Gastrointestinal Side Effects Associated With Novel Therapies in Patients With Multiple Myeloma: Consensus Statement of the IMF Nurse Leadership Board

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The novel immunomodulatory drugs lenalidomide and thalidomide and the novel proteasome inhibitor bortezomib can cause gastrointestinal side effects, including constipation, diarrhea, nausea, and vomiting, which can have a deleterious effect on quality of life and interfere with optimal therapy. The International Myeloma Foundation’s Nurse Leadership Board developed this consensus statement for the management of gastrointestinal side effects associated with novel therapies to be used by healthcare providers in any medical setting. It includes grading criteria and general recommendations for assessing and managing the side effects. Although constipation, diarrhea, nausea, and vomiting are expected side effects associated with novel therapies for multiple myeloma, they are manageable with appropriate medical interventions.

N
deral therapies for multiple myeloma include the immunomodulatory drugs lenalidomide (Revlimid®, Celgene Corporation) and thalidomide (Thalomid®, Celgene Corporation) and the proteasome inhibitor bortezomib (Velcade®, Millennium Pharmaceuticals, Inc.). The benefits of the agents for patients with multiple myeloma include increased response rates and survival times compared with conventional chemotherapy (e.g., melphalan plus prednisone; or vincristine, adriamycin, and dexamethasone) (Celgene Corporation, 2007a, 2007b; Ghobrial et al., 2007; Manochakian, Miller, & Chan-Khan, 2007; Millennium Pharmaceuticals, Inc., 2007; Rajkumar et al., 2005; Richardson & Anderson, 2006; Richardson, Hideshima, Mitsiades, & Anderson, 2007).

Like conventional chemotherapeutic agents, the novel therapies can cause serious side effects. Among them are gastrointestinal side effects, including constipation, diarrhea, nausea, and vomiting, which, although predictable and manageable, can be life threatening and interfere with adherence to optimal therapy and quality of life (Celgene Corporation, 2007a, 2007b; Millennium Pharmaceuticals, Inc., 2007). The International Myeloma Foundation’s Nurse Leadership Board, in recognition of the need for specific recommendations on managing key side effects of novel antmyeloma agents, developed this consensus statement for the management of constipation, diarrhea, nausea, and vomiting associated with lenalidomide, thalidomide, and bortezomib. The statement can be used by healthcare providers in any type of medical setting (Bertolotti et al., 2007, 2008). The recommendations, which were developed through evidence-based reviews and a consensus of the Nurse Leadership Board,
also are applicable for managing gastrointestinal side effects caused by any chemotherapeutic agent.

**Issue Statement**

Gastrointestinal toxicities are common sequelae of treatment with novel therapies, including lenalidomide, thalidomide, and bortezomib. Although they are addressed often, they may not be managed adequately. Inadequate management of constipation, diarrhea, nausea, or vomiting can affect patients in multiple ways. Physical effects can lead to decreased adherence to treatment regimens. Psychological effects include anxiety and depression. Patients may become socially isolated and experience decreased function and abilities. Adequate management of gastrointestinal toxicities increases patient adherence to treatment regimens, decreases physiologic impairment, improves quality of life for patients and their caregivers, and prevents serious adverse events that lead to prolonged hospitalization and increased morbidity and mortality.

### Table 1. National Cancer Institute Common Terminology Criteria for Adverse Events: Gastrointestinal Toxicity

<table>
<thead>
<tr>
<th>ADVERSE EVENT</th>
<th>GRADE 1 (MILD)</th>
<th>GRADE 2 (MODERATE)</th>
<th>GRADE 3 (SEVERE)</th>
<th>GRADE 4 (LIFE THREATENING OR DISABLING)</th>
<th>GRADE 5 (DEATH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constipation</td>
<td>Occasional or intermittent symptoms; occasional use of stool softeners, laxatives, dietary modification, or enema</td>
<td>Persistent symptoms with regular use of laxatives or enemas indicated</td>
<td>Symptoms interfering with activities of daily living; obstipation with manual evacuation indicated</td>
<td>Life-threatening consequences (e.g., obstruction, toxic megacolon)</td>
<td>Death</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>Increase of &lt; 4 stools per day over baseline; mild increase in ostomy output compared to baseline</td>
<td>Increase of 4–6 stools per 24 hours over baseline; IV fluids indicated &lt; 24 hours; moderate increase in ostomy output compared to baseline; not interfering with activities of daily living</td>
<td>Increase of 7 stools per 24 hours over baseline; incontinence; IV fluids 24 hours; hospitalization; severe increase in ostomy output compared to baseline; interfering with activities of daily living</td>
<td>Life-threatening consequences (e.g., hemodynamic collapse)</td>
<td>Death</td>
</tr>
<tr>
<td>Nausea</td>
<td>Loss of appetite without alteration in eating habits</td>
<td>Oral intake decreased without significant weight loss, dehydration or malnutrition; IV fluids indicated &lt; 24 hours</td>
<td>Inadequate oral caloric or fluid intake; IV fluids, tube feedings, or total parenteral nutrition indicated 24 hours</td>
<td>Life-threatening consequences</td>
<td>Death</td>
</tr>
<tr>
<td>Vomiting</td>
<td>1 episode in 24 hours</td>
<td>2–5 episodes in 24 hours; IV fluids indicated &lt; 24 hours</td>
<td>6 episodes in 24 hours; IV fluids or total parenteral nutrition indicated 24 hours</td>
<td>Life-threatening consequences</td>
<td>Death</td>
</tr>
</tbody>
</table>

*Note. Based on information from National Cancer Institute, 2006.*

### Table 2. Incidence of Gastrointestinal Events in Patients With Multiple Myeloma Receiving Novel Therapies

<table>
<thead>
<tr>
<th>TOXICITY</th>
<th>LENALIDOMIDE&lt;sup&gt;a&lt;/sup&gt; (TWO STUDIES, N = 346)</th>
<th>THALIDOMIDE&lt;sup&gt;b&lt;/sup&gt; (OPEN-LABEL STUDY, N = 102)</th>
<th>BORTEZOMIB (PHASE III TRIAL, N = 331)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ALL GRADES (%)</td>
<td>GRADE 3 (%)</td>
<td>ALL GRADES (%)</td>
</tr>
<tr>
<td>Constipation</td>
<td>39</td>
<td>2</td>
<td>55</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>29</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Nausea</td>
<td>22</td>
<td>&lt; 2&lt;sup&gt;c&lt;/sup&gt;</td>
<td>28</td>
</tr>
<tr>
<td>Vomiting</td>
<td>10</td>
<td>&lt; 2&lt;sup&gt;c&lt;/sup&gt;</td>
<td>12</td>
</tr>
</tbody>
</table>

<sup>a</sup> Administered in combination with dexamethasone
<sup>b</sup> No grade 4 events were reported.
<sup>c</sup> Only grade 3 and 4 adverse events with an incidence of ≥ 2% were reported.

*Note. Based on information from Celgene Corporation, 2007a, 2007b; Millennium Pharmaceuticals, Inc., 2007.*

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This consensus statement and the tools provided address the gastrointestinal toxicities of constipation, diarrhea, nausea, and vomiting and will allow oncology nurses, as part of interdisciplinary teams, to be better prepared to manage toxicities associated with novel therapies.

Toxicity Tool for Grading

The severity of gastrointestinal adverse events can be quantified with the National Cancer Institute (NCI) Common Terminology Criteria for Adverse Events (CTCAE). The NCI CTCAE are used for identifying treatment-related adverse events to facilitate the evaluation of new cancer therapies, treatment modalities, and supportive measures. For most adverse events, the NCI CTCAE define grades 1–5 using unique clinical descriptions; each grade is assigned a severity: grade 1 is mild, grade 2 is moderate, grade 3 is severe, grade 4 is life threatening or disabling, and grade 5 defines death associated with the adverse event. The grades may be used for monitoring gastrointestinal side effects and determining the need for intervention and dosage modifications. Table 1 defines the NCI CTCAE version 3.0 toxicity grades for constipation, diarrhea, nausea, and vomiting (NCI, 2006).

Incidence, Risk Factors, and Assessments for Gastrointestinal Toxicities

Table 2 presents the incidence of gastrointestinal toxicities in patients with multiple myeloma receiving lenalidomide, thalidomide, or bortezomib in clinical trials. Table 3 lists risk factors other than treatment with novel therapies that may cause constipation, diarrhea, nausea, or vomiting in patients with multiple myeloma. Table 4 outlines risk assessments for gastrointestinal toxicities in patients receiving novel therapies for multiple myeloma based on clinical observations, patient history, and physical and laboratory examinations.

Recommendations for Constipation

Constipation is defined as decreased frequency of defecation, usually less than three bowel movements per week, with accompanying abdominal discomfort. It is a common issue in patients with cancer because of poor oral intake or because of drugs such as opioids or antiemetics, which slow intestinal transit time. Constipation can be a disabling toxicity and often is underassessed and undertreated in patients with cancer.
Table 4. Risk Assessments for Gastrointestinal Toxicities

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>CONSTIPATION</th>
<th>DIARRHEA</th>
<th>NAUSEA</th>
<th>VOMITING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical assessment</td>
<td>Abdominal, liver, or retroperitoneal pain</td>
<td>Evaluate onset.</td>
<td>Evaluate onset and triggers.</td>
<td>Assess circumstances surrounding episodes of vomiting (e.g., after eating, empty stomach, time of day, associated with certain smells)</td>
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<tr>
<td></td>
<td>Abdominal distention</td>
<td></td>
<td></td>
<td>Assess for epigastric pain, pain on swallowing, hiccups, and heartburn; quantity and description of emesis; weight and skin turgor to monitor fluid volume deficit; postural hypotension; secondary effects from vomiting (e.g., dehydration, electrolyte imbalances, vertigo, sleep deprivation, fatigue, anorexia)</td>
</tr>
<tr>
<td></td>
<td>Anorexia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nausea and vomiting</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Urinary retention</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Confusion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pseudodiarrhea</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient history</td>
<td>Pattern of recent bowel movements: frequency and difficulty of defecation prior to illness</td>
<td>Determine normal bowel habits, diet, food intolerances, and fluid intake. Determine history of irritable bowel syndrome, colitis, or diverticulitis</td>
<td>Obtain history including patterns of nausea to include medications and effect: assess the dose of drugs, as high doses are more likely to cause nausea Determine when and how often the drug is given and how the drug is given (e.g. via IV or orally) Determine food intolerances and dietary-restriction history and reasons Determine the type of nausea: acute, delayed, anticipatory, breakthrough, refractory</td>
<td>Consider the emetogenic potential of the novel agent: high, moderate or low Medication history to include all over the counter, prescription, vitamins, and alternative medications; sudden cessation of opioid analogesics (vomiting often occurs with physical withdrawal)</td>
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<tr>
<td></td>
<td>Usual use of laxatives, stimulants, or enemas</td>
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<td></td>
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<tr>
<td></td>
<td>History of cancer and cancer treatment</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>Use of constipating medications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recent fluid and food intake</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Presence of comorbid conditions that can exacerbate constipation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical and laboratory</td>
<td>Palpation of fecal masses</td>
<td>Determine hydration status: dry mucous membrane and poor skin turgor. Assess bowel sounds (absent or hyperactive bowel sounds may indicate obstruction). Rectal examination to rule out fecal impaction Complete blood count, comprehensive metabolic panel, and stool culture if infection (e.g., Clostridium difficile is suspected)</td>
<td>Determine hydration status: dry mucous membranes, poor skin turgor, sunken eyes, tachycardia, orthostatic blood pressure changes, weight loss, fluctuation in mental status, and color of urine (dark color indicates dehydration).</td>
<td>Physical examination should include assessment of mouth for oral candidiasis, herpes, or other infections; tongue for increased furrows (smaller tongue with lack of moisture indicates dehydration); abdomen for distention; and bowel sounds for partial or total bowel obstruction.</td>
</tr>
<tr>
<td>examinations</td>
<td>Presence of feces in rectum, if present, consistency of stool</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Presence of bowel sounds: quality and character</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flat abdominal x-ray will assess amount of stool in the bowel as well as evaluate for mechanical bowel obstruction</td>
<td>Determine hydration status: dry mucous membrane and poor skin turgor. Assess bowel sounds (absent or hyperactive bowel sounds may indicate obstruction). Rectal examination to rule out fecal impaction Complete blood count, comprehensive metabolic panel, and stool culture if infection (e.g., Clostridium difficile is suspected)</td>
<td>Determine hydration status: dry mucous membranes, poor skin turgor, sunken eyes, tachycardia, orthostatic blood pressure changes, weight loss, fluctuation in mental status, and color of urine (dark color indicates dehydration).</td>
<td>Physical examination should include assessment of mouth for oral candidiasis, herpes, or other infections; tongue for increased furrows (smaller tongue with lack of moisture indicates dehydration); abdomen for distention; and bowel sounds for partial or total bowel obstruction.</td>
</tr>
</tbody>
</table>

*See Table 3.


Recommendations for Diarrhea

Diarrhea is defined as an abnormal increase in the amount of fluid in stool. Severe and uncontrolled diarrhea can lead to dehydration and electrolyte imbalances, exacerbate underly-
Table 5. Management of Constipation, Diarrhea, Nausea, and Vomiting by the National Cancer Institute Common Terminology Criteria for Adverse Events

<table>
<thead>
<tr>
<th>GRADE</th>
<th>RECOMMENDATIONS</th>
<th>CONSTITUTION</th>
<th>DIARRHEA</th>
<th>NAUSEA</th>
<th>VOMITING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Increase fluid intake: warm or hot drink approximately half-hour before time of patient’s usual defecation. Increase fiber intake (e.g., psyllium 10 gm PO daily). Provide comfort, privacy, and convenience during defecation (e.g., provide toilet, bedside commode, and appropriate assistive devices). Increase physical activity, if possible. Consider bowel regimen when constipating medications are prescribed (e.g., docusate 2–3 tablets per day, senna not to exceed 8 tablets a day).</td>
<td>Increase oral fluid intake (8–10 cups daily). Recommend water, electrolyte-replacement beverages, sports drinks, diluted fruit juices, and broth. Avoid caffeinated, carbonated, heavily sugared, and hyperosmotic beverages. Foods to avoid: alcohol, caffeine-containing products, carbonated and high-sugar beverages, fruit juices with pulp, high-fiber and high-fat foods, hot or heavily spiced foods, dairy products. Discontinue, if possible, any medications or herbal supplements that may cause diarrhea. Perineal care: Clean area using mild soap and water or wet wipes. Pat dry rather than rub dry; air dry when possible. Use skin barrier products, vitamin D ointment, diaper-rash cream, or other moisture-barrier products. Use skin-barrier products with caution as they may be difficult to remove, resulting in further skin impairment. Pharmacologic management for grade 1 diarrhea that persists for more than 12–24 hours. Antidiarrheal agent: loperamide 4 mg followed by 2 mg every four hours or after each unformed stool (maximum 16 mg per day). May take 4 mg every four hours at night to allow sleep. Correct electrolyte imbalance as needed.</td>
<td>All of the recommendations for anticipatory nausea (see Figure 1) plus the following. Strive to prevent (not just control) nausea. Start mild antiemetic mediation the night before treatment. Select medications based on how strongly the novel agents stimulate nausea. Consider palonosetron, dolasetron, aprepitant, granisetron, or ondansetron.</td>
<td>May be self-limiting. Offer PO antiemetic such as short-acting phenothiazines. Oral care after each emesis. Cool, damp cloth to the forehead, neck, and wrists. Decrease noxious stimuli. Restrict fluid with meals. Try peppermint or ginger tea, a sports beverage, ice chips, or popsicles. Eat small, frequent meals. Have others prepare meals. Eat bland, cold, or room temperature food such as crackers, toast, cereals, and ginger cookies. Chew food well; suck on mints or hard candy. Do not lie flat for two hours after eating. Wear loose-fitting clothes. Have fresh air with a fan or open window. Use relaxation techniques and guided imagery. Avoid favorite foods so that they will not be associated with vomiting later. Avoid sweet, salty, fatty, and spicy foods. Avoid citrus and tomatoes; limit sights, sounds, and smells that precipitate vomiting. Suggest that patients discuss hypnosis and acupuncture with a doctor.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>All of the grade 1 recommendations plus the following: Nutritional consultation. Consider laxatives and stimulants: magnesium sulfate 15 g PO daily, magnesium citrate 200 ml PO daily, lactulose.</td>
<td>All of the grade 1 recommendations plus the following: Consider atropine-diphenoxylate one or two tablets every six to eight hours. Correct electrolyte imbalance as needed.</td>
<td>All of the grade 1 recommendations plus the following: Increases in dosages of medications may be needed to maintain oral intake. IV fluids should be restricted to bolus amounts of fluids to prevent hypovolemia.</td>
<td>All of the grade 1 recommendations plus the following: Serotonin 5-HT3 receptor antagonists if needed. Consider benzodiazepines.</td>
<td></td>
</tr>
</tbody>
</table>

* See Table 1.

* The incidence of severe nausea associated with novel agents is ≤5%. If grade 3 or 4 nausea occurs, consider gastroesophageal reflux disease or peptic ulcer disease.

* The incidence of severe vomiting associated with novel agents is ≤3%. If grade 3 or 4 vomiting occurs, consider gastroesophageal reflux disease or peptic ulcer disease.

Note. Based on information from American Gastroenterological Association, 2000; American Society of Clinical Oncology, 2005a, 2005b, 2005c; Basch & Ulbricht, 2005; Benson et al., 2004; Berger & Clark-Snow, 2005, 2007; Bisanz et al., 2007; Bush, 2004; Dalal et al., 2007; Engelking, 2004; Ernst & Pittler, 2000; Giare et al., 2004; Grunberg, 2007; Jordan et al., 2007; Kris et al., 2006; Mercadante, 2007; Molassiotis et al., 2002; National Comprehensive Cancer Network, 2007; National Comprehensive Cancer Network & American Cancer Society, 2007; Redd et al., 2001; San Miguel et al., 2006; Shen et al., 2000; Tipton et al., 2006.
Table 5. Management of Constipation, Diarrhea, Nausea, and Vomiting by the National Cancer Institute Common Terminology Criteria for Adverse Events (Continued)

<table>
<thead>
<tr>
<th>GRADE</th>
<th>CONSTIPATION</th>
<th>DIARRHEA</th>
<th>NAUSEA</th>
<th>VOMITING</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (continued)</td>
<td>15–60 ml PO daily, bisacodyl 5–20 mg PO at night or 10–20 mg rectally after a meal</td>
<td>May manage on an outpatient basis until diarrhea resolves</td>
<td>maintain hydration and electrolyte balance. Use the lowest effective dose of the antinausea medication before novel therapy. Monitor how the individual responds to the antinausea treatment. Consider the side effects of the antinausea medications.</td>
<td>May require IV hydration or electrolyte replacement</td>
</tr>
<tr>
<td>3</td>
<td>All of the grade 2 recommendations plus the following: Initiate bowel regimen (call physician if no bowel movement in three days). Assess for bowel obstruction. Consider referral for disimpaction (following institutional guidelines). Consider IV hydration. If no response, consider referral to a gastroenterologist.</td>
<td>All of the grade 2 recommendations plus the following: Hospitalize for fluid replacement. Stool cultures and sensitivity: rule out <em>Clostridium difficile</em>, ova, cysts, and parasites. Consider empiric antibiotic, (e.g., metronidazole). Consider tincture of opium 0.6 ml PO every four to six hours. Consider sandostatin 100–150 mcg subcutaneously TID. Monitor continuously. Vigilant skin care and use of disposable pads or diapers. Consider holding or adjusting cancer therapy (see Table 6).</td>
<td>All of the grade 2 recommendations plus the following: Increase medications appropriate to the degree of incapacitation caused by nausea. Consider adding lorazepam, proclorperazine, dexamethasone, famotidine, promethazine, metoclopramine, or ranitidine. Assess for distention of abdomen and obstruction; monitor electrolytes and hydration. May require hospitalization</td>
<td>All of the grade 2 recommendations plus the following: May require hospitalization Antiemetics around the clock IV hydration and electrolyte replacement May need total parenteral nutrition Assess for intestinal obstruction.</td>
</tr>
<tr>
<td>4</td>
<td>All of the grade 3 recommendations plus the following: Hospitalization Rule out perforation, particularly if patient is taking dexamethasone combination therapy.</td>
<td>Admit to hospital. Stabilize and monitor vital signs. Aggressive electrolyte and fluid replacement Dietary modifications: nothing by mouth; consider total parenteral nutrition. Follow previous guidelines as appropriate. Strict monitoring of fluid intake and output Discontinue any agent associated with diarrhea. Monitor continuously.</td>
<td>All of the grade 3 recommendations plus the following: If nausea causes severe incapacitation, then total parental nutrition may be considered. Note that grade 4 nausea is unlikely without concommitant vomiting.</td>
<td>All of the grade 3 recommendations plus the following: Hospitalization Referral to a gastroenterologist Total parenteral nutrition</td>
</tr>
</tbody>
</table>

*See Table 1.*

*The incidence of severe nausea associated with novel agents is ≤ 5%. If grade 3 or 4 nausea occurs, consider gastroesophageal reflux disease or peptic ulcer disease.*

*The incidence of severe vomiting associated with novel agents is ≤ 3%. If grade 3 or 4 vomiting occurs, consider gastroesophageal reflux disease or peptic ulcer disease.*

**Note.** Based on information from American Gastroenterological Association, 2000; American Society of Clinical Oncology, 2005a, 2005b, 2005c; Basch & Ulbricht, 2005; Benson et al., 2004; Berger & Clark-Snow, 2005, 2007; Bisanz et al., 2007; Bush, 2004; Dalal et al., 2007; Engelking, 2004; Ernst & Pittler, 2000; Glare et al., 2004; Grunberg, 2007; Jordan et al., 2007; Kris et al., 2006; Mercadante, 2007; Molassiotis et al., 2002; National Comprehensive Cancer Network, 2007; National Comprehensive Cancer Network & American Cancer Society, 2007; Redd et al., 2001; San Miguel et al., 2006; Shen et al., 2000; Tipton et al., 2006.
Recommendations for Nausea

Nausea is defined as an uncomfortable, unpleasant feeling in the back of the throat or in the stomach that may or may not result in vomiting. Other common terms used to describe nausea are “sick to my stomach” and “queasy.” Increased saliva, dizziness, light-headedness, difficulty swallowing, changes in skin temperature, and fast heart rate are other symptoms that may occur as a result of nausea. Although nausea and vomiting are separate phenomena, risk factors and assessments are similar. Treatment-related nausea may be a difficult symptom to manage in patients with advanced cancer (ASCO, 2005c; Berger & Clark-Snow, 2005, 2007; Dalal, Palat, & Bruera, 2007; Grunberg, 2007; NCI, 2007b). Many patients worry that nausea is inevitable after treatment with anticancer agents, and it is second only to fatigue as an expected side effect (Hofman et al., 2004). The expectation of nausea has been shown to be correlated with its development during treatment (Hofman et al.). With antiemetic therapy and appropriate care and advice, the incidence and severity of nausea can be reduced (Berger & Clark-Snow, 2007). Antiemetic therapies, which also may be helpful for nausea, are listed in Appendix B. Antiemetics for older patients should have the following characteristics.

- A low risk of drug-drug interactions
- No cardiovascular side effects
- A simple, convenient dosing regimen
- No dose adjustments in patients with impaired kidney or liver function

Once a patient has been determined to have or to be at risk for nausea, the IMF Nurse Leadership Board recommends appropriate prophylactic and therapeutic interventions and an effective nausea management plan. Acute nausea usually occurs within a few minutes to several hours after administration of anticancer agents and often resolves in the first 24 hours. Delayed nausea occurs more than 24 hours after administration of anticancer agents. It often peaks 48–72 hours after treatment and can last six or seven days. Patients also may experience anticipatory nausea, which occurs before they receive anticancer treatment. Anticipatory nausea is a conditioned response and can occur before a subsequent treatment with an anticancer agent that previously caused nausea (Tipton et al., 2006). Although anticipatory nausea has no CTCAE category or grade, it requires management

Ineffective management of diarrhea not only leads to poor clinical outcomes but also has a negative impact on quality of life, including alteration of roles, responsibilities, and interpersonal relationships, and it can cause social isolation. Many patients with diarrhea are acutely embarrassed and will not discuss the issue with healthcare providers. Some fear that disclosure will cause reductions or delays in treatment. Fear of incontinence and the possibility of embarrassment often leave patients “trapped” at home. Eventually, altered body image, low self-esteem, depression, anxiety, and hopelessness may occur (Engelking, 2004). Once a patient has been determined to be at risk for or is experiencing diarrhea, the Nurse Leadership Board recommends appropriate prophylactic and therapeutic interventions and an effective diarrhea management plan. Table 5 presents recommendations for management of diarrhea by CTCAE version 3.0 grades 1–4.

### Table 6. Dosing Guidelines for Novel Therapies in Patients With Gastrointestinal Toxicities

<table>
<thead>
<tr>
<th>TOXICITY</th>
<th>THERAPY</th>
<th>RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3 or 4 toxicities judged to be related to lenalidomide therapy</td>
<td>Lenalidomide</td>
<td>Hold treatment and restart at next lower dose level when toxicity has resolved to &lt; grade 2. Do not dose below 5 mg daily.</td>
</tr>
<tr>
<td>Grade 3 or 4 constipation</td>
<td>Thalidomide</td>
<td>Patients who develop side effects such as constipation may benefit by either temporarily discontinuing the drug or continuing at a lower dose. With the abatement of these side effects, the drug may be started at a lower dose or at the previous dose based on clinical judgment.</td>
</tr>
<tr>
<td>Any grade 3 nonhematologic toxicity</td>
<td>Bortezomib</td>
<td>Hold bortezomib until toxicity resolves, then reinstate therapy at a 25% reduced dose (1.3 mg/m² dose reduced to 1 mg/m²; 1 mg/m² dose reduced to 0.7 mg/m²).</td>
</tr>
</tbody>
</table>

*Note. Based on information from Celgene Corporation, 2007a, 2007b; Millennium Pharmaceuticals, Inc., 2007.*
with preventive strategies (see Figure 1). Such strategies also form the basis of management of therapy-associated nausea; see Table 5 for recommendations for management of nausea by CTCAE version 3.0 grades 1–4.

Recommendations for Vomiting

Vomiting often is confused with nausea but is, in fact, a separate phenomenon that may or may not occur in conjunction with nausea. It is a self-protective mechanism by which the body attempts to expel toxins. Vomiting involves the expulsion of gastric contents through the mouth. The action is caused by the forceful and spasmodic contraction of the abdominal muscles and diaphragm (ASCO, 2005c; Berger & Clark-Snow 2005, 2007; Dalal et al., 2007; Glare, Pereira, Kristjanson, Stockler, & Tattersall, 2004). Like nausea, vomiting can be anticipatory, acute, or delayed (Tipton et al., 2006).

Vomiting, along with nausea, is considered one of the most disturbing and feared side effects of cancer treatment (ASCO, 2005c). The Nurse Leadership Board believes that ineffective management of vomiting has a negative effect on quality of life, often leading to anxiety and depression, delayed recovery, poor clinical outcomes, anticipatory vomiting, and aversion to future treatments. Many patients even consider stopping treatments to avoid vomiting. However, vomiting can be one of the most manageable side effects of cancer treatment. Table 5 presents recommendations for management of vomiting by CTCAE version 3.0 grades 1–4.

Dose Modification of Novel Therapies

In addition to using the general strategic recommendations for management of gastrointestinal toxicities associated with novel agents for multiple myeloma, healthcare professionals may consider dose modifications, particularly when symptoms are severe. The labeling for lenalidomide describes dose modification recommendations for grade 3 and 4 toxicities judged to be related to lenalidomide therapy. The labeling for thalidomide describes dose modification recommendations for constipation. The labeling for bortezomib describes dose modifications for any grade 3 nonhematologic toxicity. They are summarized in Table 6.

Therapies for multiple myeloma, including the newer therapies, can cause gastrointestinal side effects, including constipation, diarrhea, nausea, and vomiting, which can have a deleterious effect on quality of life, lead to or prolong hospitalization, and interfere with optimal therapy. However, with appropriate medical interventions, the side effects are manageable, and their impact on patient quality of life and adherence to therapy can be minimized.

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**Pharmacologic Interventions (Adults)**

- **Laxatives**
  - Bulk-forming laxatives
    - Methylcellulose

- Oral naloxone, an opioid receptor antagonist, has shown mixed results for managing opioid-induced constipation, potentially causing adverse reactions, including loss of analgesia and withdrawal symptoms.

### Likely to Be Effective

Interventions for which effectiveness has been demonstrated by supportive evidence from a single rigorously conducted controlled trial, consistent supportive evidence from well-designed controlled trials using small samples, or guidelines developed from evidence and supported by expert opinion.

**Opioid-Induced Constipation: Prophylactic Regimen**

A proactive approach, including initiation of a prophylactic regimen, is needed to prevent constipation when taking opioids. However, not enough evidence exists to identify the most effective regimen (see Expert Opinion section).

**Opioid-Induced Constipation: Opioid Rotation**

Research has demonstrated that some opioids have less constipating effect than others, and rotating opioids would decrease the associated side effects.

- Switching opioids from sustained-release oral morphine to transdermal fentanyl patches may decrease constipation.
- Switching opioids to methadone may result in a reduction in laxative use.

### Refractory Constipation in Adults

The National Comprehensive Cancer Network recommends the use of polyethylene glycol (PEG) as a treatment alternative for patients with cancer with persistent constipation. Standard-dose PEG with electrolytes in the United States is known as Golytely® (Braintree Laboratories) and Colyte® (Schwarz Pharma). Low-dose PEG, referred to as PEG 3350, is available without electrolytes in the United States and is marketed as Miralax® (Schering-Plough). Stimulant or osmotic laxatives are effective in improving bowel function in patients with cancer with persistent constipation and/or at the end of life, and some patients may need both types of laxatives to achieve optimal results.

### Benefits Balanced With Harms

Interventions for which clinicians and patients should weigh the beneficial and harmful effects according to individual circumstances and priorities.

**Opioid-Induced Constipation: Oral Naloxone**

Oral naloxone, an opioid receptor antagonist, has shown mixed results for managing opioid-induced constipation, potentially causing adverse reactions, including loss of analgesia and withdrawal symptoms.

### Effectiveness Not Established

Interventions for which there are currently insufficient or conflicting data or data of inadequate quality, with no clear indication of harm.

**Pharmacologic Interventions for Constipation in Adults**

These interventions are based on high-level evidence in nononcology populations and need to be studied in the oncology population.

**Bulk Laxatives (Psyllium)**

Psyllium is recommended for patients with a good functional status, including the ability to tolerate adequate fluids for the prevention and treatment of constipation. Most bulk laxatives need to be taken with at least 200–300 ml of water. Psyllium should be avoided in patients who do not have adequate physical activity or fluid intake and/or who have severe constipation, as it may worsen manifestations of constipation. Psyllium administered in large amounts has been associated with increased flatulence, abdominal distension and bloating, mechanical obstruction of the esophagus and colon, and anaphylactic reactions.

**Osmotic Laxatives (Sorbitol, Lactulose)**

Osmotic laxatives such as sorbitol or lactulose are associated with significant improvements in stool consistency, fecal impaction, and other symptoms of chronic constipation, such as straining of stool. Adverse effects include abdominal cramping, flatulence, bowel distension, an unpleasant sweet taste, and diarrhea. In many cases, osmotic laxatives were no better than other laxatives such as senna. Lactulose often is used in combination with a stimulant laxative in difficult-to-treat constipation.

**Polyethylene Glycol With or Without Electrolytes**

A high level of evidence was found in the nononcology population regarding the safety and efficacy of PEG with or without electrolytes. Caution: Do not administer electrolytes when kidney function is compromised.

**Tegaserod**

The effectiveness of tegaserod, a 5-HT₃ agonist, in patients with cancer has not been established because this population was excluded from published premarketing studies. However, in nononcology patients, tegaserod has been shown to be effective and safe in relieving symptoms of chronic constipation, with a recommended dosage of 6 mg orally twice a day.

### Interventions for Constipation Where Data Are Insufficient

The effectiveness of the interventions described below has not been established because they are based on studies that are inadequately powered, have limited sample sizes, or have flaws in study design or in study procedures. The majority of the research is in nononcology patients who have chronic constipation. Further study using randomized controlled trials is needed.

**Pharmacologic Interventions (Adults)**

- Laxatives
  - Bulk-forming laxatives
    - Methylcellulose
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EXPERT OPINION

Low-risk interventions that are (1) consistent with sound clinical practice, (2) suggested by an expert in a peer-reviewed publication (journal or book chapter), and (3) for which limited evidence exists. An expert is an individual who has authored articles published in a peer-reviewed journal in the domain of interest.

Special Note: Myelosuppressed Patients

Avoid rectal agents and/or manipulation (i.e., rectal examinations, suppositories, and enemas) in myelosuppressed patients. These actions can lead to development of bleeding, anal fissures, or abscesses. In addition, avoid manipulation of the stoma of neutropenic patients.

General Constipation

Prevention

- Take preventive measures in anticipation of constipation for those receiving medications, such as vincristine or other chemotherapies, that slow colonic transit times.

Assessment

- Perform a thorough history and physical examination in evaluation of constipation before determining the treatment plan, including assessment of individual risk factors.
- Obtain a nutritional consult.
- Consider in-depth diagnostic workup for constipation after patient fails initial treatment.

Interventions

- Teach the patient about bowel function.
- Provide a comfortable, quiet, private environment for defecating.
- Provide a toilet, bedside commode, and any necessary assistive devices. Avoid the use of a bedpan when possible.
- Minimize use of constipating medications whenever possible.
- Involve the patient in development of a bowel regimen.
- Encourage the intake of warm or hot liquids.
- Castor oil: Not recommended secondary to severe cramping.

Opioid-Induced Constipation

Stimulant Laxatives Plus Stool Softener

This combination is recommended when initiating opioid therapy. A useful bowel regimen includes docusate sodium (100–300 mg per day) along with senna (two to six tablets twice a day). Bulk laxatives are not recommended for opioid-induced constipation because of the risk of bowel impaction in poorly hydrated patients.

- The laxative dose should be individually titrated for effectiveness according to bowel function, not opioid dosing.

Pharmacologic Interventions

- Prokinetic medication (i.e., metoclopramide) should be reserved for use in individuals with severe constipation and those resistant to bowel programs. Caution: Avoid in patients with large abdominal tumors or bowel obstruction.
- Oral mineral oil is effective for hard stool but should not be used for routine prevention of constipation because it may interfere with absorption of some nutrients.
- Expert opinion supports the use of a stimulant laxative plus a stool softener in preventing and managing constipation in patients at the end of life.

NOT RECOMMENDED FOR PRACTICE

Interventions for which lack of effectiveness or harmfulness has been demonstrated by strong evidence from rigorously conducted studies, meta-analyses, or systematic reviews or interventions for which the costs, burdens, or harms associated with the intervention exceed anticipated benefit:

- Cisapride: A prokinetic drug that is known to increase gastrointestinal motility (Caution: Restricted access exists in some countries because of adverse cardiac effects. Cisapride was taken off the market in the United States in 2000 by the U.S. Food and Drug Administration [FDA].)
- Corn syrup: No longer recommended as a stool softener because it is not sterilized when packaged and may be a source of *Clostridium botulinum* spores
- Dantron™ (Hexal Pharma): This drug has not been approved by the FDA for use in the United States because it has been associated with rodent cancer.
- Nalmefene: Limited studies of the efficacy of oral nalmefene in humans are available because of its propensity to reverse analgesia or to induce withdrawal.
- Naltrexone: A lipid soluble drug that crosses the blood-brain barrier and may negatively affect the analgesic effects of opioids. It has been associated with dose-related elevations in serum transaminase levels, resulting in the discontinuation of the drug. (Note: This is different from methylnaltrexone.)
- Docusate sodium and docusate calcium
- Prokinetic agent: Erythromycin
- Enemas: Phosphate enema and sodium citrate enema
- Chloride channel activator: Amitiza® (lubiprostone, Sucampo Pharmaceuticals and Takeda Pharmaceuticals America)
Nonpharmacologic Interventions

- Recommended fluid intake per day is eight 8-oz glasses in adults.
- Treat high and low impactions differently.
  - High impactions: These are comfortably relieved with low-volume (< 300 ml) milk and molasses enemas up to four times per day along with an oral laxative. For enema recipe, see definition table at www.ons.org/outcomes.
  - Low impactions: Oil-retention enemas soften hard stool. In nonmyelosuppressed patients, stool can be manually disimpacted followed by enemas of choice.

Individualized Bowel Management Program

- After three days without a bowel movement, initiate a bowel management program.
- A good program includes fluids, fiber, and a decrease in constipating medications or provision of medications to offset constipating side effects of medications.

Appendix B. Putting Evidence Into Practice® Card on Preventing and Treating
Chemotherapy-Induced Nausea and Vomiting

What interventions are effective in preventing and treating chemotherapy-induced nausea and vomiting?

**Recommended for Practice**

Interventions for which effectiveness has been demonstrated by strong evidence from rigorously designed studies, meta-analyses, or systematic reviews and for which the expectation of harms is small compared to the benefits

**Anticipatory nausea and/or vomiting**

Nausea and/or vomiting that occurs before patients receive their next chemotherapy treatment. It is a conditioned response and can occur after a negative past experience with chemotherapy. Prevention is key, especially early in therapy.

- Benzodiazepines
  - Alprazolam 0.5–2 mg PO TID, beginning the night before treatment,
    or
  - Lorazepam 0.5–2 mg PO on the night before and the morning of treatment

- Using treatments for acute and delayed nausea and vomiting

**Acute and delayed nausea and/or vomiting: Highly emetogenic chemotherapy**

Acute nausea and/or vomiting usually occurs within a few minutes to several hours after chemotherapy administration and often resolves within the first 24 hours. Delayed nausea and/or vomiting occurs more than 24 hours after chemotherapy administration. It often peaks 48–72 hours after chemotherapy and can last 6–7 days.

- 5-HT₃ receptor antagonists
  - Palonosetron 0.25 mg IV on day 1, or
  - Granisetron 2 mg PO, 1 mg PO BID, or 1 mg IV on day 1, or
  - Ondansetron 16–24 mg PO or 8–32 mg IV on day 1, or
  - Dolasetron 100 mg PO or IV on day 1, and

- Corticosteroid
  - Dexamethasone 12 mg PO or IV on day 1, or

- NK1 receptor antagonist
  - Aprepitant 125 mg PO on day 1, 80 mg PO daily on days 2 and 3, and

- Benzodiazepine (may or may not be given with other antiemetics because of sedating effects)
  - Lorazepam 0.5–2 mg PO, IV, or SL every 4–6 hours on days 1–4

**Acute and delayed nausea and/or vomiting: Moderately emetogenic chemotherapy**

- 5-HT₃ receptor antagonists
  - Palonosetron 0.25 mg IV on day 1, or
  - Granisetron 1–2 mg PO, 1 mg PO BID, or 1 mg IV on day 1, or
  - Ondansetron 16–24 mg PO or 8–32 mg IV on day 1, or
  - Dolasetron 100 mg PO or IV on day 1, and

- Corticosteroid
  - Dexamethasone 12 mg PO or IV on day of treatment, or

- Phenothiazine
  - Prochlorperazine 10 mg PO or IV every 4–6 hours, or

- Substituted benzamide
  - Metoclopramide 20–40 mg PO every 4–6 hours or 1–2 mg/kg every 3–4 hours ± diphenhydramine 25–50 mg PO or IV every 4–6 hours, or

- Benzodiazepine (may or may not be given with other antiemetics because of sedating effects)
  - Lorazepam 0.5–2 mg PO or IV every 4–6 hours

**Breakthrough nausea and/or vomiting**

Nausea and/or vomiting that occurs despite prophylactic antiemetics and requires “rescue” antiemetic therapy.1

Consider using a drug from a class not previously used.

- Corticosteroid
  - Dexamethasone 12 mg PO or IV daily, if not previously given, or

- 5-HT₃ receptor antagonists
  - Granisetron 1–2 mg PO daily, 1 mg PO BID, or 1 mg IV, or
  - Ondansetron 8 mg PO or IV daily, or
  - Dolasetron 100 mg PO or IV daily, or

- Phenothiazine
  - Prochlorperazine 25 mg suppository every 12 hours, or 10 mg PO or IV every 4–6 hours, or

- Substituted benzamide
  - Metoclopramide 20–40 mg PO every 4–6 hours or 1–2 mg/kg every 3–4 hours ± diphenhydramine 25–50 mg PO or IV every 4–6 hours, or

- Butyrophenones
  - Haloperidol 1–2 mg PO every 4–6 hours or 1–3 mg IV every 4–6 hours, or

- Phenothiazine
  - Lorazepam 0.5–2 mg PO every 4–6 hours, or

- Cannabinoid
  - Dronabinol 5–10 mg PO every 3–6 hours, or

- Olanzapine 2.5–5 mg PO BID prn

**Likely to be Effective**

Interventions for which the evidence is less well established than for those listed under “Recommended for Practice”
Nonpharmacologic interventions are to be used in conjunction with pharmacologic interventions.
Provide referral to appropriate practitioners as needed.
Ginger
A plant herb used in traditional Chinese and Indian medicine for the treatment of nausea and vomiting. Ginger has aromatic, spasmolytic, carminative, and absorbent properties that suggest direct effects on the gastrointestinal tract.
• Study populations: Patients with leukemia; patients with gynecologic cancers receiving cisplatin

**EXPERT OPINION**

Consensus exists recognizing the growing evidence that the following interventions may be effective in the prevention and management of CINV.
• Prevention of nausea and vomiting is the goal.
• Oral and IV antiemetics have equivalent effectiveness.
• The period of expected nausea and vomiting should be covered with appropriate antiemetics (anticipatory, acute, and delayed period for at least four days).
• The lowest efficacious dose of antiemetics should be used.
• Clinicians should base selection of antiemetics on the emetic potential of the chemotherapy agent(s), as well as on patient factors.
• Healthcare providers need to consider the many potential causes of nausea and emesis in patients with cancer that may be contributing factors.

Limited evidence exists, but experts recommend the following dietary interventions in patients receiving chemotherapy to minimize nausea and vomiting.
• Eat smaller, more frequent meals.
• Reduce food aromas and other stimuli with strong odors.
• Avoid foods that are spicy, fatty, and highly salty.
• Take antiemetics prior to meals so that the effect is present during and after meals.
• Repeat previous measures, and consume foods that minimize nausea and that are “comfort foods.”

This content, published by the Oncology Nursing Society (ONS), reflects a scientific literature review. There is no representation nor guarantee that the practices described herein will, if followed, ensure safe and effective patient care. The descriptions reflect the state of general knowledge and practice in the field as described in the literature as of the date of the scientific literature review. The descriptions may not be appropriate for use in all circumstances. Those who use this card should make their own determinations regarding safe and appropriate patient care practices, taking into account the personnel, equipment, and practices available at their healthcare facility. ONS does not endorse the practices described herein. The editors and publisher cannot be held responsible for any liability incurred as a consequence of the use or application of any of this content.

Patient Education Sheet: Managing Gastrointestinal Side Effects of Novel Agents for Multiple Myeloma

**KEY POINTS**

Novel therapies used to treat multiple myeloma include thalidomide, lenalidomide, and bortezomib. Each of the drugs, alone or in combination, may be associated with gastrointestinal side effects, including nausea, vomiting, diarrhea, and constipation. Managing the side effects can reduce your discomfort and can allow you to receive the best treatment for your myeloma. Your healthcare provider may change your dose or schedule of medications to help manage your symptoms. Do not stop or adjust medications without discussing it with your healthcare provider.

**TYPES OF GASTROINTESTINAL SYMPTOMS**

- **Nausea**: an unpleasant feeling in the throat and stomach
- **Vomiting**: a forceful emptying of the stomach contents
- **Constipation**: decreased frequency of defecation accompanied by discomfort and difficulty
- **Diarrhea**: an abnormal increase in the frequency and the amount of fluid in the stool
- **Always report symptoms early to your healthcare team.**

**MANAGEMENT OF NAUSEA**

- You may be asked about the circumstances surrounding episodes, upper abdominal pain, pain when swallowing, hiccups or heartburn, weight loss, dizziness on standing up, and your medication history.
- **General nausea**: Eat small, frequent meals; do not eat fatty or fried foods; avoid strong odors; do not exercise after eating; wear loose clothing; begin appropriate medications before chemotherapy; use relaxation, acupuncture, biofeedback, and guided imagery.
- **Loss of appetite**, still able to eat normally: Adjust dosages of medications, drink enough water and other fluids, and keep track of effects of medications in a daily diary.
- **Decreased ability to eat or drink**: Consider asking for increased or different medications and see your physician for physical examination and evaluation.
- **Inability to eat or drink**: You may need hospitalization or medications through a vein. Call a physician immediately.
- **Medications that may be ordered by your healthcare team**: lorazepam, prochlorperazine, promethazine, metoclopramide, ranitidine, famotidine, and dexamethasone.

**MANAGEMENT OF DIARRHEA**

- **Severe**: Bowel obstruction should be assessed by a physician; dehydration may require fluids through a vein; treatment for an impacted colon may be discussed; medication changes may be ordered by physician; referral to a gastrointestinal specialist may be arranged by a physician.
- **Medications that may be ordered by your healthcare team**: diphenoxylate, atropine, octreotide, imodium.

**MANAGEMENT OF VOMITING**

- You will be asked about the appearance of the fluid, whether digested or undigested, whether a “trigger” was involved, whether it was new or different from other times.
- **One episode in 24 hours**: This is usually self-limiting; continue medications for nausea.
- **Two to five episodes in 24 hours**: New medications, oral or through a vein, may be needed. Contact a physician immediately.
- **Six or more episodes in 24 hours**: This may require hospitalization to assess fluid status and rule out bowel obstruction. Contact a physician immediately.
- **Medications that may be ordered by your healthcare team**: aprepitant, ondansetron, and granisetron.

**Note**: For more information, please contact the International Myeloma Foundation (1-800-452-CURE; www.myeloma.org). The foundation offers the Myeloma ManagerTM Personal Care AssistantTM computer program to help patients and healthcare providers keep track of information and treatments. Visit http://manager.myeloma.org to download the free software.

**Note**: Patient education sheets were developed in June 2008 based on the International Myeloma Foundation Nurse Leadership Board’s consensus guidelines. They may be reproduced for noncommercial use.