# A Comparison of Two Differing Doses of Promethazine for the Treatment of Postoperative Nausea and Vomiting

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**Purpose:** *To compare the use of promethazine 6.25 mg intravenous (IV) (experimental group) with promethazine 12.5 mg IV (control group) among adult ambulatory surgery patients to control established postoperative nausea or vomiting (PONV).*
**Design/Methods:** *In a double-blind, randomized controlled trial (n = 120), 59 subjects received promethazine 6.25 mg and 61 subjects received promethazine 12.5 mg to treat PONV. Study doses were administered postoperatively if the subject reported/exhibited nausea and/or vomiting. Outcomes for experimental and control groups were compared on the basis of relief of PONV and sedation levels.*
**Findings:** *Ninety-seven percent of subjects reported total relief of nausea with a single administration of promethazine at either dose. Sedation levels differed between groups at 30 minutes post-medication administration and at the time of discharge to home.*
**Conclusions:** *Promethazine 6.25 mg is as effective in controlling PONV as promethazine 12.5 mg, while resulting in less sedation.*

**Keywords:** *ambulatory surgery, nausea and vomiting, promethazine, sedation, perianesthesia nursing, research, RCT.*


**ONE OF THE MOST COMMON** adverse effects of surgery and anesthesia is postoperative nausea and vomiting (PONV).[1] These adverse effects may persist despite administration of intraoperative medications to prevent their occurrence.[2-4] Various agents including 5-$HT_3$ receptor antagonists (ondansetron, granisetron), glucocorticoids (dexamethasone), antihistamines (dimenhydrinate, cyclizine), cholinergic antagonists (scopolamine patch), dopamine antagonist (droperidol or haloperidol), metoclopramide, or neurokinin-1 receptor antagonists[4] are used to prevent or treat PONV, as is intravenous (IV) promethazine.

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*The study was funded by a combined Association of periOperative Registered Nurses (AORN) and Sigma Theta Tau International Small Grant.*

*Conflict of interest: None to report.*

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*1089-9472/$36.00*
*http://dx.doi.org/10.1016/j.jopan.2014.01.009*

Promethazine is a phenothiazine derivative that competitively blocks histamine (H [1]) receptors and exhibits anti-emetic and sedative properties.[5] Relief of PONV typically is achieved within 5 minutes of IV infusion of promethazine[6] and lasts for 2 to 6 hours.[5] The major drawback to the use of promethazine for ambulatory surgery patients is its sedating effect.[6]

Any adverse reaction to medication, including sedation, delays patients' postoperative recovery time,[7] resulting in delayed ambulation and fluid intake, increasing the need for nursing intervention, and decreasing patient satisfaction. The possibility of delayed discharge is an added inconvenience for both the patient and their family.

Because of the sedating effect of promethazine, recommendations exist for the use of doses lower than the current standard (12.5 to 25 mg) to achieve antiemetic relief.[8,9] Although limited research has been carried out related to promethazine dosing, some evidence exists for the administration of promethazine 6.25 mg in the presence of PONV. In a comparison of three IV doses (6.25, 12.5, and 25 mg), no differences were found in the effectiveness of promethazine doses in treating PONV among patients (n = 330) in a post-anesthesia care unit (Phase I).[10] In a similar comparison carried out among hospitalized elderly patients (n = 26), no difference in relief of symptoms was observed with the lower dose of promethazine (6.25 mg IV) for the treatment of nausea and vomiting.[11] Several investigators have examined the use of IV promethazine at doses of either 12.5 or 25 mg for treatment of PONV[11-14]; however, these studies compared IV promethazine with different classes of antiemetics or were carried out in settings other than perianesthesia. Moreover, a review of current literature revealed no studies that were focused on the use of promethazine 6.25 mg IV in the adult ambulatory surgery population.

## Study Purpose

The purpose of this study was to compare two doses of IV promethazine (6.25 vs 12.5 mg) in a sample of adult ambulatory surgery subjects (n = 120) who were expected to be discharged home after an elective surgical procedure. Based on direct clinical experience and direct observation of adult ambulatory surgery patients over time by Phase I and Phase II (ambulatory surgical center) nurses, the following specific aims were generated:

1. To compare the effects of two different doses of promethazine (6.25 mg IV vs 12.5 mg IV) on PONV in a sample of adult ambulatory surgery patients undergoing elective surgery.
2. To compare levels of postoperative sedation between adult ambulatory surgery patients who received promethazine 6.25 mg IV (experimental group) vs promethazine 12.5 mg IV (control group).

## Study Design

Between October 2008 and March 2011, a convenience sample of adult ambulatory surgical patients who were sent from the operating room (OR), per the determination of the anesthesiologist, to either Phase I or Phase II were randomized to receive promethazine 6.25 mg IV (experimental group) or promethazine 12.5 mg IV (control group) if PONV were to occur.

### *Setting*

The study was conducted at a 750-bed teaching hospital in the Northeastern United States.

### *Preparation of Study Team*

Phase I and Phase II nurses responsible for data collection were oriented to the study and subject enrollment procedures during educational sessions carried out by the investigators and supported by the institution's Clinical Nursing Research Center. In these sessions, data collection instruments were reviewed and regulations concerning the protection of human subjects' rights were discussed. Copies of the consent form, data collection tool, study design, study kits, and visual descriptive scale were provided and discussed in detail. Laminated cue cards were posted in each area for reference, and a nurse investigator was available to answer questions, address concerns, and monitor inter-rater reliability during data collection in both Phase I and Phase II areas.

### *Sample*

The sample for this study was drawn from adult patients undergoing elective surgery and who were between the ages of 18 and 75 years. Study inclusion criteria were elective urologic, neurologic, general surgery, thoracic, vascular, otolaryngology, orthopedic, oral maxillofacial, gynecologic, or colorectal surgery; English speaking; and able to consent to participate. Exclusion criteria were less than 18 years or older than 75 years, pregnancy, breastfeeding, known allergy to promethazine, non-English speaking, and refusal or inability to sign study consent. Any prospective subject with a sedation level greater than "3" on the hospital's internal sedation scale or who had limited IV access requiring IV placement in the lower extremities was excluded. Subjects also were excluded if the attending surgeon did not agree to enrollment of his or her patients or to the planned use of promethazine by either surgeon or anesthesiologist. No subject was excluded because of gender, income, race, or religion. Sample demographics are contained in Table 1.

## Method Used for Randomization

Using a computer-generated random numbers table, each subject was randomized to receive either promethazine 6.25 mg IV or promethazine 12.5 mg IV. Drug preparation and subject randomization were performed by the pharmacist member of the study team. The nurses administering the promethazine dose and those collecting the study data were not aware of which dose was being administered to the subject. A safety measure was put in place so that in the case of an apparent adverse response to the promethazine dose, the investigators were able to break the code for an individual subject, determine the dose given, and provide reversal measures, per anesthesiologist order, if warranted. That subject would then be dropped from the study.

## Protection of Subjects' Rights

Approval to conduct the study was granted by the University's institutional review board. Participation was voluntary, and all subjects received an explanation of the study, were given the opportunity to ask questions and receive answers, and signed a witnessed informed consent. Following consent, subjects were randomized to the experimental or control group. A pharmacist who was not involved with the study served as data safety monitor and conducted independent checks of data to monitor for evidence of unsafe or adverse events that would warrant discontinuation of the study.

## Instruments

### *Nausea Scale*

The investigators developed a verbal descriptive scale (VDS) to address subjects' degree of PONV. The tool assessed degree of nausea, vomiting, or both, by the subject with or without the assistance of the bedside Registered Nurse (reviewing the scale or asking the patient). Response options ranged from 1 (none) to 6 (vomited repeatedly). Subjects were asked, by their bedside nurse, to state, point, or indicate the whole number or words that described their level of nausea or frequency of vomiting on the VDS scale. If, after one episode of vomiting, the nausea did not independently resolve without intervention, the subjects were asked if they would like treatment (promethazine study dose) for any residual nausea. Clinical nursing observation, over time, has revealed that PONV frequently resolves, without intervention, after a single episode of vomiting.

### *Sedation Scale*

The investigators used the institution's internal sedation scale, which has been used in both Phase I and Phase II settings. Options ranged from 0 (awake/alert) to 5 (unable to arouse), similar to other scales: Ramsay Scale and Sedation-Agitation Scale.[15]

When required, study doses were administered intravenously in 50 cc sterile normal saline and infused over 15 minutes. Subjects were evaluated at the time of admission to the Phase I or Phase II setting, 15 minutes after admission, or when the subject complained of nausea or demonstrated overt signs of nausea/vomiting. If PONV was described or observed, the study dose was administered at that time, and the subject was evaluated at 15 minutes and then again at 30 minutes from the time the medication infusion was completed.

**Table 1. Sample Demographics (n = 120)**

| Variables | Experimental Promethazine 6.25 mg | Control Promethazine 12.5 mg | *P* Value |
|---|---|---|---|
| Gender, n (%) | | | |
| Male (n = 28) | 13 (22.0) | 15 (24.6) | .46 |
| Female (n = 92) | 46 (78.0) | 46 (75.4) | |
| Age (y) | | | |
| Mean (SD) | 44.9 (14.6) | 42.8 (12.9) | .41 |
| Range | 18-74 | 19-75 | |
| Confidence intervals | 41.07-48.66 | 39.50-46.11 | |
| History of nausea/vomiting, n (%) | | | |
| Yes | 11 (18.6) | 17 (29.3) | .13 |
| No | 48 (81.4) | 41 (70.7) | |
| Primary surgical service, n (%) | | | |
| Orthopedics | 18 (30.5) | 23 (37.7) | .75 |
| GYN | 11 (18.6) | 11 (18.0) | |
| General surgery | 10 (16.9) | 12 (19.7) | |
| Urology | 9 (15.3) | 7 (11.5) | |
| ENT | 5 (8.5) | 3 (4.9) | |
| Oral maxillary facial service | 2 (3.4) | 3 (4.9) | |
| Plastics | 2 (3.4) | 1 (1.6) | |
| Thoracic | 2 (3.4) | 0 | |
| Vascular | 0 | 1 (1.6) | |
| Location where dose administered, n (%) | | | |
| PACU (Phase I) | 16 (27.1) | 15 (24.6) | .46 |
| ASC (Phase II) | 43 (72.9) | 46 (75.4) | |
| Primary type of anesthesia, n (%) | | | |
| General | 54 (91.5) | 58 (95.1) | .34 |
| Other | 5 (8.5) | 3 (4.9) | |
| Time in OR (min) | | | |
| Mean (SD) | 93.3 (46.0) | 91.3 (44.3) | .82 |
| Range | 20-210 | 30-300 | |
| Confidence intervals | 80.8-105.7 | 79.7-102.3 | |
| Antiemetics received in OR, n (%) | | | |
| Decadron | 41 (69.5) | 45 (73.8) | .24 |
| Zofran | 16 (27.1) | 10 (16.4) | |
| Other | 1 (1.7) | 1 (1.6) | |
| None | 1 (1.7) | 5 (8.2) | |
| Fluids received in OR (ccs) | | | |
| Mean (SD) | 2,240.5 (634.2) | 2,234.2 (590.7) | .96 |
| Range | 1,050-3,900 | 1,000-4,000 | |
| Confidence intervals | 2,073.8-2,407.3 | 2,081.6-2,386.8 | |

SD, standard deviation; PACU, post-anesthesia care unit; OR, operating room; GYN, gynecology; ENT, ears/nose/throat; ASC, ambulatory surgical center.

Subjects were again assessed at the time of discharge from Phase I to Phase II, and at the time of discharge to home from the Phase II area.

Bedside nurses administered the study medication according to the standard institutional medication administration policy. If the nurse determined that the study dose was not effective in reducing the level of PONV to the extent desired, an anesthesiologist was contacted to order additional or alternative medication.

Using the IBM Statistical Package for Social Sciences, IBM-SPSS 18.0 (IBM Corporation, Armonk, NY), data were analyzed descriptively and through the use of two-group comparison techniques (ie, *t* tests and chi square). Findings were considered significant if $P < .05$.

## Findings

Of 352 females and 271 males (unrecorded sex of two subjects) who provided written consent, 120 subjects received a study dose of either promethazine 6.25 mg IV or 12.5 mg IV for complaints of nausea, vomiting, or retching. There were no statistically significant differences for nausea scores between groups (promethazine 6.25 mg IV vs 12.5 mg IV). No subject required hospitalization overnight because of PONV. The sample was over-represented by females (77%), although the distribution of subjects according to gender was comparable between the experimental and control groups. The age of subjects ranged from 18 to 75 years, with distribution comparable between groups. None of the other subject characteristics differed according to group (Table 1), suggesting that the randomization process produced comparable groups.

On average, subjects reported total relief of nausea with a single dose of promethazine (at either study dose). Nine subjects required an additional rescue anti-emetic and one subject received promethazine 6.25 mg in addition to the blinded study dose. Three subjects refused an additional anti-emetic and preferred to be discharged home with mild nausea. One subject was admitted to the short stay, 23 hour unit, as a result of not wanting to travel home at a late hour. The decision to stay was not related to PONV.

With the exception of level of sedation at 30 minutes post-medication administration ($P = .01$), and at time of discharge from Phase II ($P = .03$), PONV and sedation levels were comparable between groups. In cases in which differences existed, subjects who received the higher dose of promethazine demonstrated a greater level of sedation than those who received the 6.25 mg dose (Tables 2 and 3).

Some differences were observed for subjects with characteristics considered to be contributory to PONV. For example, subjects with a history of PONV were more likely to experience mild-to-severe nausea 30 minutes after admission, and 15 minutes after administration of promethazine ($X^2 = 9.4$; df = 3; $P = .02$). They also were more

**Table 2. Comparison of Outcomes According to Phase I (PACU) Group (n = 120)**

| Indicator | Experimental M (SD) CI n = 59 | Control M (SD) CI n = 61 | $X^2$ or F | *P* Value |
|---|---|---|---|---|
| Phase I nausea on admission | 1.73 (1.75) 1.27-2.18 | 2.15 (2.07) 1.62-2.68 | 1.43 | .24 |
| Phase I sedation on admission | 2.22 (1.58) 1.81-2.63 | 2.13 (1.85) 1.66-2.60 | 0.08 | .78 |
| Phase I nausea 15 min after admission or c/o nausea/vomiting | 1.59 (0.94) 1.34-1.85 | 1.63 (1.03) 1.35-1.91 | 0.04 | .85 |
| Phase I sedation 15 min after admission or c/o nausea/vomiting | 1.92 (1.74) 1.46-2.37 | 1.66 (1.81) 1.19-2.12 | 0.64 | .42 |
| Phase I nausea 30 min after admission or 15 min after administration of promethazine | 1.75 (1.02) 1.47-2.04 | 1.44 (0.79) 1.23-1.66 | 3.10 | .08 |
| Phase I sedation 30 min after admission or 15 min after administration of promethazine | 1.73 (1.89) 1.24-2.22 | 1.62 (4.86) 1.15-2.10 | 0.09 | .76 |
| Phase I nausea 30 min after administration of promethazine | 1.71 (0.98) 1.34-2.09 | 1.62 (0.67) 1.31-1.92 | 0.15 | .70 |
| Phase I sedation 30 min after administration of promethazine | 4.20 (3.02) 3.42-4.99 | 2.52 (0.32) | 3.35 | .07 |
| Phase I nausea at the time of discharge from Phase I | 1.21 (0.59) 1.04-1.39 | 1.12 (0.32) 1.03-1.21 | 1.07 | .30 |
| Phase I sedation at the time of discharge from Phase I | 2.25 (2.61) 1.57-2.93 | 1.93 (2.29) 1.35-2.52 | 0.51 | .48 |

PACU, post anesthesia care unit; M, mean; SD, standard deviation; CI, confidence interval.

**Table 3. Comparison of Outcomes According to Phase II (ASC) Group (n = 120)**

| Indicator | Experimental M (SD) CI n = 59 | Control M (SD) CI n = 61 | $X^2$ or F | *P* Value |
|---|---|---|---|---|
| Phase II nausea on admission | 1.82 (1.08) 1.53-2.11 | 1.67 (0.89) 1.43-1.90 | 0.69 | .41 |
| Phase II sedation on admission | 0.90 (1.21) 0.58-1.21 | 0.97 (1.40) 0.61-1.33 | 0.08 | .77 |
| Phase II nausea 15 min after admission or c/o nausea/vomiting | 1.68 (0.84) 1.46-1.90 | 1.63 (0.76) 1.43-1.83 | 0.12 | .73 |
| Phase II sedation 15 min after admission or c/o nausea/vomiting | 0.81 (0.94) 0.57-1.06 | 1.05 (1.52) 0.66-1.44 | 1.04 | .31 |
| Phase II nausea 30 min after admission or 15 min after administration of promethazine | 1.59 (0.93) 1.35-1.84 | 1.64 (1.10) 1.36-1.93 | 0.07 | .79 |
| Phase II sedation 30 min after admission or 15 min after administration of promethazine | 0.83 (0.97) 0.58-1.08 | 1.03 (1.52) 0.64-1.42 | 0.75 | .39 |
| Phase II nausea 30 min after administration of promethazine | 1.33 (0.53) 1.16-1.49 | 1.40 (0.77) 1.11-1.69 | 0.23 | .63 |
| Phase II sedation 30 min after administration of promethazine | 2.88 (3.10) 2.07-3.69 | 4.30 (2.96) 3.54-5.05 | 6.53 | .01* |
| Phase II nausea at the time of discharge from Phase II | 1.13 (0.38) 1.02-1.23 | 1.09 (0.29) 1.01-1.17 | 0.28 | .59 |
| Phase II sedation at the time of discharge from Phase II | 0.14 (0.47) 0.01-00.26 | 0.67 (1.75) 0.21-1.12 | 5.05 | .03* |

ASC, ambulatory surgical center; M, mean; SD, standard deviation; CI, confidence interval.
*$P < .05$, statistically significant.

likely to have severe nausea 30 minutes after promethazine administration ($X^2 = 9.8$; df = 3; $P = .02$) and to be more drowsy at the time of discharge from Phase I ($X^2 = 12.9$; df = 4; $P = .01$).

Gender differences were observed at various periods during recovery from surgery. Phase I sedation levels 30 minutes after admission and 15 minutes after administration of promethazine were significantly higher for females (n = 84; mean [standard deviation {SD}] = 1.37 [1.16]; CI = 1.12 to 1.62) than for males (n = 27; mean [SD] = 0.85 [0.95]; CI = 0.48 to 1.23; $P = .04$). Phase I sedation levels at the time of discharge from Phase I also were significantly higher for females (n = 75; mean [SD] = 1.27 [1.21]; CI = 0.99 to 1.55) than for males (n = 25; mean [SD] = 0.64 [0.91]; CI = .27 to 1.01; $P = .02$). Phase II sedation levels were significantly higher for females (n = 90; mean [SD] = 0.90 [0.93]; CI = 0.71 to 1.09) than for males (n = 27; mean [SD] = 0.37 [0.57]; CI = 0.15 to 0.59; $P = .006$) at the time of admission to Phase II and at 30 minutes after admission and at 15 minutes after administration of the study medication ($P = .04$).

Methods of anesthesia delivered in the OR resulted in significant differences in the level of nausea at the time of admission to Phase I, with subjects (n = 8) who had received other types of anesthesia (local monitored anesthesia care [MAC], spinal) demonstrating significantly higher levels of nausea (M [SD] = 4.00 [2.67]; CI = 1.77 to 6.23) than those who had received general anesthesia (n = 112; M [SD] = 1.79 [1.69]; CI = 1.46 to 2.13; $P = .001$). Level of sedation at the time of admission to Phase I also differed, with subjects (n = 5) who had received other types of anesthesia (MAC, spinal) demonstrating significantly lower levels of sedation (M [SD] = 0.60 [0.55]; CI = −0.08 to 1.28) than those who had received general anesthesia (n = 107; M [SD] = 1.89 [1.15]; CI = 1.67 to 2.113; $P = .001$).

Differences also were observed between types of surgical procedures and level of Phase I subjects' nausea at the time of discharge from Phase I (using Bonferroni post hoc testing). Although individual cell sizes were small, plastic surgery subjects (n = 3) had significantly higher discharge nausea

scores (M [SD] = 2.00 [1.73]; CI = 0.98 to 1.13) than gynecologic surgery (n = 17; M [S] = 1.06 [0.24]; CI = 0.93 to 1.18; $P$ = .03) and orthopedic surgery (n = 17; M [SD] = 1.06 [0.23]; CI = 0.98 to 1.13; $P$ = .02) subjects.

Findings for subjects who received more than one type of antiemetic in OR (n = 88) and subjects who received only one medication (n = 28) for relief of PONV (institutional standard of care) also differed. Subjects who received one medication (n = 23) to prevent PONV had significantly lower nausea scores at the time of admission to Phase I mean (SD) scores (1.04 [0.21]; CI = 0.95 to 1.13) than subjects (n = 76) who received more than one medication (M [SD] = 1.20 [0.52]; CI = 0.95 to 1.13; $P$ = .03). Subjects who received only one medication (n = 28) also had significantly higher Phase II sedation scores at the time of discharge (M [SD] = 0.50 [1.26]; CI = 0.01 to 0.99) than subjects (n = 88) who received more than one medication (M [SD] = 0.14 [0.35]; CI = 0.06 to 0.21; $P$ = .02).

No intraoperative or postoperative complications were noted for any of the subjects enrolled in the study. Oral fluids were tolerated, and all subjects were assessed as having achieved pre-admission activity levels before discharge.

## Limitations

This study was limited to one hospital and included only adult ambulatory surgery patients. Six hundred twenty-three patients provided consent to participate in the study between October 2008 and March 2011. Of these 623 prospective subjects, 120 subjects experienced PONV, and thus were eligible to participate. The final sample also was over-represented by females, which limits the ability to generalize the findings. Limitations also included the recruitment of subjects from a subsample of surgeons who agreed to allow enrollment of their patients into the study, which restricted the type of surgical diagnoses included. In addition, information pertaining to level of nausea was obtained through self-reporting. Self-reported information may be imprecise and over or under-represent the true degree of nausea.

The inability to control the amount and type of medications, including opioids, administered in pre-anesthesia, OR, Phase I or Phase II also is a concern. Efforts were made to record all interventions likely to influence study outcomes, but not all activities were recorded in all cases. The study also took considerably longer to complete than anticipated because of the number of individuals who agreed to participate, but who then did not require postoperative medication for management of PONV (recruitment with consent needed to be done before surgery when indications for treatment were not known). During this unexpected period of study prolongation, surgeon-directed or anesthesiologist-directed standards of care may have changed, resulting in findings that may have differed had the study been completed in a shorter period of time.

The differences according to type of surgical procedure also must be viewed with caution. The number of subjects for several of the procedures was small and results of prior research is mixed, with some studies reporting greater likelihood of PONV following general anesthesia,[16] and others suggesting that the procedure itself is not related to frequency of PONV.[17] Differences by variables other than treatment (which was randomized) should also be viewed with caution. Because of sample size, analysis of group comparisons did not include controlling for potential confounding variables or interaction effects.

The finding of increased sedation scores in female patients may be assumed to be secondary to the lower body weights of females versus males. An additional limitation is the sample size of 120, with mixed surgical diagnoses. These factors likely contributed to a lack of statistically significant findings. As well, the lack of power hindered the ability to detect a clinically significant difference.

## Conclusions

Study results revealed that the two informal hypotheses suggested by the bedside nurses were supported. No difference in patient response was found between promethazine 6.25 mg IV and promethazine 12.5 mg IV for the relief of PONV in a sample of adult ambulatory surgery patients. Promethazine 12.5 mg IV was found to confer a sedating effect on adult ambulatory surgery patients that may have delayed, in some cases, a discharge to home, whereas promethazine 6.25 mg IV was not

found to confer a sedating effect on adult ambulatory surgery patients.

Our results demonstrated equal efficacy with either promethazine 6.25 mg IV or promethazine 12.5 mg IV in a sample of ambulatory surgery patients managed in Phase I and Phase II recovery. The promethazine 6.25 mg IV dose had the added benefit of lesser levels of sedation at 30 minutes post-medication administration ($P = .01$) and at the time of discharge from Phase II. Similar to previous reports, women had more PONV than men,[17,18] as did those with a history of PONV.[17]

Unlike results of previous studies,[16] subjects receiving general anesthesia had fewer incidences of PONV. Subjects' age also did not contribute to differences in PONV frequency, which is consistent with prior reports.

Health care providers may find the use of a smaller dose modality desirable with regard to minimizing known side effects, specifically sedation. This finding appears to render promethazine at a lesser dose an ideal medication for the management of PONV in the ambulatory setting. Based on the safety and efficacy of promethazine 6.25 mg IV, our findings indicated that it may be used as a first-line agent for treating PONV. It is generally accepted that effective treatment at the smallest doses should be made available to postoperative patients with complaints of PONV. Thus, Phase I and Phase II perianesthesia nurses need to integrate these therapies into their plan of care for patients experiencing PONV. Patients who receive inadequate treatment for PONV may feel that nausea is under-appreciated by seemingly disinterested health care providers ("normal" after surgery, "it will pass" etc.) when their ambulatory surgical experience and postoperative satisfaction could be improved with appropriate treatment.

## Future Recommendations

Although there is extant literature surrounding the benefits of decreasing the incidence of PONV, significantly less is known about specific recommendations for managing PONV according to discrete patient characteristics, anesthetic techniques, and surgical procedures. Therefore, future research should focus on patient characteristics that may include age, gender, and comorbidities, as well as anesthesia modalities associated with these patient characteristics, and the burden of the surgical procedure. The knowledge gained from such research may provide guidance for decision-making and development of strategies to improve management of PONV, thereby contributing to the body of patient safety literature, and further improving patient comfort and health outcomes.

## Acknowledgments

The authors also acknowledge the support of the following individuals during the development and conduct of the study: Dave Webster, RPh, MSBA; Theresa Carter, RN, MS; Mary Jo Pires, RN; Cheryl Schottin, RN, CAPA; Mary Maiuri, RN; Sandra Price, BSN, RN, CAPA; Dawn A. Smith, RN, MS, ACNP; Melodie Honsinger, RN, BSN; Ashwani Chhibber, MD; Curt Haas, PharmD; Brandon Qualls, MPA, for data management, Ding-Geng Chen, PhD, for statistical consultation, and Harriet J. Kitzman, PhD, RN, FAAN, and Mary G. Carey, PhD, RN, for their thoughtful review.

## References

1. Gundzik K. Nausea and vomiting in the ambulatory surgical setting. *Orthop Nurs*. 2008;27:182-188.
2. Apfel CC, Korttila K, Abdalla M, et al. A factorial trial of six interventions for the prevention of postoperative nausea and vomiting. *N Engl J Med*. 2004;350:2441-2451.
3. Habib AS, Chen YT, Taguchi A, Hu XH, Gan TJ. Postoperative nausea and vomiting following inpatient surgeries in a teaching hospital: A retrospective database analysis. *Curr Med Res Opin*. 2006;22:1093-1099.
4. Jokinen J, Smith AF, Roewer N, Eberhart LHJ, Kranke P. Management of postoperative nausea and vomiting: How to deal with refractory PONV. *Anesthesiol Clin*. 2012;30:481-493.
5. Lacy CF, Armstrong LL, Goldman MP, Lance LL. *Drug Information Handbook*, 19th ed. Hudson, OH: Lexi-Comp; 2010.
6. Westward Pharmaceuticals. Promethazine. Eatontown, NJ; 2011.
7. Shnaider I, Chung F. Outcomes in day surgery. *Curr Opin Anaesthesiol*. 2006;19:622-629.
8. American Society of Perianesthesia Nurses. *Perianesthesia nursing standards and practice recommendations 2010-2012*. Cherry Hill, NJ: American Society of Perianesthesia; 2010.
9. Moser JD, Caldwell JB, Rhule FJ. No more than necessary: Safety and efficacy of low-dose promethazine. *Ann Pharmacother*. 2006;40:45-48.

10. Habib AS, Breen TW, Chukwurah CN, Gan TJ. Dose response of promethazine for the treatment of postoperative nausea and vomiting. *Anesthesiology*. 2004;101:A47.

11. McClintock GH, LaReau RM, Watcharotone K, DeMaagd G. The initial examination of the efficacy of low-dose promethazine for the treatment of nausea and vomiting in the hospitalized elderly. *Geriatr Nurs*. 2010;31:115-122.

12. Pellegrini J, DeLoge J, Bennett J, Kelly J. Comparison of inhalation of isopropyl alcohol vs promethazine in the treatment of postoperative nausea and vomiting (PONV) in patients identified as at high risk for developing PONV. *AANA J*. 2009;77:293-299.

13. Habib AS, Reuveni J, Taguchi A, White WD, Gan TJ. A comparison of ondansetron with promethazine for treating postoperative nausea and vomiting in patients who received prophylaxis with ondansetron: A retrospective database analysis. *Anesth Analg*. 2007;104:548-551.

14. Gan TJ, Candiotti KA, Klein SM, et al. Double-blind comparison of granisetron, promethazine, or a combination of both for the prevention of postoperative nausea and vomiting in females undergoing outpatient laparoscopies. *Can J Anaesth*. 2009;56:829-836.

15. Stawicki SP. Sedation scales: Very useful, very underused. *OPUS 12 Scientist*. 2007;1:10-12.

16. Gan TJ, Meyer T, Apfel CC, et al. Consensus guidelines for managing postoperative nausea and vomiting. *Anesth Analg*. 2003;97:62-71.

17. Murphy MJ, Hooper VD, Sullivan E, Clifford T, Apfel CC. Identification of risk factors for postoperative nausea and vomiting in the perianesthesia adult patient. *J Perianesth Nurs*. 2006;21:377-384.

18. Buchanan FF, Myles PS, Cicuttini F. Effect of patient sex on general anaesthesia and recovery. *Br J Anaesth*. 2011;106:832-839.