Cancer care is evolving from a solo practitioner care delivery system based on tradition and anecdotal experience to a multidisciplinary, collaborative, science-driven paradigm. Evidence-based practice facilitates optimal care quality for patients with cancer and is effected for medical and nursing practitioners through clinical practice guideline implementation. Clinician education based on principles of adult learning is one method of implementing clinical practice guidelines in clinical practice. However, research demonstrates that conventional static methods of education do little to change behavior; instead, effective education incorporates interactive formats, provides feedback, and includes reminder and reinforcement strategies. The EDUCATE (Educatin Clinicians to Achieve Treatment Guideline Effectiveness) Study offers one model for clinical practice guideline implementation using educational methods. A faculty of nurse educators, together with practice champions, carried out an intensive educational intervention comprised of multiple teaching/learning activities during a 12-month period in community oncology practices throughout the United States. In addition to an overview of clinical practice guidelines and educational methods that can be used for implementation of clinical practice guidelines, the obstacles faced and lessons learned through the EDUCATE Study are presented, along with recommendations for implementation in the practice setting.
At a Glance

- Achieving evidence-based practice relies on accurately translating research findings to application in clinical practice. The development, vetting, and dissemination of clinical practice guidelines help integrate findings into patient care.
- The existence of clinical practice guidelines is not sufficient to ensure quality patient care. Clinician adherence to clinical practice guideline recommendations is a critical factor; however, describing adherence in community-based oncology practices is absent from the literature.
- The EDUCATE (Educating Clinicians to Achieve Treatment Guideline Effectiveness) Study was developed to determine whether a systematic and comprehensive educational intervention affects adherence to clinical practice guidelines in the community oncology setting and is used to illustrate one approach to clinical practice guideline implementation.

The management of patients experiencing or at risk for developing anemia and neutropenia. Given the significant effects of these disease- and treatment-induced complications on patient survival, health-related quality of life, and healthcare costs, the literature consistently issues calls to action and asserts the critical role of oncology nurses in efforts to improve assessment and management of these complications. Oncology nurses have been initiators of projects to develop practice-specific guidelines for neutropenia and anemia (Hurter & Bush, 2007; Maxwell & Stein, 2006; Moore & Crom).

Nirenberg et al. (2006a, 2006b) addressed the state of the knowledge on neutropenia for use by oncology professionals and noted that the broad scope of oncology nursing ranges from developing and maintaining a personal knowledge about evidence-based guidelines to being leaders in disseminating information, doing research, and generating strategies for implementing neutropenia guidelines. Similarly, Hurter and Bush (2007) emphasized the central role of oncology nurses in assessing patients’ risk for cancer-related anemia, monitoring and evaluating symptoms, educating patients, and actualizing evidence-based standards of care into practice. Johnson, Moore, and Fortner (2007) also identified the responsibility of oncology nurses to improve supportive care for patients, and this role supported the rationale of the AIM Higher Initiative. The AIM Higher Initiative was designed to enhance nursing assessment, management, and dissemination of information about five targeted chemotherapy-related toxicities, including neutropenia and anemia. The AIM Higher Initiative was implemented in 15 community practice sites in the United States where oncology nurse practice champions directed the projects and did much of the work to implement processes intended to integrate evidence-based clinical practice guidelines into practice. This led to 11 types of new or refined clinical tools, practice processes, or procedures designed to improve patient care (Moore, Johnson, Fortner, & Houts, 2008), including assessment tools, patient education materials, and symptom management protocols. All of these efforts underscore oncology nurses’ need to build leadership skills to proficiently develop and facilitate clinical practice guideline implementation and to effect practice change that improves cancer care quality in community settings.

This article will review clinical practice guidelines and discuss educational approaches that may be useful for nurses who plan efforts to align practice-specific supportive care with nationally accepted clinical practice guidelines. The EDUCATE (Educating Clinicians to Achieve Treatment Guideline Effectiveness) Study, a large, randomized, multisite, two-arm study, was conducted by the National Oncology Alliance (NOA) and McKesson Specialty and funded by Amgen Inc. to examine the effects of continuing education on guideline adherence and will be used as an exemplar. NOA, a national group purchasing organization, together with McKesson Specialty, provide business and clinical solutions to community-based oncology practices. Specifically, this article will describe educational methods employed throughout the EDUCATE Study, challenges encountered in executing the educational component, and potential resolution strategies observed by nurse educators involved in the project. Lessons learned during the course of the study may be helpful in designing and launching clinical practice guideline initiatives to optimize nursing management of other disease- and treatment-induced adverse effects experienced by patients with cancer.

Defining Evidence-Based Practice Guidelines

Rutledge and Grant (2002) described evidence-based practice as “. . . care that integrates best scientific evidence with clinical expertise, knowledge of pathophysiology . . . [and] psychosocial issues, and decision-making preferences of patients.” Evidence-based clinical practice guidelines are “systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances” (Field & Lohr, 1992). Current guidelines address clinical practice variations and limitations on healthcare resources (both of which could negatively influence healthcare quality) and assist clinicians in integrating rapidly emerging scientific evidence into clinical practice. They also may be used as measures for clinician accountability and healthcare quality (Thomas, 1999).

Clinical practice guideline recommendations are based on rigorous scientifically derived data instead of anecdotal experiences, individual judgment, historical tradition, or habitual practices that, although not based on scientific findings, have become routine. This approach equips healthcare professionals with scientific evidence to support their selection of interventions, therefore lending credibility to the patient care plans they develop and helping to keep practice aligned with current state-of-the-art patient treatment and care (Feldstein, 2005). Oncology clinical practice guidelines are developed at national and international levels by organizations such as the National Comprehensive Cancer Network (NCCN), American Society of Clinical Oncology (ASCO), NOA/McKesson Specialty, and the Oncology Nursing Society (ONS) and often are adopted by hospitals, clinics, and community practices. To date, almost 200 structured cancer practice guidelines have been published by just three of the many national oncology organizations in the United States: NCCN, 114 (www.nccn.org); ASCO, 29 (www.asco.org); and NOA/McKesson Specialty, 49 (www.onmarkservices.com). Among other clinical practice guidelines
developed, some address supportive care management of anemia, fatigue, neutropenia, and infection. Recommendations set forth by any organization are consistent with recommendations published by another. For example, Tables 1 and 2 summarize key recommendations in the current McKesson guidelines for management of neutropenia and anemia in patients with cancer.

ONS also promotes evidence-based practice: Sixteen abstracts published for the 33rd ONS Congress in 2008 included evidence-based practice in their titles, and it also was a theme of several oral presentations. In addition, ONS has recently made available several Web-based resources for integrating evidence into practice (www.ons.org/evidence; www.ons.org/outcomes) including the development of Putting Evidence Into Practice (PEP) cards, which are available at and can be downloaded from www.ons.org. The PEP cards outline scientifically supported interventions to manage patient care issues determined amenable to nursing care. Fatigue, prevention of infection, nausea and vomiting, and sleep/wake disturbances were among the first evidence-based nursing guidelines in the PEP initiative in 2004 (Stanley, 2006).

Developing Guidelines

A panel of recognized experts in a particular specialty area developed a practice guideline through systematic and rigorous review of available evidence and interpretation of the findings’ relative importance to clinical care and patient outcomes. When evidence is limited, clinical practice guidelines may be derived from expert consensus opinion (Woolf, Grol, Hutchinson, Eccles, & Grimshaw, 1999). The resulting document provides information intended to improve clinical decision making, assist clinical planning, and facilitate delivery of appropriate patient care (Browman et al., 1998). Clinical practice guidelines have different purposes and formats, including protocols, policies, practice parameters, risk assessment checklists, algorithms, standards, standing orders, care maps, and clinical pathways (Maxwell & Stein, 2006; Miller & Kearney, 2004). Key characteristics and purported benefits of clinical practice guidelines are listed in Figure 1.

Applying Guidelines to Practice

Clinical practice guideline development is a rigorous task, but clinical application presents a greater challenge. Assimilating recommendations for new or modified clinical practices typically requires consensus among professionals from many different disciplines, necessitates attitude and behavior change, and is labor intensive. Successful consensus-building relies on the ability to anticipate and minimize cognitive, attitudinal, and systems barriers that frequently occur when attempting to implement practice change. Using effective education methods to raise awareness and disseminate information about the particular best practice to be established (e.g., employing interactive formats, providing feedback, incorporating reminder systems) is an important success factor (Bloom, 2005). It also is helpful if clinical practice guideline implementation planning anticipates potential barriers and includes the selection of a sound model upon which to build the initiative.

### Table 1. Evidence-Based Guidelines for Chemotherapy-Induced Neutropenia Management

<table>
<thead>
<tr>
<th>Risk Assessment</th>
<th>Treatment Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recommend primary CSF prophylaxis</strong></td>
<td>Chemotherapy regimens with an anticipated febrile neutropenia risk of more than 20% (regimen includes anthracycline or other high-risk agents, contains more than two agents, or has planned relative dose intensity more than 85%) Dose-dense chemotherapy</td>
</tr>
<tr>
<td><strong>Strongly consider primary CSF prophylaxis</strong></td>
<td>Chemotherapy regimens with 10%–20% febrile neutropenia risk and any of the following:</td>
</tr>
<tr>
<td></td>
<td>• Aged 60 years or older receiving moderate-risk chemotherapy regimens for febrile neutropenia (CHOP-like regimens)</td>
</tr>
<tr>
<td></td>
<td>• ECOG performance status of 2 or higher</td>
</tr>
<tr>
<td></td>
<td>• Poor renal function (glomerular filtration rate less than 30 or age older than 65 years and elevated creatinine)</td>
</tr>
<tr>
<td></td>
<td>• Small cell lung cancer or non-Hodgkin lymphoma with one or more of the following risk factors</td>
</tr>
<tr>
<td></td>
<td>– Serum albumin 3.5 g/dl or less</td>
</tr>
<tr>
<td></td>
<td>– Lactase dehydrogenase greater than 460 units/L</td>
</tr>
<tr>
<td></td>
<td>– Lymphomatous spread to bone marrow</td>
</tr>
<tr>
<td><strong>Consider primary CSF prophylaxis</strong></td>
<td>Chemotherapy regimens with 10%–20% febrile neutropenia risk and the following:</td>
</tr>
<tr>
<td></td>
<td>• Prior radiation to the pelvis or any area containing more than 20% of the bone marrow</td>
</tr>
<tr>
<td></td>
<td>• Preexisting neutropenia (absolute neutrophil count less than 1.5 x 10⁹/L)</td>
</tr>
<tr>
<td></td>
<td>• Conditions that could enhance the risk of serious infection (factors predictive of clinical deterioration, diabetes mellitus, decreased immune function, open wounds, or active tissue infection)</td>
</tr>
<tr>
<td></td>
<td>• Advanced cancer</td>
</tr>
<tr>
<td></td>
<td>• Serum albumin at 3.5 g/dl or less</td>
</tr>
<tr>
<td></td>
<td>• Extensive prior chemotherapy</td>
</tr>
<tr>
<td></td>
<td>• History of recurrent febrile neutropenia while receiving chemotherapy of equal or lesser bone marrow toxicity</td>
</tr>
<tr>
<td></td>
<td>• Bone marrow metastasis</td>
</tr>
<tr>
<td></td>
<td>• Aged 65 years or older</td>
</tr>
<tr>
<td><strong>Secondary CSF prophylaxis</strong></td>
<td>Documented febrile neutropenia episode with previous chemotherapy cycle</td>
</tr>
<tr>
<td></td>
<td>Prolonged neutropenia causing excessive dose reduction or delay in curable or adjuvant setting</td>
</tr>
</tbody>
</table>

* CSF prophylaxis provided with filgrastim, pegfilgrastim, or sargramostim at recommended dosages and schedules of administration

CHOP—cyclophosphamide, doxorubicin, vincristine, prednisone; CSF—colony-stimulating factor; ECOG—Eastern Cooperative Oncology Group

Note. Based on information from Onmark-McKesson, 2007.
Barriers to Clinical Practice Guideline Implementation

Clinician awareness, environmental conduciveness, and perceptions and attitudes of involved clinicians must be compatible with project goals. An array of potential attitudinal obstacles to clinical practice guideline integration is described in the literature. One review of 30 attitude-related studies conducted between 1990 and 2000 revealed that clinicians generally perceived clinical practice guidelines to be helpful clinical tools intended to improve patient care but were concerned that guidelines might be impractical and too rigid to apply to individual patients, were designed as a cost-cutting measure that could jeopardize patient care, could interfere with clinician autonomy in clinical decision-making, and might increase litigation or disciplinary action (Farquhar, Kofa, & Slutsky, 2002). In a survey supported by ASCO, oncologists and health maintenance organizations were queried about perceptions regarding four ASCO guidelines, including those for use of colony-stimulating factors (Bennett et al., 2003). The investigators found that physicians in community-based practice settings were more likely to read clinical practice guidelines than investigators in academic practices and, although the majority of respondents reportedly agreed with the guidelines as written, less than 40% actually used them. The authors concluded that additional research is needed to define barriers to clinical practice guideline implementation and to determine the effects of clinical practice guidelines on clinical practice.

Models for Integration

Implementing clinical practice guidelines should follow a step-by-step process, requiring an identified champion to lead the effort, involving clinician education, and occurring over time. A variety of models for integrating clinical practice guidelines that draw from behavior change theory and principles of adult learning have been developed. These models typically address general internal medicine practice but can be applied to specialty areas such as oncology. One example is the Awareness to Adherence Model developed by Pathman, Konrad, Freed, Freeman, and Koch (1996) for vaccination adherence among pediatric primary care practitioners. This model can provide a rational framework within which to consider implementation of oncology clinical practice guidelines. The model proposes four progressive cognitive steps for clinical integration of evidence-based practices; each phase is associated with specific types of clinician interactions (see Figure 2). Although the phases are presented as discrete steps in the process, considerable overlap exists in actual practice.

The EDUCATE Study: A “How to Educate” Exemplar

The EDUCATE Study was designed to examine the effects of systematically educating clinical staff in community oncology office practice settings about NOA/McKesson Specialty anemia and neutropenia practice guidelines. The effect was measured through healthcare professional or prescriber adherence to the guidelines. Enrolled practice sites were randomized to one of two groups: educational intervention group or control group (did not receive education). The randomization occurred at the practice site level in an intervention-to-control ratio of 2:1; 31 of 48 sites enrolled and were randomized to the intervention group. A 2:1 ratio was used to encourage enrollment, minimize bias, and enhance generalizability. A central institutional review board was used for approval of the protocol, informed consent documents, and other written subject information. Patient data were identified via encrypted numbers.

Site and Healthcare Professional Enrollment, Randomization, and Characteristics

Sites were recruited from five regions of the United States: Northeast, Southeast, Midwest, Southwest, and Pacific Northwest/West Coast. All sites were members of the NOA/McKesson oncology network. Practices were sent a mailer introducing the concept of the study and were encouraged to contact the sponsor if they were interested in participating. McKesson customer service members also directly contacted the sites. Interested sites were screened for eligibility with a questionnaire, and a site visit was scheduled if a practice was deemed to be a candidate. At the site visit, the practice had to demonstrate that the healthcare team could identify sequential patient charts as eligible medical records for data analysis and that the charts were complete enough for eventual chart abstraction. Eligibility for participation included practice sites that

- Had more than 150 new patients per healthcare professional annually to provide a sufficient number of sequentially eligible medical records for data analysis
- Employed at least one full-time RN in the chemotherapy infusion area

Table 2. Evidence-Based Guidelines for Chemotherapy-Induced Anemia Management

<table>
<thead>
<tr>
<th>RISK ASSESSMENT</th>
<th>TREATMENT GUIDELINES</th>
</tr>
</thead>
</table>
| **Recommend ESA therapy** | Hemoglobin less than 11 g/dl or hemoglobin 11–12 g/dl with the following anemia-associated symptoms
- Chest pain
- Peripheral edema
- Sustained tachycardia
- Severe fatigue
- Dizziness |
| **Consider ESA therapy** | Hemoglobin 11–12 g/dl with the following risk factors for development of symptomatic anemia
- Transfusion in past six months
- History of radiation therapy to more than 20% of the skeleton
- History of prior myelosuppressive therapy or significant myelosuppressive potential with current regimen
- Cardiopulmonary comorbidities (chronic pulmonary disease, cerebral vascular disease, cardiac history, or decompensation)
- Aged 65 years or older |

*a ESA therapy provided with darbepoetin alfa or epoetin alfa at recommended dosages and schedules

ESA—erythropoiesis-stimulating agent

*Note. Based on information from Onmark-McKesson, 2007.*
• Recommend “best practice” management of specific diseases and conditions.
• Based on best and most current available evidence and expert consensus.
• Sponsored by recognized organizations or are institution-based.
• Lend credibility to and scientifically support patient management decisions.
• Decrease variations in and align practice with nationally accepted standards of care.
• Serve as clinical tools or resources that complement clinician knowledge and skills and facilitate the delivery of optimal patient care.
• Streamline clinical practice, making work less cumbersome and time-consuming.
• Serve as a mechanism for clinician accountability and quality monitoring.
• May facilitate reimbursement by third party payers for clinical services.

Figure 1. Clinical Practice Guideline Characteristics and Benefits

- Were willing to appoint a practice champion and to make all practice clinicians available for the educational intervention.
- Had not implemented practice-wide systems for erythropoiesis-stimulating agent or colony-stimulating factor use.

Study Participants

Study participants were prescribers (i.e., physicians, nurse practitioners, and physician assistants) employed in community-based medical or gynecologic oncology practices. Two groups of prescribers were identified: those who agreed to have their practice behavior evaluated (referred to as healthcare professionals) and those who were not being evaluated (known as non-healthcare professionals). Another group were nonprescribers (i.e., RNs, licensed practical nurses, and pharmacists) and were referred to as clinical support staff. Eighty-four healthcare professionals (77 physicians, 5 nurse practitioners, and 2 physician assistants) at 48 sites were enrolled in the study. Two hundred sixty-eight healthcare professionals and clinical support staff were included in the educational intervention: 154 RNs (58%), 71 physicians (26%), 16 (6%) licensed practical nurses, 13 (5%) nurse practitioners or physician assistants, and 3 (1%) pharmacists. The remaining 11 (4%) participants were medical assistants, laboratory technicians, and administrative staff. The number of enrolled healthcare professionals remained constant throughout the project, but the number of total participants in the educational intervention changed somewhat because practice staffing patterns were dynamic.

Communications

Practice champions identified at each site were responsible for identifying and preparing charts for data abstraction, scheduling study-related visits and activities (e.g., data abstraction, educational intervention activities for intervention group sites including didactic presentations and standing order development), and monitoring interventions to encourage adherence among participating staff with the prescribed educational programs (e.g., scheduling staff to permit participation, providing staff reminders to complete Web-based exercises). Most practice champions were RNs; a few were physicians, licensed practical nurses, or practice administrators. The practice champion served as the onsite point person and communicated with study personnel regarding scheduling of interventions, practice staffing changes (for purposes of delivering the educational intervention), and other issues that could affect clinical practice guideline implementation (e.g., unanticipated staff absences, practice policy or documentation changes). Practice champions also were responsible for other functions, such as facilitating creation of e-mail addresses for each staff member to enable participation in Web-based clinical case vignettes.

EDUCATE Faculty

A faculty comprised of five oncology nurses with extensive experience in the clinical setting as well as with implementation of quality-improvement projects was recruited by the study sponsor; each was assigned to one of the five study regions. Known as oncology nurse educators, these faculty members qualified sites for enrollment, provided initial orientation of enrolled practices to the educational intervention, and delivered the didactic components of the intervention. In addition, oncology nurse educators provided onsite and telephone consultation to practice champions for development and implementation of standing order sets that addressed use of erythropoiesis-stimulating agents and colony-stimulating factors and generally liaised with them to ensure smooth execution of the educational component of the study. Oncology nurse educators received specialized training and were provided with literature summarizing study findings that supported NOA/McKesson Specialty anemia and neutropenia clinical practice guideline recommendations, three standardized Microsoft® PowerPoint® presentations reflective of the evidence and resulting clinical practice guidelines, and other teaching tools to enable effective and consistent content delivery. They also had access to all instructional materials (e.g., paper...
mailings, Web-based content) distributed to study participants. Regularly scheduled teleconferences and e-mail communications among the oncology nurse educators team provided an opportunity to share experiences and receive updated information and study-related tools from the principal investigator. The faculty provided input and feedback to the principal investigator on content and delivery methods throughout the study.

Comprehensive Educational Intervention

The specific goal of the educational program was to raise clinicians’ awareness about NOA/McKesson Specialty guidelines for anemia and neutropenia management and to familiarize clinicians with the details of those guidelines and the related evidence base for the recommendations. The scope of the guideline education included risk assessment, appropriate initiation and maintenance of erythropoiesis-stimulating agent and colony-stimulating factor therapies, and patient monitoring. The curriculum was developed from the NOA/McKesson Specialty chemotherapy-induced anemia and neutropenia clinical practice guidelines and was divided into categories including neutropenia and anemia risk assessment parameters (patient and chemotherapy regimen-specific risk factors in the case of neutropenia, and patient-specific factors in the case of anemia), recommendations for colony-stimulating factor administration (primary and secondary prophylaxis applications, dosing, monitoring, and duration of use), and recommendations for erythropoiesis-stimulating agent use (hemoglobin targets, initial dosing, monitoring, dose titration related to hemoglobin response, and parameters for erythropoiesis-stimulating agent discontinuation). Practice site randomization for participation in the EDUCATE Study occurred in June and August 2006, and the intervention was designed to continue for 52 weeks (through the beginning of August 2007). However, because of FDA regulatory events and changes to erythropoiesis-stimulating agent labeling and published anemia guidelines, the end date for chart abstraction was modified to February 28, 2007.

The comprehensive educational intervention reflected principles of adult learning and recommendations for using professional education as a clinical practice guideline implementation strategy (Merriam, 2001; Ockene & Zapka, 2000). The program

- Was based on clinical experience in community oncology practice
- Addressed topics with immediate relevance to oncology clinical practice (i.e., anemia and neutropenia in patients undergoing chemotherapy)
- Reflected compelling evidence related to managing anemia and neutropenia
- Was issue-centered (i.e., early recognition and intervention to prevent or minimize anemia and neutropenia-associated risks)
- Used a learner-centered, multimodal teaching learning approach (i.e., weekly interventions using a variety of methods for a one-year period) to accommodate variations in participant learning styles and preferences
- Engaged participants in active experiential learning (i.e., through day-to-day patient risk assessment, administration of erythropoiesis-stimulating agent and colony-stimulating factor, and monitoring) and debriefing (i.e., study-generated reports detailing healthcare professional behavior and case vignette quiz results)
- Involved learner-directed activities (i.e., opportunities for self- and practice assessments and development of customized standing orders and documentation forms)
- Provided feedback mechanisms to apprise learners of their progress (i.e., study-related reports detailing healthcare professional behavior and case vignette quiz results)
- Delivered content consistently and repetitively to reinforce concepts presented and participant learning.

In addition, learning activities were user-friendly and tailored to individual practice site operations. Oncology nurse educators began to establish relationships with staff of participating sites during the qualifying site visits, forecasted the planned educational intervention as part of an orientation session, and encouraged practice champions to discuss how they might need to customize program delivery for their particular sites. Oncology nurse educators worked with practice champions to identify site visit dates that coincided with the highest number of available staff, including all healthcare professionals. They also worked together to determine the timing that was most convenient given their patient schedule for those days. To accommodate busy patient schedules and limited staffing in some settings, oncology nurse educators frequently delivered content in treatment rooms (when patients were not present) to avoid gaps in patient monitoring. They also substituted hard-copy slides for the more formal projected slide show when appropriate, particularly in small, rural practice settings.

Program content was systematically presented over 12 months. Oncology nurse educators delivered the live didactic component of the educational program to healthcare professionals, non-healthcare professionals, and supportive care staff of the enrolled sites in their assigned regions. This consisted of three in-depth, 50-minute slide presentations presented at predetermined intervals throughout the year. Each live presentation was followed at timed intervals by a series of weekly educational activities designed to reinforce the specific content introduced during the didactic presentations. Content was repeated in a variety of formats as outlined in Figure 3.

Week 1. Case vignette
Addressing a patient with non-Hodgkin lymphoma who has risk factors

Week 2. Mailer: two articles

Week 3. Giveaway
Beverage coaster detailing primary prophylaxis criteria

Week 4. Other
Patient education handout addressing cancer-induced nausea and growth factor use

Figure 3. Four-Week Sample of Educational Interventions
Educational content was organized as 12 modules that addressed different aspects of managing patients at risk for or diagnosed with anemia and/or neutropenia. One unique element of the intervention was the Web-based learning tool. Adobe® Macromedia Breeze™ was used to introduce new educational modules the first week of each month. The clinical content for each module was presented through 15-minute case vignettes and interactive self-assessment quizzes. Participants received e-mail alerts to complete the Web-based activity, which involved logging into the Web site hosting the content, reviewing the case vignette, and answering a series of related multiple-choice questions. The activity was designed to permit continuation only after each question was answered correctly. Quiz scores were tracked and participants were able to view their results in comparison with national participants’ results at the end of each vignette. As a follow-up, reminder e-mails were sent to participants who had not yet completed the case vignettes.

A variety of learning materials also were mailed to practice champions. The materials then were distributed to all participants in the subsequent weeks of that month. During week two of each month, participants received a peer-reviewed publication that supported the content presented in the previous week’s case vignette along with a one-page summary document. During week three, participants received a “giveaway” (i.e., water bottle, coaster, mouse pad with printed facts related to clinical practice guideline content, or a pocket-sized laminated dosing card). In week four of each month, participants received either a patient education tool (four total), a newsletter summarizing study progress and reinforcing key learning points (three), a survey to collect participant feedback and assess knowledge retention (two), or a healthcare professional–specific report comparing baseline clinical practice guideline adherence to overall cohort adherence (one).

Patient education tools were designed for immediate use in the clinical setting and were structured to be easily understood and used by patients (e.g., lay reading levels, appropriate print size, illustrative graphics). Materials included symptom management handouts describing chemotherapy-induced anemia and neutropenia along with their associated signs and symptoms, methods of coping with these effects, and situations in which it would be appropriate to contact the physician. Drug-specific handouts addressed each medication for managing anemia and neutropenia and were created in accordance with the Department of Health and Human Service’s Keystone Guidelines for Provision of Medication Information to patients (U.S. Food and Drug Administration [FDA], 2006). Another tool introduced to participants was the Patient Passport. Presented as a hard-stock, wallet-sized card that could be customized to help patients communicate with the health team, this tool was designed to provide patient-related information to assist with patient prioritization in the case of emergency department triage. Information contained in the Patient Passport is depicted in Figure 4.

In addition to the three onsite visits to deliver educational slide presentations and meet with practice champions, oncology nurse educators made a fourth site visit to implement customized standing orders for neutropenia risk assessment, anemia assessment,
and appropriate erythropoiesis-stimulating agent and colony-stimulating factor use. Standing orders were relevant to practices that opted to include this component of the project. This activity was a learner-driven interactive educational intervention built on the principles of experiential learning and reinforcement and was applicable as a quality improvement exercise.

**Adherence Program**

To promote educational program adherence, practice champions were asked to encourage participant completion of the assigned activities. For example, practice champions received e-mail reminders to distribute the hard-copy mailers and monthly case vignette completion reports to each site participant. A variety of incentives designed to promote adherence with the prescribed educational program also were built into the intervention. Participants were presented with value-added giveaways that contained educational content and ONS continuing nursing education (CNE) credit was offered to RNs for attending onsite presentations and completing all 12 Web-based case vignette quizzes. Participants also likely were motivated by the belief that the knowledge gained would potentially improve their clinical performance and, ultimately, would optimize the patient care they delivered. Continuing education was not offered to physicians.

**Findings and Observations**

The EDUCATE Study had a pre-/post-test design to examine the effect of an intense educational intervention on healthcare professional adherence to clinical practice guidelines for anemia and neutropenia. The control group was used to examine changes in practice patterns during the study period, unrelated to the educational intervention. To examine this impact, data were abstracted from de-identified patient medical records for intervention and control sites at two time periods. Baseline abstraction included data from charts identified for the time period beginning one year before randomization; the second abstraction was intended to include data from charts for the time period beginning at randomization until one year after randomization. Baseline anemia data from patient charts beginning one year prior to randomization were analyzed with respect to guideline adherence and will be presented in Naeim et al. (in press). Patients whose records were selected for data collection were those with specific malignancies who were receiving or who had received myelosuppressive chemotherapy. Risk factors for developing neutropenia and/or symptomatic anemia related to planned chemotherapy were abstracted, along with related laboratory results, chemotherapy profile (regimen intent, planned and actual drug doses, and occurrence of and reasons for dose reductions or delays), incidence of neutropenic and febrile neutropenic events, presence of symptoms associated with anemia, and erythropoiesis-stimulating agent and colony-stimulating factor use. The EDUCATE Study design also allowed for an evaluation of participant attendance at and adherence to educational activities assigned as part of the comprehensive educational intervention. Assessing participant adherence to the educational intervention was simple and involved reviewing attendance records, quiz completion rates, and participant evaluations at each onsite presentation. Oncology nurse educators also interacted with practice champions and staff to determine reasons for non-completion of assigned educational activities.

**Baseline Clinical Practice Guideline Adherence**

The appropriateness for treatment, dosage and timing of treatment initiation, and discontinuation were used to measure practitioner adherence to recommendations for use of both colony-stimulating factors and erythropoiesis-stimulating agents. Baseline (pre-intervention) evaluation of clinical practice guideline adherence in the enrolled practice sites revealed a discrepancy between healthcare professional behavior and NOA/McKesson Specialty clinical practice guideline recommendations for pharmacologic management of anemia and neutropenia (Friedman et al., 2007; Naeim et al., 2007). Pre-intervention nonadherence occurred in dosage, timing of initiation and discontinuation, drug administration, and laboratory monitoring schedules, documenting the quality gap that continued to exist despite the existence of clinical practice guidelines for management of neutropenia and anemia. This discrepancy is consistent with other observations regarding guideline adherence in oncology and supported conducting the educational intervention (Malin et al., 2006).

**Educational Intervention Adherence**

Educational adherence was measured in three discrete categories: attendance at onsite presentations, completion of Web-based case studies, and participation in standing order implementation. Overall attendance at the three live onsite presentations was highest for the first kickoff presentation (77%) and dropped to 60% and 59%, respectively, for sessions two (focused on neutropenia) and three (focused on anemia). Specific data about reasons for nonattendance were not documented, but oncology nurse educators observed or reported a lack of interest in or perception of existing mastery of the content by practice staff; lack of availability of practice staff at the time of scheduled presentations secondary to dynamic patient workload demands, vacation schedules, and other unanticipated absences from the site (i.e., changes in rounding schedules, clinical emergencies, and personal issues); and inadequate communication regarding scheduled presentation dates and/or times. Nurses were consistently more likely to attend the sessions compared with physicians. Attendance records reveal that 85% of RNs versus 60% of MDs attended the kickoff session, 69% of RNs versus 24% of MDs attended session two, and 71% of RNs versus 37% of MDs attended session three. Possible reasons for higher attendance among nurses are that nurses may be more likely than physicians to attend presentations delivered by a nurse, perceive supportive care issues to be of greater importance compared to physicians, be more committed to follow through on project instructions, or simply have been more available to participate than physicians. In addition, because nurses drive supportive care management in many settings, related guidelines and treatment may be perceived to be a nursing issue.

Within the healthcare professional group enrolled in the study and for whom prescribing information was evaluated, 62% attended the kickoff education session, but their adherence with education dropped for the remaining two sessions to 35% and 37%, respectively. Reasons for the decline in healthcare
professional attendance are unclear but might be attributable to workloads, scheduling, and unanticipated events. Interestingly, non-healthcare professional physicians demonstrated higher educational adherence during sessions two and three compared with enrolled healthcare professional physicians (52% versus 33% and 43% versus 35%, respectively). Scheduling factors may explain this result. Alternatively, non-healthcare professional physicians may have been encouraged to attend by their healthcare professional physician colleagues who knew they would not be able to attend the sessions. Figure 5 summarizes attendance among all participants in the study at the three on-site presentations.

Completion of Web-based case vignettes was monitored as a per event basis. Overall, participants completed 2,190 of 3,037 possible case vignette events (72%) during the 12-month educational intervention period. Again, nurses were more likely than physicians to complete case vignettes (77% versus 60%) (see Figure 6). Higher nurse completion rates may be attributable to the availability of continuing education units, which were not offered to physicians as part of this study. Possible reasons that 28% of the case vignette events were not completed may be related to lack of computer access or lack of computer skills among some participants. Overall educational adherence declined over time for both groups, although physician completion declined more than nurse completion over the 12-month period.

Twenty-one of 31 (68%) enrolled intervention sites decided to participate in the standing order component of the study. The remaining 10 sites declined for various reasons, including lack of interest, physician preference not to use template documents, the perception that standing orders would be too time-consuming or concerns they were not compatible with specific clinic systems and documents, and recent practice efforts to develop protocols. For the practice sites opting to implement them, standing order templates were provided with instruction to customize the document to practice patterns and operations while maintaining accepted NOA/McKesson Specialty clinical practice guideline recommendations. Oncology nurse educators conferred with practice champions during the customization period and again once the documents were finalized to plan for implementation. Oncology nurse educators scheduled site visits to review the implementation plan and set timelines for initiation of standing orders. Practice champions and healthcare professionals in all 21 sites completed the development phase of this component of the project, but implementation was hampered for several sites by a variety of events, including competition with established forms and procedures, conversion from paper to electronic medical records, and labor intensity. To date, the impact of the educational intervention, as it relates to prescribing patterns, has not been analyzed. A number of factors have posed challenges in conducting the analysis, including regulatory and guideline changes related to erythropoiesis-stimulating agent use, which required the study period to be modified because of the potential impact on prescriber behavior and the large number of patient regimens which were not able to be analyzed by guidelines for febrile neutropenia risk.

Lessons Learned and Nursing Implications

Oncology nurse educators’ experiences and continued communication during execution of the EDUCATE Study provided important insights about the design of action plans to integrate supportive care clinical practice guidelines into day-to-day practice. The researchers learned several lessons about CNE program design elements. Although CNE does provide an important bridge between evidence-based guidelines and actual delivery of care to patients with cancer, to be effective it must not only draw from theories of adult learning but also be planned and executed in a manner compatible with the culture and character of the particular practice setting. In addition, education and implementation plans must be flexible enough to integrate emerging research data and, subsequently,
changing guidelines for practice and care that can occur during implementation.

The comprehensive educational intervention designed for the EDUCATE Study was based on a sound foundation and included the key elements necessary for success. However, the complexity of the program made it costly and resource-intensive and it likely would not be duplicated as originally designed. Elements of this program model could be effective, however, if planned on a smaller scale and if internal practice staff rather than oncology nurse educators external to the practice were more intensively engaged to lead implementation. The 12-month duration of the program and the high degree of content repetition also were problematic and may actually have dissuaded participation over the life of the educational intervention as evidenced by the declining participation. Although content reinforcement through repetition is a recognized learning enhancement strategy, it must be used judiciously to prevent “learner exhaustion” and loss of interest (Merriam, 2001). The protracted educational intervention period also introduced the element of changing guidelines midproject, as emerging clinical trial data about erythropoiesis-stimulating agents prompted FDA health advisories detailing risks associated with erythropoiesis-stimulating agent use and corresponding product label changes in March 2007, followed by Centers for Medicare and Medicaid Services reimbursement modifications in July 2007. The erythropoiesis-stimulating agent developments evolved as the EDUCATE Study was near conclusion and interfered with preplanned presentations as well as standing order implementation efforts. Post-randomization abstraction for the EDUCATE Study, as specified in the original study protocol, was intended to include data from patient charts for the time period beginning at randomization until one year after randomization (i.e., potentially until August 1, 2007). However, because of the unpredictable impact of external events, the end date for eligibility chart abstraction was modified to February 28, 2007. The dynamic nature of clinical practice guidelines must be considered when planning implementation efforts, and the plan must be flexible with mechanisms to accommodate guideline changes in a timely way.

The use of a variety of educational formats to deliver content was a positive aspect of the educational program design. However, shortening the time commitment for each activity could enhance the program’s overall desirability. This particularly applies to nursing staff who reported high satisfaction with the program as a whole but, at the same time, expressed a degree of frustration that they could not devote the time required to take full advantage of the learning opportunities. As clinical staff time is at a premium, conducting live activities onsite during the regularly scheduled work day is challenging. Electronic activities, which can be accomplished at the clinician’s convenience, may be more preferable. Live presentations should be shortened to 20 minutes at most. Web-based software survey tools could be employed for educational needs assessment. If staff is appropriately oriented, the use of Web and teleconferencing technology to deliver content can decrease resource requirements, increase efficiency, and generally ease the process for clinicians.

Standing orders are difficult to execute in the best of circumstances, particularly over a relatively short period of time that may not allow for staff input and buy-in. In addition, measuring to what extent standing orders are implemented can be difficult because practices differ operationally; standing orders may be integrated in nonstandard ways by necessity. Unanticipated events also can derail implementation plans. For example, most practices did not have electronic medical records when the study began, but several were investigating or purchasing electronic medical record products which rendered paper standing order sets obsolete by the time they were introduced. Specific knowledge of existing documents, planned documentation enhancements, workload changes, and other environmental and systems characteristics should be assessed before initiating efforts to introduce standardized order sets. In addition, timing implementation plans to coincide with other planned practice changes is key to successful clinical practice guideline integration.

Another lesson was that a project champion with strong leadership skills and a commitment to the project is vital to the success of practice change efforts. The project champion helps keep staff on track in the face of competing demands in a busy community oncology practice and to sustain the high level of collective motivation necessary to fully effect the particular practice change goal. In the EDUCATE Study, designated practice champions worked closely with oncology nurse educators to keep the project moving smoothly. In actual practice, however, project champions are less likely to have such collegial support and must be strong advocates to maintain available time to devote to practice change projects.

Finally, the awareness-to-adherence model (Pathman et al., 1996) provides a context within which clinical practice guideline implementation planning can take place. The EDUCATE Study actually unfolded progressively in a manner similar to the awareness-to-adherence model, although each phase merged with the next and actually overlapped at various times rather than having discrete starting and stopping points. The awareness phase coincided with the project launch when practice sites were being recruited and extended throughout the initial months of the project as new clinical practice guideline information was presented.
to participating clinicians. The agreement phase occurred when practices considered the key messages delivered during recruitment efforts and agreed to participate in the project. Their participation represented agreement to consider implementation of selected clinical practice guidelines. Small group discussion and exposure to opinion leaders’ recommendations took place at least during each of the sessions presented by oncology nurse educators and, in many practice sites, continued throughout the study. The development and execution of standing orders represented the adoption phase. One of the most consistent practice changes was the incorporation of patient iron stores monitoring and subsequent iron supplementation protocols. Adherence actually started sometime after awareness-building and likely extended throughout and after the study period or until practitioners or practice teams determined that there should be additional or different policy or practice changes.

**Conclusion**

Oncology nurses are strategically positioned to assume leadership roles in effecting practice change efforts but require familiarity with clinical practice guidelines and behavior change theory. In addition, the process requires the development of skills in presentation, negotiation, consensus building, group facilitation and project management to achieve successful implementation. Designing and executing an effective educational intervention is a primary pathway to clinical practice guideline implementation. Table 3 outlines 10 actions to anticipate and meet the challenges that can interfere with successful clinical practice guideline implementation in community practice settings.

However, the challenge does not end with initial clinical practice guideline implementation. Bennett et al. (2003) proposed that sustaining clinical practice guideline adherence following initial implementation requires four criteria to be met: an overarching

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<th>Table 3. Ten Actions for Successful Clinical Practice Guideline (CPG) Implementation in Community Oncology Practice Settings</th>
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<tr>
<td><strong>ACTION</strong></td>
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<tr>
<td>Obtain buy-in from practice principals.</td>
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<td>Appoint a project lead and provide clear role description.</td>
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<td>Ascertaining target audience interests, preferences, and perceptions.</td>
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<td>Identify and minimize potential systems, resource, and attitude barriers.</td>
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<tr>
<td>Customize educational intervention to the needs, interests, and operations of the community oncology practice.</td>
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<td>Build in opportunities for flexibility.</td>
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<td>Tell them and tell them again to reinforce concepts.</td>
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<td>Engage staff members in the educational intervention process.</td>
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<tr>
<td>Develop a follow-up educational plan for sustaining CPG adherence.</td>
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<td>Evaluate outcomes of the educational intervention at designated time points.</td>
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strategic plan that underscores the importance and value of clinical practice guidelines; a work culture that promotes clinical practice guideline adherence; technical support to disseminate clinical practice guideline-related information, monitor, and provide feedback on clinician adherence; and mechanisms that make access to and use of clinical practice guidelines in day-to-day practice easy and efficient. Another point that should be addressed, and which impacted the design of the EDUCATE Study, is the need to update guidelines and clinical practices to be consistent with development within evidence-based medicine. Once they have initiated change in their practice settings, oncology nurses can facilitate long-term success by mobilizing actions to ensure that the criteria are met.

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