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Symposium
Introduction

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Genomics and Precision Medicine

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Welcome to the new age of genomics, which promises to revolutionize medicine and health care. The Human Genome Project was completed in 2003[1] and advances in genomic science now are being rapidly translated into clinical practice in and out of the hospital, allowing for more precise, safe, and effective disease state prediction, evaluation, diagnosis, intervention, and prevention. The current generic approach to health care, which has provided inconsistent benefits with frequent treatment-related morbidities, soon will be history, along with the iron lung, lobotomies, and other medical relics.

The expansion in genomic research and improved genetic data analytics have led to the emergence of a ground-breaking paradigm of health care delivery known as *precision medicine*. This highly individualized approach to disease prevention and treatment incorporates the unique characteristics of a patient's gene variation, environment, and lifestyle. Early use of precision medicine primarily has occurred in oncology, a medical field in which both diagnosis and treatment are based increasingly on genomic features of the cancer and of the patient, leading to stunning improvements in patient outcomes.[2] Increasingly, precision medicine is embedding itself into primary care where, in addition to usefulness in diagnosis and therapy, this approach has shown great potential in prevention of many chronic and acute diseases. Optimism exists that the inevitable diseases of aging can be tackled by blending genomics and stem cell therapies.[2]

The enthusiasm surrounding this new medical frontier seems well founded. Yet, due to many barriers, the critical care setting has been slow to adopt genomic-precision medicine, using cautious and incremental advancements. Because many critically ill patients have genetic determinants affecting the risk of and response to diseases and related therapies, benefits exist in using precision medicine to manage patients with complex and often ambiguous disease syndromes. Hundreds of gene variants, many of which are measurable biomarkers, increase the risk and response to sepsis; these predictive biomarkers along with pharmacogenomics (targeting a patient's unique drug metabolic pathways) soon may be able to dramatically improve the efficacy and safety of treating sepsis.[2]

The impact of genomics in health care was recognized officially by the American Nurses Association (ANA) more than 20 years ago.[3] ANA joined with the American Medical Association, the National Institutes of Health, and the National Human Genome Project to support genomic education for all

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health care providers. From this partnership came the establishment in 2005 of essential genomic nurse competencies, which were updated in 2009 and later tailored for advanced practice.[3]

In 2005, nearly two-thirds of nursing leaders reported having an inadequate understanding of genomic medicine, and that number presumably was higher for bedside nurses.[4] Although genomics since has been added to many nursing curriculums, a knowledge gap remains and grows with the rapid advancements in this exciting field.[3] This knowledge gap may be especially true for advanced practice acute care nurses and nurses in the intensive care unit because genomics and precision medicine are more recent additions to critical care practice.

The symposium in this issue of *AACN Advanced Critical Care* looks at the current state of genomics medicine as it relates to various diseases. Kessler begins the discussion with an introduction to genomic and precision medicine and an exploration of the genome, offering a glimpse of the possibilities imbued in this emerging science. Cheek and Howington explore the usefulness of pharmacogenomics, which was the first and most prominent genomic-based entry into the intensive care unit. Next, Hickey and Elzomor review channelopathies and long QT syndrome (common causes for sudden cardiac death), which have the clearest gene associations among cardiovascular disorders identified to date. Maserati and Alexander follow by discussing the genomic science behind the physiological results of brain injury, brain trauma, and various neurological disorders that yield dramatic differences in clinical presentation, course of illness, and long-term outcomes, many of which are related to genetic variances in inflammatory response. Finally, Wysocki addresses the state of genomic science within pulmonary medicine, focusing on disorders that have undergone the most genetic research, such as lung cancer.

The genomics of acute disorders such as acute respiratory distress syndrome has not been sufficiently researched; therefore, some of the topics presented in this symposium may not fall fully within critical care. However, the articles presented offer descriptions of the complex nature and hope of genomic medicine. Critical care nurses are resilient and adapt; they thrive in an ever-changing environment of more acute illnesses, escalating drug developments, and expanding technology. As genomic medicine increases its presence within the critical care environments, we will adapt, but we must begin preparing now.

This symposium on genomics will prepare nurses for the tsunamic changes about to hit our acute health care practices, arm them with foundational genomic information, and inspire them toward further inquiry in genomics and precision medicine. In doing so, we may find that successfully adapting to change is truly in a critical care nurse's DNA.

REFERENCES

1. All about the Human Genome Project (HGP). National Human Genome Research Institute website. https://www.genome.gov/10001772/all-about-the--human-genome-project-hgp/. Updated October 1, 2015. Accessed December 18, 2017.
2. Maslove D, Lamontagne F, Marshall JC, Heyland DK. A path to precision in the ICU. *Crit Care.* 2017:21:79. doi:10.1186/s13054-017-1653-x.
3. Badzek L, Calzone KA. Nursing leaders hold the key to translating genomics into practice. *Am Nurse Today.* 2013;8(12):32-34.
4. Calzone K, Jenkins J, Yates J, et al. Survey of nursing integration of genomics into nursing practice. *J Nurs Scholarsh.* 2012;44(4):428-436.