Subcutaneous Immunoglobulin in Oncology Clinical Practice

Erin Streu, RN, MN, CON(C)

The administration of gammaglobulin as replacement therapy to boost immune function in patients with immunodeficiency secondary to malignancy is traditionally given in the IV formulation. A pilot program at a large Canadian cancer center led by an advanced practice nurse (APN) demonstrated that transitioning patients to home-based, self-administered subcutaneous infusions (subcutaneous immunoglobulin [SCIG]) led to savings and benefits for patients and the institution. The implementation of SCIG in oncology by an APN is a novel and innovative patient-centered approach to supportive care.

At a Glance
- Replacement therapy of gammaglobulin may be safely administered via slow subcutaneous infusions in the home setting.
- Transferring patients from IV gammaglobulin to SCIG promotes patient engagement, independence, and autonomy.
- Development, implementation, and evaluation of an SCIG program represents one role an APN can play in oncology clinical care.

Opportunities exist for advanced practice nurses (APNs) in oncology at all points in the cancer continuum, from cancer prevention and screening, to diagnosis and treatment, to palliation and end-of-life care. When effective in the role, an APN may influence the patient or client sphere, as well as the spheres of nursing and of the organization or system (Oncology Nursing Society, 2008). The development of a subcutaneous immunoglobulin (SCIG) program at CancerCare Manitoba in Winnipeg, Canada, exemplifies an innovative APN-led intervention that challenged the current standard of practice for immunodeficient patients with cancer and led to policy and procedure changes, new treatment options, and improved patient and organizational outcomes.

Background

The most common chronic immunodeficiency in patients diagnosed with chronic lymphocytic leukemia (CLL) and lymphoproliferative malignancies is hypogammaglobulinemia, with infection being a major cause of death (Hamblin & Hamblin, 2008). The exact mechanism of dysfunction is unclear, but the extent of the hypogammaglobulinemia is associated with disease duration, stage, and previous treatments (Morrison, 2010). Despite lower than normal levels of gammaglobulin, patients may not experience infectious symptoms; in addition, treatment of the underlying CLL does not restore immune function or cause immunoglobulin levels to normalize (Hamblin & Hamblin, 2008).

Acquired hypogammaglobulinemia secondary to malignancy is not unique to lymphoid malignancies. Infection is a major cause of morbidity and mortality in plasma cell dyscrasias, such as multiple myeloma occurring as a complication of the disease and resulting from the cumulative immune suppression of anticancer treatments (Nucci & Anaissie, 2009). Similarly, the immune suppression experienced from post-hematopoietic stem cell transplantation may last months to years as a consequence of the transplantation or subsequent immunosuppressive therapies to manage graft-versus-host disease (Anderson et al., 2007).

A consensus recommendation on the role of gammaglobulin replacement therapy in the treatment of hematopoietic malignancies has not been clearly delineated (Anderson et al., 2007; Lachance et al., 2016). IV gammaglobulin (IVIG) does not provide consistent benefits and does not improve overall survival in patients with multiple myeloma but should be considered on an individual basis (Anderson et al., 2007). In patients with CLL, IVIG has been shown to reduce the incidence of mild to moderate bacterial infections; however, the total number of severe bacterial and nonbacterial infections was not affected, and treatment with replacement gammaglobulin did not affect overall survival (A Randomized, Controlled Clinical Trial Cooperative Group for the Study of Immunoglobulin in Chronic Lymphocytic Leukemia, 1988).
Immunoglobulin replacement has come full circle since Ogden Bruton (1952) treated the first patient with agammaglobulinemia more than 60 years ago. Beginning as a subcutaneous formulation, this treatment has had many advances, including fractionation of doses; a change to intramuscular injections, which were painful and dose-limiting; and a purified IV product that was introduced to the market in the 1980s and has been the mainstay of treatment in North America since. However, the repeated hepatitis outbreaks that occurred worldwide in the 1980s prompted a divergence in practice. In the Netherlands, clinicians pioneered slow, overnight subcutaneous infusions and, later, the rapid push technique that is in use today (Younger et al., 2015).

Immunoglobulin replacement therapy in oncology clinical practice is most commonly hospital-based IV therapy (IVIG) with monthly dosing based on the patient’s weight (200–400 mg/m²). Alternatively, patients with primary immunodeficiency receiving gamma-globulin are also offered a second treatment option: home-based, self-administered SCIG infusions. Patients requiring low-dose weekly SCIG infusions may adopt the push technique using a syringe and infusion butterfly (see Figure 1), whereas patients requiring larger volumes and, therefore, more frequent infusions may benefit from the assistance of infusion pumps. SCIG demonstrates similar efficacy as IVIG, with better tolerance and fewer adverse events (Misbah et al., 2009).

Benefits

The benefits of SCIG for patients are well documented in the literature (Younger et al., 2015) (see Figure 2). From an organizational perspective, transitioning from a hospital- to a home-based form of treatment releases hospital infusion chairs that were previously dedicated to IVIG, ultimately reducing patient wait times for treatment. SCIG is less resource intensive and less technically demanding than IVIG and presents administrators with the opportunity to use expert nursing knowledge where it is most needed: managing complex chemotherapy regimens and focusing on new therapies (Younger et al., 2015). Adopting the simple push technique to administer SCIG (syringe and infusion butterfly) rather than investing in pumps will also translate into a significant cost differential for the institution.

Although no cost differences exist between IVIG and SCIG preparations, the advantages to the healthcare system will be realized through reduction in wait times, adherence to clinical practice guidelines through better monitoring and evaluation of outcomes, and a more efficient use of existing resources.

Program Description

Replacement therapy at CancerCare Manitoba was primarily administered and managed in chemotherapy or systemic treatment rooms by specialized oncology or infusion nurses in the form of IVIG. A yearlong SCIG pilot program completed in 2015 demonstrated that transitioning patients from IVIG to SCIG offered patients the opportunity to take an active role through self-administered infusions; it was also proven to be a desirable option for patients and a more efficient use of resources and staff. Patients remain under the primary care of their hematologists or oncologists and are closely managed in parallel by an APN. The clinical nurse specialist has expert knowledge and understanding of hypogammaglobulinemia in the context of the patient’s cancer journey and also appreciates the devastating effect an infection can have on a patient’s health and well-being. The program provides individualized care that builds on the patient’s existing education and past treatment experiences and is tailored to meet each patient’s or caregiver’s needs.

Referrals arose from outpatient clinics, and the pilot initially was restricted to patients with CLL or small lymphocytic lymphoma (SLL). A careful chart review ensured that patients met eligibility criteria and were able to successfully self-administer (see Figure 3). Careful patient selection was and continues to be instrumental in patient and program success.

Patients are contacted by the APN and given an introduction to the program and the principles of SCIG therapy. Whenever possible, patients are asked to invite their family members to support them and participate in training and education. Participants receive one-on-one education and infusion training (using the push technique), as well as a comprehensive patient handbook summarizing key information, a laminated pocket-sized administration guide, and all supplies free of charge. Patients remain in contact by telephone or email on a regular and as-needed basis. Nursing support services include ordering and processing product supply requests, troubleshooting infusion-related problems, managing mild adverse events, monitoring trough levels, and completing annual evaluations of each patient to ensure optimal gammaglobulin management. Trough immunoglobulin levels are measured at three-month intervals initially and then less frequently once levels have stabilized. Patient doses are tapered to achieve a therapeutic trough level.

- Greater treatment satisfaction and improved quality-of-life measures
- Similar efficacy and better tolerance
- Greater autonomy, independence, ability to self-schedule, ability to travel
- Less time lost to treatment (fewer hospital visits, fewer parking costs)
- Less invasive (no venous access required, less risk of line infection)

FIGURE 1. Self-Administered Infusion Via Push Technique
Note. Photo courtesy of Erin Streu. Used with permission.

FIGURE 2. Patient and Caregiver Benefits of Subcutaneous Immunoglobulin
Note. Based on information from Misbah et al., 2009; Younger et al., 2015.
Extensive skin conditions (psoriasis, eczema, edema, bruising)
Poor manual dexterity, decreased hand grip strength, tremors, neuropathy, poor eyesight
Cognitive impairment, psychiatric conditions, compliance issues
Lack of caregiver support
Caution should be used in patients with renal, cardiac, coagulation, and platelet and bleeding disorders.
Severe allergic reaction to immunoglobulin therapy
Selective immunoglobulin A deficiency

FIGURE 3. Contraindications to Subcutaneous Immunoglobulin Therapy
Note. Based on information from Younger et al., 2015.

in the absence of any infectious symptoms.

The novel and innovative approach of implementing an oncology SCIG program lends itself to many areas of research. During the pilot program, patients were asked to voluntarily complete two measures: a one-page treatment satisfaction survey and a quality-of-life measure at baseline, at three months, and at six months. Patients also reported all antibiotic prescriptions and infection-related hospital admissions prior to and during treatment to assess the efficacy of SCIG to minimize infectious complications in patients with immunodeficiency secondary to malignancy.

Discussion
The development and implementation of an SCIG program within a cancer center exemplifies one role of advanced practice nursing in oncology care. From the initial proposal through program evaluation, the SCIG program was championed by an APN.

The infusion of blood products, such as immunoglobulins, either via IV or subcutaneously does not require advanced nursing knowledge or experience. However, the ability to monitor, interpret, and correlate patients’ trough immunoglobulin levels with symptoms and intervene within the context of each patient’s journey requires specialized training and exemplifies the APN role.

Transferring from IVIG to SCIG promoted patient engagement, independence, and autonomy. It allowed patients to plan infusions to accommodate their activities, schedules, and lifestyles and not within the confines of the treatment room hours. SCIG also allows patients to continue working without the inconvenience of taking time off for treatments. In addition, it affords them the freedom to travel while on treatment and promotes the balance between health and living with chronic illness.

Transferring from hospital- to home-based treatments was expected to alleviate demand for infusion chair time and allow nursing administration to reallocate resources within the department. What was not anticipated was the satisfaction that resulted from the opportunity to offer a choice in immunoglobulin replacement therapy where none previously existed, along with the chance to engage patients and caregivers in the treatment decision-making process.

Conclusion
Since the pilot program ended, the SCIG program has continued to grow. Clinicians at CancerCare Manitoba were receptive to change and embraced SCIG. The program of more than 60 patients now includes those with immunodeficiency secondary to CLL, SLL, lymphomas, lymphoproliferative disorders, multiple myeloma, and immunodeficiency following stem cell transplantation. It has also expanded beyond the institution to 16 rural satellite cancer units across the province. CancerCare Manitoba’s standard of care has also changed as a result of the SCIG program. Replacement immunoglobulin therapy now includes the choice of IVIG or SCIG for patients and clinicians, and it has led to a number of policy updates and changes—one of which permits home care nurses to administer blood products in the community setting. The successful integration of SCIG into oncology care reinforces the importance of examining standard ideologies and practice, embracing change, and working within the full scope of practice. Most importantly, advancements have been made toward improving the quality of life for patients with cancer and their caregivers.

References