

Nabilone for Chemotherapy-induced Nausea and Vomiting

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Inadequate control of chemotherapy-induced nausea and vomiting (CINV) negatively impacts patients' quality of life and can lead to poor treatment compliance leading to progression of disease and poor outcomes. Complications such as severe weight loss, anorexia, and electrolyte imbalances lead to increased number of hospital admissions, slower wound healing and increased risk of infection. Physical complications such as esophageal tears, esophageal erosion and aspiration pneumonia may also occur adding to the emotional and financial burden of poorly controlled CINV. Several factors contribute to the incidence and severity of CINV including the emetogenicity of the cytotoxic agent, the dose of the specific agent, and patient factors such as age, sex and previous response to chemotherapy treatments.²

Emesis is triggered from the activation of the afferent pathway of the vomiting center in the medulla from the activation of the chemoreceptor trigger zone (CTZ), pharynx, gastrointestinal tract or the cerebral cortex.³ The vomiting center then sends an impulse to the salivation center, abdominal muscles, respiratory center and cranial nerves activating the various neuroreceptors which cause the individual to vomit. There are a number of key neuroreceptors involved in the emesis including dopamine, serotonin (5-HT₃), histamine, acetylcholine, corticosteroid, cannabinoid and neurokinin-1 receptors. While the exact mechanism of CINV remains to be fully understood, it is believed that certain cytotoxic agents have an affinity for these receptors and will activate the vomiting center, while other agents tend to damage these receptors. Both of these pathways may activate the vomiting center. It is suggested that in order to adequately control CINV, more than one receptor may need to be blocked.⁴

Currently, there are a number of agents available for the treatment of CINV, each targeting the various receptors involved in the emesis pathway. The National Comprehensive Cancer Network (NCCN) stratifies treatment recommendations into five categories: acute, delayed anticipatory, breakthrough and refractory emesis.² For the treatment of acute nausea and vomiting, the NCCN guidelines recommend the use of 5-HT₃ receptor antagonist to be given for the first twenty-four hours of chemotherapy. If the chemotherapy regimen contains highly emetogenic agents such as cyclophosphamide or high dose cisplatin, then it is recommended to use a corticosteroid such as dexamethasone along with aprepitant in addition to the 5-HT₃ receptor antagonist. For low-emetogenic therapy regimens, NCCN guidelines recommend the use of dexamethasone, prochlorperazine or metoclopramide with or without lorazepam. Delayed emesis is generally treated by continuing the patients' prophylactic regimen for two

or three days after completing the chemotherapy cycle. Breakthrough and refractory emesis is more challenging to treat. The NCCN guidelines recommend use of additional agents with a different mechanism of action to be given around-the-clock rather than used on an as needed basis. Prior to treating with various agents, it is important to rule out possible complications such as disease progression, electrolyte abnormalities and GI blockage. Specific agents recommended for use in breakthrough emesis include metoclopramide, haloperidol, corticosteroids, benzodiazepines and cannabinoids. The most recent NCCN guidelines included the use of nabilone for the treatment of breakthrough emesis; however, the specific place in therapy is not clearly defined. In general, different agents are added onto the treatment regimen until a specific regimen is found to work for the individual patient.

The medicinal use of *Cannabis* has been recognized for centuries, and there have been several observational or anecdotal reports from younger patients that suggested smoking marijuana prior to chemotherapy treatment decreased subsequent nausea and vomiting.⁵ There are two endogenous cannabinoid receptors located in the human body, CB₁ and CB₂. These cannabinoid receptors are known to play a role in the emesis pathway and cannabinoids agonists are believed to block emesis by binding to these receptors and by indirectly blocking the release of other neurotransmitters.³ Dronabinol was the first cannabinoid agonist approved by the FDA in 1985 for the treatment of AIDS-related anorexia and for refractory CINV.¹ Nabilone (Cesamet®, Valeant Pharmaceutical International), another cannabinoid agonist that has been approved for use in Canada since the mid-1980s for the treatment of CINV in patients who have not responded to other anti-emetic therapies, has recently been approved in the United States.

Nabilone is indicated for the treatment of CINV in patients who have failed to respond to other anti-emetic treatments. Nabilone is not intended to prevent CINV and is not to be used on an as needed basis or to be prescribed as the initial antiemetic treatment for patients. Nabilone is a controlled schedule II medication of the Controlled Substance Act and has a high potential for abuse (as compared to dronabinol, classified as a schedule III medication).

PHARMACOLOGY

Nabilone is an orally active synthetic cannabinoid similar to the active ingredient delta-9-tetrahydrocannabinol.⁶ While the exact mechanism of action is unknown, cannabinoids are thought to

work by decreasing nerve impulses to the vomiting center by interacting with cannabinoid (CB1) receptors located in the central nervous system. There are two types of cannabinoid receptors located in the body, CB1 and CB2. The CB1 is primarily located in the central nervous tissue, while CB2 is found primarily in non-neural tissues.³ By decreasing nerve impulses, less neurotransmitter is released and less activation of the vomiting center occurs.

PHARMACOKINETICS

Nabilone is completely absorbed from the gastrointestinal tract, has dose linearity within its therapeutic range and reaches a peak plasma concentration within approximately two hours of ingestion. Food does not affect the rate or extent of absorption. Nabilone has a large volume of distribution, 12.5 L/kg, and has several metabolites with a half-life ranging from two to thirty-five hours. The activity of these various metabolites in comparison to the parent compound and the risk of accumulation have not been determined.

Nabilone is extensively metabolized by the liver and several metabolites have been identified. There are at least two metabolic pathways involved, a stereo-specific enzymatic reduction of the 9-keto moiety and direct enzymatic oxidation. In vitro CYP450 studies did not reveal significant inhibition of CYP1A2, CYP2A6, CYP2C19, CYP2D6 and CYP3A4. Nabilone has a slight inhibitory effect on CYP2C8 and CYP2C9; however, the clinical significance of this is not fully known. Nabilone is primarily excreted in the feces via the biliary pathway and to a lesser extent in the urine.

The effects on age, gender, hepatic and renal function have not been determined, but it is recommended to use nabilone with caution in patients with renal or hepatic dysfunction and in the elderly population.⁶

PUBLISHED CLINICAL TRIALS

Nabilone vs. prochlorperazine

The study by Chan et al. is the only published randomized, double-blind, crossover study comparing the antiemetic efficacy of nabilone to prochlorperazine in pediatric patients 3.5 to 17.8 years of age.⁷ All patients enrolled were receiving repeated courses of chemotherapy, had experienced severe CINV and had never previously been treated with nabilone or prochlorperazine. Each patient had been receiving various cytotoxic agents; however, none of these patients were receiving cisplatin as part of their chemotherapy regimen. Each patient served as his or her own control, with either nabilone or prochlorperazine being given with the first chemotherapy cycle, and the opposite agent given with the second chemotherapy cycle. The primary endpoint of the study was the number of retching or emesis episodes noted by the nurse or parent caring for the patient. The only side effects documented were those voluntarily described by the patient.

Of the forty patients who originally enrolled in the study, only thirty patients were evaluated in the results of the trial. More patients reported an improvement of their retching and vomiting with nabilone compared to prochlorperazine (70% vs. 30%, $p=0.003$, respectively). The objective observations did not show

a significant difference between the two treatment regimens. Dizziness and drowsiness were the two most commonly reported adverse events (50% and 67% respectively). Mood alteration described as euphoria, flat affect, hysteria, excitability, and restlessness was reported in 14% of patients receiving nabilone versus 11% of those receiving prochlorperazine. Euphoria, orthostatic hypotension, ocular swelling and irritation and increased appetite were reported more frequently with nabilone than with prochlorperazine. If patients experienced severe adverse effects, the dose of nabilone was adjusted (See Table 1). Of the 30 patients evaluated, 17 of these patients had to have their doses modified due to severe adverse effects of nabilone.

TABLE 1. MODIFIED DOSING REGIMEN

Patient Weight (kg)	Nabilone Dose (mg)	Dosing Frequency
<18	0.5	BID
18-30	1	BID
>30	1	TID

It should be noted that this modified dosing regimen is the recommended standard doses for pediatric patients being treated with nabilone. Despite the necessary dose reductions, more patients preferred nabilone to prochlorperazine for the treatment of CINV.

A second randomized, double-blind, crossover trial by Einhorn et al. evaluated the efficacy of nabilone compared to prochlorperazine in the treatment of CINV.⁵ One hundred patients were randomized to receive either prochlorperazine 10 mg orally or nabilone 2 mg every six hours as needed for nausea or vomiting. Inclusion criteria were not clearly defined in the context of the article; however, patients were being treated for the following diseases: sarcoma, Hodgkin's disease, lymphoma, bladder cancer and testicular cancer. Chemotherapy agents varied depending on the disease being treated, but did include high to moderate emetic agents such as doxorubicin, cyclophosphamide and cisplatin. Patients were excluded from analysis if there was a change in their chemotherapy regimen prior to crossover or if they failed to crossover. Other exclusion criteria included patient death, insufficient data collected or toxicity. Patients served as their own controls and received the alternate antiemetic agent during their second course of chemotherapy. The primary endpoints of the study included the patients' perception of nausea severity, the number of vomiting episodes, toxicity and patient preference to the specific antiemetic agent. Patients completed a case report every twenty-four hours and rated nausea as none, mild, moderate or severe and documented the number of vomiting episodes.

Results were based on patients' self reporting of severity of symptoms. Each patient completed a 24-hour report where they rated their symptoms as none, mild, moderate, or severe and then quantified the number of vomiting episodes. This reporting scale was not indicated to be a validated rating scale. Patients reported that their nausea was not as severe or prolonged while



being treated with nabilone. Furthermore, patients treated with nabilone had a 33% decrease in overall vomiting episodes on all days of chemotherapy. This decrease was more profound following the first day of treatment. Forty patients reported feeling "high" while taking nabilone. This toxicity was not defined in the article and was reported as being dose dependent. Lightheadedness was also reported more frequently with nabilone and was associated with orthostatic hypotension. Following completion of the crossover, 75% of patients indicated a preference of nabilone over prochlorperazine for the management of their CINV.

Another prospective, randomized, double-blind crossover study by Steele et al. compared the antiemetic effects of nabilone and prochlorperazine for the treatment of CINV.⁸ Specific inclusion criteria were not described in the report; however, patients were excluded from analysis if they had a history of cardiac disease, psychiatric disease or had regularly used marijuana. Patients served as their own control and received either nabilone 2 mg orally or prochlorperazine 10 mg orally for one chemotherapy cycle and the alternate regimen for the second cycle of treatment. Each antiemetic was started the night prior to chemotherapy and continued for three to five doses. Chemotherapy regimens included high to moderate emetic agents including mechlorethamine, streptozotocin, dacarbazine, cyclophosphamide and cis-dichlorodiammineplatinum. Primary endpoints were duration and severity of nausea, duration and frequency of emesis, the incidence of side effects and patient's drug preference. Results were collected by means of daily questionnaires completed by the patients.

Fifty-five patients were enrolled in the study; however, only 37 patients were evaluated in the final results. There was no difference in the severity or duration of nausea in either treatment cycle for patients receiving platinum-based chemotherapy. There was a slight decrease in both duration and severity of nausea reported for all other regimens; however, this decrease was not determined to be significant. There was no difference reported in both duration and episodes of vomiting for patients receiving platinum-based chemotherapy; however, there was a decrease in the overall episodes of vomiting in patients receiving non-platinum based chemotherapy. The statistical and clinical significance of this was not reported in the study. The most commonly reported adverse effects with the nabilone treatment were somnolence (47%), dizziness (35.8%), dry mouth (24.6%), orthostatic hypotension (16.9%), and feeling "high" (18.9%). The most commonly reported adverse effects with prochlorperazine were somnolence (34.8%), dizziness (9.3%), and dry-mouth (4.7%) Results indicated that overall, patients tended to prefer nabilone to prochlorperazine for control of CINV; however, the total difference was not statistically different when compared between high dose platinum therapy, low dose platinum therapy and "other" chemotherapy (62.2% and 27%, $p > 0.05$ respectively).

A randomized, prospective, double-blind, crossover study by Herman et al. compared the effectiveness of nabilone to prochlorperazine in patients receiving chemotherapy.⁹ Again, specific inclusion criteria were not defined in the protocol and patients were excluded if there was a history of cardiovascular disease, psychiatric disease, or if they resided alone. Patients served as their own control and received either nabilone 2 mg orally or

prochlorperazine 10 mg orally with the first cycle of chemotherapy and received the alternate medication at crossover. The frequency in which the medications were given was dependent on the institution conducting the investigation. Patients participating at the University of Arizona ($n=52$) received every eight-hour dosing while patients at the Indiana University School of Medicine ($n=100$) received every six-hour dosing. Duration of treatment with each agent varied with the chemotherapy regimen being administered. Chemotherapy regimens included, but were not limited to the following high to moderate emetic agents: cisplatin, doxorubicin, cyclophosphamide, dacarbazine, and procarbazine. The primary endpoints of the study include severity of nausea, episodes of vomiting, side effects of the medications and patient preference. Patients recorded results on a daily questionnaire and each patient was interviewed at the end of both treatment cycles to compare the level of nausea and vomiting prior to treatment with nabilone or prochlorperazine. A complete response to treatment was defined as the absence of CINV during the entire course of chemotherapy while a partial response was defined as a 50% reduction in the duration or severity of nausea and a 50% reduction in the episodes of vomiting.

One hundred fifty-two patients were initially enrolled in the study; however only 113 patients completed crossover. No patients treated with prochlorperazine experienced complete relief of their nausea or vomiting, whereas nine patients treated with nabilone did experience complete relief of their symptoms. Eighty-one patients treated with nabilone experienced a partial response of their symptoms compared to 36 patients treated with prochlorperazine ($p < 0.01$). The most commonly reported adverse effects with nabilone were somnolence (85%), dry mouth (84%), dizziness (69%), decreased coordination (68%), blurred vision (60%), decreased concentration (50%) and euphoria (16%). Three patients experienced syncopal episodes and another three patients experienced hallucinations. In comparison, the most commonly reported adverse effects with prochlorperazine were somnolence (48%), dry mouth (35%), dizziness (30%), and depression (26%). Eighty-five percent of patients preferred nabilone for treatment of CINV, whereas 18% of patients preferred prochlorperazine for treatment of symptoms ($p < 0.001$).

Nabilone and prochlorperazine vs. dexamethasone and metoclopramide

A randomized, open-label, crossover study by Cunningham et al. compared the efficacy of metoclopramide and dexamethasone to nabilone and prochlorperazine for the treatment of nausea and vomiting in patients receiving cisplatin or cisplatin analogues.¹⁰ Patients served as their own control and were assigned to receive nabilone 2 mg twice daily and prochlorperazine orally 5 mg twice daily or metoclopramide 2 mg/kg loading dose followed by 3 mg/kg IV infusion over 8 hours and dexamethasone 20 mg intravenously prior to chemotherapy. Eligible patients had histologically confirmed cancer and were receiving their first cycle of chemotherapy. All patients were receiving cisplatin 20 to 50 mg/m² as part of their chemotherapy regimen. Patients were excluded if there was a history of psychiatric illness or if they had a past history of extrapyramidal reactions. The primary endpoints of the study included the number of vomiting epi-

sodes, the duration of vomiting, the severity of nausea and side effects and were recorded by the nursing or medical staff caring for the patient within 24-hours following administration of chemotherapy agents. Patients were assessed for the extent of emesis control with a linear analogue scale ranging from not sick to very sick and, after the second course of treatment, were assessed for which antiemetic regimen the patient preferred.

Eighty patients entered the study; however, data were reported for 75 patients. Only 70 patients completed the crossover. The median number of vomiting episodes in the metoclopramide and dexamethasone regimen was 3.45 ± 0.78 compared to the nabilone and prochlorperazine regimen with a median number of vomiting episodes of 3.92 ± 0.54 ($p=0.051$). There was complete control of nausea and vomiting in 24 patients (32%) receiving metoclopramide and dexamethasone and 14 patients (19%) receiving nabilone and prochlorperazine. There was no difference between the incidence of nausea in the two treatment arms or for the number of emesis episodes reported between the two groups. Significant side effects reported in the nabilone treatment arm were dizziness ($p<0.001$), sedation ($p<0.01$), dry mouth ($p<0.001$) and dysphoria ($p<0.01$). Extrapyramidal reactions were only reported in the metoclopramide group. Treatment with metoclopramide and dexamethasone resulted in slightly better symptom control; however, there was no difference in patient preference between the two treatment regimens. The authors argued that the efficacy difference was due to a mismatch between chemotherapy regimens and due to the mismatch in route of administration. Comparing an intravenous route to an oral route may not be a fair assessment.

Nabilone vs. nabilone and dexamethasone

A randomized, prospective, double-blind, crossover study by Niiranen and Mattson compared the antiemetic efficacy of nabi-

lone to nabilone and dexamethasone in patients with lung cancer receiving chemotherapy.¹¹ Eligible patients had histologically confirmed lung cancer, Karnofsky performance status of 60% or greater, and had to remain on the same chemotherapy regimen for at least two consecutive cycles. Patients were excluded if there was a history of drug or alcohol abuse, or if there was a history of hepatic, renal or psychiatric disease. Chemotherapy regimens included the following agents: cyclophosphamide, adriamycin, cisplatin, etoposide, vincristine and vindesine. Antiemetic regimen and doses were as follows: nabilone 2 mg twice daily with the first dose given the evening prior to chemotherapy, the second dose given 30 minutes prior to chemotherapy and the third dose given 12 hours post chemotherapy; dexamethasone 8 mg orally given with the first dose of nabilone the evening prior to chemotherapy and 10 mg intravenously 30 minutes prior to chemotherapy and repeated again two and six hours post chemotherapy. All patients served as their own controls and received nabilone and placebo or nabilone and dexamethasone with their first cycle and the alternate regimen with their second chemotherapy cycle. The primary endpoints of the study were the degree of nausea, episodes of vomiting, appetite and adverse effects.

Forty patients were initially enrolled into the study, 32 were evaluated for results, of which 23 were chemotherapy naïve. There was no significant difference between the two regimens for degree of nausea or with appetite. There was a significant difference in the episodes of vomiting experienced between the two groups (3.3 vs. 1.8, $p<0.001$ in the nabilone and nabilone/dexamethasone groups respectively). The most commonly reported adverse effects were dry mouth and dizziness. Patients experienced an increase in orthostatic hypotension with a mean decrease of 18 mmHg in systolic blood pressure in the nabilone group compared to 9 mmHg in the nabilone/dexamethasone group, which was stated to be statistically significant.

TABLE 2. DRUG INTERACTIONS INVOLVING NABILONE⁶

Interacting medication	Reaction
Amphetamines, cocaine, other sympathomimetic agents	Additive hypertension, tachycardia, possibly cardiotoxicity
Atropine, scopolamine, antihistamines, other anticholinergic agents	Additive or super-additive tachycardia or drowsiness
Amitriptyline, amoxapine, desipramine, other tricyclic antidepressants	Additive tachycardia, hypertension, and drowsiness
Barbiturates, benzodiazepines, ethanol, lithium, opioids, buspirone, antihistamines, muscle relaxants, other CNS depressants	Additive drowsiness and CNS depression
Disulfiram, fluoxetine	Hypomanic reaction
Antipyrene, barbiturates	Decreased clearance of these agents by competitive inhibition of metabolism
Theophylline	Increased theophylline metabolism reported with smoking marijuana; effect similar to that following smoking tobacco
Opioids	Cross-tolerance and mutual potentiation
Naltrexone	Oral THC effects were enhanced by opioid receptor blockade
Alcohol	Increase in the positive subjective mood effects of smoked marijuana

TABLE 3. COMMON THERAPIES FOR CINV

	Usual Adult Dose	Estimated Cost Per Dose* (oral)
5-HT3 RECEPTOR ANTAGONISTS		
Ondansetron	16-24 mg	4 mg tablet \$17.76 8 mg tablet \$29.37
Dolasetron (Anzemet)	100 mg	100 mg tablet \$76
Granisetron (Kytril)	2 mg daily	1 mg tablet \$120
Palonosetron (Aloxi)	0.25 mg IV	\$78
NK-1 RECEPTOR ANTAGONIST		
Aprepitant (Emend)	125 mg orally day 1 80 mg orally days 2-3	3 day pack \$351.48
PHENOTHIAZINES		
Promethazine (Phenergan)	12.5-25 mg every 4-6 hours as needed	25 mg tablet \$0.37
Prochlorperazine (Compazine)	5-10 mg 3 or 4 times daily	5 mg tablet \$0.09
ANTIHISTAMINES		
Diphenhydramine (Benadryl)	25-50 mg every 4 to 6 hours as needed	25 mg capsule \$0.02
BUTORPHENONES		
Haloperidol (Haldol)	1-2 mg every 8 hours	1 mg tablet \$ 0.08
CORTICOSTEROIDS		
Dexamethasone (Decadron)	12 mg daily	4 mg tablet \$0.11
BENZODIAZEPINES		
Lorazepam (Ativan)	0.5-2 mg every 4 to 6 hours as needed	1 mg tablet \$0.10
DOPAMINE ANTAGONIST		
Metoclopramide (Reglan)	20-40 mg every 4 to 6 hours	10 mg tablet \$0.06
CANNABINOIDS		
Dronabinol (Marinol)	5 mg/m ² 1 to 3 hours prior to chemotherapy & every 2 to 4 hours post chemotherapy	2.5 mg capsule \$6.50 5 mg capsule \$12.5
Nabilone (Cesamet)	1-2 mg twice daily up to 48 hours	1 mg capsule \$20

*MAC pricing if generic, AWP price if brand

DRUG INTERACTIONS

Nabilone should not be given concomitantly with alcohol, sedatives, hypnotics or other psychoactive medications. Several drug interactions are summarized in Table 2. It is important to note that there are several medications that would likely be used in combination with nabilone in this patient population including benzodiazepines, antihistamines and opioids. The risk-benefit of concomitant use of nabilone with these medications should be carefully weighed by the prescriber, and all treatment options should be discussed with the patient prior to use.

ADVERSE REACTIONS/PRECAUTIONS

The most commonly reported adverse events reported in placebo-controlled trials were drowsiness (52%), vertigo (52%), dry mouth (36%), euphoria (11%), and ataxia (14%).⁶

The frequency of orthostatic hypotension varied between trials, but had an overall incidence of 13%.¹²⁻¹⁴ Use nabilone with caution in patients with a history of psychiatric disease or a history of substance abuse. Because this agent has a long half-life, the effects may be seen for up to 72 hours.⁶

Nabilone is chemically similar to *Cannabis sativa L* (marijuana or delta-9-THC) which has high abuse potential and, as such, is classified as a Schedule II of the Controlled Substance Act. Nabilone use produces adverse effects similar to that of delta-9-THC such as euphoria or a “high” feeling. This agent is not intended to be used on an as needed basis and is not first-line therapy for treatment of nausea and vomiting. No cases of overdose with more than 10 mg daily have been reported in the clinical trials.

Nabilone is classified as pregnancy category C. It is not known if nabilone is excreted into breast milk; therefore, it is not recommended for use in nursing mothers.⁶

DOSING/ADMINISTRATION

The usual adult dosage of nabilone is 1 or 2 mg twice daily. To minimize adverse effects, start with the lowest dose and increase the dose as needed. On day one of chemotherapy, the initial dose should be given one to three hours before the cytotoxic agent is administered. A dose of 1 or 2 mg the night before chemotherapy may also be beneficial. The maximum daily dose recommended is 6 mg divided three times daily for up to 48 hours after the administration of chemotherapy.

TABLE 4. COMPARISON OF AVAILABLE CANNABINOIDS¹⁵

	Nabilone (Cesamet™)	Dronabinol (Marinol®)
Oral Dose	1-2 mg one to three hours prior to chemotherapy	5 mg/m ² , one to three hours prior to chemotherapy
Duration of Therapy	BID dosing up to 48 hours post chemotherapy	Every 2-4 hours post chemotherapy
Maximum Dose	6 mg daily	4-6 doses per day
Onset of Action	60 to 90 minutes	30 to 60 minutes
Tmax	2 hours	2 to 4 hours
Duration of Action	8 to 12 hours	4 to 6 hours
Controlled Substance Act Schedule	C-II	C-III

CONCLUSION

The ability to effectively manage patients suffering from chemotherapy-induced nausea and vomiting has improved dramatically since the advent of 5-HT₃ antagonists. Despite the advances in treatment options, there remain patients who do not respond to conventional anti-emetic therapy. Treatment of CINV requires multimodal therapy by using medications with differing mechanisms of action. Unfortunately, there are currently no published trials comparing the effectiveness of nabilone to 5-HT₃ antagonists, which are considered first line therapy. Furthermore, there are no studies comparing the effectiveness of nabilone to dronabinol. Most of the studies comparing nabilone to prochlorperazine, metoclopramide, dexamethasone or placebo were published before 1990 and were poorly designed (employing crossover designs without adequate consideration of anticipatory nausea and vomiting, using unvalidated measures of nausea, etc.). While current NCCN guidelines state that nabilone may be used for breakthrough nausea and vomiting, its specific place in therapy has yet to be established. The relatively high cost of nabilone and lack of documented effectiveness does not justify its routine use in the treatment of CINV. Nabilone should be reserved for patients who have failed on other, better studied and less expensive antiemetics. ●

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Pharmacist (full-time)

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