
PRECISION MEDICINE FOR NURSES: 101

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OBJECTIVES: *To introduce the key concepts and terms associated with precision medicine and support understanding of future developments in the field by providing an overview and history of precision medicine, related ethical considerations, and nursing implications.*

DATA SOURCES: *Current nursing, medical and basic science literature.*

CONCLUSION: *Rapid progress in understanding the oncogenic drivers associated with cancer is leading to a shift toward precision medicine, where treatment is based on targeting specific genetic and epigenetic alterations associated with a particular cancer.*

IMPLICATIONS FOR NURSING PRACTICE: *Nurses will need to embrace the paradigm shift to precision medicine, expend the effort necessary to learn the essential terminology, concepts and principles, and work collaboratively with physician colleagues to best position our patients to maximize the potential that precision medicine can offer.*

KEY WORDS: *Precision medicine, biomarkers, mutation testing, therapeutic targets*

IT is 2002, and Mary is an oncology nurse who works in a chemotherapy infusion center. In addition to daily chemotherapy administration, Mary facilitates a monthly lung cancer education and support group. Attending this month's meeting are four patients who have been recently diagnosed with metastatic non-small cell lung cancer (NSCLC). They have

each begun therapy within the past 2 weeks and are discussing their experiences with their therapies. Each is being treated with platinum doublet chemotherapy, either cisplatin or carboplatin combined with paclitaxel. As part of Mary's chemotherapy administration responsibilities, she routinely verifies orders against current drug and regimen references, and she knows that platinum doublet therapy is appropriate for patients with advanced or metastatic NSCLC. Because all four patients are receiving similar regimens, the information and education Mary provides is helpful to everyone in the group, and they agree that it is reassuring to them that they are all getting the same treatment for the same disease.

It is now 2013, and Mary is still working in the chemotherapy infusion center and facilitating the monthly lung cancer education and support

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0749-2081/3002-836.00/0.

<http://dx.doi.org/10.1016/j.soncn.2014.03.002>

group. Attending this month's meeting are six patients, all of whom have been recently diagnosed with metastatic NSCLC and all of whom have started therapy within the past 2 weeks. Despite all of the patients being diagnosed with the same stage of NSCLC, these six patients are receiving different therapies. This seeming inconsistency is very distressing to the patients who wonder out loud why they all cannot be on oral therapies like some of them are and why those getting intravenous therapies are all getting different drugs. Mary explains that in the past, the differences in NSCLCs were not fully understood or appreciated and so patients with NSCLC were treated similarly. Mary continues to explain that in the past decade, however, significant progress has been made in understanding the differences in various NSCLCs and in developing specific therapies for the different types.

Historically, therapy was based on whether the patient had small cell lung cancer or NSCLC and the stage of the cancer. Now, within NSCLC, therapies are based on squamous versus non-squamous histology, and the presence or absence of specific genetic mutations* associated with NSCLCs, including epidermal growth factor receptor (EGFR) mutations, or anaplastic lymphoma kinase (ALK) rearrangements. Additionally, other genetic mutations such as those in the Kirsten rat sarcoma (KRAS) gene, while not presently associated with a specific therapy, serve as prognostic and predictive biomarkers. Mary reassures the patients that the diversity in therapies is reflective of the genetic diversity underlying their diseases. The patients all agree that they are reassured knowing that they are getting the treatment that best matches the genetic characteristics of their tumors.

As with NSCLC, significant strides have been made in understanding the genetic mutations associated with other tumor types as well. Mary observes that for most cancers, an emerging paradigm shift in treatment – toward precision medicine - is under way, with the goal of providing each patient with the therapy most likely to benefit them based on genetic characteristics of the tumor and of the patient themselves.

Oncology nurses have a professional responsibility to remain up-to-date with current knowledge about cancer and its treatment. In order for nurses to continue to provide quality care for patients with cancer, it is essential that they understand precision medicine and its implications for therapy and patient education. The purpose of this article is to provide an introduction to the key concepts and terms associated with precision medicine and to provide a foundation to support understanding of future developments in the field. What follows is an overview of precision medicine, the scientific advances that have made it possible, related ethical considerations and the nursing implications of caring for patients with cancer in an era of precision medicine.

EVOLUTION OF PRECISION MEDICINE IN ONCOLOGY

A forerunner to precision medicine was personalized medicine. Personalized medicine as defined in the Priorities for Personalized Medicine (President's Council of Advisors on Science and Technology [PCAST], 2008), "refers to the tailoring of medical treatment to the individual characteristics of each patient".^{1(p. 1)} Rather than aiming to create patient-specific drugs for each individual patient, the goal of personalized care, as described in the 2008 PCAST report, is to allow for the clustering of patients into subpopulations according to their risk for a given health condition or their response to a particular therapy. This definition differs from the more general historical definition of the term *personalized*, which has been used to characterize the individualized approach to patient care. The scope and practice of nursing highlights the importance of an individualized plan of care based on accurate and ongoing assessment, diagnosis, outcome identification, intervention and evaluation. While some approaches, such as vaccinations, use a single strategy for virtually all patients, most therapeutic plans rely on individualized interventions to achieve the desired outcomes. Consider an infectious process exemplar. Selecting the appropriate therapy is dependent not only on identifying the causative organism but also on considering the individual patient's ability to tolerate therapy based on allergy status, organ function, and side-effect profile. Additionally, with some anti-infective therapies, dose adjustments are necessary based on individual

* Readers can find the definitions of the underlined words in [Appendix A](#). Glossary at the end of this manuscript.

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