behavioral bi-omarkers (33,44), rather than on population averages.

As you might understand, individualized genetic testing predicts and assess an individual's pre-disposition to health risks and diseases. So, Personal Genomics could anticipate a patient's po-tential reaction to certain medications, thereby ensuring the safety and efficiency of medicines for each patient, using, for instance, pharmacogenomics testing (Figure 6)

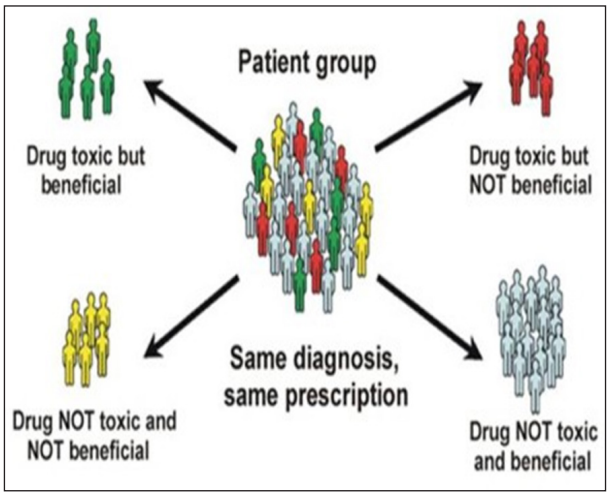


Figure 6: Pharmacogenomic testing in clinical practice

Pharmacogenomics is an important example of the field of PPM, which aims to tailor medical treatment to each person or to a group of people.

Pharmacogenomics is Studies

How a person's genes affect how he or she responds to medications. This type of testing may help inform healthcare providers' medication selection and dosing. Pharmacogenomics uses infor-mation about a person's genetic makeup, or genome, to choose the medication and dosage that are likely to work best for that person.2

While pharmacogenomic testing is currently used for only a few drugs, the field is growing very quickly. Improved understanding of how pharmacogenomics can protect your health and improve your treatment will be increasingly important.

To predict and to target medicines to good responders or to identify whether an individual has an increased risk of a specific adverse drug reaction from a particular medicine.

Meanwhile, a combination of genomic and phenotypic (OMICS-related) biomarkers (Figure 7A,B)

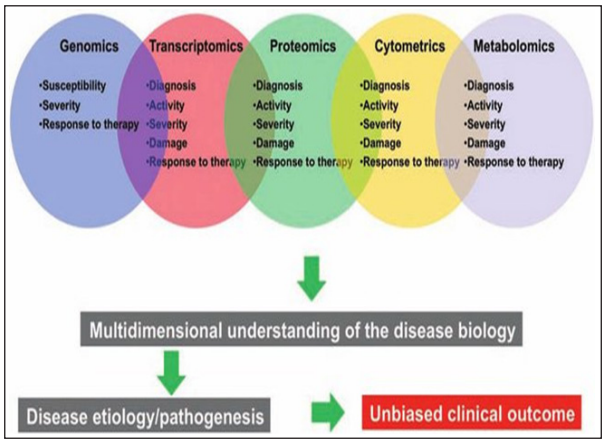


Figure 7A: A multiomics approach for the discovery and validation of biomarkers in probing the disease biology and using in clinical practice

A robust biomarker discovery, development and validation effort must bring together multiple 'omics' technologies, data types, databases and bioinformatics and biostatics to identify the most predictive biomarkers across DNA, RNA, protein, phenotype and metabolite domains.

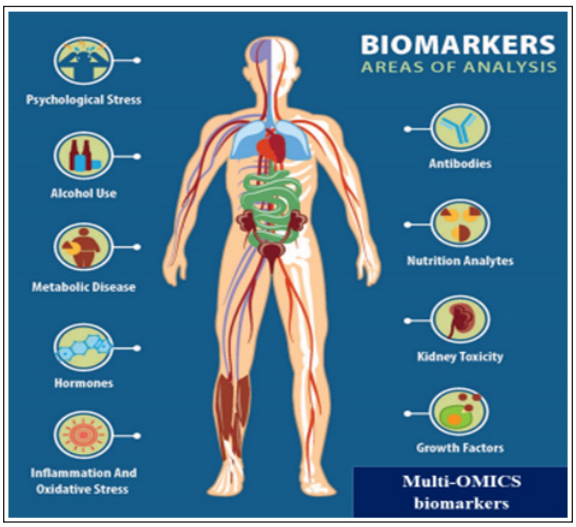


Figure 7B: Biomarkers as Tools indicating Biological Processes and Events, illustrate a principally new strategy in Personalized and Precision Healthcare Services

According to their applications, modern biomarkers can provide complementary information about the disease or the intervention under consideration. Biomarkers may be identified at any event occurring since the pathogenesis, the onset of first clinical manifestations, diagnosis, treat-ment outcome or recovery are becoming of great significance to be translated into the daily practice to predict risks of the chronification and disabling (Figure 8).

The integration of biomarkers panel with risk assessment models appears to improve disease diagnosis and management. However, integration of novel genomic biomarkers in future prognostic models requires further validation in their clinical efficacy, standardization, and costeffectiveness in routine application.

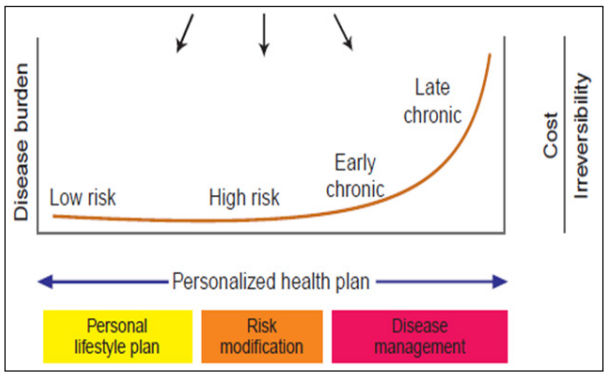


Figure 8: Risk assessment and decision support tools in clinical practice

The FDA-NIH Biomarker Working Group distinguished several types of biomarkers based on their main clinical application (Figure 9).

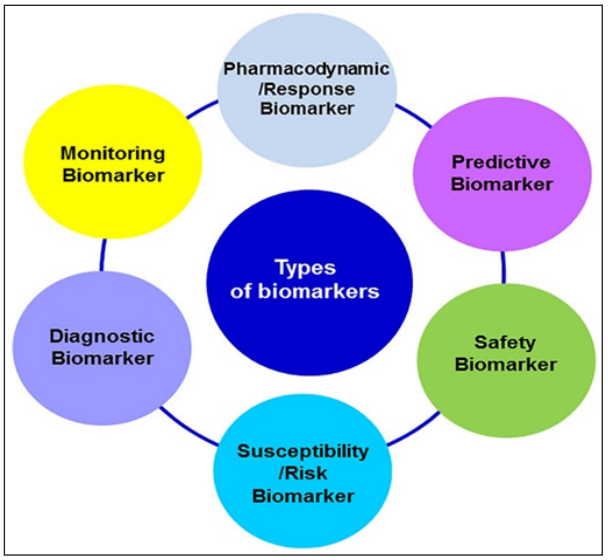


Figure 9: Type of Biomarkers aimed to be used in Clinical Practice

Biomarkers have the potential to act as rapid integrative measures that indicate adverse conditions at a biologically relevant level and to provide a more proactive approach to risk assessment. The use of biomarkers has proven useful in establishing evidence of exposure to pollutant chemicals and damage to the health of sentinel organisms. In addition, biomarkers have helped establish causal relationships.

With the application of new genomic technologies, the assessment of risk of disease (including cancer) progression and development of complications and metastatic diseases has improved. For instance, with the vast advancements in the field of PPM and PPM-related oncology practice, there is a crucial need for reliable cancer predictive and prognostic biomarkers to identify patients that may benefit from different management strategies. Integration of biomarkers into risk as-sessment models appears to enhance cancer stratification for both diagnosis and management. However, to be integrated in future prognostic and predictive models, genomic biomarkers need greater standardization to improve generalizability, validation of their clinical efficacy, and cost-effectiveness in routine application.

This new approach emphasizes the need for an integrated environmental risk assessment and of-fers the potential for the incorporation of bioeffects measures, including the use of biomarkers in the process. Biomarkers have been suggested as practical tools for environmental management for a number of decades, but their inclusion has not been universally accepted because of a number of unanswered questions regarding sensitivity, practicality, and reproducibility. It is thus vital that an integrated approach to human and ecosystem health be implemented, with biomarkers and bioassays adding value and providing complementary information to that provided by the chemical and ecological community measures currently undertaken.

As you might see from the above-mentioned, PPM will require the integration of clinical infor-mation, stable and dynamic genomics, and molecular phenotyping (Figure 10A,B)

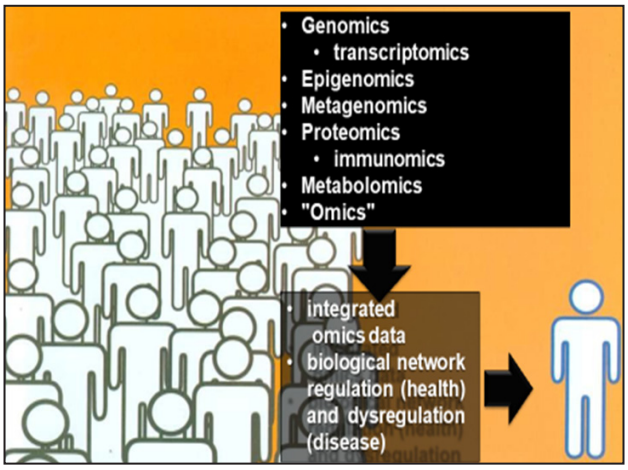


Figure 10A: The integrative personal OMICS-driven profile

Advances in OMICS technologies now allow an unprecedented level of phenotyping for human diseases. To aid the development of better understanding of these phenotypes, we performed a controlled longitudinal weight perturbation study combining multiple omics strategies during dif-ferent periods of the disorder.

Integrative Personal Omics Profile (iPOP), an analysis that combines genomic, transcriptomic, proteomic, metabolomic, and autoantibody profiles from a single individual. It also uncovered ex-tensive, dynamic changes in diverse molecular components and biological pathways across healthy and diseased conditions.

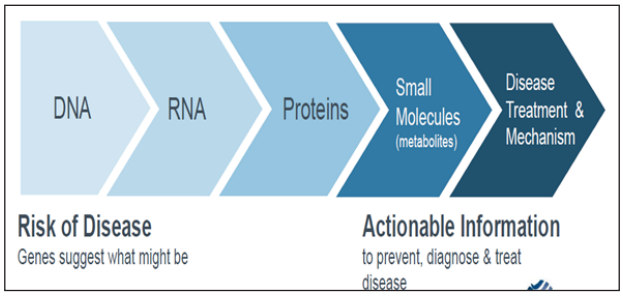
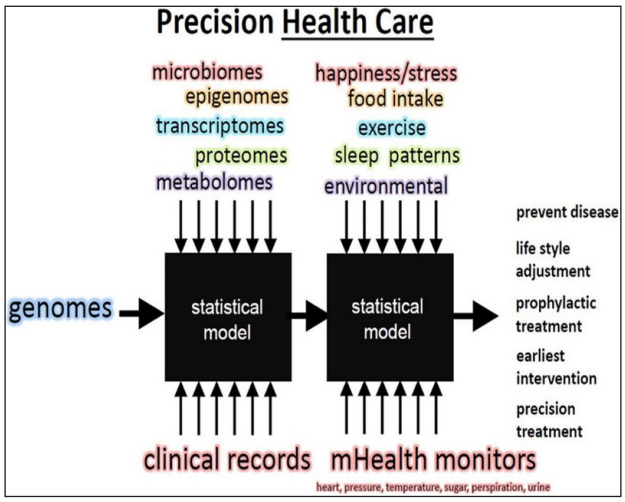


Figure 10B: Multimolecular (multi-OMICS-driven) phenotyping in Clinical and Subclinical Practice

Multimolecular (multi-OMICS-driven) phenotyping actively measures disease-related changes, as opposed to measuring a genetic predisposition or assessing risk of disease.



Figurte 11A: Biological computation view of 'The Holy Grail: Personalized & Precision Health Care'

The implementation of PPM requires major health systems changes, including the incorporation of genomics, genomics-driven technologies and IT resources 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 prepara-tion 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 im-plementation of state of the science care [2-14,17,35,39-42].

Despite the surge of interest and attention to precision health, most nurses are not well-versed in precision health 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 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.

For nursing services of the near future to come, the main challenge is the incorporation of the OMICS-technologies in training and professional practice, so that nurses can empower them-selves to provide personalized care to individuals and families based on PPM-driven innovations.

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 ge-netic testing (Figure 12).

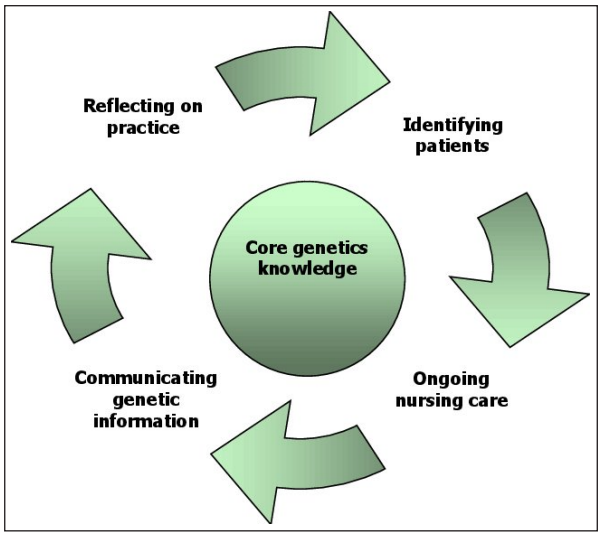


Figure 12: Applying genetics/genomics knowledge and skills in nursing practice

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 com-prehensive assessments, examine a patient's lifestyle, assess symptoms.

To meet the new demands for care, these advances need to be incorporated into professional nursing practice and, above all, into nursing care. In response to increasing demands some clinical divisions have introduced transdisciplinary care coordination teams, which would comprise staff (including practitioners and nurses) from multiple disciplines who are trained to perform roles outside their usual scope of practice.

One of the key elements to advancing nursing scholarship regarding the above-mentioned ap-proaches, is the recognition of the critical role of the nurse scientist as an essential member of many diverse transdisciplinary teams. Although nurses have long engaged in interdisciplinary approaches (working with multiple disciplines yet maintaining boundaries), only more recently have they become part of transdisciplinary research teams.

As defined by the National Institute of Nursing Research (NINR), nurse scientists study indi-viduals and their response to illness by utilizing data and observations derived from clinical set-tings Central to the above-mentioned approach is the transdisciplinary nurse scientist and the cir-cles represent the overall complex skills necessary to develop a successful career as a nurse scientist. This model is not all inclusive, the necessary elements may differ based on the individual's focus area (Figure 13).

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 out-comes while building and shaping the next generation of nurse scientists, only then will the true promise of transdisciplinary approaches be realized.

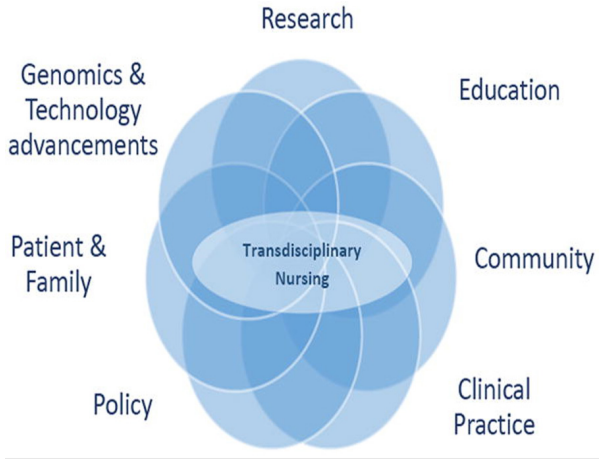


Figure 13: Model of the elements that intersect to develop a career as a transdisciplinary and highly experienced nurse or nurse scientist

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 transdisci-plinary health care teams as opposed to the regular ones

Team-based healthcare, specifically allied health transdisciplinary teams, might be a solution to improve the utilization of workforce while maintaining high-quality and value-based healthcare. Allied health transdisciplinary teams can be a valuable solution in settings where care is delivered by different allied health professionals. Transdisciplinary teams embrace overlapping skills and blur traditional professional boundaries, allowing one professional to deliver certain aspects of care without eroding the skills and knowledge that each profession offers.

Meanwhile, the idea of a transdisciplinary practice comes from nurses and advanced practition-ers, whom seeded the idea of how transdisciplinary teams could transform the way care to pro-vide in the community and to suit the PPM-related medical standards. Moreover, PPM introduc-es a new era in healthcare that tries to identify and predict optimum treatment outcomes for a patient or a cohort. It also introduces new scientific terminologies regarding therapeutic ap-proaches and the need of their adoption from healthcare providers. Nursing personnel (NP) play an important role in modern healthcare since they are consulting, educating, and providing care to patients whose needs often needs to be individualized (personalized nursing care, PNC).

NP as members of PPM as a modern healthcare system and the largest workforce of healthcare providers, have a crucial role in order to sustain the goals of PPM for hospital clinics, smaller healthcare units, or even in home care. Their duties are mainly related with care for a small patient cohort of a clinic, or a patient who is health cared at home (i.e., older people). NP should also meet up to the challenges posed from modern healthcare systems and thus enhance their collabo-ration with treating physicians to implement advanced clinical practices. And, you might feel that the above-mentioned approaches and ideas illustrate the demands that should be met for upgrad-ing the provided education and expertise of PPM-driven NP toward an updated role in a modern healthcare system (Figure 14).

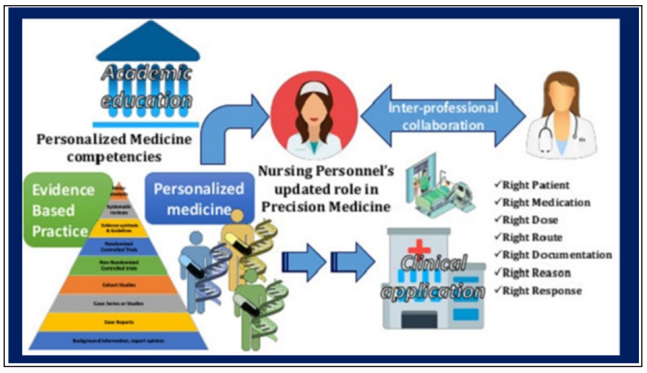


Figure 14: Nursing Personnel in the Era of PPM-driven Healthcare in Clinical Practice - the role of nursing personnel (NP) in utilizing knowledge and interpreting instructions derived from treating physicians in clinical settings toward PPM-driven nursing care

NP, as they are in direct contact with patients, represent a key factor for the goals of PPM. Their responsibilities to provide, monitor, educate, and advice individual patients, persons-at-risk and their families regarding administered medications and treatments aim toward what is today described as personalized nursing care (PNC). PNC although a term not yet clearly defined in nursing comparing to other disciplines, including medicine and computer sciences, and describes the need of provision of care intended for a particular patient or a person-at-risk at a particular time point. PNC entails the uniqueness of a human being, his/her distinctiveness in character, and own individual needs and prerequisites inter-professional collaboration between nurses, physi-cians, computer scientists, pharmacists, other bio-scientists, and social workers. PNC promotes userdriven, self-health-seeking behaviors through in depth participation, self-control, and self-promotion, which further relate to patient satisfaction and improved health outcomes.

In order for patients and their families to fully benefit from the explosion of PPM-driven genomic knowledge, healthcare professionals, especially nurses, need to grasp the underlying prin-ciples 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 [20,21,24,29,43-50].

In this context, PNC includes an individual's genetic and genomic information to make decisions about his/her care, in line with personal, health, and environmental factors. This is translated into the need for interpretation and clinical use of novel and personalized information including genetic testing, patient advocacy, and support throughout testing, anticipating results and treatment, ongoing chronic monitoring, and support for patient decision making.

Given the nature of nursing practice in direct clinical care and in public health, nurses are ideally situated to advocate for and use genetic testing results. For example, nurses who collect and interpret personal and family health histories can identify high risk individuals and groups who should be offered genetic screening. Collaborating with genetic services can help ensure that pretest counselling and formal risk assessments are conducted. Nurses are involved in patient and family education that can be individualized to genetic risks and administer prescribed treatments based on PPM. Additionally, nurses can advocate for and participate in health-system planning that includes programs related to disease prevention and health promotion based on genetic findings.

In this sense, health care professionals, including medical nurses, face educational challenges re-lated 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.

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 [21]. Faculty who have the necessary expertise and training to develop curricula in both undergraduate and graduate nursing programs are needed [21]. 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 [20]. 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 earlyinte gration of genomics within nursing academic programs, with ongoing professional development opportunities within the workplace [20].

PNC in PPM involves the interpretation and clinical use of OMICS-related information toward patient advocacy and support throughout diagnosis, treatment adherence and compliance, and follow-up monitoring. In this respect, NP have to stay up to date with the changes generated from the realization in clinical practice of PM and moreover, integrate relative content for their continuous education. This will provide NP the means to adopt state-of-the-art approaches to the bedside, essentially contributing to symptom assessment, prevention, management, and disease treatment toward optimal healthcare in their patients (e.g., a special population of elder patients).

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and disease treatment toward optimal healthcare in their patients (e.g., a special population of elder patients).

This realization in clinical settings requires the overcoming of characteristic milestones that will allow NP to look beyond the current challenges toward their new role in a modern PPM-driven healthcare system. These milestones are related with education of NP and how this knowledge will be utilized in clinical settings both with treating physicians (inter-professional collaborations) and patients (patient awareness) so that NP can actively participate in health policy as well as conduct their own research (Figure 15).

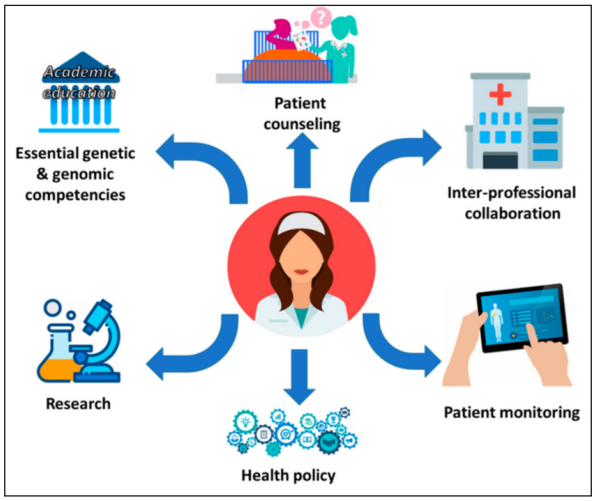

Figure 15: NP's competencies regarding PPM-related knowledge will give them an updated role in PPM as a modern healthcare system

The education of NP should be adjusted to the requirements of PPM as a modern medicine. In this sense, nurses can play a pivotal role in bringing the benefits of PPM, OMICS technologies and, in particular, genomics and precision and personalized health care to fruition. To optimize nurses' impact in genetics and genomics, a concerted effort to develop infrastructure that sup-ports genomic literacy is required. Specifically, given the rapid uptake of genetics and genomics in clinical care, additional nursing knowledge and skills are required to support patients in their health-related decisions, optimize patient care and contribute to inter-professional care. Collabo-ration between nurses in point of care, policy, administration, education and translational research and applications - and with other health professionals - will ensure that nurses develop competen-cies, knowledge and clinical skills and practice in genetics and genomics (Figure 16).

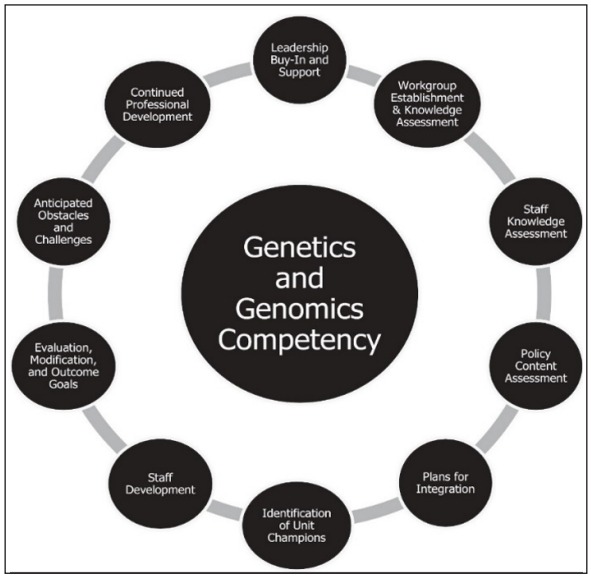

Figure 16: Method of Introducing a New (Genetics & Genomics) Competency model into Nursing Practice

The American Association of Nurses has identified essential genetic and genomic competencies for individuals prepared at the graduate level in nursing including, but not limited, to advanced practice registered nurses (APRNs), clinical nurse leaders, nurse educators, nurse administrators, and nurse scientists. The experts found thirty-eight competencies focusing on risk assessment and interpretation; genetic education; counseling; testing and result interpretation; clinical manage-ment; ethical, legal, and social implications; professional role; leadership; and research.

Nurses face increasing challenges and opportunities in communication, support, and advocacy for patients given the availability of advanced testing, care and treatment in PPM. Meanwhile, the current curricula for training nurses often fail to give them the knowledge they need to deliver precision care and thus do need to understand PPM in some depth. So, nursing education and continuing education, clinical decision support, and health systems changes will be necessary to provide personalized multidisciplinary care to patients, in which nurses play a key role. And get-ting education and collaboration right for PPM-driven resources could be just a first step towards a more universal involvement of nurses in precision health! [20,21,24,29,43-50].

NP competencies and standards of practice in order to incorporate genetics and genomics into all clinical and non-clinical nursing roles have already been described, which set clear roles for the members of multidisciplinary healthcare teams in order to avoid future conflicts and identify common areas for collaboration and interaction among the healthcare providers for every health domain: acute care, long-term care, community nursing, public health nursing. This positive im-pact of personalized and precision care in health safety promotion will raise public awareness to-ward improved and effective NP-patient communication.

Cultivating a new NP–patient interaction and communication in the context of embracing genet-ics/genomics as a novel method that does not undermine patient's right and is based on informed consent, and voluntary action will further disseminate the

evidence that PM interventions can be considered a costeffective method that improves healthcare quality and promotes wellbeing. This approach will lead to a total implementation of PNC (data collection through accurate fami-ly health histories, risk factors, etc.). Already available literature addresses the importance of de-cision making in the era of precision health regarding accurate family history risk factors as well as patient needs and preferences that are encompassed in electronic health records.

No comments but genomics is the backbone for future medical and nursing management of the disease within the frame of principles and standards of PPM. As a result, not only NP, but healthcare staff, in general, need to be upskilled to recognize the benefits and implications of ge-nomic medicine. Even today, regulatory bodies FDA and EMA demonstrate their commitment to accelerating PPPM realization and are continuously working to ensure the accuracy of the applied methods.

Those advancements are also changing the scope of nursing care and practice. 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 clari-fy patient values and priorities; provide information to enhance decision making around screen-ings or risk-reducing treatments; and provide support for family notification and testing as indi-cated.

In reality, a new buzzword has crept into the health sciences lexicon: PPM-based public health (Figure 14).

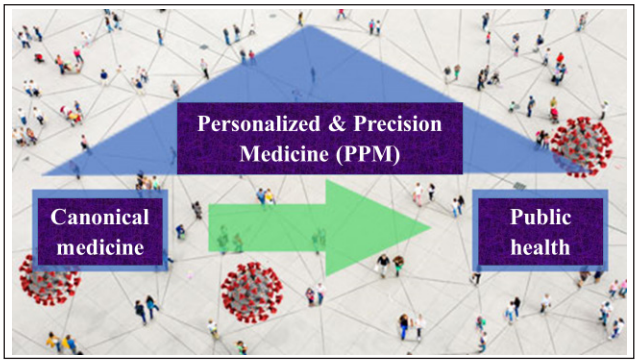

Figure 14: PPM and precision public health

PPM and precision public health are emerging fields that use genomics and other big data tech-nologies to provide more targeted interventions at the individual and population levels. PPM can be thought of as delivering the right intervention to the right individual at the right time, while pre-cision public health can be simply viewed as delivering the right intervention to the right popula-tion at the right time. Precision public health is deeply rooted in addressing health disparities and is "about using the best available data to target more effectively and efficiently interventions of all kinds to those most in need

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 (Figure15)

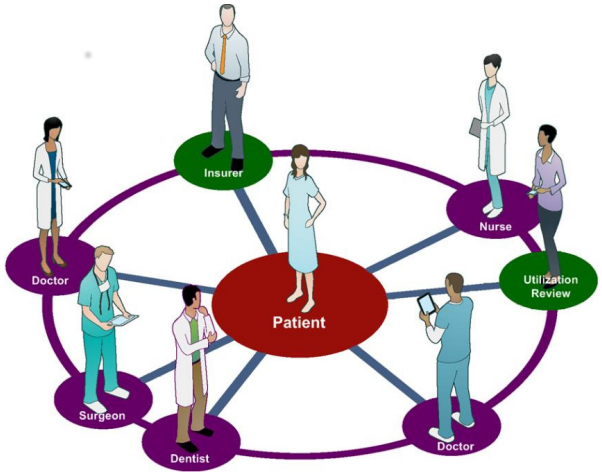

Figure 15: Key Members of the Transdisciplinary Clinical Healthcare Service Team

All healthcare professionals of the future should be educated to deliver patient-centric care as members of transdisciplinary teams

to support safe and effective deployment of the new enabling diagnostic and therapeutic tech-nologies stressing: not to treat but to get cured!!! And thus the latter would need for novel train-ing 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, and not a canonical nurse from the deepest past but of the high quality Doctor's Assistant, to be able both 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.

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 indi-vidualized tumor analysis and the evolution of targeted drugs for blocking more specific bio-chemical pathways. Those advancements are also changing the scope of nursing care and prac-tice, as nurses address patient implications of PPM.

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 clini-cal 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 clin-ical 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.

The implications in PPM-based cancer nursing care include interpretation and clinical use of nov-el and personalized information including support for patient decision-making

mentioned above. 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. So, nursing education and continuing educa-tion, clinical decision support, and health systems changes will be necessary to provide personalized multidisciplinary care to patients, in which nurses play a key role.

As a member of the transdisciplinary health care team, nurses must be prepared to move ahead with the advances in PPM and PPM-related services, and to facilitate their use in clinical practice. This will require nursing education, patient education, health systems changes, and the engagement of a multidisciplinary team in oncology care. The improved and personalized care provided to patients should lead to continued improvements in patient outcomes, as long as nurses and other health care professionals [51-60].

Moreover, as the largest clinical body of healthcare providers, the nursing profession can serve as a unifying and ubiquitous presence in the ethical and safe clinical translation, dissemination of OMICS (presumably, genomics!) (Figure 16) advances in this new era of precision health, across the globe.

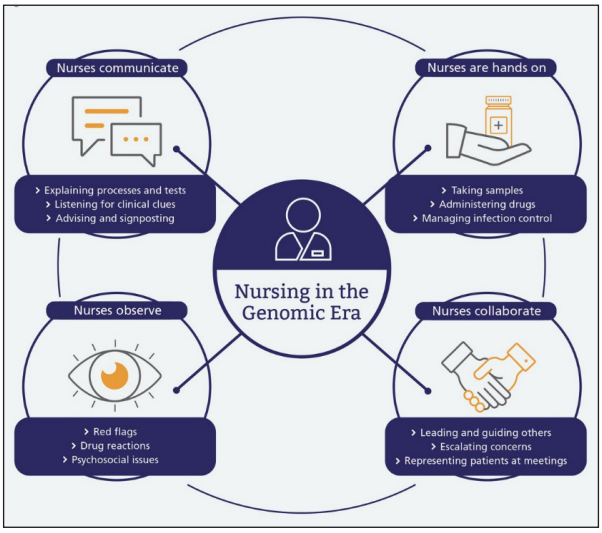

Figure 16: The Role of Nurses in Healthcare Team in Genomic Era

The implications in PPM-based nursing care include interpretation and clinical use of novel and personalized information including support for patient decision-making mentioned above. Nurses face increasing challenges and opportunities in communication, support, and advocacy for pa-tients given the availability of advanced testing, care and treatment in PPM.

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 guide-lines to support the implementation of PPM! 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. So, nursing education and continuing 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 provid-ing care to patients whose needs often needs to be individualized (personalized nursing care).

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