Precision Health in Aging and Nursing Practice

Precision health marks an exciting new era of health care. Approaches to care are shifting from one-size-fits-all to individualized and tailored care. The Council for the Advancement of Nursing Science defines *precision health* as "an emerging approach to individualizing health care" through the examination of genetic, behavioral, environmental, and individual lifestyle factors (Hacker et al., 2019, p. 287). Precision health in nursing includes tailored symptom prevention, management, and treatment (Hickey et al., 2019). By placing the individual at the center of treatment, nurses can comprehensively address patient-specific needs, such as how unique genetic factors relate to symptoms and individual lifestyle choices. These insights are crucial to clinical nursing care of older adults experiencing complex symptoms of illness, such as chronic pain and multimorbidity. Background information that informs precision health in clinical practice including examples of precision health in the nursing care of older adults for symptom and self-management, treatment decisions, and polypharmacy is presented. Challenges of precision health in aging and nursing practice and resources for nurses caring for older adults are also identified.

PRECISION HEALTH AND OMICS

Recent advances in omics-based science can inform tailored approaches to nursing practice. *Omics* is a collective term that integrates important characteristics from genomics, epigenomics, transcriptomics, proteomics, and metabolomics (Institute of Medicine, 2012). Omics combines biological, functional, and behavioral knowledge that reflects the complexity and heterogeneity of individuals over time. Findings from omics-based studies assist nurses in identifying molecular characteristics of health and diseases, managing symptoms, and recognizing which patients are best suited for specific medications and/or treatments. This knowledge enables nurses to bring cutting-edge advancements in science to the bedside, making contributions in the areas of symptom assessment, prevention, management, and treatment, with the goal of achieving optimal health among aging individuals, families, and communities (Hickey et al., 2019). Omics-based precision health research can also be applied from the bedside back to the laboratory. Practicing nurses inspire precision health researchers to ask new questions and consider future directions to improve care, quality of life, and outcomes for aging individuals.

PRECISION HEALTH IN SYMPTOMS MANAGEMENT AMONG OLDER ADULTS

The increasing prevalence of chronic illness in aging and the burden of symptoms, such as fatigue, pain, and cognitive decline, are important areas of concern for nursing. A precision health approach to individualizing symptom management in older adults involves strategies to understand the substantial inter-individual variability in symptoms and self-management strategies with the goal of identifying more precise markers that may explain why people with similar conditions and ages can experience markedly different symptoms and self-management behaviors (Hickey et al., 2019). The Nursing Science Precision Health Model provides a framework for advancing precision symptoms science in nursing through measurement, characterization of symptoms sub-groups including environmental and lifestyle factors, biological characterization or biomarkers of sub-groups, and using results from precision studies to guide more individualized interventions and outcomes (Cashion & Grady, 2015; Hickey et al., 2019). Two areas of study using precision health strategies are chronic pain in aging and age-related cognitive impairment. Using omics technologies, variations in

genetic and protein profiles are being discovered that may allow more individualized treatments and self-management programs for older adults with chronic pain or who are at high risk for cognitive impairment (Dorsey et al., 2018; Ryan et al., 2019). Precision health approaches to symptom science hold great potential to understand important sources of variability that can inform more tailored and effective interventions to address symptoms and improve outcomes for older adults.

PRECISION HEALTH IN TREATMENT DECISIONS AMONG OLDER ADULTS

Developing personalized strategies to optimize treatment outcomes across diverse populations and settings is another important component of precision health. For example, most cancers are caused by somatic gene mutations, and inherited mutations increase susceptibility to cancers. Because such mutations may arise as a natural consequence of aging, most newly diagnosed cancers occur in older adults. In oncology, implications in precision nursing care include interpretation and clinical use of novel and personalized information, such as genetic testing, anticipation of results and treatment, and support for patient decision making (Vorderstrasse et al., 2014). A variety of genetic tests are in clinical use and under investigation, assisting health care teams and patients to make better decisions with respect to treatment. Nurses will need to interpret test results, discuss suggested regimen options, and ensure whether patients have a good understanding of the results and their meaning. Nurses will also need to understand what really matters to each individual older adult, to tailor treatment decision-making processes to personalize goals, values, and preferences. Nurses can initiate conversations about what is important to individual older adults and advocate for putting them in the center of their care.

PRECISION HEALTH IN POLYPHARMACY

Polypharmacy is common in the aging population and is typically defined as five or more medications taken on a regular basis each day (Masnoon et al., 2017). Older patients may experience multimorbidities and be prescribed multiple medications for symptom management of their health conditions. Multiple medications can put older adults at risk for drug–drug, drug–disease, and drug–gene interactions (McLachlan et al., 2009). Older adults may be prescribed sedative, antidepressant, antipsychotic, dementia, and/or Parkinson's medications, putting individuals at risk for drug-induced cognitive impairment. If these medications are not properly metabolized in the body, serious complications can occur, such as falls, fractures, pain, and mortality. Finding the right medication, at the right dose, for each aging patient is often challenging.

A new report from the John A. Hartford Foundation and the Institute of Healthcare Improvement (2019) offers a patient-centered approach that accommodates age-friendly care to health systems as part of the Creating Age-Friendly Health Systems Initiative. The Age-Friendly Health System Initiative works closely with geriatric experts addressing four essential concepts referred to as the 4Ms. The 4M framework stands for what matters, medications, mentation, and mobility, and complements precision health when implemented into existing care. Keeping the 4Ms in mind, nurses can provide the most effective care by initiating critical conversations with clinicians about deprescribing medications that may no longer be warranted. Precision health also addresses genetic biomarkers and their influence with regard to a patient's risk for developing diseases and how a patient responds to medications (McLachlan et al., 2009). Pharmacogenomics uses genetic information from a patient regarding his/her predicted response to medications, so the most effective ones are used. This information will decrease the incidence of adverse drug reactions. The U.S. Food and Drug Administration (2019) has identified approximately 200 medications for which there are molecular biomarkers that may aid in improving therapeutic outcomes and reducing adverse drug reactions. Older adults may benefit from targeted, patient-specific pharmacogenomic considerations. Examples of these medications include antiplatelet (clopidogrel) and anticoagulation (warfarin) therapies, pain management (codeine), and antiretroviral therapy (abacavir). With increased efforts in precision health, there are opportunities for nurses in identifying and understanding biomarkers that can improve shared clinical decision making, patient safety, and quality of life in older adults.

CHALLENGES OF PRECISION HEALTH FOR NURSING

Even with the increasing use of precision health care in nursing practice, many challenges remain. As treatment becomes more individualized based on genetic profiles, nurses must acquire more in-depth genetic and genomic knowledge to optimize patient care. Nurses will need to interpret the results of genetic tests, understand how that information is relevant to treatment plans, and educate patients throughout their personalized plan of care (U.S. National Library of Medicine, 2019). Nurses will also need to be more involved in multiple aspects of genetic testing to provide sufficient information to patients, including the purpose and procedure of testing and its potential risks and benefits. Nurses will also need to gain training in pharmacogenomics, to assist patients in developing individualized treatment plans involving medications. In addition, ethnic and racial differences in response to drug therapies are well documented (Burroughs et al., 2002). There is some evidence that these differences are associated with multiple polymorphisms and genetic variants

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TABLE 1

Resources Related to Precision Health and Omics in Nursing Practice

Resource/URL	Explanation
Summer Genetics Institute (SGI) https://www.ninr.nih.gov/training/trainingopportunitiesintramural/summergeneticsinstitute#SGI%20Program%20Description	Sponsored by the National Institute of Nursing Research, SGI is a month-long research training program for nurses interested in molecular genetics and the application to research and clinical practice
Genetics and Genomics Comprehensive Center (G2C2) https://genomicseducation.net	Online repository of genomics educational materials
Omics Nursing Science & Education Network (ONSEN) https://omicsnursingnetwork.net	Provides nursing scientists with omics resources and networking opportunities for their program of research
International Society of Nurses in Genetics (ISONG) https://www.isong.org	Fosters scientific and professional growth of nurses who are dedicated to genomic health care, education, research, and scholarship
Genetics Education Program for Nurses (GEPN) https://www.cincinnatichildrens.org/education/clinical/nursing/genetics	Located within Cincinnati Children's Hospital, GEPN created the Genetics is Relevant Now educational program, which is an instructional resource focusing on nurses' views and patient stories
Institute for Healthcare Improvement (IHI) http://www.ihi.org	Focuses on advancing the quality of care and health in the population, patient safety, and achieving better outcomes in health and health care
	The IHI created *Age-Friendly Health Systems: Guide to Using the 4M Framework in the Care of Older Adults*
The Conversation Project https://theconversationproject.org	A public engagement initiative focusing on patient-specific values and preferences for end-of-life care
National Institutes of Health All of Us Research Program https://allofus.nih.gov	Began enrollment in 2018 and provides information about goals and participants in the Precision Medicine Initiative
National Center for Biotechnology Information (NCBI) https://www.ncbi.nlm.nih.gov	Has databases on various topics involving genetics and medicine, genes and expression, and genomes and mapping
ClinVar https://www.ncbi.nlm.nih.gov/clinvar	Gathers information about genomic variation and its relationship to human health

(Roden et al., 2011). Nurses will need to understand important racial and ethnic differences to identify the right genetic test and medication for the right patient at the right dose, the first time. Cost is also an issue with precision health. Genetic testing has become more affordable in recent years, but technologies such as sequencing large amounts of DNA are expensive to perform and insurance coverage may be limited (U.S. National Library of Medicine, 2019).

SUMMARY

Precision health uses genetic, social, psychological, and environmental information to develop effective treatments for illnesses common in older adults. Much remains to be learned about using precision health approaches to provide the best treatments to the growing population of older adults who have unique health and psychosocial needs. Several resources related to precision health and omics in nursing practice are listed in **Table 1**.

Although the benefits of precision health to address complex health problems are expanding rapidly, there are also significant challenges to precision health, such as the need to study diverse populations, lack of knowledge for the role of nursing in omics-based care, and the high cost of precision health methodologies. Using precision health in addressing individual health needs and preferences of older adults has great potential to decrease health care costs, enhance quality of care, and improve quality of life. Nurses knowledgeable in precision health will be at the forefront of this new era in advancing the health of older adults.

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Sarah R. Martha, PhD, RN
Post-Doctoral Fellow

Jonathan P. Auld, PhD, MAT, RN
Post-Doctoral Fellow

Jonika B. Hash, PhD, RN
Post-Doctoral Fellow

Hyejeong Hong, PhD, FNP-BC
Post-Doctoral Fellow

Omics and Symptom Science Training Program
University of Washington
Seattle, Washington