ABSTRACT

Myelosuppression represents a significant complication of cytotoxic cancer therapy, and has also been reported as a toxicity associated with novel targeted therapies. Patients with cancer are at increased risk for anemia and neutropenia. Anemia may result from chemotherapy, radiation therapy, or from the cancer itself, whereas neutropenia is most often observed with myelosuppressive therapies. Patients with anemia may experience reduced quality of life, with accompanying symptoms, including fatigue or dyspnea. Anemia has also been investigated as a potential prognostic factor associated with reduced treatment efficacy. Neutropenia renders patients vulnerable to infectious diseases and can lead to dose reductions and delays in therapy, which has the potential to affect tumor response and even survival. Guidelines for supportive care that encompass anemia and neutropenia include a focus on careful assessment of risk; evaluation and documentation of symptoms and changes over time; planned interventions, including myeloid growth factors for prophylaxis and treatment; and appraisal of the response to interventions. A variety of agencies and organizations have published guidelines relating to anemia and neutropenia in cancer, which may be evidence-based and/or consensus-based. The consensus guidelines for management of cancer-related anemia and neutropenia developed by the National Comprehensive Cancer Network serve as the focus for this article. (Adv Stud Nurs. 2005;3(9):300-309)
and delays in therapy. These outcomes potentially may adversely affect quality of life (QOL), tumor response, or even survival. As with anemia, the risk of severe neutropenia varies with the type and intensity of therapy delivered. The risk of life-threatening neutropenia may range from 20% to 70%, depending on the specific treatment regimen used.

**Etiology of Anemia and Neutropenia**

**Erythropoiesis and Underlying Mechanisms of Anemia in Cancer**

The etiology of anemia in cancer is multifarious in nature. The growth factor erythropoietin (EPO), which is produced primarily in the kidneys, controls the process of erythropoiesis, regulating the proliferation, differentiation, and survival of erythroid cells. Renal EPO acts in the bone marrow, and is responsible for maintaining homeostasis due to stable conditions, in addition to quickly responding to increased oxygen demands by increasing red cell production. The red cells leave the bone marrow in the form of reticulocytes, which mature over a day into erythrocytes with a life span in the circulation of approximately 120 days, during which they deliver oxygen to the tissues. Anemia represents a decrease in circulating erythrocytes and a lowered hemoglobin level. As oxygen delivery is reduced secondary to anemia, tissue hypoxia occurs, generating a series of physiologic responses as the body attempts to gain or maintain and improve tissue oxygenation.

In addition to the anemia that occurs as a result of the cancer itself (anemia of chronic disease), other possible underlying causes of anemia in patients with cancer include hemorrhage or blood loss, replacement of normal bone marrow cells by tumor cells, functional damage to bone marrow because of the myelosuppressive effects of chemotherapy and radiation therapy, hemolysis, nutritional deficiencies, and compromise of kidney function, such as by nephrototoxic agents. Individually or in combination, these factors may lead to impaired EPO production, decreased sensitivity to EPO, and a consequent reduction in erythroid progenitor cells. Anemic patients with cancer usually have a blunted EPO production or a deficient response to EPO, which may be further exacerbated by when chemotherapy is administered. The normal range of serum EPO is 5 to 30 mU/mL, although serum EPO is not routinely assessed in patients with cancer. For those patients whose endogenous EPO levels are abnormally low, based on the degree of anemia experienced, the administration of exogenous EPO administration, through erythropoiesis-stimulating therapies, may be beneficial. However, if endogenous levels of EPO are adequate, the addition of exogenously administered EPO may be of little help in alleviating the anemia. This explains in part why response to erythropoiesis-stimulating therapy may be varied and why a dose-response effect is not consistently observed. Patients with anemia may experience reduced QOL, with accompanying debilitating symptoms, including fatigue or dyspnea. Anemia has also been investigated as a potential prognostic factor associated with reduced treatment efficacy and reduced survival.

**Neutrophil Physiology and Underlying Mechanisms of Neutropenia in Cancer**

The primary function of the neutrophil is to rapidly deploy to sites of infection and destroy the invading microorganism through the process of phagocytosis. Neutrophils are also actively recruited to sites of inflammation. The neutrophil life cycle is defined by bone marrow, blood, and tissue phases. The bone marrow stores approximately 8.8 x 10^9 neutrophils, and neutrophil maturation in the bone marrow takes approximately 14 days. Circulating neutrophils account for less than 10% of the body’s neutrophils, or approximately 0.7 x 10^9 cells. Neutrophils are released into the blood as a result of several factors and, once in the circulation, have a half-life of only 6 to 9 hours. The physiology of neutrophils takes on further importance when applied to prophylactic and therapeutic interventions for neutropenia in cancer.

Neutropenia, defined as a neutrophilic granulocyte count of lower than 1500/mm^3, may be because of a decrease in production of granulocytes, a reallocation of neutrophils from the circulation to the tissue or marginating neutrophil pool, increased neutrophil destruction, or a combination of these factors. In patients with cancer, the primary cause of neutropenia is cytotoxic chemotherapy, involving direct bone marrow suppression, which frequently develops in a dose-dependent fashion. Patients with a diagnosis of neutropenia caused by cancer therapy are at increased risk of significant bacterial infections, for which the risk correlates with the degree of neutropenia. Absolute neutrophil counts of lower than 1000/µL are associated with increased risk of developing serious and potentially life-threatening infections.
GUIDELINES FOR SUPPORTIVE CARE

Several different agencies and organizations have developed guidelines related to supportive care in oncology. Topics covered by these guidelines include symptom management addressing pain, nausea and vomiting, and myelosuppression. Guidelines may be developed based on a review of the published evidence, meta-analyses, summaries of best clinical practice, consensus of experts and/or practitioners, or a combination of approaches. A comprehensive resource for searching published guidelines may be found at the National Guideline Clearinghouse, sponsored by the Agency for Healthcare Research and Quality (AHRQ) of the Department of Health and Human Services.

EVIDENCE-BASED GUIDELINES

Specialized professional organizations, such as the American Society of Clinical Oncology (ASCO) or the American Society of Hematology (ASH), have developed evidence-based clinical practice guidelines for anemia and neutropenia. Other evidence-based guidelines in cancer have been established by Cancer Care Ontario in Canada and the Cochrane Review Group. These guidelines seek to review and synthesize published evidence systematically, and grade the guidelines based on level of evidence. Descriptions for grading of evidence, as developed by AHRQ, are listed in Table 1. An absence of evidence, or an absence of high-level evidence, often means that evidence-based guidelines are unable to address certain areas of clinical practice, other than by stating that better evidence is needed to support specific practices or interventions. Such a review of guideline may recommend pursuit of desired high-level evidence as derived from a meta-analysis or a randomized controlled clinical trial. For example, the systematic review of evidence that was used to develop the ASH/ASCO guidelines for use of epoetin in cancer concluded that limited evidence supported the use of epoetin to improve anemia-related symptoms, including fatigue or QOL, particularly when the anemia level is mild or moderate, and that more randomized controlled clinical trials were desirable. In some cases, evidence-based guidelines may present recommendations based on evidence from other settings or disease conditions, or from opinions expressed by expert panels to fill in the “gaps” existing because of a lack of disease- or condition-specific evidence. However, guidelines would note that the source differed from case-specific high-level evidence or published data.

Consensus Statements and State-of-the-Science Conferences

Consensus development may be based on discussions among a panel of experts, experienced practitioners, and public representatives as to the best practices for a particular problem, using existing evidence combined with clinical experience. The National Institutes of Health (NIH) has sponsored multiple Consensus Development and State-of-the-Science Conferences in the past several decades, in an attempt to sort through conflicting, controversial, or

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>Type of Evidence</th>
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<tbody>
<tr>
<td>1</td>
<td>Quantitative systematic review (eg, meta-analysis) of several well-designed randomized controlled trials of adequate quality or qualitative systematic review (eg, integrative review)</td>
</tr>
<tr>
<td>2</td>
<td>One or more controlled, randomized trials of appropriate size (note if more than 1 site and sample is &gt;100 subjects)</td>
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<tr>
<td>3</td>
<td>Well-designed trial but without randomization (eg, single group pre-/post-intervention, cohort study, and meta-analysis of cohort studies)</td>
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<tr>
<td>4</td>
<td>Well-conducted qualitative systematic review of nonexperimental design studies</td>
</tr>
<tr>
<td>5</td>
<td>Well-conducted case-control studies</td>
</tr>
<tr>
<td>6</td>
<td>Poorly controlled study (eg, randomized controlled trial with major flaws) or uncontrolled studies (eg, correlational descriptive study and case series)</td>
</tr>
<tr>
<td>7</td>
<td>Conflicting evidence, with the weight of the evidence supporting the recommendation, or meta-analysis showing a trend that did not reach statistical significance; National Institutes of Health Consensus Reports; published practice guidelines from professional organizations (eg, Oncology Nursing Society and American Society of Clinical Oncology), healthcare organizations (eg, American Cancer Society), or federal agencies (eg, National Cancer Institute and Centers for Disease Control and Prevention)</td>
</tr>
<tr>
<td>8</td>
<td>Qualitative designs; case studies; opinions from expert authorities, agencies, or committees</td>
</tr>
</tbody>
</table>

*Highest level of evidence at top of scale.
Data from National Center for Biotechnology Information.
incomplete evidence to produce a synthesis of knowledge to aid in clinical decision making. NIH Consensus and State-of-the-Science statements are prepared by independent panels of health professionals and public representatives on the basis of the results of a systematic literature review with input from expert investigators and the public. The NIH produced a State-of-the-Science consensus statement in July 2002 for “Symptom Management in Cancer: Pain, Depression, and Fatigue.” Previously, an NIH Consensus Development Conference statement was released in November 2000 relating to “Adjuvant Therapy for Breast Cancer.” Such statements will require significant revision and updating of knowledge over time as new data and advances in therapy become available.10

**Consensus-Developed Practice Guidelines of the NCCN**

Similar to Consensus Statements are Consensus-Developed Guidelines, which take the combination of evidence and clinical experience to produce practical guides for clinical decision making. The most well-known and wide-ranging consensus guidelines in oncology have been authored by the National Comprehensive Cancer Network (NCCN).11 The NCCN represents an alliance of 19 prominent cancer centers, most of which are NIH-designated comprehensive cancer centers. The major goal of these guidelines is to support decision making as it relates to cancer care. Through the establishment of several expert panels, the NCCN has developed, revised, and distributed a comprehensive collection of clinical practice guidelines, which are designed to serve as the basis for cancer policy and consistent practice in clinical oncology. These guidelines are available to oncology practices and institutions outside of the NCCN alliance online and through a CD-ROM that can be requested through the NCCN Web site.11

Most of the NCCN guidelines are the result of consensus development through the expert panels for each set of guidelines. Categories of consensus set by the NCCN are listed in Table 2. Unless identified specifically as another category, NCCN guidelines are category 2A, defined by the NCCN as “uniform NCCN consensus, based on lower-level evidence including clinical experience, that the recommendation is appropriate.”11 The NCCN guidelines differ from evidence-based guidelines in that, although published evidence may be used in generating these NCCN guidelines, the primary resource is the consensus of experts serving on the NCCN panels.

The NCCN has published many guidelines that apply to the supportive care setting, including adult cancer pain, antiemesis, cancer- and treatment-related anemia, cancer-related fatigue, distress management, fever and neutropenia, myeloid growth factors, palliative care, pediatric cancer pain, and senior adult oncology. Although several of these guidelines partially address the care of patients with cancer experiencing anemia and/or neutropenia, the major NCCN guidelines used for this specific review were “Cancer- and Treatment-Related Anemia” (version 2.2005) and “Myeloid Growth Factors” (version 2.2005). The guidelines on “Fever and Neutropenia” are almost exclusively dedicated to clinical risk assessment and diagnosis, pharmacologic prophylaxis, and pharmacologic treatment of FN, accompanied by documented or presumed infection. As the focus herein is primarily on neutropenia, rather than the treatment of infection, the “Fever and Neutropenia” guidelines dealing with antibiotic coverage are considered beyond the scope of this article.

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**Table 2. NCCN Categories of Consensus**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
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<tbody>
<tr>
<td>Category 1</td>
<td>There is uniform consensus, based on high-level evidence, that the recommendation is appropriate.</td>
</tr>
<tr>
<td>Category 2A</td>
<td>There is uniform NCCN consensus, based on lower-level evidence including clinical experience, that the recommendation is appropriate.</td>
</tr>
<tr>
<td>Category 2B</td>
<td>There is nonuniform consensus (but no major disagreement), based on lower-level evidence including clinical experience, that the recommendation is appropriate.</td>
</tr>
<tr>
<td>Category 3</td>
<td>There is major NCCN disagreement that the recommendation is appropriate.</td>
</tr>
</tbody>
</table>

*All NCCN guideline recommendations are Category 2A unless otherwise noted.
NCCN = National Comprehensive Cancer Network.
Reprinted with permission from National Comprehensive Cancer Network.11
STRATEGIES FOR MANAGEMENT OF ANEMIA AND NEUTROPENIA IN THE PATIENT WITH CANCER

MANAGEMENT OF CANCER- AND TREATMENT-RELATED ANEMIA AS RECOMMENDED BY THE NCCN PRACTICE GUIDELINES (VERSION 2.2005)

Presentation and Screening: The NCCN Practice Guidelines for Cancer- and Treatment-Related Anemia focus on patients with a diagnosis of anemia, as defined by the hemoglobin level (Table 3), outside the setting of bone marrow transplantation. The complete practice algorithm can be reviewed at www.nccn.org. The algorithm starts with a patient presenting with a hemoglobin of less than 11 g/dL, leading to a screening evaluation that, at a minimum, includes a complete blood count with red cell indices (eg, mean corpuscular volume), a possible review of the blood smear for any abnormalities, and additional screening and diagnostic studies if clinically relevant, such as a reticulocyte count, iron studies, serum creatinine, or a bone marrow evaluation. Based on this clinical workup, the anemia would then be classified as cancer- or treatment-related anemia or anemia due to other causes (eg, bleeding, hereditary disorders, or renal dysfunction). Anemia caused by noncancer or nontreatment etiology would receive interventions appropriate to the underlying cause(s).

Risk and Symptom Assessment: Anemia found to be related to a particular type of cancer, such as a hematologic malignancy, would be managed following specific interventions outlined in other NCCN practice guidelines (eg, “Guidelines for Non-Hodgkin’s Lymphoma”). Other cases would be further assessed for risk based on a thorough evaluation of the severity of the anemia; the presence of significant physiologic symptoms, including cardiac, pulmonary, and fatigue; and patient comorbidities that may also exacerbate the condition, such as cardiopulmonary disease. Based on the initial assessment of the level of anemia combined with the severity of the patient’s symptoms, the most appropriate action may be an immediate transfusion of red cells. This action is usually directed by institutional policy defining a transfusion trigger, which may be set at a specific hemoglobin level or anemia grading criteria (eg, grade 3 [<8.0 g/dL] or grade 4 [<6.5 g/dL]), as shown in Table 3.

If immediate correction of the patient’s anemia by transfusion is not required, further assessment of symptoms and subsequent needed interventions should be performed. Objective assessment of significant accompanying symptomology may be difficult because individual patients may not report the same physical findings, despite having the same hemoglobin level. Cancer-related anemia often develops slowly over time and many patients are already experiencing declines in their functional status before they reach a hemoglobin level that their healthcare providers consider as necessitating an intervention.

If an anemic patient is found to be asymptomatic, yet presents with anemia, the underlying cause and possible risk factors that could lead to symptoms should be evaluated. Factors identified that could place the patient at risk for development of symptomatic anemia include transfusion history in the previous 6 months, prior or current myelosuppressive therapy, previous radiation therapy to greater than 20% of the skeleton, patient age, and current hemoglobin level. Asymptomatic patients without risk factors would be observed and re-evaluated later for the presence of new symptoms or risk factors.

| Table 3. Common Terminology Criteria for Adverse Events for Anemia and Neutropenia |
|----------------------------------------|--------|--------|--------|--------|--------|
| **Toxicity**                          | **1**  | **2**  | **3**  | **4**  | **5**  |
| Hemoglobin                            | <LLN–10.0 g/dL | <10.0–8.0 g/dL | <8.0–6.5 g/dL | <6.5 g/dL | Death |
| Neutrophils/gramulocytes              | <LLN–1500/mm³ | <1500–1000/mm³ | <1000–500/mm³ | <500/mm³ | Death |
| Granulocytes                          | <LLN–1.5 × 10⁹/L | <1.5–1.0 × 10⁹/L | <1.0–0.5 × 10⁹/L | <0.5 × 10⁹/L |        |

LLN = lower limit normal.
Data from National Cancer Institute."
Treatment Options: Asymptomatic patients with assessed risk factors, or those patients with symptoms of anemia, could be candidates for varied interventions, dependent on level of risk and severity of symptoms. Possible treatments range from erythropoietic therapy with or without iron supplementation to red cell transfusion. Response to the intervention (ie, hemoglobin increase) would then be evaluated at periodic intervals to ensure correction of adverse symptoms, maintenance of an adequate hemoglobin level, or termination of ineffective therapy. Pharmacologic interventions presented in the NCCN guidelines include epoetin alfa and darbepoetin alfa, with a choice of multiple approved or investigational regimens. Complete descriptions of all guideline-related interventions, including prescribing and administration information, are included in the NCCN guidelines.31

MANAGEMENT OF CANCER-RELATED NEUTROPENIA THROUGH USE OF MYELOID GROWTH FACTORS AS RECOMMENDED BY THE NCCN PRACTICE GUIDELINES (VERSION 2.2005)

Chemotherapy-induced neutropenia remains the most serious risk for morbidity and mortality in patients with cancer undergoing cytotoxic therapy, and continues to represent the dose-limiting toxicity for most treatment regimens. Neutropenia may lead to FN or serious infections requiring antibiotic treatment and hospitalization. Resulting complications, dose reductions, and dose delays can negatively impact clinical outcomes. Although the prophylactic use of colony-stimulating factors (CSF) may reduce risk, severity, and duration of severe neutropenia and/or FN, the costs associated with these interventions, and incomplete evidence in some situations, has prevented the widespread use of CSFs in patients who are at increased risk of FN and resulting negative outcomes.

The current NCCN guidelines “Myeloid Growth Factors” (version 2.2005) focus on adult patients with solid tumors and nonmyeloid malignancies and the application of CSFs in this setting. The efficacy of prophylaxis with CSFs depends in large part on the potential risk of FN associated with the individual chemotherapy regimens and dose intensity delivered.

RISK:BENEFIT ANALYSIS OF DIFFERENT DOSING REGIMENS IN CANCER THERAPY

The importance of delivering the maximum dose intensity of planned chemotherapy, with full doses given on schedule as much as possible, has been highlighted through several pivotal studies.33 In a 20-year follow-up study of women treated with adjuvant chemotherapy for early stage breast cancer, Bonadonna et al demonstrated that outcomes, including long-term survival, were significantly better in those women who had received at least 85% of their expected doses of chemotherapy.44 However, despite this compelling finding, a recent nationwide study of community practices (n = 1243) involving more than 20,000 patients with early breast cancer revealed that more than 36% of the sample experienced dose reductions of at least 15%, and almost 25% of the group experienced treatment delays of 7 or more days. Only 45% of patients with early stage breast cancer in this study received 85% or more of their intended relative dose intensity, demonstrating that frequently standard dose intensity in oncology is unable to be achieved, although the precise reasons for this finding remain to be elucidated.35

Building on the concept that “more is better,” several studies have investigated the role of dose density and dose intensity in cancer therapy. The German Lymphoma Study Group conducted a trial in patients older than 60 years with non-Hodgkin’s lymphoma, randomizing subjects to CHOP (cyclophosphamide, doxorubicin, vincristine, and prednisone) administered every 21 days or every 14 days with growth factor support, or to CHOEP (cyclophosphamide, doxorubicin, vincristine, etoposide, and prednisone) administered every 21 days or every 14 days with growth factor support. The study group reported that time to treatment failure and overall survival were significantly improved in elderly patients who received dose-dense chemotherapy, administered every 14 days with CSF support, compared to standard 21-day dosing regimens.36

Similarly, the results of Cancer and Leukemia Group B (CALGB) 9741, comparing 2 dose-density regimens in addition to different sequences of chemotherapy in node-positive breast cancer, showed significant clinical benefit for women treated on the dose-dense arms of the study. In this trial, women were randomized to 1 of 4 different treatment arms: sequential chemotherapy of doxorubicin followed by paclitaxel followed by cyclophosphamide, with each drug administered every 3 weeks; same sequential therapy administered every 2 weeks with CSF support;
combination chemotherapy, with doxorubicin and cyclophosphamide administered concurrently every 3 weeks, followed by paclitaxel administered every 3 weeks; or same combination chemotherapy regimen administered every 2 weeks, followed by paclitaxel administered every 3 weeks, each cycle administered with CSF support. The dose-dense arms showed improved outcomes. Four-year disease-free survival was 82% on the dose-dense regimens versus 75% for the standard regimens.37

The risks associated with dose-dense and dose-intense regimens need to continue to be more fully explored. For example, 13% of patients in one of the dose-dense arms of CALGB 9741 required red cell transfusion compared to less than 4% of patients on the other arms (P <.0001). Dose-dense regimens typically require CSF as part of the plan to allow delivery of highly myelosuppressive chemotherapy; however, even with CSF support, significant anemia and neutropenia are still observed.37 Clinical trials continue to identify the most effective dose-intense regimen, combined with the optimal supportive care regimen to reduce hematologic and other toxicities, for most solid tumors.

**THE ROLE OF THE ADVANCED PRACTICE NURSE IN IMPLEMENTATION OF SUPPORTIVE CARE GUIDELINES FOR ANEMIA AND NEUTROPENIA IN CANCER**

The advanced practice nurse (APN) has a unique role in the implementation of supportive care guidelines for anemia and neutropenia in cancer. The awareness of the impact of anemia, or its lack of prevention or early treatment, on clinical and QOL outcomes is inconsistent among healthcare providers and patients with cancer who experience this condition. The evidence supporting the optimal means to assess anemia in oncology practices, and the most appropriate interventions based on assessment, is lacking in many clinical scenarios. Likewise, the effect of anemia treatment, or lack thereof, on clinical outcomes, costs, and health-related QOL continue to be investigated through clinical research studies.48

Therefore, the role of advanced practice and other oncology nurses in the risk assessment, evaluation of symptomology, and decision making regarding treatment options for their patients with anemia and neutropenia needs to be more fully developed. In particular, APNs in oncology, who may have the primary responsibility for symptom identification and management in many practice settings, can contribute significantly to improvements in patient QOL and potentially to clinical outcomes in cancer-related anemia and neutropenia through careful assessment, documentation, and intervention.39

Over the past 2 decades, oncology nurses have assumed a pivotal role in addressing the need to prevent and control other significant symptoms associated with cancer and its therapy, including pain, nausea/vomiting, and diarrhea.49 Although nurses have been central to documentation of neutropenia, the decision making regarding interventions have traditionally been delegated to the physician. Conversely, anemia has been a condition that is rarely carefully assessed, and often perceived to produce little or no change in cancer outcomes.6 APNs, in particular, by following the practice guidelines set forth by the NCCN and other evidence, have the unique opportunity to enhance clinical outcomes and the quality of patient care. The role of APNs in patient assessment and symptom management underscores the need for consistent adherence to guidelines incorporating thoughtfully designed evaluations and therapeutic interventions.

The optimal strategies to effect change in outcomes related to anemia and neutropenia in cancer and promote adherence to guidelines are not always clear. Often, clinical decision making, including the decision to follow specific practice guidelines, is multifarious and influenced by many issues. One possible approach for APNs to implement the NCCN guidelines, or new evidence, in their practice is outlined as a toolkit in Table 4. This tool allows nurses to assess decision making related to anemia and neutropenia within their own practice setting, evaluate what factors impact how decisions are made and who makes such decisions regarding symptom management, and to plan workable strategies customized to their own clinical setting. Consistent adoption of the NCCN guidelines related to anemia and neutropenia may represent a successful approach to change and enhance clinical practice, improve patient clinical and QOL outcomes, and ensure that APNs play a key role in decision making related to assessment, risk appraisal, and interventions for anemia and neutropenia in cancer.
Table 4. Implementation of NCCN Guidelines to Manage and Assess Risk of Hematologic Toxicities by APNs in Oncology Practices: A Toolkit of Strategies

Objectives:
- Design a model to be used to assess symptom management decision making in the oncology practice setting.
- Develop and/or implement tools to be used for assessment and management of hematological toxicities by APNs in oncology practices.
- Explore ways for APNs to become decision makers in management of hematological toxicities through consistent use of NCCN guidelines.

Before clinical practice can be changed (eg, by implementing practice guidelines), the usual means by which decisions are made need to be assessed.

Assessment of Decision Making in Clinical Practice:
- What drives clinical decisions in your practice?
- Who are primary decision makers?
- What types of decisions do APNs make independently or with minimal input from others?
- How are clinical decisions made? Are they changed regularly? Do they vary with individual clinicians?
- What role do each of these have in your practice (symptom management)?
  - Medical oncologist(s)
  - Administrator/business manager
  - Office manager
  - Nursing supervisor
  - Advanced practice nurses
  - Staff nurses
  - Others—specify
- Do roles vary based on type of symptom (eg, who makes decisions)?
  - Pain
  - Nausea/vomiting
  - Diarrhea
  - Peripheral neuropathy
  - Anemia
  - Neutropenia
- Other than personal experience, what drives decision making in your practice for management of symptoms, such as anemia and neutropenia?
  - Published data/evidence
  - Established guidelines (eg, NCCN guidelines for clinical practice)
  - Clinical outcomes (eg, survival, response, and QOL)
  - Finances/reimbursement
  - Referral patterns
  - Research involvement
  - Staffing needs/resources
  - Scheduling needs

Nurses, especially APNs, need to establish means to recognize nurses as symptom management experts within their practice setting.

Evaluation of Assessment:
- What is needed to change methods of, or primary individuals involved in, decision making?
- Can decision making be shifted to APNs for symptom management in general, and anemia and neutropenia specifically?
- What tools are needed to make change happen and sustain change over time?
  - Consistent implementation of clinical practice guidelines
  - Cost-effectiveness analysis
  - Patient satisfaction and input
  - Documentation of the APN as the symptom management expert

Tools to Effect Change in Practice:

Evidence-Based or Consensus-Developed Guidelines
- Does the practice utilize/prefer evidence-based guidelines? Does it prefer certain types (eg, NCCN or ASCO)?
- Are guidelines to be followed by all staff or only those with specific roles?
- Would the practice be open to guidelines if developed or identified by nurses or others?
- What are the criteria for guideline adaptation in your practice?

(Continued on page 308)
Table 4. Implementation of NCCN Guidelines to Manage and Assess Risk of Hematologic Toxicities by APNs in Oncology Practices: A Toolkit of Strategies (Continued from page 307)

Clinical Pathways and Algorithms
- Does the practice utilize/prefer algorithms rather than broader guidelines?
- Are pathways for all staff or only specific roles?
- Would the practice be open to pathways or algorithms if developed or identified by APNs or others?
- What are the criteria for pathway adaptation in your practice?

Standing Orders
- Does the practice utilize/prefer standing orders?
- Are standing orders for all staff or only specific roles?
- Would the practice be open to standing orders if developed by nurses or others?
- What are the criteria for standing orders in your practice?

Assessment of Practice
- Do APNs have resources/expertise to accomplish this task?
- Would other decision makers in the practice respond to this assessment? Under what conditions would they respond more favorably?
- What resources and tools are needed to accomplish a meaningful assessment?

Assessment and Tracking of Outcomes Related to Anemia and Neutropenia and Impact on Practice
- Do nurses have resources/expertise to accomplish this task?
- Would other decision makers in the practice respond to this assessment? Under what conditions would they respond more favorably?
- What resources or tools are needed to accomplish a meaningful assessment and tracking?
- What outcomes are most important for the practice to track?
- Could consistent adherence to practice guidelines be one measure to assess impact on the practice and assess strategies to address anemia and neutropenia?

Nursing Role Delineation and Modification
- Does the practice specifically define nursing role(s) for all nursing staff?
- What might be the specific role of APNs in the management of anemia and neutropenia?
- What are the criteria for role definition and change in your practice (eg, published data)?
- Does the nursing staff, including APNs, have expertise/resources to make these role delineations or modifications?

Treatment Patterns and Changes Over Time
- Can APNs assess how treatment changes (eg, movement to therapy administered every 1–2 weeks from every 3–4 weeks) have impacted the practice and also affected neutropenia incidence?
- Do APNs have resources/expertise to accomplish this task?
- Would the other decision makers in the practice respond to this assessment? Under what conditions would they respond more favorably?
- What resources and tools are needed to accomplish a meaningful assessment and tracking of treatment patterns and changes?
- What outcomes are most important for the practice to track?

Building Your Own Toolkit to Implement NCCN Guidelines for Supportive Care in Anemia and Neutropenia:
- Identify driving forces and roles in practice.
- Assess current state of practice, patterns of treatment, and specific outcomes of importance to practice (cost, QOL, etc).
- Make recommendations for a plan to implement guidelines based on assessment.
- Obtain buy-in for plan.
- Implement plan or portions of plan (eg, guidelines for neutropenia may be more widely accepted than those for anemia).
- Evaluate and measure outcomes of identified importance: compliance with guidelines, cost, QOL, utilization, etc.

Next Steps:
- Focus on possibilities and potential.
- Remember and return to driving forces for your own practice.
  - What works for your practice is what works.
- The goal of improving patient care and quality of care delivery, such as improving outcomes related to anemia and neutropenia, is likely to always be perceived as positive and beneficial to the patients and the practice.

APN = advanced practice nurse; ASCO = American Society of Clinical Oncology; NCCN = National Comprehensive Cancer Network; QOL = quality of life.
REFERENCES


