

## The Importance of Laboratory Data in Public Health Nursing Initiatives

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#### Abstract

**Background:** Precision health refers to tailored medical treatment that considers an individual's unique genetic, genomic, or omic makeup, as well as lifestyle, social, economic, cultural, and environmental factors. The goal is to assist individuals in achieving optimal health and well-being through personalized care. This approach utilizes extensive datasets that integrate omics data—such as genetic sequences, proteomics, metabolomics, and microbiome information—with clinical information and health outcomes. Despite the growing interest in precision health, there remains a significant gap in nurses' understanding and engagement in its implementation, which could enhance illness diagnosis, treatment, and prevention.

**Aim of Work:** This article aims to comprehensively examine the concept of precision health and underscore the importance of integrating nursing professionals in its execution. The study seeks to provide insights into how nursing can contribute to the advancement of precision health through interprofessional cooperation, community outreach, and care coordination.

**Methods:** The study involved a meticulous review of existing literature on precision health, including the role of big data, omics, information science, and the importance of family health history. An examination of nursing omics research focusing on symptom science was also conducted. Expert viewpoints were gathered to assess the current understanding and implications of precision health for the nursing profession.

**Results:** The findings highlight the necessity for nurses to acquire knowledge about precision health to play a crucial role in its implementation. The report identifies key areas where nursing can contribute, including research, education, clinical practice, nursing administration, and policy-making. Guidelines for nurse leaders to facilitate the strategic adoption of precision health in healthcare settings were developed.

**Conclusion:** Precision health has the potential to transform healthcare delivery and outcomes, but its successful implementation requires the active participation of the nursing profession. By developing a comprehensive understanding of precision health principles and practices, nurses can enhance their

contributions to patient care and improve health outcomes. Suggestions for education and policy reforms are essential to empower nurses in this evolving field.

**Key Words:** Precision Health – Nursing – Omics – Interprofessional Collaboration – Patient Care.

#### Introduction

**IN 2015**, President Obama introduced the Precision Medicine Initiative (PMI) which aimed to launch the “All of Us” longitudinal research cohort study. The study's objective was to recruit one million participants from various communities and ethnic backgrounds in the United States. It sought to investigate the relationships between demographic, psychosocial, environmental, and genetic/genomic data over a period of 10 or more years of follow-up [1-5].

There is no text provided. Precision medicine refers to the use of an individual's genetic profile to inform choices related to illness prevention, diagnosis, and treatment. The recruitment progress in the PMI effort as of October 2019 has reached over 269,000 participants, with more than 80,000 electronic health records and over 210,000 biosamples. The project will include a wide range of digital, genetic/genomic, clinical, biologic, and electronic health information data. Soon, nurse researchers will have access to this data for conducting approved analyses [5-10]. Precision health is a concept that involves tailoring healthcare to an individual's specific genetic, genomic, or omic makeup, taking into account their lifestyle, social, economic, cultural, and environmental factors. The goal is to promote well-being and attain optimum health for each person [1, 11-15]. Nurses are in an ideal position to spearhead the goal of implementing precision health, which involves interprofessional cooperation, community outreach activities, and coordina-

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tion of care. Although precision health and omics have gained significant interest and attention, most nurses lack a comprehensive understanding of the aims of precision health and its significance for nursing science and practice. This study aims to provide a comprehensive understanding of precision health and emphasize the significance of including the nursing profession in order to improve individualized healthcare for people, families, communities, and populations.

#### *Personalized medicine:*

The Human Genome Project (HGP) was a global and cooperative scientific initiative that started in the early 1990s with the objective of sequencing the whole human genome. In 2001, the Human Genome Project (HGP) published a paper in the magazine *Nature*, which marked the beginning of the genomics era. The paper stated that over three billion base-pairs of the human genome, accounting for 90% of its whole, had been successfully sequenced [16]. In 2011, the National Academies of Sciences, Engineering, and Medicine released a consensus document that introduced the term precision medicine, which refers to customizing medical treatment based on the unique characteristics of each patient. This document also paved the way for advancements in technologies and the utilization of omics data, such as genomic, proteomics, metabolomics, and microbiomics, in patient care [17].

The age of genomics, which refers to the study of all genes and their activities, signifies a fundamental change in healthcare. It emphasizes the importance of an individual's genetic or genomic contribution to their health and the development of diseases, as well as the influence on treatment regimens and drug metabolism [18-20]. Genetics and genomics are insufficient in completely elucidating the intricate linkages of cellular processes or the interplay within and across physiological systems, and their effects on health and illness [20]. Following that, a new discipline known as "omics" arose to more accurately characterize the molecular interactions of cells within and across physiological systems [19-21]. Omics refers to the thorough examination of the metabolome, which consists of tiny molecules found in cells, organs, and bodily fluids. These molecules are encoded by the genome and provide a more precise understanding of an individual's general health at the molecular level [21]. Omics encompasses several fields such as genomes, epigenetics (specifically methylomics and transcriptomics), proteomics, metabolomics, and microbiomics [19-21]. The PMI has garnered the interest of scientists, physicians, policymakers, and the general public. Its objective is to enroll one million individuals in order to moni-

tor their medical history, omic data, socioeconomic determinants, health, and environmental exposures for a period of 10 or more years [3-5]. This program is distinctive since it includes a diverse group of under-represented minorities. Participants have the choice to get information on their omic health, which may be used to educate their general healthcare provider, themselves, and their family [5].

Other comparable initiatives worldwide include the Million Veteran Program, a health care effort by the Veteran's Administration that combines a large-scale biobank with electronic health record data. This project aims to enroll around 1 million participants and has now recruited 700,000 individuals [6]. The NHS Genomic Medicine Service in the UK plans to increase the number of genomes sequenced from the 100,000 Genomes Project and UK Biobank's genomic medicine repository. They want to sequence a total of 5 million genomes within a span of 5 years [8,11]. The Genomic Medicine 2025 Program in France has allocated \$745 million to establish a network of sequencing and analysis facilities with the capacity to sequence 235,000 genomes annually by 2020 [12]. The objective of the Genome India Project is to establish a biobank repository and conduct sequencing of 10,000 human genomes. Additionally, the project attempts to connect this genetic data with clinical information obtained from certain hospitals [10]. The National Health and Medicine Big Data Center in Jiangsu Province, China, is a 6-billion-yuan initiative that aims to integrate health and medical data from 80 million people. Additionally, it will have the capacity to do DNA sequencing on 400,000-500,000 persons annually [9]. The primary objective of the Hong Kong Genome Project is to sequence the genetic material of 40,000-50,000 people in order to enhance the accuracy of diagnosing and treating rare genetic illnesses and malignancies [7].

#### *Precision health:*

Precision health is an advanced kind of precision medicine that integrates several types of information, including as genetic and genomic sequence, protein, metabolite, and microbiome data (referred to as "omics"), together with lifestyle, social, economic, cultural, and environmental aspects [15,22,23]. Wearable devices and electronic health records may provide data that can be used to create exact molecular taxonomies. These taxonomies can then be used to determine illness diagnosis, therapy, and prevention for individual patients [15, 22, 23]. Nurse leaders have recognized precision health as a key focus for advancing nursing science due to its consideration of individual variability in personal and environmental characteristics. This includes

factors such as lifestyle, existing co-morbidities, biomarkers, cognitive and emotional factors, as well as genetic, epigenetic, and other omic factors [24].

Effective execution of precision health necessitates collaborative efforts between computational data scientists, bioinformatics specialists, statisticians, genomics medicine experts, and many interdisciplinary clinical content professionals, with nursing playing a crucial part. Nurse scholars and leaders possess the necessary expertise and qualifications to effectively carry out clinical and translational scientific research. They are adept at interacting with patients and their families, recruiting participants, and closely monitoring the health and symptoms of patients involved in interventional studies. Additionally, they serve as influential advocates for patients, families, communities, and populations. The emergence of precision health offers nurses and nurse leaders a valuable chance to enhance nursing practice and scientific knowledge by implementing innovative changes in healthcare interventions. However, it also brings about challenges such as the requirement for education, training, and understanding of omics and precision health in order to effectively integrate these advancements into nursing practice [25].

#### *Big data and information systems:*

The objective of the PMI is to provide a comprehensive healthcare database that monitors an individual's socioeconomic factors and exposures during their whole lifespan, taking into account their genetic and molecular characteristics [3,4]. Upon achieving this objective, a substantial volume of data will be created for each individual patient, sometimes referred to as "big data". The PMI serves as a data network that enables the blending of new research on the genetic and molecular characteristics of illnesses with clinical information about specific patients. This collaboration aims to further the creation of a more precise disease categorization system and targeted treatment approaches [3,4]. The intricate nature of precision health, which encompasses the use of extensive patient-specific omic data, necessitates the collaboration of healthcare practitioners and patients in making informed decisions about illness treatment and management across various care settings. Therefore, a significant obstacle in the age of precision health is to create information technology systems that can effectively combine and examine large amounts of data for healthcare practitioners and patients using automated data visualization or algorithm creation. Technology solutions facilitate the integration of extensive individual data, eventually leading to the achievement of the aims of the PMI.

The US Office of the National Coordinator (ONC) for Health Information Technology has endorsed the efficient use of health information and technology (IT) to facilitate the country in attaining superior healthcare outcomes at reduced expenses [26]. The aim of the ONC has four primary objectives: (a) promote health that is focused on the individual and managed by themselves; (b) revolutionize the delivery of healthcare and improve community health; (c) encourage research, scientific knowledge, and innovation; and (d) improve the nation's health IT infrastructure [26]. One aspect of ONC's strategic objective is to identify and establish a standard for using omic data stored in patients' electronic health records. Utilizing PMI expertise and clinical support technologies may enhance precision health by enhancing patient care procedures [27]. Precision health technology systems will facilitate the meaningful integration of omic and other pertinent personal data for people, as well as the precise interpretation and application of such data. Considering that nurses are at the forefront of providing patient care, it is essential for nurses to participate in the development and effective use of data collected from the electronic medical record. Nurses, as primary healthcare practitioners, may use precision health to enhance patient care by making well-informed treatment choices, assessing treatment efficacy, and monitoring and managing patient symptoms. This data is valuable for the purpose of monitoring patients' well-being, making informed judgments about the effectiveness of treatments, and tracking any changes in a patient's illness condition.

The integration and standardization of omic data into patients' electronic medical records, promoted by ONC's leadership, is a crucial prerequisite for the advancement of the precision health system. Given the crucial significance of nursing in precision health, it is essential for nurse leaders and nurses to proactively engage in the development of precision health systems. Nursing professional organizations, like the American Academy of Nursing, have the ability to establish task forces that can collaborate with the ONC and other healthcare organizations. This collaboration aims to create opportunities for patients and healthcare providers to contribute their input or feedback, ensuring that omic data is practically useful for patients, clinicians, and insurance payers. Collaborative endeavors from nursing and other healthcare professionals are necessary to establish a proficient framework for acquiring and evaluating input or feedback across various systems and environments. Significant progress will be necessary in expanding knowledge in important fields such as omics, patient and family health literacy, research ethics, cultural and legal challenges,

thorough evaluation of patient preferences, and cost evaluations. Additional information will become available as the PMI progresses and precision health improves.

*An analysis from the viewpoint of nursing about precision health:*

Nursing is the most prominent and influential profession in the healthcare industry, comprising the greatest share of the workforce. Nurses have a key role in healthcare, as they work to enhance, safeguard, and maximize health by providing comprehensive care to people, families, communities, and populations [36]. In order to advance precision health, nurses have utilized a holistic approach to evaluate the impact of biological variability (referred to as omics) and environmental factors (such as family and environmental exposures), as well as social and economic determinants, on biology (specifically epigenetics). This approach involves promoting, protecting, and optimizing health [14,36,37,38].

The holistic nursing approach to patient care goes beyond the conventional medical paradigm, which primarily focuses on treating diseases. Instead, it takes into account the biological variations in genetics and genomics, as well as the influence of family and societal factors on environmental conditions and their effects on the biology of epigenetics [37]. Nursing's comprehensive approach to patient care has established nurses as leaders in addressing crucial challenges of PMI (Precision Medicine Initiative) and precision health, which need inter-professional cooperation for effective implementation. Effective collaboration among healthcare professionals, with nurses playing a crucial part, is essential for attaining the goals of PMI and precision health by enhancing individualized healthcare. This is achieved by administering appropriate therapy to the appropriate individual at the appropriate moment, while also understanding the omic and environmental components and their interactions that contribute to or safeguard against prevalent and intricate ailments [1,37].

*The significance of nurses in precision health:*

The primary objective of PMI and precision health is to improve accurate diagnosis and customized therapy for both uncommon and prevalent illnesses, as well as to provide a novel categorization system that corresponds with increased use and application of omic data [13,37]. The nursing profession has seen significant developments to provide them with the skills necessary to lead scientific discoveries and use data in order to enhance population health and preventative initiatives. An

instance of this is when nurses examine the impact of genetic variation in genes (pharmacogenetics) or many genes at once (pharmacogenomics) and how this alters human reactions to drugs and nutrition [39,40]. Nurses may use this information to oversee and control patient care using pharmacological medicines in order to repair, maintain, and enhance patients' health. Therefore, nursing in the age of genomics necessitates a concentration on the personal susceptibility of each individual to diseases and the efficacy of therapies based on the distinct amalgamation of their genetic/genomic and environmental risk factors. Despite the crucial role of the nursing viewpoint in effective implementation, the endeavor to include nursing into the leadership of PMI continues to encounter obstacles.

*The relationship between genomics and nursing research and its connection to the purpose of the National Institute of Nursing Research:*

Nursing science, a distinct field of study derived from the philosophy of nursing practice, has a crucial position in both clinical and scientific endeavors. The National Institute of Nursing Research (NINR) is the primary governmental organization in the United States that provides support for nursing research. Its main objectives are to establish the scientific basis for clinical practice, prevent diseases and disabilities, address symptoms caused by illnesses, and improve end-of-life and palliative care [41]. Nursing research has traditionally focused on the genomic and molecular factors that are associated with health. The NINR initiated the Summer Genetic Institute (SGI) in 1999. This program offers nurses and nurse researchers a comprehensive research training experience in molecular genetics, which is relevant for both research and clinical practice. The SGI is a tuition-free and intense program. In the year 2000, the National Institute of Nursing Research (NINR) designated genomics as a key focus for nursing research. This decision has resulted in the integration of genomic research within the field of nursing during the last twenty years [42].

NINR is at the forefront of training academics and clinicians in omics for precision health research and practice. For the last several years, NINR has been offering intensive training in omics to equip nurses with the skills needed to integrate clinical and omic data. Since the summer of 2016, the National Institute of Nursing Research (NINR) has organized a tuition-free, 1-week intensive training program called Precision Health: From 'Omics' to Data Science Boot Camp. This program is supervised by nurse scientists who specialize in genomics, big data, or other omic research. The objective of this training is to actively involve and educate

a varied audience consisting of nurse scientists, clinicians, graduate students, and faculty members about the most recent advancements in genomics, pharmacogenomics, nutrigenomics (the study of multiple genes that collectively influence human responses to food/nutrition), metabolomics, microbiomics (analysis of bacterial profiles), and data science. The curriculum has a distinct and significant emphasis on the ethical, legal, and social aspects of precision health from the nursing standpoint [43].

Symptom science is the scientific investigation of symptoms that are associated with an illness or caused by a therapy. It plays a crucial role in the comprehensive knowledge of disease characteristics and the underlying mechanisms of symptoms in the field of precision health [25,37]. Exploring the connections between omics and symptoms is crucial for uncovering the fundamental processes behind them. Over the course of its existence, NINR has provided funding and resources to support research and the education of researchers in order to provide individualized approaches for managing and preventing negative symptoms, whether they arise from disease or therapy [37]. The intramural research program at NINR comprises a robust network of nurse scientists with PhD qualifications who investigate the conversion of clinical symptom observations via the use of fundamental and biobehavioral omic research methodologies. Intramural nurse scientists at NINR are now doing foundational explorations utilizing the NIH-SSM. These explorations include evaluating biomarkers in traumatic brain injury among collegiate athletes [44-46] and exploring correlations and therapies of tiredness in cancer patients [47,48].

The National Institute of Nursing Research (NINR) has offered external funding for research on the investigation of genomes and biomarkers associated with chronic symptoms, including pain, exhaustion, and sleep disruption. Nurse scientists use genomes as possible indicators of susceptibility to chronic pain, particularly in individuals with low back pain [19]. Another group of nursing scientists conducted a study to examine the biological route of lymphedema symptoms using an omic method. They found that lymphedema symptoms are caused by an inflammatory biological mechanism, which is supported by strong associations with many inflammatory genes [49]. These study fields are yielding fresh perspectives that enable nurses and other healthcare practitioners to discern the underlying causes of symptoms and to devise precise strategies for managing symptoms, therapy, and illness.

NINR has been instrumental in the establishment of an Omics Nursing Science and Education

Network (ONSEN) [50], which is of great importance to the global society. ONSEN is a joint initiative involving three NIH institutes, namely NINR, National Human Genome Research Institute, and National Cancer Institute. Its purpose is to create an online database that provides information about nurse scientist investigators and their projects. This database aims to facilitate the involvement and contribution of the global nursing professional community in the field of omic and precision health science [51]. ONSEN (The website can be accessed at <https://omicsnursingnetwork.net/>). The resource provides information on several topics, including: nurse scientist principal investigators available for collaboration; available projects in different clinical specialties; common data elements to be used in omic and precision health research studies; available mentors and other co-investigator and trainee resources; and information on key omic nursing science education content and skills (Genomic Knowledge Matrix) that doctoral programs can incorporate into their academic institutions [52].

Overall, nursing science has made significant contributions to the study of symptoms by doing research on the biological and clinical aspects, as well as the impact of environmental, behavioral, social, and economic variables on the development and treatment of symptoms [37]. In the age of omics, nursing is centered on precision health, which aims to assess an individual's specific risk for illness conditions and the efficacy of treatments. This assessment is based on the individual's distinct mix of genetic/genomic and environmental risk factors.

*Examining family health histories in the age of precision health:*

Acquiring and recording a precise family health history is an important duty of nursing that may aid in identifying the need for genetic testing for different disease problems, such as familial hypercholesterolemia [28]. Typically, healthcare clinicians gather family health information by conducting interviews or having patients complete clinical questionnaires, which is then included in their medical records. Typically, people acquire family health information via the transmission of knowledge from their relatives, either through spoken or written means. Nevertheless, there are some persons who do not have the privilege of seeing their family's health information. Analyzing the information in a three-generation pedigree, such as identifying the family member who was first diagnosed with a certain condition like cancer, offers valuable understanding of the patient's need for genetic/genomic counseling and testing. If a patient is discovered to

possess a genetic mutation, it is advisable to use a cascade screening approach to effectively identify and test additional relatives who may also be susceptible to the mutation. Cascade screening is a method used to identify if family members who do not show any symptoms are carriers of a certain mutation. It also suggests ways to manage the situation in order to minimize any negative consequences in the future [28]. In 2002, the Netherlands introduced a cascade-screening program for familial hypercholesterolemia in people at risk, including school-aged children. This program successfully identified over 28,000 instances of hypercholesterolemia before any symptoms appeared [28].

Progress in genetic science is enabling people to proactively address their family health history in order to avoid sickness and enhance their general well-being [30,32]. Personalized genomic healthcare acknowledges the importance of a family history in directing specific preventive and illness treatment strategies. Nurses should be ready to assist in the regular gathering of family history risk assessments in electronic health records [31,33]. Assessing an individual's risk for a broad range of illnesses may be easily done by examining their family health history. However, these talks take place in only around 50% of new clinical visits and 25% of existing appointments, with an average duration of 2.5 minutes. An individual patient's interview with a clinician, often nurses or advanced practice nurses (APRNs), to get a three-generation family health history might need up to 45 minutes. There is a shortage of readily available tools that make it easy to capture and preserve family history before seeing a healthcare practitioner. The implementation of the PMI and precision health is currently lacking in a crucial aspect, which is the involvement of nurses and advanced APRNs. These healthcare professionals have the potential to have a significant impact by accurately and comprehensively documenting individual and family health histories, educating patients, and delivering appropriate health treatments. An instance of progress in this field is the adoption of three-generation family health histories for every patient by the National Institute of Health's (NIH) Clinical Center Nursing Department and Department of Clinical Research Informatics [34]. As part of this innovative pilot initiative, nurses will gather family health history data and generate a pedigree diagram within the Clinical Research Information System. This diagram will then be incorporated into the electronic medical record, accessible to all members of the healthcare team, including nurses, physicians, nurse practitioners, physician assistants, and genetic counselors. Additional investigation using these lineage diagrams will enhance comprehension

of ideal healthcare procedures and predicted precision for certain health results.

#### *Self-governance:*

Another crucial element in constructing a precision health knowledge base will include developing procedures to guarantee that any omic testing and transmission of test findings are in accordance with the choices of patients and their families. Initiating this process involves engaging in patient-centered conversations on the significance of certain tests, their outcomes, considerations of risk and reward, and the precise findings the patients want to get. Nurses, as advocates for patients, possess extensive knowledge in engaging in challenging conversations with patients and their families, as well as converting complex medical jargon into comprehensible information for patients. Nevertheless, due to the many ethical, legal, and social consequences associated with the sharing of patient data, as well as data access and privacy, it is crucial to prioritize the establishment of research and clinical practice procedures to address these concerns [35].

#### *Conclusion:*

The advent of emerging scientific advancements and longitudinal cohort research programs heralds a new age of precision health. However, there are several problems that must be comprehensively addressed before it can be regularly incorporated into healthcare systems. The nursing profession is crucial in transitioning from a disease-centered approach to a precision health approach that focuses on preventing the onset of severe chronic illnesses by considering many aspects of individuals, such as their characteristics, omics, and environment. In order to integrate genomic information into the healthcare industry, it is crucial for the nursing profession to develop strategic initiatives that advance precision health in nursing research, education, clinical practice, and administrative and health policy domains.

Nurses are in a favorable position to introduce and guide the implementation of precision health, including it into health promotion, illness prevention, and treatment via the use of nursing's comprehensive approach. The below suggestions are proposed for nurses in research, education, clinical practice, and health policy contexts to effectively incorporate precision health into the future of patient care.

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## أهمية بيانات المختبر في مبادرات التمريض الصحي العام

الخلقية: يشير مفهوم الصحة الدقيقة إلى العلاج الطبي المخصص الذي يأخذ في الاعتبار التركيبة الجينية والحمض النووي أو العوامل الأومية الفريدة للفرد، بالإضافة إلى نمط الحياة والعوامل الاجتماعية والاقتصادية والثقافية والبيئية. الهدف هو مساعدة الأفراد على تحقيق صحة ورفاهية مثلى من خلال رعاية مخصصة. يعتمد هذا النهج على استخدام مجموعات بيانات واسعة تدمج بيانات الأوميك - مثل تسلسلات الجينات، والبروتينات، والميتابولوم، ومعلومات الميكروبيوم - مع المعلومات السريرية ونتائج الصحة. على الرغم من الاهتمام المتزايد بالصحة الدقيقة، لا يزال هناك فجوة كبيرة في فهم المرضين ومشاركتهم في تنفيذها، مما يمكن أن يعزز تشخيص الأمراض وعلاجها والوقاية منها.

هدف العمل: يهدف هذا المقال إلى فحص شامل لمفهوم الصحة الدقيقة وتبسيط الضوء على أهمية دمج المهنيين في التمريض في تنفيذها. تسعى الدراسة إلى تقديم رؤى حول كيفية مساهمة التمريض في تقديم الصحة الدقيقة من خلال التعاون بين التخصصات المختلفة، وأنشطة التوعية المجتمعية، وتنسيق الرعاية.

الطرق: شملت الدراسة مراجعة دقيقة للأدبيات الموجودة حول الصحة الدقيقة، بما في ذلك دور البيانات الكبيرة، والأوميك، وعلم المعلومات، وأهمية التاريخ الصحي للعائلة. كما تم إجراء فحص لأبحاث الأوميك في التمريض التي تركز على علم الأعراض. تم جمع وجهات نظر الخبراء لتقييم الفهم الحالي وأثار الصحة الدقيقة على مهنة التمريض.

النتائج: تبرز النتائج ضرورة أن يكتسب المرضون المعرفة حول الصحة الدقيقة للعب دور حاسم في تنفيذها. تحدد التقرير المجالات الرئيسية التي يمكن أن يساهم فيها التمريض، بما في ذلك البحث والتعليم والممارسة السريرية وإدارة التمريض وصنع السياسات. تم تطوير إرشادات لقادة التمريض لتسهيل التبني الاستراتيجي للصحة الدقيقة في بيئات الرعاية الصحية.

الخلاصة: تمتلك الصحة الدقيقة القدرة على تحويل تقديم الرعاية الصحية ونتائجها، ولكن يتطلب تنفيذها الناجح المشاركة النشطة لمهنة التمريض. من خلال تطوير فهم شامل لمبادئ وممارسات الصحة الدقيقة، يمكن للمرضين تعزيز مساهماتهم في رعاية المرضى وتحسين نتائج الصحة. تعتبر الاقتراحات للإصلاحات التعليمية والسياسية ضرورية لتمكين المرضين في هذا المجال المتطور.