Hyperglycemia and Cancer
An algorithm to guide oncology nurses

Veronica Sampayo, DNP, ARNP-C, and Cindy Tofthagen, PhD, ARNP, AOCNP®, FAANP, FAAN

BACKGROUND: A dual diagnosis of cancer and hyperglycemia has demonstrated untoward effects on patients’ cancer treatment, prognosis, and survival.

OBJECTIVES: The purpose of this evidence-based project is to improve knowledge and awareness of the consequences of hyperglycemia in patients with cancer, increasing nurses’ capability to effectively intervene. In addition, a clinical algorithm based on current evidence was developed and is presented.

METHODS: An educational program was developed and pilot tested. The program addressed the etiology of hyperglycemia and its effects on patients with cancer. Knowledge of hyperglycemia in patients with cancer was assessed with a pre- and post-test.

FINDINGS: All participants found the educational program effective and deemed the clinical algorithm useful. Results improved significantly after participation in the educational intervention.

KEYWORDS
professional development; nurse education; diabetes; cancer; hyperglycemia

DIGITAL OBJECT IDENTIFIER
10.1188/17.CJON.345-352

ABOUT 8%–18% OF INDIVIDUALS WITH CANCER HAVE PREEXISTING DIABETES at the time of diagnosis (Barone et al., 2008; Hammer & Voss, 2012; Hershey et al., 2014). Cancer therapies, including chemotherapeutic, biologic, and hormonal agents, have the potential to cause hyperglycemia (Hershey et al., 2014). Researchers have found that patients with elevated fasting blood glucose (FBG) levels and body mass index (BMI) have a reduced time to tumor progression (Pantano et al., 2013). Elevated FBG and BMI are not only predictive factors for time to progression (Pantano et al., 2013), but also are risk factors for diabetes (American Diabetes Association [ADA], 2015).

Oncology nurses need information and resources to guide them in providing care to patients at risk for hyperglycemia. Identifying modifiable and nonmodifiable risk factors for hyperglycemia, understanding how cancer treatments can affect glycemic control, and recognizing potential cancer-related and non–cancer-related complications of hyperglycemia are important to providing the best possible care to patients at risk for hyperglycemia. However, these types of resources may not be readily available to nurses across treatment settings. The goal of this article is to provide information and resources to help guide oncology nurses caring for individuals with, or at risk for, hyperglycemia.

Review of the Literature
Diabetes mellitus is a group of metabolic disorders that share one common trait, hyperglycemia. Many factors contribute to an individual’s hyperglycemic state, including decreased insulin production, decreased glucose uptake, and an increase in glucose secretion (Powers, 2015a). Type I diabetes is an autoimmune disorder that causes destruction of pancreatic beta cells. The destruction of insulin-producing beta cells causes individuals to be dependent on exogenous insulin (Powers, 2015a). Type II diabetes accounts for more than 95% of all diagnosed cases (Giovannucci et al., 2010). It is characterized by insulin resistance, impaired insulin secretion, and increased glucose production (Powers, 2015a). A long, asymptomatic phase often occurs before a diagnosis is made (ADA, 2015). Prediabetes is a condition associated with impaired fasting glucose and impaired glucose tolerance (McCance & Huether, 2010). Hammer et al. (2015) found that 26% of patients with cancer undergoing cancer treatment for solid tumors had prediabetes.
Corticosteroids are often used in chemotherapy regimens and for the treatment and prevention of chemotherapy-related side effects. Corticosteroids affect the insulin-signaling pathway by decreasing expression of insulin receptor substrate, causing a down-regulation of glucose transport in the muscle, which requires more insulin for cellular glucose uptake, and stimulating the liver to secrete glycogen stores, with a resultant surge in circulating glucose (De Vos-Schmidt & Dilworth, 2014). Prediabetic patients who are prescribed corticosteroids often develop diabetes, and patients with preexisting diabetes can develop severe hyperglycemia (Vigneri, Frasca, Sciaccia, Pandini, & Vigneri, 2009). Docetaxel (“Taxotere®”), mTOR inhibitors, and androgen deprivation therapy are additional cancer therapies that may contribute to hyperglycemia (Hershey et al., 2014).

**Modifiable Risk Factors**

Obesity is associated with insulin resistance and an increased incidence of type II diabetes, and higher BMIs are associated with increased cancer risk, particularly cancers of the breast, colon, rectum, endometrium, pancreas, esophagus, kidney, gallbladder, and liver (Giovannucci et al., 2010). Diets high in sugar and refined carbohydrates are known to contribute to obesity and increase the risk for developing type II diabetes (Barclay et al., 2008; Giovannucci et al., 2010; Hammer & Voss, 2012). Some research suggests that an excess intake of refined carbohydrates and sugars are strongly associated with increased cancer risk (Vigneri et al., 2009). The American Cancer Society (ACS), World Research Fund, and American Institute for Cancer Research have all recommended limiting excess intake of these foods (Giovannucci et al., 2010). A consensus statement by ACS and ADA emphasizes the benefits of increased physical activity (Giovannucci et al., 2010). Decreased physical activity is associated with adiposity, insulin resistance, and inflammation (Lynch, Courneya, Sethi, Patrao, & Hawkes, 2014).

ADA (n.d.) describes elevated blood pressure as a risk factor for diabetes mellitus. Patients with blood pressures greater than 120/80 are recommended to undergo lifestyle modifications, including increasing physical activity, adjusting diet, and exercising weight control. Uncontrolled hypertension not only increases the risk of diabetes but also increases the risk of cardiovascular events, ocular complications, and kidney dysfunction, all of which can complicate the course of cancer treatment. Abnormal lipid metabolism is also associated with an increased risk of diabetes (ADA, n.d.).

Patients with cancer may be prescribed potentially hyperglycemia-inducing medications unrelated to cancer treatment. Beta blockers and thiazide diuretics may increase serum glucose levels, particularly in patients with diabetes (Rehman, Setter, & Vue, 2011). Antihypertensives most commonly associated with elevating serum glucose levels include propranolol (Hemangeol™), metoprolol (Lopressor®), atenolol (Tenormin®), and hydrochlorothiazide (Microzide). The onset of hyperglycemic induction among these medications varies; however, onset of hyperglycemia typically occurs from 9–18 weeks after initiation (Rehman et al., 2011). Table 1 summarizes recommendations for modifiable risk factors.

### Table 1. Recommendations for Modifiable Risk Factors

<table>
<thead>
<tr>
<th>RISK FACTOR</th>
<th>RECOMMENDATION</th>
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| Alcohol           | ■ May cause exacerbation of cancer treatment side effects  
|                   | ■ May increase risk of delayed hypoglycemia           |
| Body mass index   | ■ Maintain healthy body weight, from 18.5–25 kg/m²   |
| Diet              | ■ Maintain a diet rich in fruits, vegetables, lean meats, low-fat dairy, whole grains, tree nuts, and olive oil.  
|                   | ■ Avoid processed meats and foods high in sugar.      |
| Physical activity | ■ 150 minutes per week spread over at least three days  
|                   | ■ Two days of strength training exercises             |
| Smoking           | ■ Smoking cessation counseling                        |

**Note.** Based on information from Giovannucci et al., 2010.

### Table 2. American Diabetes Association Diagnostic Criteria for Prediabetes and Diabetes

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>PREDIABETES</th>
<th>DIABETES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1c</td>
<td>5.7%–6.4%</td>
<td>6.5% or greater</td>
</tr>
<tr>
<td>Fasting plasma glucose</td>
<td>100–125 mg/dl</td>
<td>126 mg/dl or greater</td>
</tr>
<tr>
<td>Two-hour plasma glucose</td>
<td>140–199 mg/dl</td>
<td>200 mg/dl or greater, with classic symptoms of hyperglycemia or hyperglycemic crisis</td>
</tr>
<tr>
<td>Random plasma glucose</td>
<td>–</td>
<td>200 mg/dl or greater, with classic symptoms of hyperglycemia or hyperglycemic crisis</td>
</tr>
</tbody>
</table>

**Note.** A1c levels may be altered if a patient has hemodynamic alterations, such as anemia or recent blood transfusion.  
**Note.** Based on information from American Diabetes Association, 2015.

### Nonmodifiable Risk Factors

Increasing age is a risk factor for diabetes and cancer (Giovannucci et al., 2010). Older adult patients are at increased risk for complications associated with their comorbidities and treatments (American Geriatrics Society Expert Panel on the Care of Older Adults With Multimorbidity, 2012). The number of older adults...
with comorbidities is expected to increase, as is the incidence of cancer and diabetes (American Geriatrics Society Expert Panel on the Care of Older Adults With Multimorbidity, 2012; Giovannucci et al., 2010). An estimated 78% of all newly diagnosed patients with cancer are aged older than 55 years (ACS, 2015). Type II diabetes is more prevalent in older adults, and more than 29 million older adults in the United States have diabetes (Centers for Disease Control and Prevention [CDC], 2014). ADA (2015) suggests diabetic screening for all patients aged older than 45 years. In addition, family history is a known risk factor for the development of diabetes, particularly in first-degree relatives (CDC, 2014).

Complications of Hyperglycemia and Diabetes in Patients With Cancer
Peripheral neuropathy is prevalent in 30%–66% of diabetics, and the longer that patients are diabetic, the more likely they are to develop peripheral neuropathy (Watson & Dyck, 2015). Patients with cancer undergoing treatment are also at increased risk for peripheral neuropathy because of frequently prescribed neurotoxic drugs, including chemotherapy and biotherapy. Patients with peripheral neuropathy are at increased risk for physical impairments and decreased quality of life. Patients can experience physical distress from neuropathic pain and progressive neuromuscular

<table>
<thead>
<tr>
<th>Symptoms?</th>
<th>Yes</th>
<th>No</th>
</tr>
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<tbody>
<tr>
<td>Glucose &gt; 300 mg/dl</td>
<td>Evaluate for hyperglycemic crisis (polydipsia; dry mouth; warm, dry skin that does not sweat; high fever; sleepiness and confusion; loss of vision; hallucinations; weakness on one side of body).</td>
<td>Determine if the patient is on high-dose steroids, is dehydrated, or shows signs of infection.</td>
</tr>
<tr>
<td>Diabetic?</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Glucose &lt; 300 mg/dl</td>
<td>Notify oncologist to make referrals to primary care provider, endocrinologist, registered dietitian, and diabetic educator.</td>
<td>Consider insulin administration.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Educate on reducing risk through diet, exercise, and glucose control, and educate on risk for hyperglycemic crisis.</td>
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<td></td>
<td>Recommend self–glucose monitoring log.</td>
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<td></td>
<td>Evaluate signs and symptoms of hyperglycemia (polydipsia, polyphagia, polyuria, blurry vision, and extreme fatigue).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Notify oncologist to obtain orders for baseline A1c, if not anemic, and make referrals to primary care provider, endocrinologist, and registered dietitian.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Educate patient to reduce risk by modifying risk factors through diet, exercise, and glucose control.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If suspect hyperglycemic crisis, immediately notify oncologist and consider referral to the emergency department.</td>
</tr>
</tbody>
</table>

Note. Based on information from American Diabetes Association, 2015.
HYPERGLYCEMIA AND CANCER

weakness, which ultimately affects patients’ ability to perform activities of daily living (Tofthagen, Visovsky, & Hopgood, 2013). Evidence suggests that diabetic patients undergoing neurotoxic chemotherapy for colorectal cancer develop peripheral neuropathy at lower cumulative doses than those without diabetes (Uwah, Ackler, Leighton, Pomerantz, & Tester, 2012). Similarly, Vissers et al. (2015) found that patients with colorectal cancer and diabetes reported a higher incidence of neuropathic symptoms following chemotherapy than those without diabetes. In a study by Hershman et al. (2016), diabetic patients receiving taxane-based chemotherapy had more than twice the odds of developing chemotherapy-induced neuropathy. The researchers concluded that diabetes and increased age are independent predictors of neuropathy. Overall, diabetic patients are at a greater risk for occurrence of peripheral neuropathy and should be monitored closely for glucose levels and symptoms of neuropathy.

Patients with coexisting diabetes and cancer are at risk for developing kidney dysfunction because of the effects of diabetes and chemotherapy on the kidneys. Diabetic kidney disease occurs in about 20%-40% of patients with diabetes and is the leading cause of end-stage renal disease (ADA, 2015). Caution should be maintained when diabetic patients with cancer receive nephrotoxic chemotherapy, as they are already predisposed to renal dysfunction. Acute kidney injury resulting from nephrotoxic che-

“Patients with elevated fasting blood glucose levels and body mass index have a reduced time to tumor progression.”

motherapy has been shown to decrease glomerular filtration rates long-term (Bhat et al., 2015). In addition, compromised renal function is associated with increased mortality. Diabetic patients with cancer should be closely monitored for kidney dysfunction.

Patients with cancer with hyperglycemia are at risk for developing infections. Hyperglycemia causes prolonged inflammatory cytokine expression, ultimately leading to inhibition of the signaling pathway that detects and eliminates foreign microorganisms (Storey & Von Ah, 2012). Patients with coexisting cancer and hyperglycemia have an increased risk for life-threatening infections with ensuing poor outcomes (Magliano et al., 2015).

Diabetic patients with cancer are at risk for developing hyperglycemic crisis. Predisposing factors for this condition include infection and dehydration, which are also common factors associated with cancer and diabetes. Patients in this state develop severe hyperglycemia (often greater than 300 mg/dl) because of insulin deficiency, dehydration, and acid base abnormalities (Powers, 2015b).

Diagnosis of Prediabetes and Diabetes

The hemoglobin A1c test measures the average serum glucose levels during the previous one to three months (Nicoll, Lu, Pignone, & McPhee, 2012). It is one of the diagnostic tests used by providers to evaluate diabetic status and is convenient because it does not require fasting (ADA, 2015). In the general population, this is an excellent tool that can be used to diagnose and manage hyperglycemia. However, several factors may influence A1c results, including age, ethnicity (ADA, 2015), smoking, and conditions that affect red blood cell turnover, such as iron deficiency anemia (Hong et al., 2015) and blood transfusions (Spencer, Grossman, & Scott, 2011). Evidence suggests that A1c levels are inaccurate in individuals with anemia (Hong et al., 2015) and in those receiving blood transfusions (Spencer et al., 2011). As a result, ADA (2015) has advised against using A1c results in patients with conditions that affect red blood cell turnover. This is noteworthy because anemia is reported in 40%-75% of patients with cancer (Gobel, Triest-Robertson, & Vogel, 2015).

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FIGURE 2.
DIABETES EDUCATIONAL PROGRAM LEARNING OBJECTIVES

- Identify the etiology of diabetes and hyperglycemia.
- Identify the pathophysiology and possible biologic links between diabetes and patients with cancer.
- Identify the implications of hyperglycemia and diabetes in patients with cancer.
- Identify risk factors for the development of hyperglycemia and diabetes.
- Identify the criteria for the diagnosis of diabetes and prediabetes.
- Identify best practices and prevention strategies in the management of hyperglycemia.
- Identify medications that place patients at greater risk for hyperglycemia.
- Identify recommendations for lifestyle management of hyperglycemia, including physical activity, healthful eating, tobacco cessation, and weight management.
- Identify complications associated with prolonged hyperglycemia.
- Identify areas of referral and resources.
- Define goal of glucose levels.
- Define the recommendations for physical activity.
- Determine the usefulness of the clinical algorithm for nursing management of hyperglycemia in patients with cancer.
- Identify the likelihood that the clinical algorithm will be used in practice.
Table 2 summarizes the diagnostic criteria for prediabetes and diabetes.

Developing Education Program
Focusing on the information previously described, an educational program was designed to increase nurse knowledge and awareness of the consequences of hyperglycemia in patients with cancer. The authors also designed an algorithm to guide screening and nursing management of hyperglycemia in an outpatient oncology setting. The specific aims of this project were to (a) develop an evidence-based algorithm to guide nursing management of hyperglycemia in oncology settings and (b) evaluate efficacy of an educational program for management of hyperglycemia in an outpatient oncology setting.

Project Implementation
SAMPLE AND SETTING
The convenience sample consisted of 11 oncology nurses at University of Florida Health Cancer Center at Orlando Health. All nurses at the facility who were involved in the care of patients with cancer undergoing chemotherapy and had a current RN license in Florida were eligible.

HYPERGLYCEMIC ALGORITHM AND PROGRAM CONTENT
The clinical algorithm was based on the latest standards of care from ADA (2015). The algorithm guides the nursing process from assessment of glycemic level to intervention, which includes collaborating with the interdisciplinary team and educating the patient on self-management strategies (see Figure 1). The algorithm directs the nurse to assess for hyperglycemic crisis and intervene when glucose levels are greater than 300 mg/dl. The algorithm also includes recommended resources for glycemic control.

The educational program included information on (a) epidemiology of cancer and diabetes, (b) pathophysiology and possible biologic links between diabetes and cancer, (c) etiology and risk factors for the development of hyperglycemia and diabetes in cancer, (d) implications of hyperglycemia and diabetes in cancer, (e) criteria for the diagnosis of prediabetes and diabetes, and (f) best practices for nursing management.

PROCEDURES
Administrative approval for this project was obtained from the unit manager of the ambulatory treatment center, the Orlando Health Nursing Research Council, and the human resources committee. The project was granted exempt status by the University of South Florida Institutional Review Board (IRB) and the Orlando Health IRB. Participation in the educational program was voluntary. Notice of the educational program was distributed to potential participants throughout the center through word of mouth. The unit’s learning specialist announced the event at staff meetings and huddles about one month prior to the event.

The evaluation method employed a pre-/post-test design. Knowledge of hyperglycemia was measured immediately before and after the intervention. The pre- and post-test questionnaires were modeled after the Drass, Muir-Nash, Boykin, Turek, and Baker (1989) Diabetes Basic Knowledge Test (DBKT). DBKT is a reliable (Cronbach alpha = 0.79) instrument used to assess a nurse’s basic knowledge of diabetes and its treatment (Drass et al., 1989). Items were created to align with the objectives of this program (see Figure 2).

The pretest assessed the nurses’ baseline knowledge of hyperglycemia, diabetes, and implications for patients with cancer. The pre- and post-test included multiple-choice, choose-all-that-apply, and Likert-type scale items. The post-test assessment included an additional question that assessed the nurses’ attitudes toward implementation of a clinical algorithm. Demographic information, including level of education, employment status (full-time, part-time, or per diem), years of nursing experience, and years of oncology nursing experience, was collected. To maintain anonymity, no other identifying information (e.g., name, age, race) was collected.

DATA ANALYSIS
Descriptive statistics, including means, percentages, and frequencies, were used to describe the sample. Frequencies and

Table 3.
SAMPLE CHARACTERISTICS (N = 11)

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>n</th>
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<tbody>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Diploma</td>
<td>1</td>
</tr>
<tr>
<td>Associate degree</td>
<td>2</td>
</tr>
<tr>
<td>Bachelor of science</td>
<td>7</td>
</tr>
<tr>
<td>PhD</td>
<td>1</td>
</tr>
<tr>
<td>Received diabetes continuing education</td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>4</td>
</tr>
<tr>
<td>More than two years ago</td>
<td>7</td>
</tr>
<tr>
<td>Encounter hyperglycemic patients</td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td>2</td>
</tr>
<tr>
<td>Weekly</td>
<td>3</td>
</tr>
<tr>
<td>A few times a month</td>
<td>5</td>
</tr>
<tr>
<td>Rarely</td>
<td>1</td>
</tr>
</tbody>
</table>
percentages of correct scores for each item, as well as total scores, were calculated pre- and post-test. Total differences in percentage from pre- to post-test were calculated, and student t tests were used to compare the results from pre- to post-test to assess knowledge gained. The likelihood of implementing the clinical algorithm into practice was also described using frequencies and percentages.

Results
Demographics
Eleven oncology nurses with varying degrees of experience and education attended the educational program (see Table 3). The mean overall nursing experience was 14.7 years, and the mean oncology experience was 9.5 years. Most participants were full-time employees at the center; only one was a per diem nurse. Before the educational program, participants reported a mean score of 5.5 on a 10-point scale when asked how confident they felt caring for a patient with cancer with hyperglycemia.

Pre-/Post-Test Results
Results of the pre- and post-test are presented in Table 4. Participants had a mean pretest score of 63%. Although the pretest scores revealed areas for improvement, participants did relatively well with identifying the etiology of diabetes, biologic links between diabetes and patients with cancer, nonmodifiable risk factors, hyperglycemia-inducing medications, effective management of hyperglycemia, and associated complications. Prior to the intervention, nurses were

| TABLE 4. | COMPARISON OF PRE- AND POST-TEST MEAN SCORES (N = 11) |
|------------------------|------------------------|------------------------|
| QUESTION | PRETEST x SCORE | POST-TEST x SCORE |
| Which statement is characteristic of the etiology of type II diabetes? | 91% | 91% |
| What are the possible biologic links between diabetes and patients with cancer? | 91% | 100% |
| Identify implications of hyperglycemia in patients with cancer. | – | 29% |
| Identify the modifiable risk factors in the development of hyperglycemia and diabetes in patients with cancer. | 36% | 27% |
| Identify nonmodifiable risk factors in the development of hyperglycemia and diabetes in patients with cancer. | 91% | 100% |
| Which of the following would require referral for further evaluation of glycemic levels in a patient with cancer? | 64% | 100% |
| Which of the following patients would be classified as prediabetic? | 55% | 64% |
| Why is it important to identify prediabetes prior to undergoing cancer treatment? | 60% | 91% |
| Which of these statements about management of hyperglycemia is true? | 82% | 100% |
| Which of the following drugs have the greatest potential to increase serum glucose? | 91% | 91% |
| Which of the following chemotherapies have potential to increase serum glucose levels (without the effect of steroid use)? | – | 91% |
| Which of the following patients is most effectively managing his or her hyperglycemia, therefore reducing complications? | 100% | 100% |
| What are the complications associated with prolonged hyperglycemia? | 91% | 100% |
| Who are the most appropriate healthcare providers to provide interventions for hyperglycemia in patients with cancer? | 36% | 55% |
| You just gave your patient and his caregiver education on how to manage hyperglycemia during cancer treatment. The patient’s caregiver asks, “How much exercise should he be getting?” | 82% | 100% |
| Which of the following patients is meeting his or her glycemic goal? | 45% | 45% |
| How likely are you to request an A1c on the first day of treatment?* | 1.55 | 7.14 |
| How likely are you to use a clinical algorithm when managing hyperglycemia in patients with cancer?* | 4.55 | 10 |

*Rated on a scale of 1 (not at all likely) to 10 (very likely)

Note. Percentages indicate the percentage of participants who answered the question correctly.
not likely to request a baseline hemoglobin A1c test. In addition, nurses were not likely to use a clinical algorithm when managing hyperglycemia in patients with cancer. The mean post-test score was 80%, which was an improvement of 17% from mean pretest scores. This indicates a statistically significant (p < 0.001) change in the post-test scores. Areas of greatest improvement were identification of hyperglycemic-inducing chemotherapies and nonmodifiable risk factors. All participants believed the clinical algorithm was very useful. In addition, all participants believed the educational program was very effective at increasing knowledge and awareness of hyperglycemia in patients with cancer.

Discussion
The findings of the current study support the need for specific nursing education related to hyperglycemia in patients with cancer. Pretest scores indicated that nurses did not know the implications of hyperglycemia in patients with cancer or which medications posed a greater risk for inducing hyperglycemia. This may be because of the lack of education for nurses regarding this issue, as postintervention results demonstrated a significant increase in these scores. Most participants indicated that more than two years had passed since receiving education on hyperglycemia. Many participants indicated never receiving continuing education regarding hyperglycemia or diabetes. Hyperglycemia is often overlooked in outpatient oncology settings, and nurses in these settings may not be prepared to manage this problem. Educational programs should emphasize the role of glycemic control on improved morbidity and mortality, including cancer-related outcomes, and provide realistic guidelines for monitoring and managing glucose levels.

This program identified areas for needed improvement in nursing knowledge related to management of hyperglycemia in oncology. Although this program was specifically designed for oncology nurses, nurses are just one element of the interdisciplinary team. All members of the team must understand the consequences of hyperglycemia in patients with cancer so that effective management may take place. Additional work should aim to increase provider awareness of all implications of hyperglycemia in patients with cancer and recommend a baseline evaluation of risk factors prior to cancer treatment planning. With this baseline knowledge, providers may incorporate prevention strategies prior to the initiation of potential hyperglycemic-inducing cancer treatments.

This educational program was the first of its kind at the center. The results of this project demonstrate a statistically significant increase in nursing knowledge and awareness of the consequences of hyperglycemia in patients with cancer. In addition, nurses who participated in the program were more likely to use an algorithm guiding nursing management and intervention for hyperglycemic patients with cancer.

Limitations
This project had several limitations that may limit its integration into other practice settings. First, the authors evaluated this program specifically in the infusion center of a large urban cancer center. Other settings may differ in protocols or the nurses’ educational background. The current sample size was small, which was intentional because the goal was to improve management of hyperglycemia on a specific unit; however, the educational program and algorithm provided likely could be useful to other facilities interested in improving nursing care in this area.

Conclusion
The goal of this educational program was to provide nurses with the knowledge and tools to deliver nursing interventions for hyperglycemic patients during their cancer treatment. Educating nurses about the possible effects of hyperglycemia in patients with cancer may empower them to advocate for their patients, provide appropriate education, and promote patient self-care, ultimately leading to improved patient outcomes. This program encouraged nurses to advocate for their patients, communicate with the multidisciplinary team, and provide evidence-based recommendations to patients. Overall, the program brought excitement and awareness to this important issue of hyperglycemia in patients with cancer. Implementation of the algorithm on the unit and throughout the facility is planned.

Veronica Sampayo, DNP, ARNP-C, is a nurse practitioner in the gastrointestinal medical oncology division of the University of Florida Health Cancer Center at Orlando Health, and Cindy Toftthagen, PhD, ARNP, AOCNP®, FAANP, FAAN, is an associate professor in the College of Nursing at the University of South Florida in Tampa. Sampayo can be reached at vsampay1@gmail.com, with copy to CJON Editor@ons.org. (Submitted April 2016. Accepted September 7, 2016.)

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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