Resource Utilization for Chemotherapy-Induced Nausea and Vomiting Events in Patients with Solid Tumors Treated with Antiemetic Regimens

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BACKGROUND: Chemotherapy-induced nausea and vomiting (CINV) can lead to increased emergency department visits and hospitalizations, which may contribute to increased cost of care. Antiemetic agents, such as neurokinin-1 (NK1) receptor antagonists and 5-hydroxytryptamine (5-HT3) receptor antagonists, are prescribed for patients receiving highly emetogenic chemotherapy (HEC) and moderately emetogenic chemotherapy (MEC). The current guidelines recommend a 3-drug combination of an NK1 receptor antagonist, a 5-HT3 receptor antagonist, and dexamethasone with HEC regimens and certain MEC regimens.

OBJECTIVE: To compare the incidence of CINV and CINV-related resource utilization among patients who receive guideline-adherent HEC and MEC regimens and patients who receive non–guideline-adherent regimens.

METHODS: In this retrospective, claims-based study, Inovalon’s Medical Outcomes Research for Effectiveness and Economics Registry (MORE2 Registry) Research Edition database was used to identify 8089 patients with solid tumors receiving therapy with anthracycline plus cyclophosphamide (AC), cisplatin, or carboplatin from June 2013 to December 2013. The patients were stratified according to the use of an NK1 receptor antagonist regimen. International Classification of Diseases, Ninth Revision, Clinical Modification codes were used to identify CINV events associated with hospital, emergency department, and outpatient office visits among patients in the NK1 receptor antagonist group and the non-NK1 receptor antagonist group.

RESULTS: A total of 1059 patients were included in the analysis, of whom 51% (N = 536) used an NK1 receptor antagonist–based regimen and 49% (N = 523) used non-NK1 receptor antagonist therapy. A higher percentage of patients receiving AC (73%) than cisplatin (56%) or carboplatin (23%) received an NK1 receptor antagonist. The incidence rates of total CINV events and CINV-related emergency department visits were lower in the group receiving an NK1 receptor antagonist (44% and 9%, respectively) than in the group not receiving an NK1 receptor antagonist (50% and 15%, respectively).

CONCLUSION: The patients receiving an NK1 receptor antagonist had a lower rate of resource utilization, suggesting that the use of NK1 receptor antagonist–containing regimens according to current national guidelines may reduce healthcare resource utilization, such as CINV-related office, hospital, and emergency department visits for patients receiving highly and moderately emetogenic chemotherapy.

KEY WORDS: antiemetic agents, chemotherapy-induced nausea and vomiting, emetogenic chemotherapy, NK1 receptor antagonist, 5-HT3 receptor antagonists, resource utilization

Chemotherapy-induced nausea and vomiting (CINV) is a common side effect of cancer treatment. Without antiemetic prophylaxis, highly emetogenic chemotherapy (HEC) and moderately emetogenic chemotherapy (MEC) regimens may cause acute emesis (within 24 hours of chemotherapy) in >90% and in 30% to 90% of patients, respectively. Furthermore, up to 57% of patients experience anticipatory CINV, a conditioned response that may result from suboptimal

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Disclosures are at end of text
The prevention of CINV in the first cycle of first-line emetogenic chemotherapy, notably cisplatin, carboplatin, and anthracycline plus cyclophosphamide (AC), is important, because previous studies have shown that patients who fail to control CINV in the first cycle of chemotherapy are more likely to experience CINV in subsequent cycles.1-3,11 Moreover, CINV in the first cycle of chemotherapy may result in anticipatory CINV before the administration of the next cycle.4

Episodes of CINV, particularly delayed CINV, can lead to increased office visits, emergency department visits, and hospitalizations, as well as the use of additional supportive care therapies and procedures, thereby increasing the overall cost of cancer care.20,25 A number of studies have evaluated the impact of CINV, the use of antiemetics, and subsequent healthcare resource utilization and costs in a comprehensive manner on medical and pharmacy benefits in the inpatient and outpatient settings.4,5,11-14,17,21,23-26 However, the costs of managing HEC-related CINV with neurokinin-1 (NK1) receptor antagonists per the current guidelines, and the impact of CINV on subsequent healthcare resource utilization have remained largely unquantified.

Antiemetic drugs, including 5-hydroxytryptamine (5-HT3) receptor antagonists and NK1 receptor antagonists combined with dexamethasone, have improved CINV prophylaxis in patients receiving HEC or MEC regimens in the past decade, and various national and international guidelines have been updated on an ongoing basis to incorporate these agents as they gain US Food and Drug Administration approval.1-3 Notably, for patients receiving HEC (including cisplatin plus AC), a 3-drug combination—of an NK1 receptor antagonist, a 5-HT3 receptor antagonist, and dexamethasone—is recommended by the American Society of Clinical Oncology (ASCO), the National Comprehensive Cancer Network (NCCN), and the Multinational Association of Supportive Care in Cancer (MASCC).1-3 Although NK1 receptor antagonists are not required for non-AC MEC, the NCCN and ASCO guidelines specifically allow for the addition of an NK1 receptor antagonist at the physician’s discretion. According to these consensus guidelines, patients receiving HEC or MEC should be protected from CINV throughout the entire 5-day period of risk.12 A recent systematic review of 17 randomized controlled trials demonstrated that the use of NK1 receptor antagonists in addition to standard antiemetic therapies substantially increased the control of CINV in the overall phase (ie, in the first 120 hours of chemotherapy).6

The objective of this study was to compare the incidence of CINV and its associated healthcare resource utilization with NK1 receptor antagonist or non-NK1 receptor antagonist regimens using claims data from...
2013 for patients receiving chemotherapy with AC-, cisplatin-, or carboplatin-containing regimens.

Methods

Data Source

The retrospective cohort study population was selected from Inovalon’s Medical Outcomes Research for Effectiveness and Economics Registry (MORE Registry) Research Edition claims database, which has compiled longitudinal claims data from more than 98% of US counties and Puerto Rico, with 121 million unique covered patient-lives since 2000. The data include 9.6 billion medical events from 763,000 physicians and 257,000 clinical facilities.

The payer claims are adjudicated longitudinal records representing medical and pharmacy benefits for patients with commercial, Medicare, or Medicaid coverage. The data include information on patient demographics, primary and secondary diagnoses, tumor type, comorbidities, payer information, medication utilization, and refill history for all drugs and dosage forms, including intravenous and oral, and information on place of service, including hospitalizations and emergency department visits. All data are linked for a given patient and are deidentified to protect the personal health information in accordance with the Health Insurance Portability and Accountability Act.

Study Population

This study included 3 cohorts, with 353 patients in each group. The patients received treatment with AC, cisplatin, or carboplatin on the first day of chemotherapy for solid tumors, between June 2013 and December 2013. The chemotherapy regimens selected for the study were identified as HEC (ie, AC and cisplatin) or MEC. The study index date was defined as the start date of the first cycle of treatment with 1 of the 3 chemotherapy regimens (ie, AC, cisplatin, or carboplatin). The patients were aged 18 to 70 years, with claim records available for at least 1 month of follow-up. To ensure that the participants did not have recent exposure to chemotherapy, patients with no data in the database for 1 month before the first dose of chemotherapy were excluded from the study. Patients were also excluded if the identified chemotherapy regimen was part of a clinical trial. The Figure depicts the selection process for patients in each of the chemotherapy regimens of interest.

Sample Characteristics

The demographics that were used to characterize patients in this study included age, sex, payer type, region, type of solid tumor, comorbidities, and the emetogenic potential of the chemotherapy regimen. The comorbidities at the time of the cancer diagnosis and at the start of chemotherapy (the index date) were determined based on International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes (Appendix 1, see supplemental material online) and were characterized with the Charlson Comorbidity Index. Emetogenic potential was determined based on a scoring system first developed by Hesketh and colleagues in 1997, which was modified at an expert consensus conference in 2004.11 Each patient’s cancer diagnosis was identified using ICD-9-CM codes, and the cancer with the highest number of chemotherapy claims for first-line treatment was considered primary. National Drug Codes and Healthcare Common Procedure Coding System J codes were used to identify the chemotherapeutic agents and the antiemetic medications.

The combination of AC- and cisplatin-containing regimens were considered HEC, and the carboplatin-containing combinations were considered MEC, based on the regimen classification, the doses of administration, and the revised Hesketh scale adopted by the NCCN, ASCO, and MASCC in their current guidelines.13
The antiemetics evaluated in this study consisted of the 5-HT3 receptor antagonists dolasetron, granisetron, ondansetron, and palonosetron; the NK1 receptor antagonists aprepitant and fosaprepitant; and dexamethasone. The patients were stratified into 2 groups based on the first cycle of the antiemetic regimen, with one group receiving an NK1 receptor antagonist and the second group not receiving an NK1 receptor antagonist.

Both groups included dexamethasone in their antiemetic regimen. Intravenous antiemetic drugs administered on the same day as chemotherapy, 5-HT3 oral agents taken up to day 3, and steroids used up to 4 days after the first day of chemotherapy were considered part of the scheduled prophylactic regimen. Antiemetic drugs taken after day 4 of the chemotherapy regimen were considered unscheduled rescue medications, based on the package inserts and the guideline recommendations of the drugs chosen.

### CINV Period Definition and Resource Utilization

The CINV events associated with hospital and/or emergency department visits and the additional outpatient visits were selected for analysis at each cycle based on the ICD-9-CM codes, as is listed in Appendix 2 (see supplemental material online). Patients with multiple visits for CINV on the same day were classified into a single, mutually exclusive healthcare resource utilization category according to the hierarchy of inpatient, emergency department, or outpatient physician clinic. All visits coded on the day of chemotherapy administration were excluded from the count of CINV-related healthcare resource utilizations.

The patients’ claims histories were utilized to determine the first line of therapy that occurred after their diagnosis date. The patients could not have received chemotherapy within the previous 30 days. This allowed for a sufficient washout period from any previous chemotherapy. The administration of the same drug combination within 90 days was considered part of the same regimen and line of therapy (the initial line considered in this analysis). The removal of an existing agent did not constitute the end of a regimen if the removal was temporary.

The addition of a new agent to the regimen constituted an advance to the next line of therapy. Therefore, a chemotherapy course in the initial therapy line that was eligible for evaluation was defined as the time from the date of the patient’s first regimen administration to the date of the last cycle of the regimen plus the time to the last antiemetic date after the last cycle before the start of a new regimen.

The duration of therapy was defined as the regimen end date minus the regimen start date plus 1 day (to account for the first day of therapy). One day is added to account for the first day of therapy. For example, if the patient started therapy on January 2 and the last administration was on January 31, the duration of therapy is 31 days minus 2 days plus 1 day, for a total of 30 days, to account for every day of the cycle. The last antiemetic administration date was defined as the last administration date of an antiemetic drug for a patient in the period up to 1 day before the beginning of second-line chemotherapy, if applicable. If a patient did not begin a second-line treatment, the average cycle length of the last chemotherapy administration for first-line therapy was used.

### Statistical Analysis

The sample size was determined based on the proportion of patients with complete responses for CINV based on phase 3 clinical trials. Based on the 69% of patients who experienced a complete response in those trials, 353 patients per chemotherapy regimen group were deemed to be necessary to detect a 10% difference with 80% power. Of the patients who met the study inclusion criteria, the study cohort was selected using a random sampling method for the AC- and carboplatin-containing treatment regimens, which comprised all patients who met the inclusion and exclusion criteria for the cisplatin group.

The patients were stratified into 2 groups—the NK1 receptor antagonist regimen group or the non-NK1 receptor antagonist regimen group, based on the first cycle of the antiemetic regimen for an intent-to-treat analysis. The baseline demographics and treatment characteristics were analyzed using descriptive statistics. All resource utilization was reported using mean and standard deviation by the NK1 receptor antagonist and the non-NK1 receptor antagonist groups for the eligible chemotherapy course.

### Results

#### Patient Demographics

The study population consisted of 1059 patients, with 353 patients in each chemotherapy regimen group; 51% of all the patients received NK1 receptor antagonist–based regimens. The average age of the total population was 56 years at the index date, 73% of the participants were female, and 55% had commercial health insurance (Table 1).

The mean comorbidity index was 6.3, and the mean follow-up time was 8.9 months. Breast cancer was the most common diagnosis, representing 40% of the study sample. Almost all (95%) of the patients receiving AC chemotherapy had breast cancer, and the mean age at the start of therapy was lower (ie, 53.1 years) for these patients compared with patients receiving cisplatin (56.8 years) or carboplatin (60.0 years; Table 1). Commercial
## Table 1  Study Population Demographics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>By chemotherapy regimen</th>
<th>By antiemetic regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Anthracycline plus cyclophosphamide (N = 353)</td>
<td>Cisplatin (N = 353)</td>
</tr>
<tr>
<td>Mean age at start of first-line treatment, yrs (SD)</td>
<td>53.1 (9.8)</td>
<td>56.8 (9.1)</td>
</tr>
<tr>
<td>Female, N (%)</td>
<td>342 (97)</td>
<td>180 (51)</td>
</tr>
<tr>
<td>Insurance, N (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial</td>
<td>212 (60)</td>
<td>209 (59)</td>
</tr>
<tr>
<td>Medicare</td>
<td>42 (12)</td>
<td>55 (16)</td>
</tr>
<tr>
<td>Othersa</td>
<td>99 (28)</td>
<td>89 (25)</td>
</tr>
<tr>
<td>Tumor type (top 3 shown), N (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast</td>
<td>335 (95)</td>
<td>3 (1)</td>
</tr>
<tr>
<td>Lung</td>
<td>0 (0)</td>
<td>59 (17)</td>
</tr>
<tr>
<td>Head and neck</td>
<td>1 (0)</td>
<td>118 (33)</td>
</tr>
<tr>
<td>Mean comorbidity index at start of first-line treatmentb</td>
<td>6.0</td>
<td>6.6</td>
</tr>
<tr>
<td>Mean follow-up time from start of first-line treatment, mo</td>
<td>9.3</td>
<td>8.6</td>
</tr>
<tr>
<td>Receiving NK₁ receptor antagonist regimen, N (%)</td>
<td>258 (73)</td>
<td>198 (56)</td>
</tr>
</tbody>
</table>

*aIncludes Medicaid and unknown payers.

*bDetermined by Charlson Comorbidity Index using ICD-9-CM codes.

ICD-9-CM indicates International Classification of Diseases, Ninth Revision, Clinical Modification; N/A, not applicable; NK₁, neurokinin-1; SD, standard deviation.

## Table 2  Top Antiemetic Regimens Used for Eligible Chemotherapy Course

<table>
<thead>
<tr>
<th>Antiemetic regimen</th>
<th>Category</th>
<th>Total, N (%) (N = 1059)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fosaprepitant, palonosetron, dexamethasone</td>
<td>NK₁ receptor antagonist/5-HT₃ receptor antagonist/steroid</td>
<td>221 (21)</td>
</tr>
<tr>
<td>Palonosetron, dexamethasone</td>
<td>5-HT₃ receptor antagonist/steroid</td>
<td>179 (17)</td>
</tr>
<tr>
<td>Ondansetron, dexamethasone</td>
<td>5-HT₃ receptor antagonist/steroid</td>
<td>150 (14)</td>
</tr>
<tr>
<td>Fosaprepitant, palonosetron, ondansetron, dexamethasone</td>
<td>NK₁ receptor antagonist/5-HT₃ receptor antagonist/steroid</td>
<td>104 (10)</td>
</tr>
<tr>
<td>Fosaprepitant, ondansetron, dexamethasone</td>
<td>NK₁ receptor antagonist/5-HT₃ receptor antagonist/steroid</td>
<td>58 (5)</td>
</tr>
<tr>
<td>Palonosetron, ondansetron, dexamethasone</td>
<td>5-HT₃ receptor antagonist/steroid</td>
<td>58 (5)</td>
</tr>
<tr>
<td>Other regimens</td>
<td></td>
<td>289 (27)</td>
</tr>
</tbody>
</table>

*aPalonosetron and ondansetron were administered at different cycles.

5-HT₃ indicates 5-hydroxytryptamine; NK₁, neurokinin-1.
insurance was the most common type of insurance in each chemotherapy treatment group, including 60% of patients receiving AC, 59% of patients receiving cisplatin, and 45% of patients receiving carboplatin.

The patient demographics by type of antiemetic regimen are shown in Table 1, with 51% of the patients receiving an NK1 receptor antagonist–based regimen and 49% receiving a non-NK1 receptor antagonist–based regimen. The patients in the NK1 receptor antagonist group were younger (54.7 years) and more predominantly female (78%) compared with the non-NK1 receptor antagonist group (57.3 years and 67%, respectively). The majority of the patients in the NK1 receptor antagonist group had commercial insurance (61%), which was also the most common insurance type in the non-NK1 receptor antagonist group (48%). More than half (54%) of patients in the NK1 receptor antagonist group had breast cancer compared with only 25% of patients in the non-NK1 receptor antagonist group.

### Antiemetic Treatments

More patients received NK1 receptor antagonist regimens in the AC group (73%) and in the cisplatin group (56%) than in the carboplatin group (23%; Table 1), which is consistent with the emetogenic potential score for each group. It should also be noted that at the time the data were collected, Medicare’s coverage of an NK1 receptor antagonist for carboplatin had only just been determined (on May 29, 2013), which might have affected utilization. The combination of fosaprepitant, palonosetron, palonosetron,

<table>
<thead>
<tr>
<th>Event/resource utilization</th>
<th>NK1 receptor antagonist (N = 536)</th>
<th>Non-NK1 receptor antagonist (N = 523)</th>
<th>Total (N = 1059)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CINV-related events, N (%)</td>
<td>238 (44)</td>
<td>263 (50)</td>
<td>501 (47)</td>
</tr>
<tr>
<td>Mean per patient</td>
<td>1.188</td>
<td>1.618</td>
<td>1.400</td>
</tr>
<tr>
<td>Median per patient</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Mean per patient with ≥1 CINV events</td>
<td>2.677</td>
<td>3.217</td>
<td>2.960</td>
</tr>
<tr>
<td>Median per patient with ≥1 CINV events</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>CINV-related office visits, N (%)</td>
<td>216 (40)</td>
<td>232 (44)</td>
<td>448 (42)</td>
</tr>
<tr>
<td>Mean per patient</td>
<td>1.015</td>
<td>1.138</td>
<td>1.138</td>
</tr>
<tr>
<td>Median per patient</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Mean per patient with ≥1 office visits</td>
<td>2.519</td>
<td>3.060</td>
<td>2.799</td>
</tr>
<tr>
<td>Median per patient with ≥1 office visits</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Emergency department visits, N (%)</td>
<td>88 (16)</td>
<td>109 (21)</td>
<td>197 (19)</td>
</tr>
<tr>
<td>Mean per patient</td>
<td>0.112</td>
<td>0.201</td>
<td>0.156</td>
</tr>
<tr>
<td>Median per patient</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Mean per patient with ≥1 emergency department visits</td>
<td>1.277</td>
<td>1.382</td>
<td>1.341</td>
</tr>
<tr>
<td>Median per patient with ≥1 emergency department visits</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Hospitalizations, N (%)</td>
<td>48 (9)</td>
<td>67 (13)</td>
<td>115 (11)</td>
</tr>
<tr>
<td>CINV-related hospitalizations, N (%)</td>
<td>24 (4)</td>
<td>29 (6)</td>
<td>53 (5)</td>
</tr>
<tr>
<td>Mean per patient</td>
<td>0.062</td>
<td>0.059</td>
<td>0.060</td>
</tr>
<tr>
<td>Median per patient</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Mean per patient with ≥1 hospitalizations</td>
<td>1.375</td>
<td>1.069</td>
<td>1.208</td>
</tr>
<tr>
<td>Median per patient with ≥1 hospitalizations</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

NOTE: CINV events associated with hospitalization, emergency department visits, and additional outpatient office visits were selected for analysis at each cycle based on ICD-9-CM codes. CINV indicates chemotherapy-induced nausea and vomiting; ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification; NK1, neurokinin-1.
and dexamethasone was the most common CINV prophylaxis regimen, which was used by 21% of the overall study population, followed by palonosetron plus dexamethasone (17%; Table 2). The 3-drug combination of fosaprepitant, palonosetron, and dexamethasone was the most common CINV prophylaxis regimen in the group receiving an NK1 receptor antagonist regimen (used in 41% of the subgroup), whereas palonosetron plus dexamethasone was the common antiemetic regimen in the non-NK1 receptor antagonist group (used in 34% of the subgroup).

CINV Events and Associated Resource Utilization

The proportion of patients who experienced a CINV event was lower in the NK1 receptor antagonist group (44%) than in the non-NK1 receptor antagonist group (50%; Table 3). The NK1 receptor antagonist group had fewer CINV events per patient (mean, 1.2; median, 0) than the non-NK1 receptor antagonist group (mean, 1.6; median, 1). Similarly, patients receiving an NK1 receptor antagonist had a lower number of CINV-related office visits (40% vs 44%, respectively) and fewer mean office visits per patient than the non-NK1 receptor antagonist cohort (1.0 vs 1.4, respectively).

The proportions of overall emergency department visits and hospitalizations were lower in the NK1 receptor antagonist group than in the non-NK1 receptor antagonist group (Table 3). A lower proportion of patients in the NK1 receptor antagonist group than in the non-NK1 receptor antagonist group experienced a CINV-related emergency department visit (9% vs 15%, respectively; mean number of visits, 0.1 vs 0.2, respectively), whereas the incidence of CINV-related hospitalizations was similar in the 2 cohorts (4% vs 6%, respectively; mean number of hospitalizations, 0.06 for both). Similar trends were observed in patients who had ≥1 CINV events or emergency department visits (Table 3).

Discussion

In this retrospective, claims-based study, patients who received an NK1 receptor antagonist with a 5-HT3 receptor antagonist and dexamethasone for CINV prophylaxis were less likely to have a CINV-related emergency department visit (9%) than patients receiving a 5-HT3 receptor antagonist and dexamethasone alone (15%). Hospitalizations related to CINV also occurred infrequently, and were less likely to occur in patients receiving an NK1 receptor antagonist regimen than in patients receiving a non-NK1 receptor antagonist regimen. The guidelines set forth by the NCCN, ASCO, and MASCC suggest that combinations of an NK1 receptor antagonist, 5-HT3 receptor antagonist, and dexamethasone be used to prevent CINV for HEC, which includes cisplatin and AC therapy, whereas a 5-HT3 receptor antagon-
the database may result in the overestimation of the number of CINV events not requiring intervention. Although we aimed to limit our study to chemotherapy-naïve patients by identifying the first chemotherapy after diagnosis, and by excluding patients without treatment data for 1 month before their chemotherapy, all patients may not have been chemotherapy-naïve. We cannot discount the lasting psychological and physiological effects from previous regimens, which might have impacted the level of response that was observed in our study. If patients who experienced CINV events with previous regimens were more likely to be given an NK1 receptor antagonist, then our results may be biased toward not finding a difference between the 2 groups.

In addition, although these results demonstrate differences for some CINV-related events and resource utilization, caution should be used in interpreting the implications for other populations. Notably, these data represent US-based patients with solid tumors. The differences in the demographics, such as the higher proportion of patients with breast cancer in the NK1 receptor antagonist group than in the non-NK1 receptor antagonist group, may also impact CINV-related events as a result of the distinct treatment protocols. It should also be noted that female sex is a predictive indicator of greater incidence and severity of CINV.2,10,12,13 Because our study had a high proportion of female patients, our results may underrepresent resource utilization by male patients.

Furthermore, we have applied descriptive statistics only to baseline demographic data and treatment characteristics. Thus, it is uncertain if any of the differences between the groups, such as the lower median age or the larger percentage of female patients receiving NK1 receptor antagonists, are clinically meaningful or significant. As demonstrated by the difference between the mean and the median values in Table 3, the data may not be distributed normally. The mean events per patient are higher than the medians, which may be the consequence of a small number of patients experiencing multiple events.

Conclusions
This study adds a real-world perspective to the current literature through its use of a national claims database, which incorporates evidence of resource utilization in actual practice in the setting of CINV prophylaxis. The current treatment guidelines of the NCCN, ASCO, and MASCC recommend the concurrent use of an NK1 receptor antagonist with a 5-HT3 receptor antagonist and dexamethasone for CINV prophylaxis in patients receiving HEC, including AC; the NCCN and ASCO allow for the use of an NK1 receptor antagonist for MEC at the discretion of the provider. However, prescriber adherence to these guidelines is less than perfect, and patients who do not receive adequate prophylactic treatment have a higher incidence of CINV. These findings suggest that the use of NK1 receptor antagonist–containing regimens in patients receiving HEC or MEC may lead to reduced resource utilization for CINV-related events. Further investigation is needed to confirm these findings.

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Author Disclosure Statement
Dr Schwartzberg is a consultant to Helsum, TESARO, and Eisai. Dr Harrow is an employee of TESARO. Dr Lal is an employee of Cardinal Health and is a consultant to TESARO. Ms Radtchenko is an employee of and owns stocks in Cardinal Health, and is a consultant to TESARO. Dr Lyman reported no conflicts of interest.

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STAKEHOLDER PERSPECTIVE

Impact of Chemotherapy-Induced Nausea and Vomiting Treatment on Patient Outcomes and Resource Utilization

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The treatment of chemotherapy-induced nausea and vomiting (CINV) is an important consideration for health plans and has the potential to significantly impact patient adherence to chemotherapy regimens, overall healthcare costs, and patient quality of life. Highly emetogenic chemotherapy (HEC) and moderately emetogenic chemotherapy (MEC) create challenges for providers in terms of ensuring that patients are able to continue using their chemotherapy regimens and maintain their general health and nutritional status while preserving their ability to perform reasonable daily functions and activities.

PAYERS: Health plans are concerned with the impact of failed CINV treatments or poor response to specific regimens that can lead to extensive medical resource utilization. There is a critical need to treat patients who are experiencing acute or delayed CINV events in a cost-effective and clinically appropriate manner. In addition, the chemotherapy regimens selected must be continued if the patient is to achieve maximum clinical benefits. Poor physical and emotional health coupled with nutritional deficiency that may accompany CINV events may prohibit continued treatment and may potentially lead to progression of the disease (which in this case can be life-threatening).

Failed CINV treatment may also require the provider to change the chemotherapy regimen to a more expensive regimen with a different set of side effects that will need to be managed. The primary benefit of successful
CINV treatment to the health plan will be to reduce the risk for emergency department visits, oncologist office visits, and any subsequent hospitalizations.

Based on the clinical data, providers tend to select a particular CINV regimen according to the specific chemotherapeutic regimen that is prescribed to the patient. However, the study by Schwartzberg and colleagues addresses the importance of choosing an appropriate regimen for HEC or MEC to achieve clinical success in the treatment of patients with cancer. Nationally recognized treatment guidelines promote appropriate options for the management of HEC and MEC in patients with cancer. Health plans generally support and follow such guidelines and may adhere to them in an effort to develop clinical pathways or treatment algorithms for specific cancer types. Acute CINV rates of 30% to 90% in the untreated population of patients undergoing chemotherapy highlight the importance of selecting an appropriate regimen and promoting patient adherence to the therapy.

The distribution of antiemetic regimens identified in the study by Schwartzberg and colleagues suggests that Pharmacy and Therapeutics committees may face challenges when trying to manage CINV or when promoting particular preferred agents or treatment algorithms. If health plans take a hard-line approach to this clinical treatment area, suboptimal CINV management or chemotherapy impact may result. A reasonable approach to treatment guidelines will likely satisfy all parties involved and lead to improved outcomes from the clinical, qualitative, and financial perspectives.

**PATIENTS/PROVIDERS:** The article by Schwartzberg and colleagues also supports the importance of education for all parties in the treatment of the patient, including physicians, nurses, case managers, and pharmacists. Conditions such as anticipatory CINV present an interesting opportunity for the education of patients and physicians, by encouraging the focus on true CINV events as the issue and the opportunity to eliminate or significantly blunt the effects of the nausea and vomiting induced by the use of chemotherapy with an appropriate and clinically effective treatment approach, coupled with optimal medication adherence by the patient. The delay or discontinuation of chemotherapy as a result of CINV events increases the risk for disease progression and ultimately can lead to wasted resources if the patient cannot continue to use a particular treatment protocol or if the patient requires additional medical care to address the CINV events.