Chemotherapy-induced nausea and vomiting (CINV) is a serious adverse effect of chemotherapy that limits patients’ physical, mental, and functional capabilities and may cause a delay or cessation of treatment. Antiemetic therapy can reduce the incidence of CINV. Research, using data from visits by patients receiving moderately (MEC) or highly emetogenic chemotherapy (HEC), identified that antiemetics were prescribed for 86% (in 2007) and 82% (in 2008) of patients receiving MEC or HEC. For these visits, 5-hydroxytryptamine-3 receptor antagonists were prescribed in at least 97% of visits for both years, whereas neurokinin-1 (NK-1) receptor antagonists were prescribed at a rate of 10% and 11%, respectively. Studies show that nurses and physicians underestimate the incidence of CINV after HEC and MEC. Oncology nurses often critically influence patients’ selection of CINV therapy and can play a significant role in increasing awareness about the benefits of adding an NK-1 receptor antagonist to standard prophylactic regimens for acute and delayed CINV.

More than 70% of all patients with cancer who are receiving chemotherapy will experience nausea, vomiting, or both in the absence of any antieptic (National Comprehensive Cancer Network [NCCN], 2009). In addition, 10%-44% will experience anticipatory nausea and vomiting (NCCN, 2009). Chemotherapy-induced nausea and vomiting (CINV) can have a significant negative impact on the quality of a patient’s life (Ballatori et al., 2007; Bloechl-Daum, Deuson, Mavros, Hansen, & Herrstedt, 2006; Cohen, de Moor, Eisenberg, Ming, & Hu, 2007; NCCN, 2009), perhaps leading to poor adherence to cancer treatment as well as physical, mental, and functional complications.

Despite advances in the management of CINV since the late 1980s, most patients continue to fear nausea and vomiting following chemotherapy (Bloechl-Daum et al., 2006; Carelle et al., 2002; Hoffman et al., 2004). Improvements in the management of acute CINV (in the first 24 hours after infusion) have resulted in lower incidences of nausea and vomiting at the site of care. However, when patients experience delayed CINV, they are generally not under the direct supervision of a healthcare provider. Because physicians and nurses do not witness patients’ delayed CINV episodes firsthand, they often underestimate the scope of the issue (Grunberg & Ireland, 2005).

According to a survey conducted on site at the 33rd annual Oncology Nursing Society Congress in Philadelphia, PA, in May 2008, nurses reported that, aside from fatigue, CINV is the most
significant adverse effect of chemotherapy affecting quality of life for patients with cancer (Oncology Resource Center, 2009). In addition, nurses reported that 50% of their patients stopped or delayed chemotherapy because of CINV. Of the 581 nurses who responded to the 2008 survey, 70% reported that they approached the issue of CINV with a zero-tolerance policy, compared with only 40% of physicians who adopted the same policy.

The recognition of the neurokinin-1 (NK-1) receptor pathway in the development of CINV has led to a new class of antiemetics called NK-1 receptor antagonists (aprepitant was approved by the U.S. Food and Drug Administration in 2003). The addition of NK-1 receptor antagonists to standard therapy has been shown to be effective for the management of acute and delayed CINV (Jordan, Kasper, & Schmoll, 2005). The NCCN Clinical Practice Guidelines in Oncology™ and the American Society of Clinical Oncology guidelines recommend adding an NK-1 receptor antagonist to standard CINV-prevention regimens for patients receiving either moderately (MEC) or highly emetogenic chemotherapy (HEC) (Kris et al., 2006; NCCN, 2009). The NCCN panel specifically recommended that an NK-1 receptor antagonist be used for multiday chemotherapy regimens likely to be highly emetogenic and associated with significant risk for delayed nausea and vomiting (NCCN, 2009). Adoption of these guidelines, however, has been slow, and CINV remains an important target for improved therapeutic intervention (Grunberg et al., 2004; Jordan et al., 2005).

The purpose of this study was to examine the frequency of use of 5-hydroxytryptamine-3 (5-HT3) receptor antagonists and NK-1 receptor antagonists for the prevention of CINV.

### Methods

#### Study Design and Patients

The analysis included data obtained from more than 29,000 patients and more than 200,000 chemotherapy visits for the 12-month period ending June 2007 and from more than 31,000 patients and more than 200,000 chemotherapy visits for the 12-month period ending April 2008. A patient visit was defined as any day on which chemotherapy was administered, provided the administration date was at least six days from the previous administration date (i.e., patients had only one visit in any seven-day period). The data reported included the projected number of annual chemotherapy patient visits in the United States during the specified time periods, stratified by level of emetogenic potential (Hesketh, 2008) (see Table 1), as well as the projected number of patient visits in which antiemetics were used. Results are reported for MEC and HEC regimens (emetogenic potential levels of 3, 4, or 5).

#### IntrinsiQ Data Analysis

Analysis of the frequency of use of 5-HT3 receptor antagonists and NK-1 receptor antagonists for the prevention of CINV was conducted by the IntrinsiQ data warehouse, using the company’s IntelliDose® software to collect and process longitudinal chemotherapy records for patients with cancer. The IntrinsiQ data warehouse contains patient- and provider-level information for more than 160,000 patients with cancer and more than 12 million administrations of various drug therapies (IntrinsiQ, LLC, 2008). The data from IntelliDose are gathered from chemotherapy records of a representative population of more than 570 oncologists across the United States. The participating oncologists are representative of the overall population of oncologists in the United States with regard to specialty (67% medical, 20% hematologic, 9% gynecologic, and 4% pediatric), type of practice (64% office, 25% community hospital, 10% academic, and 1% Veterans Administration), size of practice, and geographic location.

IntrinsiQ’s projection methodology is based on a cohort component approach that uses nationally available data to generate projection factors (IntrinsiQ, LLC, 2008). Data used in these calculations include IntelliDose census data, population data on patients and chemotherapy visits, and an understanding of the potential changes in the U.S. healthcare environment.

### Table 1. Definitions for Emetogenic Potential Values

<table>
<thead>
<tr>
<th>POTENTIAL VALUE</th>
<th>RISK</th>
<th>FREQUENCY (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimal</td>
<td>Less than 10</td>
</tr>
<tr>
<td>2</td>
<td>Low</td>
<td>10–30</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>31–60</td>
</tr>
<tr>
<td>4</td>
<td>Moderate</td>
<td>61–90</td>
</tr>
<tr>
<td>5</td>
<td>High</td>
<td>More than 90</td>
</tr>
</tbody>
</table>

**Note.** Based on information from Hesketh, 2008.

### Table 2. Visits of Patients Receiving Therapy With 5-HT3 and NK-1 Receptor Antagonists, June 2007*

<table>
<thead>
<tr>
<th>EP VALUE</th>
<th>PATIENT VISITS</th>
<th>ANY ANTIEMETIC</th>
<th>ANY 5-HT3 ANTAGONIST</th>
<th>ANY 5-HT3 ANTAGONIST WITHOUT NK-1</th>
<th>ANY 5-HT3 ANTAGONIST PLUS NK-1</th>
<th>NK-1 TREATMENT (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>827,806</td>
<td>634,799</td>
<td>631,673</td>
<td>612,447</td>
<td>19,226</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>2,875,518</td>
<td>2,432,947</td>
<td>2,319,500</td>
<td>2,185,702</td>
<td>133,798</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>1,329,610</td>
<td>1,277,665</td>
<td>1,268,405</td>
<td>1,001,643</td>
<td>266,762</td>
<td>21</td>
</tr>
<tr>
<td>MEC plus HEC (EP 3–5)</td>
<td>5,032,934</td>
<td>4,345,411</td>
<td>4,219,578</td>
<td>3,799,792</td>
<td>419,786</td>
<td>10</td>
</tr>
</tbody>
</table>

*Values are projected annual patient visits based on samples of more than 29,000 patients and more than 200,000 chemotherapy visits collected during the 12-month period ending June 2007. EP—emetogenic potential; 5-HT3—5-hydroxytryptamine-3; HEC—highly emetogenic chemotherapy (EP 4–5); MEC—moderately emetogenic chemotherapy (EP 3); NK-1—neurokinin-1
Table 3. Visits of Patients Receiving Therapy With 5-HT\textsubscript{3} and NK-1 Receptor Antagonists, April 2008\textsuperscript{a}

<table>
<thead>
<tr>
<th>EP VALUE</th>
<th>PATIENT VISITS</th>
<th>ANY ANTIEMETIC</th>
<th>ANY 5-HT\textsubscript{3} ANTAGONIST</th>
<th>ANY 5-HT\textsubscript{3} ANTAGONIST WITHOUT NK-1</th>
<th>ANY 5-HT\textsubscript{3} ANTAGONIST PLUS NK-1</th>
<th>VISITS RECEIVING NK-1 TREATMENT (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>808,283</td>
<td>590,949</td>
<td>582,131</td>
<td>566,476</td>
<td>15,654</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>3,014,745</td>
<td>2,417,335</td>
<td>2,407,733</td>
<td>2,226,666</td>
<td>181,068</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>1,354,527</td>
<td>1,257,404</td>
<td>1,241,124</td>
<td>974,479</td>
<td>266,645</td>
<td>21</td>
</tr>
<tr>
<td>MEC plus HEC (EP 3–5)</td>
<td>5,177,555</td>
<td>4,265,688</td>
<td>4,230,988</td>
<td>3,767,621</td>
<td>463,367</td>
<td>11</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Values are projected annual patient visits based on samples of more than 31,000 patients and more than 200,000 chemotherapy visits collected during the 12-month period ending April 2008.

EP—emetogenic potential; 5-HT\textsubscript{3}—5-hydroxytryptamine-3; HEC—highly emetogenic chemotherapy (EP 4–5); MEC—moderately emetogenic chemotherapy (EP 3); NK-1—neurokinin-1

Although this study includes data only from oncologists in the United States who used the IntelliDose software application, the data include information from a representative population of 570 oncologists, with even geographic distribution throughout the United States. In addition, the number of patients with cancer included in the IntrinsiQ data warehouse exceeds 160,000, with more than 12 million projected chemotherapy visits.

The addition of NK-1 receptor antagonists to standard therapy significantly improves emesis protection in both acute and delayed CINV by about 20% (Jordan et al., 2005). However, as evidenced by the results of this analysis, the addition of NK-1 receptor antagonists to standard antiemetic regimens has been slow. The low clinical use of NK-1 receptor antagonists despite their established antiemetic benefit (Grunberg et al., 2009; Jordan et al., 2009) and recommendations for their use in national guidelines (Kris et al., 2006; NCCN, 2009) may be linked to poor clinical understanding

Results

The projected number of annual visits for patients receiving either MEC or HEC regimens for the 12-month period ending June 2007 was more than 5 million (see Table 2). Antiemetics were prescribed in a projected 86% of those visits. For the visits in which antiemetics were prescribed, 5-HT\textsubscript{3} receptor antagonists were prescribed at 97% of visits compared with NK-1 receptor antagonists at only 10% of visits. Results were similar for the 12-month period ending April 2008 (see Table 3). Antiemetics were prescribed in 82% of the projected 5.2 million patient visits. For the visits in which antiemetics were prescribed, 5-HT\textsubscript{3} receptor antagonists were prescribed at a projected 99% of visits compared with NK-1 receptor antagonists at a projected 11% of visits.

A comparison of the 2007 and 2008 data revealed similar numbers of annual chemotherapy patient visits (see Figure 1) for patients receiving MEC or HEC as well as a similar percentage of visits at which patients received 5-HT\textsubscript{3} receptor antagonists (see Figure 2). Relative use of NK-1 receptor antagonists remained low in both years, with little change in the percentage of penetration into the 5-HT\textsubscript{3} receptor antagonist market (see Figure 3).

Discussion

The assessment and projections reported here illustrate the low use of NK-1 receptor antagonists in combination with 5-HT\textsubscript{3} receptor antagonists for the prevention of CINV in patients receiving MEC or HEC. Among patients who are the most eligible for antiemetic therapy (i.e., those receiving chemotherapeutic agents with emetogenic potential of 3–5), only 10% and 11% of patients in 2007 and 2008, respectively, received an NK-1 receptor antagonist in addition to a 5-HT\textsubscript{3} receptor antagonist.
of the value of the addition of an NK-1 receptor antagonist to antiemetic regimens for patients receiving HEC or MEC.

The additional cost (which varies from region to region) associated with adding an NK-1 receptor antagonist to an antiemetic regimen also may contribute to low clinical use. Given the significant negative impact of CINV and the antiemetic protection provided in acute and delayed CINV, the benefits of adding an NK-1 receptor antagonist to the antiemetic regimen likely justify the additional cost. However, the authors acknowledge that the added cost associated with the addition of a second antiemetic agent is a potential barrier to prescribing and use.

Potential drug-drug interactions should be considered when adding NK-1 receptor antagonists to CINV antiemetic regimens. NK-1 receptor antagonists can alter the metabolism of certain drugs and change their plasma concentrations; therefore, caution should be taken when used with any chemotherapeutic agent that is metabolized by CYP3A4 (including but not limited to docetaxel, paclitaxel, and etoposide). Also, NK-1 receptor antagonists have the potential to significantly reduce the clinical effectiveness of warfarin and oral contraceptives (NCCN, 2009).

Because quality of life and adherence to future chemotherapy regimens are significantly affected by CINV, clinicians should recognize the value of effective antiemetic therapy as a factor in chemotherapy tolerability. In a prospective, observational study of adult patients receiving MEC or HEC that compared rates of acute and delayed CINV with physician and nurse predictions, physicians and nurses accurately predicted the incidence of acute CINV but underestimated the incidence of delayed nausea and emesis after HEC by 21 and 28 percentage points, respectively, and delayed nausea after MEC by 28 percentage points. More than 75% of physicians and nurses underestimated the incidence of delayed CINV after HEC and MEC (Grunberg et al., 2004); therefore, a significant gap remains in healthcare professionals’ awareness of the benefits of adding an NK-1 receptor antagonist to the standard prophylactic regimen for acute and delayed CINV.

Nurses are critical to the prevention and management of CINV and other aspects of supportive care. They directly encourage use and influence selection of CINV therapies, advocating for the most effective antiemetic regimens for their patients. To be more effective in this role of gatekeeper and advocate, oncology nurses should better understand current concepts in managing CINV to maximize effective antiemetic therapy. Additional assessment of factors influencing changes in clinical practice, such as the use of an NK-1 receptor antagonist in the management of CINV, should occur.

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References


