Immunotherapy research provides opportunities for nurse scientists and researchers to be at the forefront of the changing landscape of cancer treatment. As these therapies continue to develop, current initiatives will seek to support nurses in clinical practice who must provide safe, evidence-based care and education to patients and their families. This article explores the current state of immunotherapy research and the ways in which continued research can help to advance nursing education and practice.

**AT A GLANCE**
- Nurse scientists and researchers need to assess the potential challenges of immunotherapy treatment, including initial patient response and long-term effects.
- Current initiatives in cancer research will support nursing education on new and emerging immunotherapy treatments.
- Nurses can contribute to future research by providing insight into patient-reported outcomes and symptom management following immunotherapy treatment.

**KEYWORDS**
- immunotherapies; clinical trials; personalized medicine; nursing research

**DIGITAL OBJECT IDENTIFIER**
10.1188/17.CJON.S2.9-12

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**Immunotherapy**

Exploring the state of the science

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Immunotherapy has several distinct advantages over traditional approaches to cancer treatment. First, the human immune system can distinguish between healthy and unhealthy cells and, in many cases, can mount a response against the unhealthy cancer cells. Second, immunotherapy treatment can be dynamic and react to cancer cells as they develop, leading to more lasting results.

As promising as cancer immunotherapy appears to be, challenges do exist. When patients respond well to immunotherapy, there is a good chance that the response will last. However, less than half of patients undergoing treatment will benefit from existing immunotherapy drugs (Farkona, Diamandis, & Blasutig, 2016). A significant challenge in the near future will be identifying why some patients respond well to immunotherapy treatment and others do not (Kalia, 2013). Scientists, physicians, nurses, and many other healthcare professionals will need to address these questions in the coming years.

Like many great discoveries in science and health care, the initial thought to use the immune system to fight cancer began with a clinical question. In 1890, a young woman named Elizabeth “Bessie” Dashiell hurt her hand and soon developed a lump and nagging pain. She went to see a young doctor, William Coley, who performed a biopsy that revealed a sarcoma. Bessie died a few months later, and Coley was deeply affected by her death. Following her death, Coley focused his career on finding a better way to treat aggressive forms of cancer such as sarcoma. During the course of his research, one particular case jumped out at him: a young man who had also been diagnosed with sarcoma but whose disease regressed completely after he suffered a postoperative bacterial strep infection. Coley also found other cases of cancer that had spontaneously regressed following an infection. His findings led him to question: if an unintentional infection sometimes caused cancer to regress, could an intentionally produced infection stimulate the immune system to treat cancer? Coley spent the remainder of his career experimenting with immunotherapy cancer treatments (Hall, 1997).

**The Changing Science**

Cancer treatment has changed dramatically since Bessie Dashiell’s diagnosis in 1890, particularly during the past several decades. Survival rates are increasing and at an all-time high, and more people than ever before are living with cancer as a chronic disease (Miller et al., 2016). Nurse researchers and scientists have also learned that cancer is not one disease but hundreds—each with its own unique features, treatment challenges, and vulnerabilities. The ability to analyze the human genome has provided insights into cancer biology, pathogenesis, and treatment that were previously unimaginable. Treatments can now be targeted to how tumors grow and spread, protecting healthy cells and improving patient outcomes. This abundance of new knowledge has allowed nurse scientists and researchers to revisit Coley’s theory of enlisting the immune system to fight cancer.
Nurses and the National Cancer Moonshot Initiative

One effort that will enable science to move forward at a rapid pace is the National Cancer Moonshot Initiative. During his State of the Union address in January 2016, former President Barack Obama announced the Cancer Moonshot with the goal to advance cancer treatment, prevention, and diagnosis more quickly than has occurred previously. The Cancer Moonshot aims to provide a decade’s worth of advancements within five years. Since the Cancer Moonshot’s inception, a panel of experts, including scientists, nurses, patients, healthcare providers, and industry leaders, among others, released a 10-point Blue Ribbon Panel Report designed to meet and potentially exceed the initiative’s primary goal (National Cancer Institute, 2016). Deborah Mayer, PhD, RN, AOCN®, FAAN, was appointed as the oncology nursing representative to the Blue Ribbon Panel.

The Blue Ribbon Panel established seven working groups to assess the science and identify major research opportunities that could benefit from the support of the Cancer Moonshot (see Figure 1). The initiative prominently involves nurses, with three Oncology Nursing Society (ONS) members appointed to two of the seven working groups. Mayer and Kathi Mooney, PhD, RN, were appointed to the Implementation Science Working Group. Jeannine Brant, PhD, APRN, AOCN®, FAAN, serves on the Clinical Trials Working Group.

One of the 10 recommendations from the Blue Ribbon Panel is to create a clinical trials network devoted exclusively to discovering and evaluating immunotherapy treatments. Many of the other recommendations directly affect implementation and the ability to broaden the specificity of cancer care by finding the right cancer treatment for each patient. Two initiatives detailed in the 2016 report include enhancing public access to potential clinical trials and creating a national database clearinghouse with free access for scientists (National Cancer Institute, 2016).

Blue Ribbon Panel Recommendations

The Blue Ribbon Panel also recommends additional symptom management research, an important component of nursing practice and scientific inquiry, to improve patient quality of life. Nurses are intimately involved in assessing, anticipating, evaluating, and managing cancer treatment side effects, such as fatigue, pain, and nutritional challenges, in various settings. As such, nurses are well positioned to generate research and best practices in symptom management. Understanding the complexities of newer treatments and engaging the public in partnership through education and relationship building is a highly regarded skill within the nursing profession. Oncology management (Hylton, Featherstone, & Sauter, 2015), and overviews of immunotherapeutic approaches (Bourdeau & Luu, 2013; Chan et al., 2016; Kannan, Madden, & Andrews, 2014; Thomas, 2016). Melanoma, which has perhaps the longest standing immune-based treatment approaches, is a particularly robust field for nursing publications. Articles have provided an overview of many immunotherapeutic agents, including checkpoint inhibitors (Peterson & Steele-Moses, 2016; Rubin, 2015); monoclonal antibodies such as nivolumab (Opdivo®) (Bayless & Schneider, 2015), ipilimumab (Keytruda®) (Rubin, 2012), and blinatumomab (Blincyto®) (Turner & Schneider, 2016); and the emerging use of talimogene laherparepvec (Imlygic®) (Hofner, Iodice, & Gasal, 2016). Although these articles represent a small sampling of the many publications by nurse authors,

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Symptom Management Research

One recommendation of the Cancer Moonshot focuses on minimizing the negative effects of cancer treatment, and a particularly strong platform where nurse scientists can contribute additional research is symptom management. Although numerous publications relay the outcomes of treatment, particularly related to disease progression and survivorship, few report on patient-reported outcomes (PRO), a key recommendation for understanding the extent to which treatment approaches and their side effects impact nurses can help make this recommendation a reality as researchers generating evidence, as research coordinators explaining the complexities of research protocols to patients and families, and as clinicians providing excellent care to the patients and families encountered in practice.

Nursing Science Advancements

As the science of immunotherapy continues to advance, nurse scientists have a unique opportunity to engage in research related to these new and emerging therapies. To date, nurse scientists have contributed to the ever-growing body of literature on immunotherapy, including articles on original research (Goldberg et al., 2016), clinical care and patient management (Hylton, Featherstone, & Sauter, 2015), and overviews of immunotherapeutic approaches (Bourdeau & Luu, 2013; Chan et al., 2016; Kannan, Madden, & Andrews, 2014; Thomas, 2016). Melanoma, which has perhaps the longest standing immune-based treatment approaches, is a particularly robust field for nursing publications. Articles have provided an overview of many immunotherapeutic agents, including checkpoint inhibitors (Peterson & Steele-Moses, 2016; Rubin, 2015); monoclonal antibodies such as nivolumab (Opdivo®) (Bayless & Schneider, 2015), ipilimumab (Keytruda®) (Rubin, 2012), and blinatumomab (Blincyto®) (Turner & Schneider, 2016); and the emerging use of talimogene laherparepvec (Imlygic®) (Hofner, Iodice, & Gasal, 2016). Although these articles represent a small sampling of the many publications by nurse authors,
patient outcomes and disease experience (Secord et al., 2015). The integration of PRO measures, including symptom severity and quality of life, into the clinical trials of diverse immunotherapeutic agents is an opportunity for nurse scientists to contribute to the advancement of knowledge about immunotherapies. Such research is also consistent with the ONS research agenda for 2014–2018 (Knobf et al., 2015), which includes an emphasis on symptoms, late effects of cancer treatment and survivorship care, and palliative and end-of-life care, all of which are integral to emerging immunotherapies.

Because individuals are living longer with or in remission from previously terminal cancer diagnoses, this is only the beginning of understanding the potential late effects of immunotherapy treatments and the long-term needs of survivors. As highlighted in this supplement, familiar symptoms, side effects, and toxicities are emerging in new ways related to single agent or combination immunotherapy treatments that require careful research, assessment, and evidence-based management. Despite tremendous breakthroughs in cancer treatment, palliative care remains an integral focus of immunotherapy, both to ameliorate symptoms resulting from treatment, as well as to provide holistic support to those for whom immunotherapy does not offer a cure.

Conclusion
Nurse scientists are uniquely positioned to contribute to the new and emerging body of science related to immunotherapies. Whether at the bench or bedside, nurse scientists are challenged to explore the mechanisms of action, efficacy of treatment, side effects and symptoms, toxicities of treatment, and the patient experience with immunotherapy. Every nurse scientist, regardless of specialization by cancer type or research methodology, can contribute collaboratively to this next chapter in oncology research.

The articles presented in this supplement provide high-level overviews of emerging immunotherapy treatments, including checkpoint inhibitors, monoclonal antibodies, oncolytic viral therapies, and adoptive T-cell therapies, as well as clinical initiatives by clinical and advanced practice nurses and their interprofessional colleagues, to support and manage patients receiving immunotherapy. This work is the beginning of initiatives to support safe, evidence-based, and patient-centered care to individuals undergoing immunotherapy-based treatment. Opportunities to contribute to the evolution of clinical practice related to immunotherapy are expanding for nurses from diverse backgrounds and practice settings.

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The authors gratefully acknowledge Kate Krause, MLS, CLIS, AHIP, and Marisol Hernandez, MLS, MA, for their assistance with review of the literature for this supplement.

The authors take full responsibility for this content and did not receive honoraria or disclose any relevant financial relationships. The article has been reviewed by independent peer reviewers to ensure that it is objective and free from bias. Mention of specific products and opinions related to those products do not indicate or imply endorsement by the Oncology Nursing Society.

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