2009

POST DISCHARGE NAUSEA AND VOMITING IN AMBULATORY SURGICAL PATIENTS: INCIDENCE AND MANAGEMENT STRATEGIES

Jan Odom Forren
University of Kentucky, Jan.Forren@uky.edu

ABSTRACT OF DISSERTATION

Jan Odom Forren

The Graduate School

University of Kentucky

2009

POST DISCHARGE NAUSEA AND VOMITING IN AMBULATORY SURGICAL PATIENTS: INCIDENCE AND MANAGEMENT STRATEGIES

ABSTRACT OF DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Nursing
at the University of Kentucky

By
Jan Odom Forren

Lexington, Kentucky

Director: Dr. Debra Moser, Professor of

Lexington, Kentucky

2009

ABSTRACT OF DISSERTATION

POST DISCHARGE NAUSEA AND VOMITING IN AMBULATORY SURGICAL PATIENTS: INCIDENCE AND MANAGEMENT STRATEGIES

Approximately 65% of all surgeries are conducted in the outpatient surgery setting involving more than 35 million patients. Thirty-five to fifty percent of these outpatients will experience post discharge nausea and vomiting (PDNV), nausea and vomiting that occurs after discharge from the health care facility after surgery. A dearth of literature details the problems associated with nausea and vomiting experienced by patients after discharge home from outpatient surgery.

The purposes of this dissertation were to (1) review the current knowledge in the area of post discharge nausea and vomiting; (2) present results of an integrative review of the research literature to determine best evidence for prevention of PDNV in adults or rescue of patients who suffer from post discharge nausea and vomiting (PDNV); (3) present a critical review and analysis of measurement of nausea and vomiting after discharge from outpatient surgery, and (4) present findings of a prospective research study.

The purposes of the research study were to: 1) describe the incidence and severity of PDNV over a 7-day period in a sample of adult surgical patients undergoing outpatient surgeries under general anesthesia, 2) describe the pharmacologic and nonpharmacologic modalities of care used by patients with PDNV to manage it, 3) compare the incidence and severity of PDNV between those who do and do not use pharmacologic and nonpharmacologic modalities, and 4) determine outcomes associated with PDNV. This study was part of a multi-site study that had as a primary objective development of a simplified risk model for predicting patients most likely to suffer PDNV. In this research study we described the incidence and severity of PDNV in adult outpatients after ambulatory surgery, described the pharmacologic and nonpharmacologic modalities of care used by patients with PDNV to manage it, compared the incidence and severity of PDNV between those who do and do not use pharmacologic and nonpharmacologic modalities, and determined outcomes associated with PDNV.

Keywords: post discharge nausea and vomiting, ambulatory surgery, outpatient surgery, nausea, vomiting

Jan Odom Forren

Student's Signature

10/21/09

Date

POST DISCHARGE NAUSEA AND VOMITING IN AMBULATORY SURGICAL PATIENTS: INCIDENCE AND MANAGEMENT STRATEGIES

By

Jan Odom Forren

Debra Moser, D.N.Sc., M.N., R.N., F.A.A.N.

Director of Dissertation

Terry A. Lennie, Ph.D., R.N., F.A.H.A.

Director of Graduate Studies

10/22/09

Date

RULES FOR THE USE OF DISSERTATIONS

Unpublished dissertations submitted for the Doctor's degree and deposited in the University of Kentucky Library are as a rule open for inspection, but are to be used only with due regard to the rights of the authors. Bibliographical references may be noted, but quotations or summaries of parts may be published only with the permission of the author, and with the usual scholarly acknowledgments.

Extensive copying or publication of the dissertation in whole or in part also requires the consent of the Dean of the Graduate School of the University of Kentucky.

A library that borrows this dissertation for use by its patrons is expected to secure the signature of each user.

Name	Date

DISSERTATION

Jan Odom Forren

The Graduate School

University of Kentucky

2009

POST DISCHARGE NAUSEA AND VOMITING IN AMBULATORY SURGICAL PATIENTS: INCIDENCE AND MANAGEMENT STRATEGIES

DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Nursing
at the University of Kentucky

By
Jan Odom Forren

Lexington, Kentucky

Director: Dr. Debra Moser, Professor of Nursing

Lexington, Kentucky

2009

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

Nausea and vomiting after surgery was discussed in the literature as early as 1899 when Blumfeld linked vomiting after surgery to ether anesthesia. At that time the incidence of postoperative nausea and vomiting (PONV) was 75%.[1] By 1956, Knapp and Beecher were evaluating antiemetic drugs available for patients and discussed the differences between nausea, vomiting and retching.[2] During the 1990s, research began extensively with publication of an editorial calling PONV the "big, little problem"[3] and with two significant articles, in which the authors discussed the etiology, treatment and prevention of PONV.[4, 5] Research focused first on nausea and vomiting immediately after inpatient surgery. Since that time, the number of ambulatory surgeries has increased exponentially, with the resulting adverse effects of nausea and vomiting impacting patients as they recover at home.

The treatment and consequences of post discharge nausea and vomiting (PDNV) have not been as thoroughly assessed and evaluated as postoperative nausea and vomiting (PONV), nausea and vomiting experienced immediately after surgery and in the hospital. Much time and effort has been expended in research and publication regarding PONV. However, most of this research was conducted in the post anesthesia care unit (PACU), up to 24 hours in a hospitalized patient, or in postanesthesia phase II immediately before patient discharge home.[6]

Approximately 65% of all surgeries are conducted in the outpatient surgery setting[7] involving more than 35 million patients.[8] Thirty-five to fifty percent of these outpatients will experience post discharge nausea and vomiting (PDNV), nausea and vomiting that occurs after discharge from the health care facility after surgery.[6, 9-12] That figure translates into millions of patients who suffer from PDNV yearly.[13-15] Unfortunately, the incidence of PDNV is under-reported.[16] A dearth of literature details the problems associated with nausea and vomiting experienced by patients after discharge home from outpatient surgery.[6, 17] Just this past year, one editorial, "We're tired of waiting," emphasized the effect of PDNV on daily function and pointed out that patients are tired of waiting for PDNV to end.[18] In a second editorial last year the authors discussed PDNV as an overlooked aspect of ambulatory anesthesia and pointed out the necessity for further research in this arena.[19]

In the first published study specifically conducted for the purpose of investigating PDNV in the outpatient, Carroll, et al.[11] found an overall incidence of 35% for PDNV in 211 ambulatory surgery patients. In a systematic review of randomized, controlled studies, the authors reported an overall incidence of post discharge nausea as 32.6% and the overall incidence of post discharge vomiting as 14.7%.[12] In another systematic review in which post discharge symptoms were

examined, the authors found that the incidence of post discharge nausea ranged from 0% to 55% and post discharge vomiting ranged from 0% to 16%.[20] However, it has been difficult to compare the different incidences reported because the definitions of PDNV vary per researcher. A recent multidisciplinary and evidence-based guideline published by the American Society of PeriAnesthesia Nurses is the first guideline to address PDNV. Contained within this guideline are definitions of PONV and PDNV (See Figures 1-1 and 1-2) that have been formulated to aid in further research.[9]

Only a small number of studies are available in which the investigator specifically examines strategies to reduce PDNV.[6, 21] In one recent study, patients responded to PDNV with inappropriate responses such as stopping pain medication.[22] In another study, 35% of patients who experienced PDNV lost time from work or normal activities.[10] Postanesthesia care for the patient experiencing PDNV is not standardized, and there has been no research to determine the pharmacologic and nonpharmacologic modalities that have been used with PDNV and how that relates to PDNV. Until a very recent multi-site study[23], predictors for PDNV had not been determined, although it was assumed those predictors might be similar to predictors for PONV.[9]

Risk Factors

Risk factors specific to PDNV are only now being determined. More is known about risk factors associated with PONV.[24-26] The cause of PONV is multifactorial.[16] Risk factors for PONV can be described as those related to the patient, the surgical procedure, the anesthesia, and the postoperative period.[13, 25] Apfel, et al.[24] developed a risk score to predict the risk that a patient would experience PONV. The final score was derived from four predictors: female gender, history of motion sickness or PONV, nonsmoking, and the use of postoperative opioids. If no risk factors were present, the incidence of PONV was 10%. With 1, 2, 3, or 4 risk factors present, the incidences for an individual patient were 21%, 39%, 61%, and 79%, respectively. Koivuranta et al.[27] developed a risk assessment tool that included five variables in the risk score calculation: female gender, nonsmoking status, history of PONV, history of motion sickness, and length of surgery (> 60 minutes). The incidences based on the risk factors were 17%, 18%, 42%, 74%, and 87% respectively.

In general, increased age has been associated with a decreased incidence of PONV, although the predictive value was not supported in several studies.[9, 25] Better health status as determined by the American Society of Anesthesiologists (ASA) physical status classification system is a possible risk factor for PONV.[26, 28] The ASA classification system ranges from 1 (a patient who is normal and healthy) to 6 (a brain-dead patient who is having organs harvested)[29]

In other words, the healthier patient is more at risk for PONV than patients determined as less healthy. This may have implications for PDNV because outpatient surgery is usually performed only on patients who have a better health status, typically a physical status of 1-3.[30] Other factors that are associated with PONV include use of volatile anesthetics,[31] use of nitrous oxide,[28] duration of anesthesia[32], duration of surgery[24, 32], and type of surgery.[28] There is conflicting evidence on the impact of pain.[25, 33] There is no definitive answer as to whether PONV is related to PDNV[11, 34], although the answer may lie with differing physiologic mechanisms for PONV and PDNV.[17] Until now, experts have recommended using the same risk factor assessment tool for PDNV as that used for PONV based on benefit versus risk. [9] Apfel et al. have recently determined predictors for a simplified assessment tool for early PDNV (48 hours after surgery).[23] The five statistically significant independent risk factors for PDNV for the first 48 hours are female gender, age less than 50 years, history of PONV, opioids administered in the PACU, and nausea in the PACU.[23]

Consequences

Identified consequences of PDNV in the outpatient surgery patient include impaired sleep time due to vomiting[35], drowsiness as a side effect of the rescue antiemetic[34], increased anxiety for parents of pediatric patients[36], a delay in resumption of activities of daily living (ADL)[11, 20], a negative effect on quality of life, [37] and a decision by the patient not to self-administer an analgesic for pain because they believe it is related to the nausea and vomiting.[22, 38]

Other potential consequences of PDNV are numerous, but are speculative because they are based on information about PONV. The patient may be unable to tolerate fluids or food and become dehydrated, possibly with an accompanying electrolyte disturbance such as alkalemia. The patient may aspirate contents after postoperative emesis resulting in pneumonia. Additionally, the patient may experience sweating, tachycardia, increased salivation, hypertension, hypotension or cardiac dysrhythmias. Surgical consequences include disruption of suture lines, bleeding from the wound, increased intracranial and intraocular pressure, and esophageal tears.[14, 39] Economic consequences include delayed discharge home, unplanned admission to the hospital, increased medication use, and nursing costs, as well as possible loss of work wages for the patient.[14, 39, 40]

Management and Treatment

Prevention of PDNV begins with the anesthesia plan preoperatively with prophylaxis warranted only in high-risk patients. Risk factors can determine high risk patients for PONV, and soon a simplified risk assessment tool will be available in the literature to further assess the potential for PDNV in outpatients.[9, 23, 25] In one review of the literature only one systematic review and three studies specific to management and treatment of PDNV were discovered.[6] Five algorithms published for care and treatment of PONV were discussed in this same review, but none of those algorithms guide management of nausea and vomiting for the surgical outpatient after discharge.[6] Recent multidisciplinary and evidence-based guidelines published by the American Society of PeriAnesthesia Nurses are the first guidelines to address PDNV.[9] The overall evidence concerning antiemetics as prophylaxis or other pharmacologic or nonpharmacologic treatment for PDNV is sparse.[17] However, based on the limited evidence available, and until the risk assessment tool for PDNV is published, patients are assessed for PDNV using a PONV risk factor assessment tool. If the patient is at risk for PDNV, prophylaxis is considered with dexamethasone, scopolamine patch, NK-1 receptor antagonist, or P6 acstimulation.[9] If the patient experiences PDNV, rescue treatment may include ondansetron dissolving tablets, promethezine suppositories or tablets, or a scopolamine patch.[9]

Summary

Modalities of care for patients who experience PDNV have been documented in no studies. Risk factors have only recently been determined,[23]and only one study has reported self-care activities for the patient experiencing PDNV.[22] The three most common responses of self-care for PDNV were stopping pain medications, altering physical activities and ingesting food or liquids.[22] Many patients initiated no self-care activities at all, and none of the patients reported the use of complementary interventions.[22] Little research is available that describes the incidence and severity of nausea and vomiting after discharge home. Severity of nausea is rarely documented. Management and treatment of PDNV has been seriously overlooked with patients suffering at home unable to return to work or perform other activities of daily living. In one school project, the author discovered that patients who had experienced PDNV were very reluctant to return for future surgery.[41] Therefore, initial exploration of the incidence and severity of PDNV, pharmacologic and nonpharmacologic modalities of care for these patients, and relationship to quality of life after surgery must occur in order to determine future relief for patients in the form of self-care.

The purposes of The dissertation were to (1) review the current knowledge in the area of post discharge nausea and vomiting; (2) present results of an integrative review of the research literature to determine best evidence for prevention of PDNV in adults or rescue of patients who suffer from post discharge nausea and vomiting (PDNV); (3) present a critical review and analysis of measurement of nausea and vomiting after discharge from outpatient surgery, and (4) present findings of a prospective research study. The purposes of the study conducted as a part of this dissertation were to: 1) describe the incidence and severity of PDNV over a 7-day period in a sample of adult surgical patients undergoing outpatient surgeries under general anesthesia, 2) describe the pharmacologic and nonpharmacologic modalities of care used by patients with PDNV to manage it, 3) compare the incidence and severity of PDNV between those who do and do not use pharmacologic and nonpharmacologic modalities, 4) determine outcomes associated with PDNV, and 5) determine predictions for late (Days 3-7) PDNV. This study was part of a multi-site study that had as a primary objective development of a simplified risk model for predicting patients most likely to suffer PDNV.[23]

Overview of Chapters

Chapters Two and three review the literature that is available concerning post discharge nausea and vomiting. Chapter Two is a review of any study that been published through 2005 on the subject of PDNV. The purpose of Chapter Two was to review the current knowledge in the area of discharge nausea and vomiting.[6] The findings were that PDNV had not been as thoroughly assessed and evaluated as nausea and vomiting immediately post surgery. Future implications were discussed as were research recommendations for the ambulatory surgery population. Chapter Three focused on interventional studies that specifically addressed the effect of an intervention designed to prevent PDNV or rescue the patient who develops PDNV.[17] This chapter presents an integrative review of the literature that determined best evidence for prevention of PDNV in adults or for rescue of patients who suffer from PDNV. The chapter synthesized evidence from interventional studies conducted with adult patients using pharmacologic or nonpharmacologic modalities of care.

Chapter Four includes discussion of the measurement of nausea and vomiting. Inconsistent measurement of nausea, vomiting and retching has made it difficult to compare the incidence of PDNV among studies. Further complicating the situation is that differing definitions of the terms PONV and PDNV have been used throughout the literature. There is a lack of standardized instruments in studies of PONV and PDNV and a reliance on instruments developed by the individual investigator. A critical review and analysis of measurement of nausea and vomiting after discharge from outpatient surgery is presented as are new directions for measurement.

Chapter Five is a study that describes the incidence and severity of PDNV over a 7-day period in a sample of adult surgical patients undergoing outpatient surgeries under general anesthesia, describes the pharmacologic and nonpharmacologic modalities of care used by patients with PDNV to manage it, compares the incidence and severity of PDNV between those who do and do not use pharmacologic and nonpharmacologic modalities, and determines outcomes associated with PDNV. The study was comprised of data from 12 study sites across the United States for the first 48 hours post surgery and from 2 study sites for 7 days post surgery.

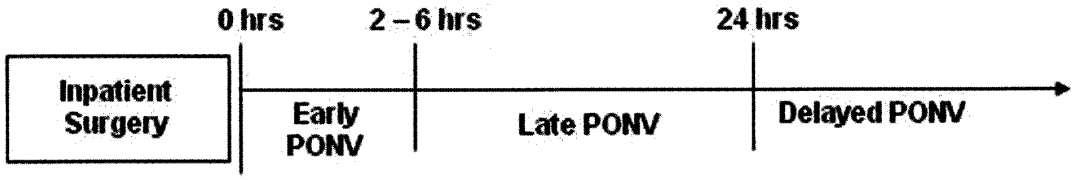
Findings from the study presented in Chapter Five show that over a third of ambulatory surgery patients continue to suffer the effects of PDNV during the first week after surgery, some suffering symptoms up to 7 days. Several factors were associated with an increased risk of PDNV including younger age, female gender, previous PONV or motion sickness, ASA status, and OR (operating room) time. Patients were more likely to use minor self-care strategies to manage symptoms than to use antiemetics. The presence of nausea and vomiting was significantly related to quality of life (QOL). In this study, we recommend that future studies focus on patient education needs, use of risk assessment tools for PDNV and randomized controlled trials that determine appropriate long-term antiemetics and non-pharmacologic methods to control nausea and vomiting.

Chapter Six provides an overview of review and study findings, suggests recommendations on the development of comprehensive and effective interventions to promote prevention of PDNV and management of symptoms should they occur, and provides future research recommendations for patient education, risk assessment tools and further research into management strategies.

Future Impact of the Study

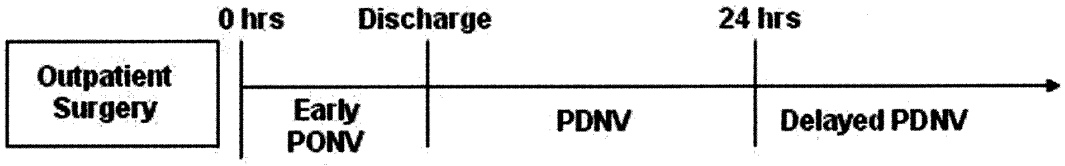
The data in this dissertation point out the extraordinary number of patients who undergo ambulatory surgery and then go home to struggle with nausea and vomiting. There are some patients who continue to have problems up to 7 days later. This dissertation builds a foundation for future studies to examine interventions that decrease the impact of nausea and vomiting. Further research can be conducted to look at newer long-acting antiemetics and the appropriateness of use for discharged ambulatory surgery patients. Use of nonpharmacologic methods of care to manage PDNV is a wide-open field for research in this population. Of special interest is research to determine an algorithm that patients could follow to alleviate symptoms. Also of special interest is the effect of anxiety on these patients and the effect of a patient education intervention. Now that it has been confirmed that patients do suffer at home, typically without notifying the healthcare provider, the science can be built on further interventional studies.

Figure 1.1 PONV Timeline



Used with permission.[9]

Figure 1.2 PDNV Timeline



Used with permission.[9]

CHAPTER TWO

POST DISCHARGE NAUSEA AND VOMITING: A REVIEW OF CURRENT LITERATURE

ABSTRACT

Postoperative nausea and vomiting continues to occur in approximately one third of patients who have surgery despite newer medications and emerging guidelines for care. There is a paucity of literature that relates to patients who experience post discharge nausea and vomiting after outpatient surgery. The purpose of this article is to review the current knowledge in the area of post discharge nausea and vomiting. The findings were that the problems with post discharge nausea and vomiting (PDNV) have not been as thoroughly assessed and evaluated as nausea and vomiting immediately post surgery. More research needs to be conducted in this population, as the rate of surgeries performed in this setting will only increase.

Introduction

Postoperative nausea and vomiting (PONV) is a known complication for patients after surgery and has been called the "big, 'little problem.' "[1] In spite of newer anesthetic agents, antiemetic medications, and considerable research into the subject, one third of all postoperative patients continue to experience PONV at some point after surgery.[2-4] In a recent study of six interventions for prevention of PONV, the average incidence was 34%.[5] The incidence of PONV in high-risk patients with four determined risk factors can be as high as 70-80%.[6]

Today, approximately 65% of all surgeries are conducted in the outpatient surgery setting.[7] The Federated Ambulatory Surgery Association states that approximately 6 million surgeries are performed yearly in 3,300 ambulatory surgery centers.[8] The current healthcare environment requires that patients are quickly and efficiently moved through the system from admission to discharge.

Only a small number of studies are available that specifically examine strategies to reduce PDNV.[9] Much time and effort has been expended in research and publication regarding PONV. However, most of this research was conducted in the post anesthesia care unit (PACU) or in postanesthesia phase II immediately before patient discharge home. There is a paucity of literature that details the problems associated with nausea and vomiting experienced by patients after discharge home. The problems with post discharge nausea and vomiting (PDNV) have not been as thoroughly assessed and evaluated as PONV immediate post surgery. When conducting the literature review for this article, using "post discharge nausea and vomiting" as a keyword

elicited only 2 articles from CINAHL (1982-2004). PubMed delivered 56 articles with the same keyword, but some articles that only had one or two lines applicable to the subject.

To perform the literature search for appropriate articles, the author used the keywords "ambulatory surgery" (933 results), "nausea and vomiting" (948 results), and "postoperative complications" (5749 results). Combining those three keywords in one search resulted in 26 articles. The authors then searched the abstracts for suitable articles. The authors also searched the reference lists in those articles for additional articles. The result was 24 articles that specifically mention nausea and vomiting after discharge home. Of those 24 articles, several had only one –two sentences that were applicable. One of the articles was a systematic review and analysis of postdischarge symptoms, including nausea and vomiting. The purpose of this review is to synthesize a review of the literature that has been published on the subject of post discharge nausea and vomiting.

Post Discharge Nausea and Vomiting

Incidence

It is possible that PDNV has been underreported in the past because the symptoms were not identified.[10] Upon discharge, patients are not as accessible to surveillance and care by healthcare workers, which may have contributed to underreporting of these symptoms.[11] Carroll, et al.[11]found an overall incidence of more than 35% in 211 ambulatory surgery patients who had one of four selected surgeries: laparoscopy, dilation and curettage, arthroscopy, or hernia repair. Interestingly, most of the patients who experienced PDNV in the study had not experienced PONV before discharge. Wu, Berenholtz, Pronovost, and Fleisher found an incidence of post discharge nausea (PDN) that ranged from 0% to 55% and an incidence of post discharge emesis (PDV) that ranged from 0% - 16% in a systematic review that evaluated the incidence of reported postdischarge symptoms and included PDNV.[12] In a systematic review of randomized, controlled studies published in the English literature, the authors examined whether routine prophylaxis with antiemetics affected the incidence of PDNV after ambulatory surgery. The overall incidence of PDN was reported as 32.6% (35.7% placebo and 31.2% treatment) and the overall incidence of PDV was 14.7% (19.6% placebo and 12.1% treatment).[13]

Risk Factors

The cause of PONV is multifactorial.[10] Risk factors can be described as related to the patient, the surgical procedure, the anesthesia, and the postoperative period.[2] Apfel, et al. developed a risk score to predict the chances a patient would experience PONV. The final score had four predictors: female gender, history of motion sickness or PONV, nonsmoking, and the use of postoperative opioids. If no risk factors were present, the incidence of PONV was 10%. With 1, 2, 3, or 4 risk factors present, the incidences were 21%, 39%, 61%, and 79%, respectively.[6]

There are no studies that specifically determine risk factors related to PDNV. Carvalho et al.[14] evaluated the influence of inhalational versus total intravenous anesthesia (TIVA) maintenance on functional recovery and symptom distress after gynecological surgery. No significant differences were found between the two groups with respect to functional recovery, nausea, vomiting or pain. In one study of 211 outpatients who had one of four selected surgeries, PDNV was not related to PONV in the immediate postoperative period[11]while in another study 95 healthy, female patients who had PONV immediately after laparoscopic surgery were reported to be four times more likely to experience PDNV.[15]

Consequences

PONV is known to have physiologic consequences as well as an impact on patient satisfaction.[3, 16-20] Identified consequences for the post discharge patient include impaired sleep time due to vomiting[21], drowsiness as a side effect of the rescue antiemetic[15], increased anxiety for parents of pediatric patients[22], a delay in resumption of activities of daily living (ADL)[11, 12], and a decision by the patient not to self-administer an analgesic for pain because they believe it is related to the nausea and vomiting.[23, 24]

PDNV Published Information

Pfisterer, et al.[25] studied the incidence and impact of PONV before and after discharge following outpatient surgery. A total of 586 patients from nine countries were enrolled in the study. Upon leaving the facility sixty-four patients experienced PONV, with 29 reporting moderate and 8 reporting severe symptoms. Another 76 patients experienced PDNV while traveling home. Some patients experienced PDNV five days after surgery. There was also an impact on activities of daily living and time lost from work. Of the 129 patients who experienced PDNV, 35% lost time from work or normal activities requiring 21 patients to take one or more days off work and 21 friends and relatives to take time off from work to assist the patient. The

authors go on to state that PONV is "either not adequately recognized or treated in hospital and beyond, or that some of the anti-emetic agents may be inadequate".[25]

Enever, et al.[26] compared postdischarge morbidity after outpatient dental care under general anesthesia between pediatric patients with and without disabilities. Symptoms were similar in both groups and included nausea and vomiting (20%), unexpected drowsiness (13%), and need for pain relief at home (42%). One patient was readmitted for persistent nausea and vomiting. Ernst and Thwaites[27] evaluated post discharge pain, nausea and vomiting of outpatients undergoing elective surgeries over a 2-month period. The types of surgeries were general surgery, orthopedic, dental, ENT, and gynecology. They discovered that more patients suffered from nausea and vomiting after discharge (33% nausea; 10% vomiting) than before discharge (16% nausea; 6% vomiting). The authors concluded that pain, nausea, and vomiting are persistent problems after discharge and that they increase in incidence after discharge.

Amanor-Boadu and Soyannwo[28] followed pediatric patients from time of discharge to first outpatient visit. They discovered that the most prevalent problem was pain (18.9%), but also discovered that vomiting (12.2%) was a significant finding. These authors did not address nausea in this population. The authors conclude that "concerns for safety and comfort of the patients should extend beyond the recovery room to the ward and home".[28]

Young, et al.[29]examined whether enhanced discharge education would make a difference once patients returned home after outpatient surgery. While compiling symptoms that occurred after surgery, the authors discovered that many patients stated they were not feeling hungry, had no interest in food, or felt nauseous during the first two days at home. The enhanced teaching package, a procedure-specific patient educational tool that was implemented, had no effect on patient recovery or the patient's ability to self-manage. The authors concluded that the patient's own understanding of self-care affected the recovery more significantly than the enhanced teaching package.

Waterman, et al.[30] conducted qualitative research of postoperative pain, nausea, and vomiting after discharge. They discovered that one third of patients found the pain and nausea worse than they had imagined. They also discovered that some patients are reluctant to take their pain medications because they felt they were related to the nausea. One patient stated, "The first day post-op was awful….I had pain but I was reluctant to take painkillers because of nausea."[31] The authors incorporate recommendations based on their interviews with the patients that include advising patients preoperatively on how to manage nausea and side effects of drugs and deferring discharge for those who have higher levels of pain or who are nauseous.

Kangas-Saarela, et al.[32]studied patients' experiences with outpatient surgery. This was a survey of the incidences of pain, nausea, and vomiting and patient satisfaction. Overall, 11.3% of patients surveyed experienced nausea either during recovery, travel home, or after arriving home. The authors believe that the lower than usual incidence of nausea was due to the high number of orthopedic cases who received regional anesthesia during surgery. See Table 2-1 for a summary of studies.

Management and Treatment

Prevention of PONV and PDNV begins with the anesthesia plan preoperatively. Because only one-third of surgical patients will experience PONV or PDNV, prophylaxis is warranted only in high-risk patients.[33] The decision to give antiemetics should be based on risk factors with a focused plan of care developed to decrease the chances the patient will experience PONV/PDNV, e.g. use of local anesthetics to decrease opioid need or limiting use of neuromuscular agents to avoid reversal agents. There is no one drug that can block all pathways mediating nausea and vomiting. Different classes of drugs are available that affect one or more receptor sites, and alternative treatments for PONV are becoming more common although not yet tested specifically in the PDNV population.[2, 3, 33-35] Most alternative treatments are completed in conjunction with pharmacologic methods of controlling nausea and vomiting.

One systematic review and three studies were found in which the efficacy of pharmacologic treatment was considered in patients with PDNV. Gupta, et al.[13] conducted a systematic review of randomized controlled trials to determine if the routine prophylactic use of antiemetics affected the incidence of PDNV after ambulatory surgery. A total of 815 patient had PDN with an overall incidence of 26% PDN in the treatment group and 40.4% in the placebo group. A significantly lower risk of PDN was discovered with ondansetron 4mg, dexamethasone 4-10 mg and combination treatment with more than one drug compared to placebo. The overall incidence of PDV was 14.6 % in the treatment group and 26.5% in the placebo group. The relative risk was lower with ondansetron 4mg and combination treatment with two or more drugs than with placebo.

Tang, et al.[36]compared ondansetron and droperidol as a prophylactic antiemetic agent for elective outpatient gynecologic procedures. This study was included in the above systematic review. Droperidol 1.25 mg and ondansetron 4 mg significantly reduced the incidence of PDNV when compared to placebo or droperidol 0.625 mg. Parlow, et al.[15] assessed the efficacy of prophylactic administration of promethazine for PDNV after ambulatory laparoscopy. An intramuscular injection of either saline or promethazine 0.6 mg/kg was administered to patients

immediately prior to discharge home. There was no difference between the placebo group and treatment group regarding the incidence of PDNV. The incidence of "excessive drowsiness" was notably higher in those patients who had received promethazine ($P = 0.008$).

Wright, et al.[37] evaluated the effectiveness of promethazine suppositories in decreasing nausea and vomiting in adult outpatients following discharge home. Patients who had a prolonged stay in PACU due to PONV, developed PONV after the IV was discontinued, or had a long car trip home were given two promethazine suppositories (25 mg each) upon discharge. A high percentage of the patients who had PDNV used the suppositories. All patients who used the suppositories stated that their PDNV improved after use, and no significant side effects were reported. Promethazine suppositories were determined to be clinically, as well as, cost effective.

Guidelines for Determining Prevention and Treatment

There were five algorithms published for the care and treatment of PONV. Gan[10] lists patient and surgical risk factors and advises avoidance of those risk factors. The algorithm is specific for prophylactic antiemetic therapy and lists options for mild to moderate risk (1-2 factors), moderate to high risk (3-4 factors) or very high risk (>4 factors). The author believes that a multimodal approach to prevention of PONV should be adopted that includes identification of preoperative risk factors, reduction of avoidable risk factors, and use of combination antiemetics. The guideline is based on the 45 references, a mixture of clinical and research, included in the article.

Watcha[4] identified guidelines for prophylaxis and therapy of PONV. Patients were divided into four groups based on estimated risk: low risk (<10 %), mild to moderate risk (10-30%), high risk (30-60%), and extremely high risk (>60%). This guideline lists suggested prophylaxis, as well as, suggested rescue antiemetics. The references for the guideline are two editorials published by White and Watcha.[38, 39] One discusses the use of meta-analysis in improving an understanding of treatment of PONV, and the other includes recommendations on prophylaxis of high-risk patients based on several studies referenced in the editorial.

Gan, et al.[40], in a consensus guideline, listed an algorithm for management of PONV. The algorithm begins with evaluation of risk and divides patients into low, moderate or high-risk groups. This algorithm does suggest consideration of nonpharmacologic therapies, consideration of regional anesthesia, and reduction of baseline risk factors, as well as, antiemetics alone or in combination for treatment. This group of experts considered an evidence rating scale that was based on study design and also considered strength of recommendation based on expert opinion. The panel consisted of ten physicians, 1 pharmacist, and 1 certified registered nurse anesthetist.

Notably missing from the panel were expert perianesthesia registered nurses. There has been concern voiced in the literature about the make-up and selection of the expert panel and the fact that the panel was funded by a pharmaceutical company.[41, 42] Others considered it important that for the first time, an international expert panel attempted to determine a guideline based on evidence-based strategies.[20]

Tramer[20] describes a possible decision tree for PONV prophylaxis. Patients are identified as positive or negative for risk. If patients are positive for risk factors, the decision tree suggests keeping baseline risk low and describes a prophylactic antiemetic cocktail. Tramer recognizes the difficulty in defining what "high-risk" actually means and assuring that the appropriate patients are identified. Tramer further discusses the need for evidence concerning the efficacy of therapeutic antiemetic cocktails. He believes that trials are needed to determine the best rescue treatment for patients who continue to vomit after surgery and that minimal effective doses are unknown. Tramer's premise is that more research is needed for dissemination of best practices and implementation of evidenced-based guidelines.

Golembiewski and O'Brien[34] illustrate the most extensive algorithm that covers the immediate perioperative period. It begins with assessment of risk factors in the preoperative period. Patients are divided into mild to moderate risk (1-2 factors), moderate to high risk (3-4 factors), or very high risk (>4 factors). For all groups there is consideration of intraoperative and postoperative factors that can decrease the incidence of PONV or treat PONV should it occur, and then suggests rescue antiemetics. The algorithm is based on nine references; two that discuss systematic reviews of the literature.

None of the algorithms, guidelines, or decision trees attempts to guide management of nausea and vomiting in the post discharge phase of patient care. Two of the algorithms address prophylactic antiemetic therapy only. Even those algorithms that discuss postoperative care are specific to the immediate postanesthesia phase of care. The only guidelines based on an evidence rating scale were those from Gan, et al.[40]

Future Implications

Very little research has been conducted specifically regarding PDNV. We do know that postdischarge symptoms, including PDNV, can affect patient recovery and resumption of normal activities. We do not know how those symptoms impact the recovery, how extensive the delay in recovery remains, or the costs attributable to these symptoms.[12]

Pfisterer, et al.[25]suggest the need to consider risk factors when using antiemetics for outpatients. The authors also suggest that future studies should compare the use and effectiveness of older antiemetics with newer antiemetics. They state that the newer anti-emetics seem to result in less impact on post discharge activity (due to less drowsiness or other side effects.) Other authors[10] suggest that study of the neurokinin 1 (NK-1) receptor antagonists may hold hope for the future in terms of preventing or limiting PDNV. Further suggestions for research include creation of valid and reliable instruments to collect information on postdischarge symptoms.[12]

Carroll, et al.[11] found that patients who experienced PDNV were more likely to report delay and inability to perform their normal daily activities. The authors also discovered that patients usually did not call the health professional or purchase products to treat the problem. Fetzer, et al.[24]discovered that only 7 of 190 subjects who experienced PDNV contacted a health care provider for PDNV symptoms. These authors discovered that patients' most common response to PDNV was to stop the pain medication, even though pain can contribute to nausea and vomiting.

One practice implication would be to provide education for patients including more detailed instructions for managing the PDNV episodes.[11] The patient's ability to self-manage should be considered because Young et al.[29] discovered that the ability to self-manage was related to the patient's understanding of self-care. Fetzer, et al.[24]call for an antiemetic algorithm for patients to use upon discharge home. This algorithm would take other algorithms one step further by adding the period of time that patients are recovering at home. This algorithm would also need to be written in lay-terms, easy to understand and follow. Instructions for patients' home care could also include suggestions for complementary therapy. Further research is needed to validate the usefulness of complementary therapies at home for PDNV.

The economic impact of postdischarge symptoms, including PDNV, is not known.[12] Research implications include studying the economic impact of PDNV on delays in resumption of normal activities and examining cost-effectiveness, cost-benefit, cost utility, as well as, direct and indirect costs. These costs include not only the costs of unplanned hospital admission or increased rescue medication, but also delays in return to work, time that must be taken off, not only by the patient, but by the caregiver.[12]

Conclusion

In conclusion, PDNV continues to be a problem for at least one third of patients after return home. More research needs to be conducted in this arena as the rate of surgeries in the outpatient setting is only going to rise. Suggestions for study include antiemetic efficacy in the post discharge setting, the effectiveness of a detailed education program for these patients, and economic impact.

Table 2.1 Studies Addressing PDNV

Reference	Publication Year	Study	PDNV	PDN	PDV	Findings
Amanor-Boadu et al. [28]	1997	Complications after pediatric outpatient surgery			12.2%	Need to continue to trend complications post-discharge to aid in prevention
Carroll, et al. [11]	1995	Patient experiences with nausea and vomiting after discharge from outpatient surgery	35%			Significantly more likely to report impairment in daily activities if PDNV present. Little correlation between predischarge NV and PDNV. Few patients called HCP or purchased products to treat NV.
Carvalho, et al.[14]	2002	Longterm functional recovery: Inhalation vs. TIVA		35% (during journey)	10.3% (during journey)	Incidence of PONV similar between 2 groups (TIVA and inhalation)
Enever, et al. [26]	2000	Postoperative morbidity following outpatient dental care under general anesthesia in pediatric patients with and without disabilities	20%			No differences between groups of patients with and without disabilities. N/V most commonly reported symptom

Table 2.1 (Continued) Studies Addressing PDNV

Reference	Publication Year	Study	PDNV	PDN	PDV	Findings
Ernst, et al.[27]	1997	Incidence and impact of pain, nausea and vomiting after outpatient surgery		33%	10%	Pain, nausea, vomiting serious and persistent problems post discharge, increasing in incidence after discharge.
Fetzer, et al.[24]	2005	Self-care activities for PDNV	PDNV required for inclusion in study			Few patients contacted their HCP. Significant number of pts believed PDNV due to analgesics and therefore did not self-administer analgesics.
Grenier, et al.[22]	1998	Quality at home of pediatric patients after outpatient surgery			9%	PDV and agitation was one of 3 main causes for anxiety by parents
Gupta, et al.[13]	2003	Routine prophylactic use of antiemetics on incidence of PDNV after ambulatory surgery		32.6%	14.7%	Prophylactic treatment with ondansetron 4mg or combination with 2 drugs produced significant decrease in PDNV
Kangas-Saarela, et al.[32]	1999	Patients' experiences of outpatient surgery		6%		Decreased incidence of PDN probably due to high number of patients in study who received regional anesthesia.

Table 2.1 (Continued) Studies Addressing PDNV

Reference	Publication Year	Study	PDNV	PDN	PDV	Findings
Kokinsky, et al.[21]	1999	Postoperative comfort after pediatric outpatient surgery	20%			Incidence of PDNV significantly higher in those patients given intraoperative opioid (fentanyl)
Parlow, et al.[15]	1999	PDNV after ambulatory laparoscopy is not reduced by promethazine prophylaxis		48%	17%	Patients requiring an antiemetic in PACU are at higher risk for PDNV. Prophylactic promethazine IM before discharge did not reduce the incidence of PDNV.
Pfisterer, et al. [25]	2001	An international study of PONV in outpatient surgery	21.4% (prophylactic antiemetic) 19.2% (no prophylactic antiemetic)			Some patients reported N/V up to 5 days after surgery. Inadequate control of PDNV remains a problem.
Tang, et al.[36]	1996	Comparison of ondansetron and droperidol for antiemetic prophylaxis in outpatient gynecological procedures		68% (P) 57% (D) 41% (D2) 32% (O)	52% (P) 27% (D) 15% (D2) 14% (O)	Incidence of emesis and need for rescue significantly lower with both droperidol and ondansetron groups.

Table 2.1 (Continued) Studies Addressing PDNV

Reference	Publication Year	Study	PDNV	PDN	PDV	Findings
Waterman, et al.[30]	1999	Postoperative pain, nausea, and vomiting—a qualitative perspective				One-third of the group (55) reported pain and nausea worse than imagined.
Watt-Watson, et al. [23]	2004	Pain management following discharge after outpatient surgery		14%		Patients stopped taking analgesics despite considerable pain due to side effects of constipation or nausea.
Wright, et al [37]	1999	Efficacy of promethazine suppositories for home use after outpatient surgery	55%			Promethazine suppositories well tolerated; used by 89% of patients with access. All patients who used reported decrease in nausea.
Wu, et al. [12]	2002	Systematic review and analysis of postdischarge symptoms after outpatient surgery		0-55%	0-16%	Post discharge symptoms may be significant factor in patient's resumption of normal activities patient recovery. Need further studies to determine impact.
Young, et al [29]	2000	Does enhanced discharge instruction make a difference after outpatient surgery.		13-16% (Day 1) 7-9% (Day 4)		Majority of patients did not experience problems with recovery at home. Patients needed carer assistance for average of 3 days. The enhanced teaching package made no difference

CHAPTER THREE

EVIDENCE-BASED INTERVENTIONS FOR POST DISCHARGE NAUSEA AND VOMITING: A REVIEW OF THE LITERATURE

ABSTRACT

Postoperative nausea and vomiting (PONV) and post discharge nausea and vomiting (PDNV) continue to be a problem for one third of all patients who require surgery and anesthesia. Very few studies have been reported that specifically target PDNV in the outpatient surgery population for interventions after discharge home. Twenty studies were identified that specifically addressed the effect of an intervention for the purpose of preventing PDNV or rescuing the patient who develops PDNV. This article presents an integrative review of the research literature to determine the best evidence for prevention of PDNV in adults or for the rescue of patients who suffer from PDNV.

Introduction

Postoperative nausea and vomiting (PONV) continues to be a problem in the postanesthesia setting for one third of all patients who require surgery and anesthesia. [1-5] The incidence can be as high as 70-80% among patients with predetermined risk factors.[6] Unfortunately, as many as 30% to 50% of outpatients will continue to struggle with post discharge nausea and vomiting (PDNV) after arrival home.[3, 7, 8] With over 60 to 65% of all surgeries performed currently performed in the ambulatory surgery setting, thousands of patients experience PDNV.[9] PONV and PDNV are not conditions that typically contribute to mortality; however, it has been called the "big, little problem"[10] because of patient aversion to nausea and vomiting, the effect on quality of recovery, the potential for morbidity and hospitalization in high risk patients and loss of patient satisfaction.

Many investigators have focused on assessment of the patient risk for PONV.[11, 12] In one study, a risk assessment using only 4 or 5 factors was determined as effective as other tools that predicted nausea and vomiting using up to 13 criteria.[11] Other studies have focused on effects of anesthetic agents or other medications on the incidence and severity of PONV. [13-14] Prophylactic use of antiemetics has been considered, as well as the most effective timing of the administration of those antiemetics.[7, 16, 17] Historically, most studies were limited to inpatient populations, although a few analyzed data for 24 hours after surgery. Some studies combine inpatient and outpatient data for the first 24 hours post operative. While PONV has been well described and

interventions tested there is limited research on PDNV and interventions that could improve the care of outpatient surgery patients after discharge. The purpose of this article is to present results of an integrative review of the research literature to determine best evidence for prevention of PDNV in adults or rescue of patients who suffer from PDNV.

Defining PDNV

A precise definition for PDNV has not been established. Researchers have called for the post discharge period to be defined in a standardized manner.[7] PDNV is clearly related to the discharge of a patient after ambulatory surgery. But there have been questions as to whether PDNV encompasses the first 24 hours after discharge or whether a patient who was nauseated or had emesis during transport home had PONV or PDNV. The members of the multidisciplinary PONV/PDNV Strategic Work Team, convened by the American Society of PeriAnesthesia Nurses, distinguished PDNV from PONV for the purpose of the consensus guideline and for future research. PONV was defined as nausea and/or vomiting that occurs within the first 24-hour period following surgery in relation to inpatients. [18] PDNV is "nausea and/or vomiting that occurs after discharge from the health care facility following surgery."[18] The terminology "delayed PDNV" is used for nausea and/or vomiting that occurs beyond the initial 24 hours after surgery.

Researchers have posited that a patient history of PONV is predictive of PONV. However, findings have shown mixed results. Carroll, et al.[8] found that PDNV was not related to PONV in a descriptive study of 211 outpatients. Conversely, Parlow and others,[19] conducted an interventional study and found that patients with PONV were found to be four times more likely to experience PDNV than those who had not suffered PONV. While there is no definitive answer yet, it is possible that the physiological mechanisms responsible for PONV are different from the physiological disturbances responsible for PDNV.

Guidelines developed to this point for the prevention and care of patients with PONV have focused on the preoperative and intraoperative period, while a few have targeted rescue treatment in the PACU.[3] One consensus conference was held in 2003 to develop guidelines for PONV. These guidelines focused on prevention and rescue treatment in the immediate postoperative area, but there were no recommendations for established nausea and vomiting after discharge or new onset nausea and vomiting after discharge.[20] Published algorithms and guidelines have focused on prophylaxis and therapy,[21] risk factors, prophylactic antiemetic therapy and options for pharmacology.[2] A decision tree for prophylaxis[22] and an extensive algorithm that begins with assessment of risk factors and continues through the immediate

postoperative period including suggestions for rescue have been presented.[23] ASPAN's newly developed evidence-based guideline on prevention and management of PONV/PDNV is the first to cover the entire period of the patient's perioperative experience, including post discharge.[18]

Methods

Systematic Search

To perform the literature search for applicable articles, the authors searched MEDLINE (Pubmed, from 1966) limited to research literature on adults. The keywords used were "postdischarge nausea and vomiting" (26 results), "post discharge nausea and vomiting (62 results) "postoperative nausea and vomiting" (1761 results), "complementary medicine" (85287 results), and "outpatient surgery" (6116 results). "Outpatient surgery" and "complementary medicine" were combined for a total of 58 articles, " outpatient surgery" and "postoperative nausea and vomiting" for a total of 255 articles and "complementary medicine" and "postoperative nausea and vomiting" for a total of 73 articles. The Cochrane Controlled Trials Register (2005, Issue 4) was also searched. CINAHL (from 1960) was searched though no additional literature was identified. Abstracts were searched for suitable articles, and reference lists were examined for additional sources. The search resulted in 20 articles specific to interventions for the purpose of preventing or dispelling nausea and vomiting after discharge home.

Inclusion and Exclusion Criteria

Articles that were not interventional studies or systematic reviews of intervention studies were excluded. Any articles reporting findings on the pediatric population (age < 19 y) were excluded. Studies reporting on PONV risk assessment, PONV prophylaxis or treatment of immediate PONV were excluded as well as any studies that had mixed populations of inpatients and outpatients. The review was restricted to studies published in the English. The included studies described interventions specific to PDNV in the adult population after outpatient surgery. (Table 3-1.)

Analysis

Variables used by the authors in this analysis included sample description and size, research design, objective or purpose of the study, methodology, time of data retrieval after discharge, outcome measures, findings, and limitations. The strength of the evidence was rated as suggested by ASPAN's evidence-based practice (EBP) conceptual framework[24] and Stetler, et al.[25] The level of evidence ranges from Level 1, a meta-analysis to Level VI, expert opinion. The quality of each study is rated from A to D with A representing a well-designed study and D representing a study with a major flaw or questions about scientific credibility.[25] (Table 3-2.)

Results

The search identified two systematic reviews, 17 randomized controlled trials (RCTs), and one non-experimental study with a convenience sample. All of the studies were published between 1990 and 2004. All of the studies were published in medical journals; none in nursing journals. The two systematic reviews were rated as IA according to strength of reviewed literature.[25] The 17 RCTs were classified as IIA to IIC, with the one non-experimental study classified as IIIB.

Four of the studies (20%) concerned anesthetic techniques, comparing some form of total intravenous anesthesia (TIVA) to inhalation anesthesia. Ten studies (50%) compared various antiemetics and one study (5%) compared analgesics and the effect on PDNV. Five studies included non-pharmacological variables. One study (5%) compared therapeutic suggestions via tape to a comparison tape, three studies (15%) looked at acupuncture or acustimulation, and one study (5%) compared ginger to placebo. See Table 3-1 for a full list of studies.

Interestingly, none of the 17 RCTs included information on the recruitment of patients. All authors assured that approval had been obtained from their facility IRBs and informed consent was obtained, but no recruitment guidelines were included in any of the studies. None of the studies included reliability or validity data on the instruments used to obtain information. In some studies, it was unclear as to how the information was obtained from the patient, or by whom. Only four studies included information on the data collectors after discharge. The training of research assistants or other data collectors was not addressed.

On the other hand, power analysis was included in 12 of the 17 RCTs. The sample population was described in detail in all studies with a clear and concise purpose stated in all studies. Exclusion and or inclusion information was detailed.

Pharmacological Interventions

Anesthetic Techniques

Paech, Lee, and Evans[14] conducted an RCT of 144 outpatients who were divided into 3 groups: (1) inhalational anesthesia plus dolasetron, (2) total intravenous anesthesia (TIVA) plus dolasetron. and (3) TIVA alone. Significantly more outpatients in the inhalational/dolasteron group had postdischarge nausea (PDN) with the lowest incidence of PDN in the TIVA plus dolasetron group. There was no significant difference among groups in regard to post discharge vomiting (PDV).[14] Visser and others,[26]in an RCT oof 563 outpatients, found significantly less PONV in TIVA patients at 24 hours compared to patients who received inhalational anesthesia with isoflurane and nitrous oxide. There was no significant difference at 14 days.

Carvalho and associates[27] separated 99 outpatients undergoing laparoscopic sterilization into two groups: one receiving TIVA with propofol and the other receiving inhalational anesthesia with isoflurane. There were no significant differences with regard to PDNV between the groups. Gupta and others[15] conducted a systematic review to determine the effects of four different anesthetic techniques on postoperative recovery and complications, including PDNV. The incidence of PDNV was less frequent with intraoperative use of propofol compared to isoflurane, but not when compared to desflurane or sevoflurane. The authors conclude their review by stating that the specific anesthetic appears to play a minor role in outcome after outpatient surgery.[15]

Antiemetics

Gupta and others[7] completed a systematic review to determine whether the routine prophylactic use of antiemetics affects the incidence of PDNV following outpatient surgery. The review included only RCTs published in the English language. They found an overall beneficial effect of using either combination treatment with two drugs or ondansetron alone for prevention of PDNV. Dexamethasone prevented nausea, but not vomiting after discharge. No differences between placebo and treatment groups were found when droperidol or meoclopramide were used as the antiemetic. Numbers-needed-to-treat (the number of patients who would need to be treated for PDNV to prevent one adverse outcome) favored the use of combination therapy for prophylaxis of PDNV, especially in high-risk patients.[7]

Coloma and others[17] investigated the antiemetic effect of dexamethasone (4 mg) as an adjunct to a 5-HT_3 antagonist. All patients who had undergone laparoscopic cholecystectomies received dolasetron 12.5 mg. The control group received saline and the treatment group received dexamethasone 4 mg IV. The dexamethasone group had significantly less nausea at home.

Rothenberg and others[28] compared the incidence of PDNV after dexamethasone versus droperidol following laparoscopic gynecologic outpatient surgery. They found significantly less PDNV in patients who received dexamethasone even though there were no significant differences in early PONV before discharge. The authors conclude that dexamethasone is as efficacious as droperidol and may have a longer duration of action.

Tang, Watcha, and White[16] compared the efficacy, safety, and cost-effectiveness of ondansetron 4 mg with 2 differing doses of droperidol (0.625 mg and 1.25 mg) in the prevention of PONV and a placebo group. They found that PDV was significantly decreased in groups receving droperidol of either amount and ondansetron versus placebo. In regard to PDN, the only significant difference was between ondansetron and the placebo. Their conclusion was that the lower dose of droperidol provided the same antiemetic relief as ondandsetron 4 mg and was more cost-effective.[16]

Gan, Franiak, and Reeves[29] compared ondansetron orally disintegrating tablet (ODT) with placebo to determine if administration of ondansetron ODT (8 mg) would result in decreased PDNV. All patients received ondansetron 4mg IV prior to induction. The treatment group received ondansetron ODT immediately before discharge and were given a second tablet to take 12 hours later. The investigators found that the patients in the treatment group had significantly less severe nausea and fewer vomiting episodes after discharge. There was also a significant difference in patient satisfaction scores between groups.[29] Thagaard and others[30] compared ondansetron ODT 8 mg twice daily for three days to placebo. There was no significant difference in groups, so the authors concluded that use of ondansetron ODT did not decrease PDNV in outpatients undergoing laparoscopic surgery.

Rajeeva and others[31] compared an ondansetron/dexamethasone combination to ondansetron alone for prevention of PONV. The medications were given intravenously immediately after intubation. At 24 hours, there was significantly less PDNV in the combination group. The authors concluded that PDNV was better controlled with the combination group than early PONV, where there was no significant difference between the two groups.

Bailey and others[32] evaluated the effect of transdermal scopolamine on the incidence of PDNV. After surgery, there was overall significantly less nausea, retching and vomiting in the scopolamine-treated group. However, after discharge, only 10 of 138 patients experienced nausea, vomiting, or retching with no significance between groups.

Parlow and others[19] assessed the efficacy of administering promethazine prophylactically prior to discharge home from the healthcare facility. All patients received 0.5 mg droperidol during surgery and were then randomized to receive 0.6 mg/kg promethazine or a placebo

intramuscularly prior to transfer from PACU. There was no significant difference between treatment and placebo groups; however the incidence of drowsiness was higher in those receiving the promethazine on arrival home and bedtime. Promethazine did not change the incidence of PDNV in this study.[19] In a non-experimental study, Wright, Jilka, and Gentry[33] assessed the usage of promethazine and evaluated the efficacy in ameliorating PDNV. All outpatients during a year who had excessive PONV and were at risk for PDNV were sent home with two promethazine suppositories. Fifty five percent of the patients in this groups experienced PDN, and of that group, 89% used the suppositories. All of those patients reported improvement in symptoms with no reported side effects. The authors concluded that promethazine suppositories were effective in treating PDNV and were well tolerated.[33]

Pain Medication

Claxton and others[34] compared the analgesic efficacy and incidence of side effects of intravenous morphine and fentanyl for pain after ambulatory procedures. Fifty-eight patients were randomized into either a morphine or fentanyl group for postoperative analgesia in the PACU. There was no significant difference between groups in the PACU, but there was a significantly higher incidence of PDNV in the morphine group at 24 hours.[34]

Non-Pharmacological Interventions

Therapeutic Suggestions

Lebovits, Twersky, and McEwan[35] compared two groups of outpatients, one group who listened to a therapeutic tape (TT) during surgery and the other group who listened to a comparison tape to determine if the TT resulted in improved recovery for the surgical outpatients. They found a significant difference between groups during the first 90 minutes, but no significant difference in PDNV at 2,4, or 24 hours. The TT group did experience fewer overall side effects.

Acupuncture/Acustimulation

Al-Sadi, Newman, and Julious[36] assessed the efficacy of acupuncture as a prophylactic antiemetic. Eighty-one outpatients were randomized to two groups: a treatment group that received acupuncture intraoperatively at the PC6 point, and a group that received placebo. They found a significant difference between groups before and after discharge with the placebo group four times more likely to have PDNV than the acupuncture group.

Coloma and others[37] compared acustimulation to ondansetron for the treatment of established PONV in outpatient laparoscopic surgery patients. All patients received prophylaxis with either droperidol 0.625 mg IV or metoclopramide 10 mg IV. Ninety of 268 enrolled patients developed PONV and were randomized to one of three treatment groups: ondansetron 4 mg IV and sham acustimulation, acustimulation and 2 ml of IV saline, or a combination of ondansetron 4 mg IV and acustimulation. The combination group of ondansetron and acustimulation had a higher complete response rate (no emesis or complaints of nausea) than the acustimulation group within two hours. Fewer patients in the combination group versus the acustimulation group experienced further emetic events. There were no other significant differences among the three groups. The authors conclude that acustimulation may be a satisfactory alternative to ondansetron for established PONV, and that ondansetron seems to enhance the efficacy of acustimulation for treatment of established PONV.[37]

White and others[38] compared the efficacy of acustimulation to ondansetron when used alone or in combination. The 120 outpatients were divided into 3 treatment groups: ondansetron and sham acustimulation, acustimulation and saline, and a combination of ondansetron and acustimulation. They found that acustimulation in combination with ondansetron significantly reduced PDN and PDV and the need for rescue antiemetics compared to ondansetron alone at 24 hours post discharge. There were no significant differences between the acustimulation and ondansetron groups. At 72 hours the only significant difference was satisfaction with antiemetic treatment The authors concluded that acustimulation with ReliefBand® appeared to be an effective alternative to ondansetron for prevention of PDNV in the plastic surgery patient.

Ginger

Pongrojpaw and Chiamchanya[39] conducted a study of 80 outpatients to determine the efficacy of ginger in prevention of PONV after discharge. The treatment group received two capsules of ginger (0.5 mg ginger powder each) one hour before the procedure. The control group received placebo tablets. They found significantly less nausea at two and four hours, but no significant difference at 24 hours. There was no significant difference in PDV at any time during the study. The authors concluded that ginger significantly reduced postoperative nausea compared to the placebo in outpatient laparoscopic gynecology procedures. However the group taking ginger experienced no significant difference in PDN or PDV than placebo.[39]

Discussion

Pharmacological Interventions

Three RCTs and one systematic review determined whether TIVA or inhalational anesthesia was more closely related to PDNV. The results of one study determined that there was significantly more nausea with the isoflurane plus dolasetron group compared to other inhalational agents and TIVA.[14] There was no significant difference among groups in regard to PDV. One study found significantly less PONV in the TIVA group at 24 hours, but no difference in PDNV at 72 hours and 14 days.[26] The third RCT found no significant difference between groups anesthetized either with TIVA or isoflurane at seven days post discharge.[27] Results of a systematic review showed that the incidence of PDNV was less frequent with propofol than with isoflurane, but not compared to desflurane or sevoflurane.[15] Based on Stetler et al.[25] and ASPAN's EBP conceptual framework,[24] the studies ranked from IA to IIB. See Tables 3-1 and 3-2.

The evidence supports the use of isoflurane as an influencing factor in early PONV, but not PDNV. The evidence also points to TIVA as decreasing early PONV, but not an influence on PDNV. This evidence is supported by Apfel and others[40] who concluded that volatile anesthetics are the main cause of early PONV, but have no impact on delayed PONV (2-24 hours).

The overall evidence concerning antiemetics as prophylaxis or treatment for PDNV is sparse. One systematic review that summarized whether routine prophylaxis with antiemetics had an effect on PDNV was found. Nine studies compared antiemetics with other antiemetic treatments or placebo. Strong evidence exists to support prophylaxis with antiemetics versus placebo, a beneficial effect of combination treatment as well as a beneficial effect of dexamethasone for prevention of PDN.[7, 17, 31] There was mixed evidence as to the effect of ondansetron orally disintegrating tablets (ODT) to decrease PDNV, although there is evidence ondansetron does have a beneficial effect on PDNV.[7, 16, 29-31, 37, 38] There is evidence that droperidol is not an effective prophylaxis for the post discharge population.[7, 16, 28] The evidence in these studies varied from IA to IIC and is sufficient to recommend prophylaxis in the post discharge population.

There is some evidence that transdermal scopolamine reduces PDNV (IIB).[32] This evidence is supported by a systematic review of efficacy and safety of transdermal scopolamine for prevention of PONV.[41] Even though the review did not differentiate PDNV from PONV, the

conclusion was that transdermal scopolamine significantly reduces the risk of postoperative vomiting although associated with some side effects such as visual disturbances or dry mouth.[41]

There is evidence (IIB) that promethazine given IM prior to discharge home does not decrease the incidence of PDNV, but does increase the incidence of drowsiness.[19] There is some evidence (IIIB) from a non-experimental study that promethazine suppositories did improve the symptoms of PDNV.[33]

One study addressed the preferential use of an opioid on the incidence of PDNV. There is some evidence (IIB) to indicate that even though morphine was associated with a better level of analgesia, it was also associated with an increased incidence of PDNV.[343]

Non-Pharmacological Interventions

Based on the available evidence, it appears that therapeutic suggestions in outpatients do not decrease the incidence of PDNV (IIC).[35] Although there was a significant difference over the first 90 minutes, the treatment group did not experience a difference in PDNV over later assessment periods. This evidence is supported by a study conducted by Jelicic, Bonke, and Millar[42] to determine the effect of different therapeutic suggestions on postoperative recovery well-being. The results of that study demonstrated no significant differences on well-being the third and fifth day.

There is evidence (IIB) to support the use of acupuncture in the prevention of PDNV. Patients in the placebo group were four times as likely to experience PDNV as those in the treatment group.[36] There is also evidence to support the use of acustimulation for the prevention of or treatment for PDNV. Acustimulation in combination with ondansetron had a higher complete response rate than acustimulation alone (IIC).[37] In another study, acustimulation in combination with ondansetron significantly reduced PDNV and the need for rescue antiemetics compared with ondansetron alone at 24 hours after surgery (IIB).[38]

Ginger is a botanical remedy used in China to alleviate nausea and vomiting that has also been suggested as beneficial to PONV. The recommended dose is 1 g of powdered ginger given before surgery.[43] There is no evidence supporting the use of ginger for PDNV (IIB). This evidence is supported by a study conducted primarily on inpatients that showed no significant benefit of ginger for PONV.[44]

Limitations

The limited number of studies evaluated in each category limits the conclusions of the review. On the other hand, only studies that specifically addressed the post discharge period of the perioperative period were included. No previous reviews have addressed interventional studies to determine evidence for treatment of the postdischarge patient.

Recommendations

There is a dearth of research that specifically targets and directly affects the patient after discharge home. More studies should be conducted focusing on interventions for PDNV in the outpatient after discharge. Research addressing those interventions that can best prevent or alleviate symptoms of PDNV need to be conducted. Researchers need to determine if risk factors for PONV are the same for PDNV.

There was a total lack of nursing research in this review; all studies were conducted by physicians. Nurse researchers could conduct studies on the effects of patient education or education of the responsible adult, preoperative anxiety, interactions of pain and pain medication, and non-pharmacologic methods of relief. Nurse researchers could collaborate with physician researchers to determine the best antiemetics for use in the postdischarge setting or the most appropriate medication for pain relief in the postdischarge setting that will alleviate pain, but cause less symptoms of PDNV.

Other research indications include the most effective risk identification tools in prediction of PDNV, reliable and valid tools to measure PDNV, most effective prophylactic interventions to prevent or relieve PDNV, identification of common self-care activities used by patients and effectiveness, most effective patient educational content, the impact of PDNV on patient satisfaction and quality of life, and the economic impact.[18]

Finally, the terminology needs to be standardized in future research on this population. Until the terminology is standardized by all researchers, confusion will still exist. Use of the definitions as identified by ASPAN's multidisciplinary strategic work team[18] will begin to alleviate the confusion surrounding the operational definition of each term.

Conclusion

Thousands of patients continue to experience PDNV every year. In spite of newer anesthetic medications and a focus in the past few years on PONV and PDNV, a significant percentage of patients still suffer. This review attempted to consolidate the findings from research that has been conducted specifically for the patient experiencing PDNV. It is certain that prophylactic antiemetics and combination medications work significantly better than placebo to

curtail the symptoms post discharge. It is unlikely that the type of anesthetic administered has any effect on PDNV. It appears that acupuncture and acustimulation may work, but others, such as use of ginger and therapeutic suggestions may not work as effectively. More research needs to be conducted to discover the interventions that allow patients to recover to their pre-surgery conditions at a quality and rate of recovery that is satisfactory to the patient and to the health care provider.

Table 3.1 Interventional Studies in Adults for PDNV in the Discharge Setting

Study	*Population*	*Design*	*Objective*	*Method & Tools*	*Duration*	*Outcome Measures*	*Findings*	*Limitations/ Quality of Evidence*
Al-Sadi, et al., 1997[36]	81 outpatients undergoing gynecologi-cal laparoscopic surgery	Double blind RCT	To assess the efficacy of acupuncture as a prophylactic antiemetic	2 treatment groups: acupuncture and control	24 hr	PDNV	Significant difference between groups before and after discharge; placebo group 4 times more likely to have PDNV than acupuncture group	Severity of PDNV was not measured IIB
Bailey et al, 1990[32]	199 outpatient laparoscopy patients enrolled; 53 excluded due to breach in study protocol	RCT: Double blind, placebo control-ed Study	To evaluate the effect of transdermal scopolamine on the incidence of PON, retching, and vomiting	Band-aid-like patch containing either scopolamine or placebo was placed behind the ear the night before surgery.	48 hr	PDNV and retching	Overall significantly less nausea, retching, and vomiting in the scopolamine-treated group. Only 10 patients experienced nausea, vomiting, retching at home with no significance between groups. Safe and effective antiemetic	Only 10 patients had PDNV IIB

Table 3.1 (Continued) Interventional Studies in Adults for PDNV in the Discharge Setting

Study	*Population*	*Design*	*Objective*	*Method & Tools*	*Duration*	*Outcome Measures*	*Findings*	*Limitations/ Quality of Evidence*
Carvalho, et al., 2002[27]	99 outpatients undergoing laparos-copic sterilization	RCT: semi-open (attending anesthesia provider aware of allocated treatment, but neither patient, research nurse, nor recovery staff were aware)	To evaluate the influence of anesthetic technique on functional recovery and symptom distress	2 groups: received either total intravenous anesthesia with propofol or isoflurane inhalational anesthesia	7 day	Functional recovery and symptom distress including PDNV	No significant differences between the groups	Study was underpowered to detect differences in regard to nausea and vomiting IIB
Claxton, et al., 1997[34]	58 outpatients undergoing surgery anticipated to be painful	RCT: prospective, double blind	To compare the use of IV morphine and fentanyl after ambulatory procedures with respect to analgesic efficacy and incidence of side effects	2 groups: received either morphine or fentanyl IV for postoperative analgesia during PACU stay	24 hr	Side effects including PDNV	Even though PONV not significantly different between groups in PACU, there was a significantly higher incidence of PDNV in the morphine group at 24 hours.	Small groups IIB

Table 3.1 (Continued) Interventional Studies in Adults for PDNV in the Discharge Setting

Study	*Population*	*Design*	*Objective*	*Method & Tools*	*Duration*	*Outcome Measures*	*Findings*	*Limitations/ Quality of Evidence*
Coloma et al, 2002[37]	Enrolled 268 outpatients receiving laparoscopic surgery; 83 of 90 patients with established PONV studied	RCT: Double-blind, placebo and sham-controlled study	To evaluate acustimu-lation compared with ondansetron for treatment of established postopera-tive N/V of outpatient laparoscopic surgery patients	All patients received prophylaxis with either droperidol 0.625 mg IV or metoclopramide 10 mg IV. 90 patients developed PONV and were randomized to 1 of 3 treatment groups: ondansetron 4mg IV and sham ReliefBand®; ReliefBand® and 2 ml IV saline; or combination of 4mg IV ondansetron and ReliefBand®. Requested to keep ReliefBand® on arms for 72 hours except when bathing.	24 and 72 hr	PDNV as well as other effects, such as patient satisfaction and quality of recovery	Combination group had significantly higher complete response rate than acustimulation group (73% vs 40%; $P <$ .01) within 2 hours. Fewer patients in combination group vs acustimulation had further emetic events ($P <$ .03). No other significant differences between 3 groups. Ondansetron in combination with acustimulation improved complete response rate to acustimulation therapy.	Effect of acustimulation may have been increased if applied before surgery instead of after established PONV. Relatively small group sizes (N = 30). IIC

Table 3.1 (Continued) Interventional Studies in Adults for PDNV in the Discharge Setting

Study	*Population*	*Design*	*Objective*	*Method & Tools*	*Duration*	*Outcome Measures*	*Findings*	*Limitations/ Quality of Evidence*
Coloma, et al., 2002[17]	140 outpatients undergoing laparoscopic cholecys-tectomy	RCT: placebo-controlled, double-blind	To investigate the effect of administering 4 mg IV dexametha-sone as adjunct to a 5-HT3 antagonist	2 groups: control group received 1 ml IV saline, dexamethasone group received 4 mg IV dexamethasone. All patients received 12.5 mg dolasetron	24 hr	Post discharge side effects	Dexamethasone group had significantly less nausea at home.	IIB
Gan et al., 2002[29]	60 outpatient laparoscopic gyn patients	RCT: Randomly assigned to groups. Research personnel collecting data were blinded	To determine if adminis-tration of ondansetron ODT would result in decreased PDNV	All patients received ondandsetron 4 mg IV at induction. Treatment group received ondansetron ODT immediately before discharge and given second tablet to take 12 hours later; control group received placebo tablets. Nausea scored using 11-point linear numerical scale from 0 – 10.	2 hr and 24 hr	PDNV: incidence, severity of nausea, side effects, satisfaction	Ondansetron ODT patients had significantly less severe nausea and fewer vomiting episodes after discharge. PDV: ondansetron ODT 3%; Placebo 23%. *P* <.05 Severity of nausea: ondansetron ODT 0 (0-10), placebo 2 (0-10). *P* < .05. Patient satisfaction: ondansetron ODT 90%, Placebo 65%; *P* < .05.	Small groups. IIC

Table 3.1 (Continued) Interventional Studies in Adults for PDNV in the Discharge Setting

Study	*Population*	*Design*	*Objective*	*Method & Tools*	*Duration*	*Outcome Measures*	*Findings*	*Limitations/ Quality of Evidence*
Gupta, et al., 2003[7]	22 articles	Systematic review of RCTs	To assess whether routine prophylactic use of antiemetics influences incidence of PDNV	MEDLINE via PubMed		PDN, PDV	Incidence of PDN (32.6%) & PDV (14.7%) in placebo vs treatment groups significantly different ($P < .05$). Beneficial effect of combination treatment or ondansetron 4 mg for prevention of PDNV; beneficial effect of dexamethasone which prevented PDN, but not PDV; droperidol not effective as prophylactic for PDN	IA
Gupta, et al., 2004[15]	58 articles	Systematic review	To assess whether use of propofol infusion, isoflurane, sevoflurane, or desflurane is associated with faster recovery and fewer side effects during ambulatory surgery in adults	MEDLINE via PubMed, hand search through references		PDNV as subset of side effects	The incidence of PDNV was less frequent with propofol compared to isoflurane but not compared to desflurane or sevoflurane. Specific anesthetic appears to play minor role in outcome.	IA

Table 3.1 (Continued) Interventional Studies in Adults for PDNV in the Discharge Setting

Study	*Population*	*Design*	*Objective*	*Method & Tools*	*Duration*	*Outcome Measures*	*Findings*	*Limitations/ Quality of Evidence*
Lebovits, et al., 1999[35]	70 adults undergoing elective outpatient hernia repair under general anesthesia	RCT: Double blind	To determine if patients receiving intraoperative therapeutic suggestions would result in improved recovery in surgical outpatients	2 groups: therapeutic tape group (TT) and comparison tape group. Played continuously during surgery.	24 hr	Pain, nausea, vomiting	Significant difference between groups during first 90 minutes, but no significant difference in PDNV at 2, 4, or 24 hours. TT group did experience fewer side effects.	IIC
Paech, et al., 2002[14]	144 outpatients receiving laparoscopic gynecology surgery	RCT: Prospective double blind	To compare the incidence of PONV using TIVA with or without dolasetron with balanced inhalational anesthesia using sevoflurane and dolasetron	3 groups: Inhalational + dolasetron (I+D); TIVA + dolasetron (T+D); TIVA alone (T)	24 hr and 4th day	PDN, PDV	Significantly more nausea in I+D, no significant difference of PDV between groups	IIB

Table 3.1 (Continued) Interventional Studies in Adults for PDNV in the Discharge Setting

Study	*Population*	*Design*	*Objective*	*Method & Tools*	*Duration*	*Outcome Measures*	*Findings*	*Limitations/ Quality of Evidence*
Parlow et al, 1999[19]	95 women who received ambulatory laparoscopic cholecys-tectomy or gynecologic surgery	RCT: Double blind, placebo controlled study	To determine the incidence of PDNV after outpatient laparoscopic procedures and assess the efficacy of the prophylactic administration of promethazine prior to discharge from hospital	All patients received prophylactic 0.5 mg droperidol during surgery. Randomized to receive 0.6 mg/kg^{-1} promethazine or placebo IM before transfer from PACU. Incidence and severity of nausea, pain, drowsiness documented using patient diaries at 4 intervals using 4-point scales.	24 hr	PDNV	PDN = 48% (moderate to severe = 30%) PDV = 17% Rescue anti-emetic use 28% No statistical difference between groups regarding PDNV. Incidence of excessive drowsiness higher in those receiving promethazine or arrival home (P = .001) and bedtime (P < .001)	IIB
Pongrojpaw, et al., 2003[39]	80 outpatient gyneco-logical laparoscopy patients	RCT: Double blind	To study the efficacy of ginger in prevention of PONV/PDNV	2 treatment groups: 2 capsules of ginger 1 hr before procedure and placebo	2, 4, 24 hr	PONV/ PDNV	Significantly less nausea at 2 and 4 hours, but no significant difference at 24 hrs; no significant difference in PDV.	IIC

Table 3.1 (Continued) Interventional Studies in Adults for PDNV in the Discharge Setting

Study	*Population*	*Design*	*Objective*	*Method & Tools*	*Duration*	*Outcome Measures*	*Findings*	*Limitations/ Quality of Evidence*
Rajeeva, et al., 1999[31]	51 female outpatients receiving diagnostic laparoscopic gynecological surgery	RCT: Double blind	To compare the efficacy of ondansetron-dexamethasone with ondansetron alone for prevention of PONV	2 treatment groups: ondansetron-dexamethasone or ondansetron alone. Drugs given IV immediately after intubation	24 hr	PONV/ PDNV	Significantly less PDNV in combination group (ondansetron-dexamethasone)	Small group size IIC
Rothenberg, et al., 1998[28]	95 outpatient undergoing laparoscopic gynecology procedures	RCT: Double blind	To compare the incidence of PONV after dexamethasone versus droperidol following laparoscopic gynecologic outpatient surgery	2 groups: dexamethasone 0.17 mg/kg IV or droperidol 0.02 mg/kg IV just before abdominal incision.	24 hr	PONV/ PDNV	Significantly less PDNV in patients who received dexamethasone. No difference in early PONV before discharge.	IIC

Table 3.1 (Continued) Interventional Studies in Adults for PDNV in the Discharge Setting

Study	*Population*	*Design*	*Objective*	*Method & Tools*	*Duration*	*Outcome Measures*	*Findings*	*Limitations/ Quality of Evidence*
Tang, et al., 1996[16]	161 elective outpatients undergoing gynecologic procedures	RCT: Prospective, double-blind, placebo-controlled	To compare the efficacy, safety, and cost-effectiveness of ondansetron 4mg with 2 doses of droperidol (0.625 mg and 1.25 mg) in prevention of PONV	4 treatment groups: saline placebo, droperidol 0.625 mg, droperidol 1.25 mg, or ondansetron 4mg given immediately before induction	24 hr; 7 days	PDN, PDV	PDV significantly less in groups receiving droperidol of either amount and ondansetron versus placebo. PDN only significantly different between ondansetron and placebo.	IIA
Thagaard, et al., 2003[30]	96 outpatients requiring elective laparoscopic surgery	RCT: Double blind	To compare ondansetron ODT with placebo during first 72 hours after ambulatory surgery focusing on PONV and other side effects	2 groups: placebo and treatment, received 6 tablets with one tablet taken twice a day until box was empty	24 and 72 hr	PDNV	No significant differences between groups on nausea, vomiting, or other side effects	IIB
Visser, et al., 2001[26]	563 outpatients (and 1447 inpatients) requiring elective surgery with general anesthesia)	RCT: all personnel except anesthesia blinded to group	To assess the incidence of PONV after TIVA with propofol versus inhalational anesthesia with isoflurane/nitrous oxide	2 treatment groups: TIVA with propofol, inhalational anesthesia with isoflurane/ nitrous oxide	24, 72 hr, 14 d	PONV, PDNV	Significantly less PONV in TIVA group at 24 hr. No difference at 72 hr and 14 d.	IIA

Table 3.1 (Continued) Interventional Studies in Adults for PDNV in the Discharge Setting

Study	*Population*	*Design*	*Objective*	*Method & Tools*	*Duration*	*Outcome Measures*	*Findings*	*Limitations/ Quality of Evidence*
White et al., 2002[38]	120 outpatients undergoing plastic surgery	RCT: Double-blind, placebo- and sham-controlled study	To compare the efficacy of acustimulation to ondansetron when used alone or in combination	All patients received low dose droperidol prophylaxis. Groups were: ondansetron 4 mg IV and sham ReliefBand®; acustimulation and 2ml saline IV; combination with 4 mg ondansetron IV and active ReliefBand®. IV medications were given in the PACU. All groups request to wear ReliefBand® for 72 hours except when bathing.	24 hr and 72 hr	PDNV, quality of recovery score, patient satisfaction, need for rescue antiemetics, ability to resume normal diet within 24 hours	Acustimuation using ReliefBand® in combination with ondansetron significantly reduced PDN and PDV, and need for rescue antiemetics compared with ondansetron alone at 24 hr after surgery. No significant differences between the acustimulation and ondansetron groups. At 24 hr: combination group 20% with PDN and 0% with PDV; Acustimulation PDN 35%; PDV 10%; ondansetron group PDN 50%, PDV 20%. PDN, PDV and need for rescue antiemetic medication were significantly reduced in the combination (vs ondansetron) group ($P < .05$). At 72 hr only significant difference was satisfaction with antiemetic ($P < .05$.)	IIB

Table 3.1 (Continued) Interventional Studies in Adults for PDNV in the Discharge Setting

Study	*Population*	*Design*	*Objective*	*Method & Tools*	*Duration*	*Outcome Measures*	*Findings*	*Limitation /Quality of Evidence*
Wright et al., 1999[33]	99 adult OP discharged OP surgery with promethazine suppositories (80 GA, 18 MAC, 1 spinal)	Non-experimental study	To assess the usage of 52 romethazine and evaluate the efficacy in ameliorating nausea & vomiting in adult OP following discharge	All patients who had excessive PONV& at risk for PDNV sent home with two promethazine suppositories	24 hr	PDNV Choice of responses to supp use: no improvement, great improvement, worsening of symptoms	PDN = 55% (N = 54); PDV = 15% (N = 15); 89% of PDN used suppositories (N = 48). All reported improvement. There were no reported side effects. Promethazine suppository was effective in treating PDNV. Well tolerated.	Study design was non-experimental IIIB

Abbreviations: GA, general anesthesia; MAC, monitored anesthesia care; N/V, nausea/vomiting; ODT, orally disintegrating tablet; OP – outpatient; RCT, randomized controlled trial; TIVA, total intravenous anesthesia.
ODT – orally disintegrating tablet

Table 3.2 Rating Study Design and Quality of Evidence

Level I	Meta-analysis/Systematic review
Level II	Experimental
Level III	Quasi-experimental
Level IV	Non-experimental or qualitative
Level V	Case reports
Level VI	Expert opinion

Quality Rating

A	Well-designed study with up to one issue unaddressed
B	Well-designed study with two issues unaddressed
C	Design of study fair, with two – three issues unaddressed
D	Design of study has major flaw

Quality Indicators

- Power analysis
- Recruitment of patients detailed
- Hypothesis/objective of study
- Randomization issues
- Blind assessment issues
- Drop-outs/attrition rates addressed
- Exclusion/inclusion information
- Data collection methodology
- Appropriate statistical analyses
- Instruments addressed
- Factor analysis/dimensions on instruments, if appropriate

CHAPTER FOUR

MEASUREMENT OF NAUSEA AND VOMITING FOR PATIENTS WITH POST DISCHARGE NAUSEA AND VOMITING: A CRITICAL REVIEW AND ANALYSIS

ABSTRACT

Both postoperative nausea and vomiting (PONV) and post discharge nausea and vomiting (PDNV) continue to affect over 30% of patients after surgery. There is a lack of standardized definitions and instruments that measure PONV and PDNV, and a reliance on instruments developed by the individual investigator. This article presents a critical review and analysis of measurement of patient nausea and vomiting after discharge from outpatient surgery and discusses relevant needs and new directions in the area of measurement.

Introduction

Despite newer anesthetic agents and antiemetic drugs, post surgery patients continue to experience nausea and vomiting at a rate of over 30%.[1-3] Postoperative nausea and vomiting (PONV), nausea and vomiting immediately after surgery, has been studied in more detail than nausea and vomiting after discharge home from an outpatient setting.[4] In a recent study of six interventions designed to prevent PONV, the average incidence was 34%.[5] Some patient or anesthesia-related factors, (i.e. female gender, nonsmoking status, postoperative opioids, history of PONV, elevate the risk of PONV for patients to 70-80%).[6]

Today more than 34 million patients undergo ambulatory surgery annually in the United States and over one third will experience post discharge nausea and vomiting (PDNV).[7, 2, 4, 8-10] The need for research into this growing population of patients has intensified. With that research comes the necessity for reliable and valid instruments to study the phenomena surrounding the experience of PDNV. The purpose of this paper is to present a critical review and analysis of measurement of nausea and vomiting after discharge from outpatient surgery.

Defining PDNV

Post discharge nausea and vomiting (PDNV) is not well defined in studies that measure nausea and vomiting. The terms PONV and PDNV are frequently used interchangeably with some investigators using PONV as nausea and vomiting immediately after surgery and others using the term to denote nausea and vomiting after discharge home. In some instances, any nausea and vomiting experienced from the moment the patient leaves the ambulatory surgery center or hospital is defined as PDNV. In other instances, PDNV is defined as any nausea and

vomiting that occurs more than 24 hours after the patient is discharged. In some studies, PDNV has been measured over a 24 hour period and in other studies, where the phenomena is considered to be PDNV, PDNV has been measured for 5 – 7 days.

Knapp and Beecher in 1953 defined *nausea* as a subjective sensation; the desire to vomit without the expulsive muscular movements.[11] The authors also noted that *vomiting* produced stomach contents as a result of the expulsive efforts of the patients and *retching* did not.[11] Definitions of nausea and vomiting as well as retching have remained similar to definitions offered by Rhodes[12] who defined *nausea* as a subjective, unobservable experience of an unpleasant sensation experienced in the back of the throat that may or may not end in vomiting. She further defined *vomiting* as the forceful ejection of the contents of the stomach, duodenum, or jejunum through the mouth, and *retching* as an attempt to vomit, otherwise known as dry heaves. The terms vomit or emesis are used interchangeably to describe the forceful ejection of contents through the mouth in medical literature. Retching and dry heaves are occasionally used interchangeably.

Twenty years ago, Olver, et al.[13] stated the "clear need for standardization of definitions" in antiemetic studies and went on to declare that one of the greatest needs was the adaptation of standards of measurement with nausea and vomiting. Researchers have specifically called for a standardized definition of PDNV.[10] The members of a multidisciplinary PONV/PDNV Strategic Work Team convened by the American Society of PeriAnesthesia Nurses differentiated PONV from PDNV for the purpose of the consensus guideline they were charged to develop and, further, to aid in future research.[8] This group defined PONV as nausea and/or vomiting that occurs to patients after inpatient surgery. Post discharge nausea and vomiting is defined as nausea and/or vomiting that occurs after discharge from the health care facility following outpatient surgery. PONV and PDNV are further delineated as early, late, or delayed PONV or delayed PDNV. See Figure 1 and Figure 2. The ASPAN guideline contained the first published definition of PDNV that addressed standardization for research.[3, 8]

Measurement of PDNV

Research using measurement of nausea and vomiting began in the patient population receiving chemotherapy. The instruments used now in PONV or PDNV began as instruments to measure nausea and vomiting after treatment for cancer and then were refined for use with surgery patients and pregnant women. Measurement of PONV and PDNV has been conducted for the most part through the use of investigator-developed instruments. Most commonly, patients are asked to rate nausea on a subjective visual analog scale (VAS), numerical rating score

(NRS), or verbal rating scale (VRS). Emesis has been measured in most studies by reporting the number of episodes. Rhodes noted the lack of information on reliability and validity of instruments used to measure nausea and vomiting. Her concern was that the results of studies may not be valid if the instrument used to measure nausea and vomiting is not an accurate measure.[12]

Method

To perform the literature search for appropriate articles that measured nausea and vomiting after discharge in the outpatient surgery patient, the author searched MEDLINE (PubMed from 1966-2009) using the keywords "postdischarge nausea and vomiting" (37 results), "post discharge nausea and vomiting" (95 results), "ambulatory surgery-index of nausea, vomiting, and retching," (0 results), Morrow assessment of nausea and emesis (MANE; 15 results) and "functional living index emesis" (45 results). A search through CINAHL did not add further articles. The author then searched the abstracts for suitable articles. The author also examined reference lists in those articles for additional sources. The result was 28 articles that specifically mention nausea and vomiting after discharge home.

Only articles that were descriptive or interventional studies of PDNV were included. Any articles findings, in which were reported on the pediatric population (age <19 years) were excluded. The review was restricted to studies published in English.

Results

In 28 studies of PDNV, only in four studies were instruments with established reliability and validity used (14.3%). (Table 4-1.) In nine studies (32.1%) only the incidence of nausea and vomiting was obtained by telephone. In the other nineteen studies (67.9%) a VRS, VAS, or NRS scale was used to obtain incidence and intensity of symptoms. In twenty-one (76%) of the studies telephone calls were used to interview the patients, in seven (25%) a mail-in investigator-developed diary or questionnaire was used that required return to the investigator. In many of the studies, patients completed an investigator-developed questionnaire, but these were supplemented with telephone interviews to obtain the information from the diary. In one study a telephone interview at 24 hours was used in conjunction with a mail-in questionnaire to return after five days. In one study data were obtained with a phone call at 24 hours and then another telephone call 1 –2 weeks later to ask if PDNV was present from 24 to 48 hours after surgery.

In the majority of studies (22), data were obtained at 48 hours; thirteen of those had data obtained exclusively at 24 hours. Of those 22 studies, in the remaining nine studies data were also obtained at other time points including 48 hours, 72 hours, 5 days, or 7 days. In one study

data were obtained at 9 hours after surgery, in three studies data were obtained after 7 days only, and in one study at 5 days only.

Description of Existing Self-Report Measures of Nausea and Vomiting

Diaries and Scales

Ponce de Leon, et al. studied the performance of VRS, VAS, and NRS scales for rating visual stimuli.[14] The VRS was a 5-point response scale using the terms "very little", "little", "intermediate", "much" and "very much." The VAS was a 100 mm line with "none" and "the highest possible" as anchors. The NRS was an 11-point scale (0 – 10) with 0 = white and 10 = black. Participants were shown cards showing five intensities of gray. The VRS (k_w = 0.71) ranked as more consistent than either the VAS (k_w = 0.58) or NRS (k_w = 0.63). Validity was analyzed by distribution, progression and correlation. The authors stated that it is unknown if the greater consistency of the VRS results from its verbal descriptors or use of only five response categories, but go on to assert that some clinicians believe subjective phenomena are articulated more easily in words than numbers. [14]

In an article on methodology and assessment in clinical anti-emetic research, Morrow[15] discussed the use of categorical scales using adjectives such as mild, moderate, or severe, and VAS with a 10 cm line marked as no nausea on one end and extreme nausea on the other end as useful for standardized reports of nausea. Both types of scales have been reported as reliable and valid using correlations between scales and consistent results over time.[15-19] Interestingly, reliability and validity of scales used in PDNV studies, whether VRS, VAS, or NRS, are not typically reported.

In many of the studies for PDNV a patient diary and the number of nausea and emetic episodes as recorded by the patient or nurse before patient discharge was used. The investigator created these diaries; there are no standardized diaries with reliability and validity mentioned in the literature for report of nausea and vomiting.[20] Investigators also reported use of visual analog scales (VAS), numerical rating score (NRS), and verbal rating scales (VRS) to evaluate subjective and objective stimuli.

In most studies, to rate nausea, the VAS and NRS scales are 0 – 10[2, 21-30], but have been reported as 0 – 3.[31, 32] Grimsehl, et al. and Tang, et al. used a VAS of 0 to 100 mm.[33, 34] VRS scales have descriptors that vary among investigators, e.g., *worst possible, severe,* or *as bad as it can be*.[9, 23, 35] Some investigators simply asked whether nausea occurred. [36-43] One study used a 0 cm to 10 cm VAS, but converted those findings to yes or no (less than 1 cm was counted as no nausea).[44] Only two instruments for measuring PDNV have been reported in any PDNV studies,

the Ambulatory Surgery Index of Nausea, Vomiting, and Retching (AS-INVR)[22] and the Functional Living Inventory-Emesis (FLIE).[26, 45]

The frequency of vomiting was not reported consistently in studies. In some studies the number of times a patient vomited per day were reported while in other studies whether the patient experienced emesis during the day was reported as "yes" or "no." A confusing factor in reporting the number of episodes of emesis is whether the patient who is self-reporting understands the difference between an episode of vomiting (with results) or an episode of retching (dry heaves). In two studies an emetic episode was defined as vomiting or retching.[29, 33] Rajeeva et al. [27] was the only investigator to rate the severity of vomiting by number of episodes over a 24-hour period other than Fetzer who used the AS-INVR.[22] For a patient who is in the hospital or still present at the ambulatory surgery facility, an observer can rate the objective symptom of emesis. However, in the PDNV population, because the patient is at home and not observable, emesis must be self-reported, as is the experience of nausea.

Ambulatory Surgery Index of Nausea, Vomiting, Retching (AS-INVR)

The Ambulatory Surgery-Index of Nausea and Vomiting (AS-INVR), an instrument based on Rhodes Index of Nausea and Vomiting (INV), was developed and modified for use in the ambulatory surgery population.[46] The Rhodes INV was developed to separately measure the patient's perception of nausea and vomiting.[47] The instrument included the patient's perception of duration of nausea, frequency of nausea and vomiting, distress from nausea, and amount of vomiting. The final instrument had five items using a 5-point numerical score with verbal descriptors such as "I did not throw up during the last 12 hours."[48] Reliability for the instrument was determined using Cronbach's alpha as .89 – .97 and the split-half correlation was .90.

During tests using the Rhodes INV, patients reported also experiencing retching or dry heaves, as well as distress from vomiting. [49] The Rhodes INV Form 2 added 3 items to the original Rhodes INV to measure those constructs. Cronbach's alpha for Form 2 was calculated as .98. Concurrent validity was assessed during two administrations using Spearman's correlation coefficient and were $r = .87$ and $r = .83$.[49] Construct validity was supported by the ability of the instrument to distinguish between cancer patients and well persons .[50] Zhou, et al.[51] performed a confirmatory factor analysis of the Rhodes INV Form 2 in a sample ($N = 161$) of pregnant women. The model that treated nausea and vomiting as one-factor, and the model that included two factors (symptom occurrence and symptom distress) did not fit the data. The authors concluded that the three-factor structure measuring nausea, vomiting and retching should be used when measuring the nausea and vomiting of pregnancy.[51]

In an effort to modify the Rhodes INV Form 2 to a more-user friendly format, Rhodes and McDaniel developed a new version entitled the Index of Nausea, Vomiting and Retching (INVR).[52] The INVR has eight items that begin with an introductory statement using the same component as the INV-2 and allows the patient to complete the sentence by inserting one of five possible responses by checking the appropriate response box. In a study to determine the reliability of the INVR and using a population of cancer, medical-surgical, and obstetric patients, the responses to the INVR were more frequently consistent than the INV-2.[52] Ming, et al.[53] used the INVR to measure incidence of PONV in an interventional study in the postoperative setting. Cronbach's alpha was .85. Fu, et al.[54] examined the reliability and validity of the Chinese translation of the INVR and the INV-2. Cronbach's alphas for the Chinese translation of the INV-2 in two different samples were .95 and 0.93, and 0.95 and 0.94 for the INVR. Both versions were found to have good reliability and validity and high agreement rates, although a majority of patients expressed preference for the INVR.

Fetzer et al.[22, 46] evaluated a modified version of the INVR for use with an ambulatory surgery population. The 8-item Rhodes INVR was modified by rewording the introductory statements as applicable to the ambulatory surgical patient and collecting the data via telephone call 24 hours after patient discharge. Internal consistency reliability of the Ambulatory Surgery (AS)-INVR was determined using Cronbach's alpha (0.897); the Guttman split-half procedure produced a correlation of .90. The authors suggested that these data indicate the AS-INVR measures upper gastrointestinal distress as a single concept in ambulatory surgical patients. Item eight was dropped from further analysis due to poor correlations of that item with the other seven items as well as the weak internal consistency of the retching subscale. After dropping item eight, the Cronbach's alpha increased to .91.[46] Both Ming et al.[53] and Fetzer et al.[46] found a much lower incidence of retching among postoperative patients than in the pregnant and cancer populations.

Functional Living Index Emesis (FLIE)

The only other preexisting scale used in the articles in Table 4-1 is the Functional Living Index Emesis (FLIE) developed to address the impact of CINV on daily living. [55] This instrument consists of 18 items and has nine items for nausea and nine for emesis. Each item asks a question and then offers options of 1-7 using the anchors "not at all" or "none" and "a great deal" or "not at all", e.g. "How much nausea have you had in the past three days?" The instrument was used first to compare two groups of patients who had received chemotherapy, those who had emesis and those who did not for a three-day period.[55]

There was a significant decrease in FLIE scores in patients who experienced emesis and a constant score for those who did not indicating that the instrument measured what it was intended to measure. Pearson correlations between FLIE scores after treatment and patient-reported nausea and vomiting (-.65, -.68) show a negative effect on the patient's daily living. The nausea-related subscale of the FLIE correlated (r = .83) with the nausea factor of the Functional Living Index Cancer (FLIC).[55]. Cronbach's alpha was .90 for before and after responses to FLIE. The authors conclude that the results demonstrated FLIE was a responsive instrument for assessing the effects of CINV on quality of life and daily function of patients after chemotherapy treatment.[55]

Martin and others[56] modified the original FLIE for use with 5-day recall instead of 3-day recall of the original FLIE. The patients completed the modified version on day one for training purposes and on day six after the first cycle of chemotherapy. Cronbach's alpha for nausea and vomiting domains was .79. Acceptable construct validity was supported by item-domain correlations within domains ($\underline{r}$ = .74 to .97; $p < .0001$) stronger than across domains ($\underline{r}$ = .52 to .76; $p < .0001$).[56] The modified version of the FLIE was a reliable and acceptable instrument to determine impact on daily living of patients after initiation of chemotherapy.

Only 45 studies were found during a PubMed search using the search term "functional living index emesis". Of those studies, only two were found for the PONV/PDNV population. The cancer population was the focus in the other 43 studies. Zarate et al.[45] used the FLIE to determine nausea and vomiting in a study on the use of transcutaneous acupoint electrical stimulation for preventing PONV after laparoscopic surgery. The respondents were a mix of inpatients and outpatients who were evaluated after a 9-hour period of time. No reliability or validity data are included in the published study. It is interesting to note that even though existing reliability and validity statistics are for use after three days and five days, the authors used the instrument to measure PONV/PDNV after only nine hours, using a telephone call to contact outpatients who had been discharged. Pan and others[26] used a study investigator to administer the modified FLIE on the last day of the study (day 5) to participants. The authors do note that the FLIE is a validated instrument for assessing impact of nausea or vomiting after chemotherapy. The modified FLIE used in this study differed from the original FLIE because items were rated 0 to 10 instead of 1 to 7 as in the original instrument. Also, no items were reverse scored as in the original FLIE. No reliability or validity data were included in the study.

Morrow Assessment of Nausea and Emesis (MANE)

One instrument that has been used in studies of chemotherapy induced nausea and vomiting (CINV) is the Morrow Assessment of Nausea and Emesis (MANE).[57]. This instrument has 17 items that assess occurrence, duration, and severity of pre-and post CINV. The items are 6-point verbal descriptive scales. Reliability and validity of the MANE have been supported in the cancer-related chemotherapy population in use of this instrument.[57]. This instrument has never been used for a study in the PDNV or PONV population, probably due to suspected differences in the cancer chemotherapy population and ambulatory surgery population related to the issue of anticipatory nausea. Anticipatory nausea and vomiting are measured in the MANE, and those symptoms have not been established for the PONV/PDNV population.

Discussion

Definitions and Measurement

Assessment and findings of PONV and PDNV have been inconsistent because endpoints are defined differently by study. [58] Consistency of the term PDNV in future studies should improve with the definitions published in ASPAN's multidisciplinary clinical practice guideline for prevention and management of PONV and PDNV.[8] At the present time, the terminology of nausea and vomiting is still used interchangeably in the literature PDNV, defined in some articles as late PONV and in others as after discharge from the hospital without specifying whether the patient was an outpatient or inpatient discharged after 24 or 48 hours from the hospital. The term PDNV should be defined as nausea and vomiting after outpatient discharge from the healthcare facility. Delayed PDNV defines nausea and vomiting that occurs after 24 hours post outpatient discharge. For the outpatient, PONV would refer to nausea and vomiting experienced while in the PACU. Any nausea and vomiting for the inpatient is defined as early, late, or delayed PONV. (Figures 1 and 2).

One difficulty with measurement of PONV and PDNV is the confusion with terminology of nausea, vomiting, and retching. Rhodes[12] addressed the issue, defined all three terms, and went on to create an instrument that distinguishes between the three. Khamales and others[59] define emesis for their study as "the number of vomits (excluding dry retches) in each 24 hours period." Not all studies distinguish between vomiting and retching. For example, Zarate et al [45] defined an emetic episode as "a vomiting, or retching event, or a combination of these events, that occurred in a rapid sequence (<1 minute between events.)" One study defined vomiting as "emesis or retching."[29]

Fetzer et al.[22, 46] determined that retching was not as significant a problem for the PONV/PDNV population as for the pregnant and cancer populations. However, until further studies are completed that determine whether patients experiencing PDNV do not experience retching as a separate entity, nausea, vomiting, and retching should be measured separately. Researchers suggest that nausea and vomiting occur independently and should be assessed separately.[13, 16, 60, 61]

Outcomes of Studies

Consistency when determining outcomes is an important measurement issue with PDNV. In some studies, emesis is measured as "no emesis" or "any number of emetic episodes". In other studies, the number of episodes of emesis that occur each day is measured. In some studies participants are simply asked if any emesis occurred during the day at all using a yes/no format. In a methodological discussion of antiemetic studies, Olver et al.[13] discussed the importance of distinguishing between a complete response with no nausea or vomiting and a lesser response that the authors state is obtainable by use of a severity of nausea scale and recording the number of vomiting episodes during the study. The authors go on to say that a "standardized system would be ideal and agreement on such a scale is of paramount importance."[13]

The outcome of paramount interest should be the experience of PDNV for the patient. Nausea is a subjective experience and cannot be measured by an observer. The patient must self-report nausea. Investigators should use the simplest scales that give the information needed. Vomiting is an observable behavior, but for the outpatient surgery patient who has been discharged, must also be measured by self-report. It would be possible for a responsible adult to observe and report vomiting and/or retching, but none of the studies found described using observers.

Other outcomes that may be of interest in research about the patient experiencing PDNV are appetite, pain or comfort, quality of life, patient satisfaction with care, sedation issues (related to antiemetic use), anxiety, or an overall question to describe any changes in degree of severity. See Table 4-2 for suggested measurement of PDNV.

Difficulties with Collecting Data

New research is needed to establish how effective self-reporting instruments are for patients who are asked to evaluate the phenomena while experiencing nausea and vomiting. Research should also determine other factors that may come into play and affect how the patient feels and is able to conduct activities of daily living, such as fatigue and anxiety. Research should also determine the most effective method of rating PDNV, e.g. a 12-hour or daily basis.

Some patients have difficulty distinguishing retching from vomiting or counting emetic episodes if they are continuous or prolonged. This could affect the data obtained from a patient who had to self-report the information. It is possible that the two instruments mentioned in this paper (FLIE, AS-INVR) would aid the patient in determining the best answers to the questions. Tonato, et al.[17] believe that any information obtained by telephone or by questioning the patient on their next visit was unreliable. Use of a daily diary card with scales imbedded in the card proved more satisfactory. Studies of PDNV should incorporate a written instrument for the patient as well as telephone calls to maintain contact with the patient and encourage follow through.

Both the FLIE and the AS-INVR are easy to use and reproducible. They also allow the patient to record the information on a daily basis. Follow-up telephone calls could be used to obtain the information or remind the patient to mail the card to the investigator in a pre-stamped, pre-addressed envelope.

Reporting of Reliability and Validity of Instruments

Studies in the medical literature rarely discuss the issues of reliability and validity of the instrument used to determine nausea or emesis unless the study was designed for that specific purpose. None of the studies reported in Table 4-1 discuss reliability or validity issues except Fetzer et al.[22] when using the AS-INVR. Pan, et al,[26] when using the FLIE mentions the past reliability of the instrument, but gives no reliability data. Use of established instruments to determine the frequency and distress associated with nausea and vomiting is warranted. At this point in the PDNV literature, there are only three studies that have used established instruments, the FLIE or the AS-INVR.[22, 26, 45] More studies should be performed using the two established instruments with normative values, timing needed to complete the instrument, and grade level established. See Table 4-3. Those studies that are performed should report reliability and validity of instruments.

Conclusion

In conclusion, approximately one third of patients continue to experience nausea and vomiting after discharge from outpatient surgery settings. In studies for that group of patients, there have been no clear and definitive instruments in use to measure the phenomena of nausea and vomiting. The AS-INVR and the FLIE provide the possibility of standardization of outcome for studies with those patients. Although they both possess strengths, more study is clearly needed to progress the measurement of nausea and vomiting in the post discharge ambulatory surgery patient.

Table 4.1 Measures Used to Assess PDNV

Reference	Publication Year	Study	Outcome	Measurement Used for PDNV
Candiotti, et al.[62]	2008	Evaluate efficacy and safety of three doses of palonsetron versus placebo for preventing PONV	PONV/PDNV	Emetic episodes and intensity of nausea measured at 2, 6, 24, 48, and 72 hours. Intensity measured on 4 point scale (none to severe).
Carroll, et al.[2]	1995	Patient experiences with nausea and vomiting after discharge from outpatient surgery	PDNV	Phone interview after 24 hours with VRS 0 (no nausea or vomiting) to 10 (very severe); mail in questionnaire after 5 days (incidence only).
Claxton, et al.[36]	1997	Evaluate morphine and fentanyl for analgesia after outpatient surgery	PDNV	Phone interview at 24 hours. Asked if they experienced nausea or vomiting (yes, no).
Coloma, White, Ogunnaike, et al.[21]	2002	Evaluation of acustimulation compared to ondansetron for established PONV	PONV/PDNV	Phone call at 24 and 72 hours. Incidence of N or V; VRS to score nausea (0 = none to 10 = worst imaginable).
Coloma, White, Markowitz, et al.[37]	2002	Evaluate dexamethasone in combination with dolasetron on outcome after laparoscopic cholecystectomy	PONV/PDNV	Phone call at 24 hours to determine incidence of nausea or vomiting.
Ernst, et al.[38]	1997	Incidence and impact of pain nausea and vomiting after outpatient surgery	PDNV, pain, serious problems post discharge	Questionnaire for 72 hours: Incidence of nausea and vomiting (yes/no)

Table 4.1 (Continued) Measures Used to Assess PDNV

Reference	Publication Year	Study	Outcome	Measurement Used for PDNV
Fetzer, et al.[22]	2005	Self-care activities for PDNV	PDNV required for inclusion in study	Phone call at 24 hours. AS-INVR for PDNV; NRS 0 – 10 for distress of PDNV
Fish, et al.[39]	1999	Compare sevoflurane with use of TIVA in regard to rapidity of recovery to home readiness	PONV/PDNV	Telephone call at 24 hours. Asked about occurrence of N or V
Gan, et al.[23]	2002	Administration of ondanetron ODT (orally dissolving tablet) for PDNV	PDNV	VRS 0 (no nausea) to 10 (as bad as it can be). Incidence of vomiting—phone call at 24 hours.
Grimsehl, et al.[33]	2002	Comparison of cyclizine and ondansetron for prevention of PONV in outpatients	PONV/PDNV	Questionnaire for first 24 hours. Nausea rated as none, mild, severe, and with use of 100-mm VAS. Emetic event—nausea or retching.
Hache, et al.[40]	2009	Aprepitant in a multimodal approach for prevention of PONV	PONV/PDNV	Information received on postop phone call for 24 hours. Follow up phone interview in 1 -2 weeks that asked if there was any PDNV during 1st 48 hours. Recorded incidence only.
Mattila, et al.[31]	2005	Postdischarge symptoms after ambulatory surgery	PDN/PDV	Mail-in questionnaire covering 7 days using 4 point scale (0 = nonexistent to 3 = severe)
Monagle, et al.[24]	1997	Compared ondansetron to moderate dosage of metoclopramide in minor gynecologic surgery	PONV/PDNV	Phone call at 24 hours. Verbal scale 0 – 10. Incidence of emesis recorded.

Table 4.1 (Continued) Measures Used to Assess PDNV

Reference	Publication Year	Study	Outcome	Measurement Used for PDNV
Moore, et al.[44]	2008	Effect of anaesthetic agents on induction, recovery, and patient preferences in adult day case surgery	PONV/PDNV	Patients given 7 day mail-in diary to record N,V on 0 cm to 10 cm VAS. Converted to Yes/No (<1cm = No).
Paech, et al.[25]	2002	Effect of anaesthetic technique on outpatient	PDNV	Phone call at 24 hours and 4 days. Nausea = 0 to 10 verbal scale; # of episodes emesis
Pan, et al.[26]	2008	Antiemetic prophylaxis for postdischarge nausea and vomiting and impact on functional quality of living during recovery in patients with high emetic risks	PDNV and QOL	Daily diary for 5 days after surgery to record daily incidence and severity (0-10) of emetic symptoms. Phone call at hours 8, 24, 72, and 120 hours to go over diary. On last day, administered modified FLIE.
Parlow, et al.[32]	1999	PDNV after ambulatory laparoscopy is not reduced by promethazine prophylaxis	PDN, PDV	24 hour diary with 4 point scale for nausea (none, mild, moderate, severe); # episodes emesis. Information retrieved with phone call.
Pfisterer, et al.[9]	2001	An international study of PONV in outpatient surgery	PONV/PDNV	Patient diary cards for DOS plus 4 days reporting nausea (none, mild, moderate, severe); distress by nausea (not at all to extreme); # emetic episodes

Table 4.1 (Continued) Measures Used to Assess PDNV

Reference	Publication Year	Study	Outcome	Measurement Used for PDNV
Rajeeva, et al.[27]	1999	Compare ondansetron with ondansetron and dexamethasone in prevention of PONV	PONV/PDNV	Interviewed patient at 24 hours. Nausea 0 (none) to 10 (as bad as it can be); Vomiting episodes >2 = severe; 2 = moderate; <2 = mild; 0 = none.
Rothenberg, et al.[41]	1998	Compare dexamethasone versus droperidol following outpatient laparoscopy with propofol general anesthesia	PONV/PDNV	Phone call at 24 hours. Presence of nausea or vomiting noted.
Tang, et al. [34]	1996	Comparison of ondansetron and droperidol for antiemetic prophylaxis in outpatinet gynecological procedures	PDN, PDV	Nausea VAS 0 mm (none) to 100 mm (maximum); # emetic episodes; phone call at 24 hours and 7 days.
Thagaard, et al.[42]	2007	Analgesic and antiemetic effect of ketorolac compared to betamethasone and dexamethasone	PONV/PDNV	Questionnaire for patient to complete at 24 and 72 hours that asked about nausea and vomiting.
Waterman, et al.[35]	1998	Assess the frequency and duration of PONV over 7 days post orbital hydroxyapatite implant surgery	PONV/PDNV	Nausea—ordinal scale (nil, mild,moderate, severe). Vomiting—presence or absence. Rated 4 times daily for 7 days by patient.
White, et al.[28]	2002	Comparing efficacy of acustimulation to ondansetron when used alone or in combination	PDNV	VRS 0 (no nausea) – 10 (worst imaginable); # episodes emesis; patient diary for 72 hours. Phone call at 24 and 72 hours.

Table 4.1 (Continued) Measures Used to Assess PDNV

Reference	Publication Year	Study	Outcome	Measurement Used for PDNV
White, et al.[29]	2006	Evaluate the hypothesis that oral granisetron would be cost-effective alternative to IV ondandsetron for preventing PONV and/or PDNV	PONV/PDNV	At 24 and 48 hours, patients asked about incidence of N/V. Nausea measured on 11 point scale (0 = none; 10 = maximum). Emesis = vomiting or retching.
White, et al.[43]	2007	Comparison of two antiemetic strategies in high risk patients undergoing minor gynecologic surgery	PONV/PDNV	Phone call at 24 hours to determine presence or absence of PDNV
Zarate, et al.[30]	2000	Compare costs and efficacy of ondansetron versus dolasetron	PONV/PDNV	Phone call at 24 hours; Post discharge side effects noted. Maximum nausea during previous 24 hours—VRS 0(none) to 10 (worst possible).
Zarate, et al.[45]	2001	Use of transcutaneous acupoint electrical stimulation for prevention of PONV	PONV/PDNV	Phone call after 9 hours to outpatients; FLIE measured nausea scores; # episodes vomiting or retching

PDNV = Post discharge nausea and vomiting; PONV = Post operative nausea and vomiting; PDN = Post discharge nausea; PDV = Post discharge vomiting; N = nausea; V = Vomiting; VRS = verbal rating scale; AS-INVR = Ambulatory Surgery-Inventory of Nausea, Vomiting, and Retching; NRS = Numerical rating scale; VAS = visual analog scale; IV = intravenous; FLIE = Functional living index of emesis; Postop = postoperative, DOS = Day of Surgery.

Table 4.2 Measurement of PDNV

Instrument should contain:

- Nausea, vomiting, and retching measured as a separate entities
- PDNV as outcome
- Separate measures of frequency, severity (intensity), and duration
- Format should be daily diary card (mailed in, or data retrieved from telephone calls)

Measurement:

- Nausea
  - Easy to use scales (VAS, NRS, or VRS) that are simple and reproducible
- Vomiting
  - Number of episodes
  - Duration
  - Volume (Information less useful)

When to measure

- Report every 12-24 hours
- PDNV reported for 5 – 7 days after discharge

Indirect measures of PDNV

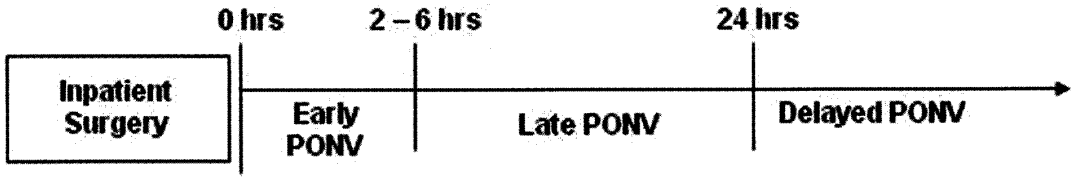
- Time to food intake
- Appetite change over time
- Comfort
- Quality of life
- Sedation as related to antiemetic side effects
- Anxiety
- Overall quality of life assessment
- Overall question to capture change in degree of severity

Data from: [13, 15-17, 51, 60, 61]

Table 4.3 Comparison of Two Self Report-Measures of PONV/PDNV

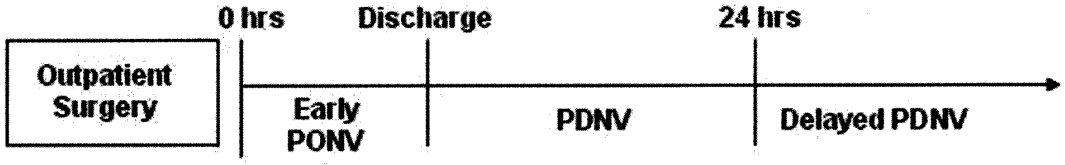
Instrument Year	**Number of Items**	**Response Options for Each Item**	**Scoring and Range**	**Time Required to Complete**	**Grade Level**	**Normative Values**
Functional Living Index Emesis 1992 (3 Day) with validation in 2003 (5 Day)	18 items (9 for nausea and 9 for vomiting)	Scale range is from 1 (not at all affected) to 7 (affected a great deal.)	Responses for items are summed with a possible score range of 18 to 126.	Unknown	Unknown	Unknown
Ambulatory Surgery Index of Nausea, Vomiting, and Retching 2004	7 items (3 related to nausea, 3 related to vomiting, 1 related to retching, symptoms distress 3 items, symptom occurrence 4 items)	Patient has 5 choices for each item, such as no, 1-2, 3-4, 5-6, 7 or more.	5 choices per item are scored as 0-4 with a total score of possible of 0 – 28.	Unknown	Unknown	Unknown

Figure 4.1 PONV Timeline



Used with permission.[8]

Figure 4.2 PDNV Timeline



Used with permission.[8]

CHAPTER FIVE

Over 34 million patients undergo ambulatory surgery annually in the U.S.[1] with as many as 35-50% experiencing nausea and/or vomiting after discharge following ambulatory surgery. This phenomenon is called post discharge nausea and vomiting (PDNV),.[2-6] With more than 60% of all surgeries performed in the ambulatory setting and millions of patients experiencing PDNV every year, it is imperative that we look more closely at incidence, management strategies, and outcomes for these patients.[7] The impact of PDNV requires that treatment of this complication extend well beyond discharge.

Researchers have focused on patient risk for postoperative nausea and vomiting (PONV), nausea and/or vomiting that occurs within the first 24-hour period after inpatient surgery.[2, 8, 9] PONV has been well-described, risk factors determined, and is far better studied than PDNV.[8, 9] Little research is available in which the incidence and severity of PDNV is described. PDNV is an underreported condition that can affect quality of recovery, has the potential for morbidity and hospitalization in high-risk patients, and impacts patient satisfaction. [10-15] Patients who experience PDNV are likely to manage their symptoms using self-care strategies at home, sometimes by discontinuing medications they believe are contributing to the problem.[16]

Nausea and vomiting after surgery was noted by Kapur as the "big, little problem" over a decade ago.[12] Recently, an editorial entitled "We're tired of waiting" called for an end to nausea and vomiting after surgery noted the importance of solving our "big, little problem" and emphasized treatment in the post discharge period.[17] In another editorial this past year, authors called PDNV "an overlooked aspect of ambulatory anesthesia."[18] Although variable, earlier investigators described the incidence of PDNV to be as high as 55%. [4 5, 19] In current studies of this continuing problem, an incidence of 30-60% has been reported. [3, 10, 11, 13, 15]

Patients have expressed their aversion to nausea and vomiting after surgery.[20, 21] When asked to rank postoperative and postanesthesia outcomes from the most undesirable to least undesirable, patients rated vomiting as the most undesirable outcome, ranking it as more undesirable than pain or shivering.[20] Patients who had experienced nausea after surgery were willing to pay $73 (USD) out-of-pocket for a preventative drug, and those who experienced vomiting were willing to pay $100 (USD).[22] It is likely that nausea and vomiting after surgery affects not only the cost of healthcare, but directly impacts patient satisfaction.[23]

The purposes of this study were to: 1) describe the incidence and severity of PDNV over a 7-day period in a sample of adult surgical patients undergoing outpatient surgeries under general anesthesia, 2) describe the pharmacologic and nonpharmacologic modalities of care used

by patients with PDNV to manage it, 3) compare the incidence and severity of PDNV between those who do and do not use pharmacologic and nonpharmacologic modalities, 4) determine outcomes associated with PDNV, and 5) determine predictions for late (Days 3-7) PDNV. This study was part of a multi-site study that had as a primary objective development of a simplified risk model for predicting patients most likely to suffer PDNV.[3] This study differed from the primary study by following a subset of patients over a 7-day period to better describe the incidence and management of PDNV.

Methods

Design and Sample

The methods for this prospective, descriptive multi-site study have been described previously.[3] Briefly, twelve U.S. ambulatory surgery sites received approval from local institutional review boards to conduct the study. Ten of the twelve sites collected data for 48 hours post discharge and two of the twelve sites collected data for 7 days post discharge. Eligible patients were adults (> 18 years of age) who were undergoing an outpatient procedure under general anesthesia requiring a tracheal tube or laryngeal mask airway. Excluded from the study were those unable to communicate in English, individuals whose surgery ended in a planned or unplanned inpatient stay, current pregnancy, persistent or recurrent nausea and/or vomiting before anesthesia, and patients who required regional anesthesia only. Eligible participants were recruited consecutively either in preadmission testing or in the preoperative area on the day of surgery by the primary investigator or trained research assistant. Informed consent was obtained from all participants.

Variables and Measurement

Participants were asked to provide self-reported data including demographics, medical and surgery-related history, and to answer questions rating distress caused by pain, nausea, and vomiting; how these symptoms impaired their functional living and satisfaction, and the frequency of symptoms and actions taken to alleviate symptoms. Postoperative data were assessed using standardized questions about severity of symptoms per time interval on an 11-point numeric rating scale. Specifics about measurement of each of these follow.

Demographics and Clinical Characteristics

An inpatient data report sheet was used to obtain patient characteristics including age, gender, height, weight, and ethnicity; medical history including history of smoking, motion sickness, and migraines; previous general anesthetics, and current diagnoses; surgical procedure; anesthesia data including the type and length of surgery, airway device, anesthetic drugs (e.g. type and concentration of inhalational anesthetics), and type and dose of intraoperative opioids and other medications; and PACU/StepDown data including PACU and Step-Down arrival and departure, incidence and severity of nausea, presence of vomiting or retching, and drugs given to the patient. Basic demographics and clinical measures were obtained from patient interview during initial contact with the primary researcher or other trained personnel. Other perioperative data were obtained from the clinical record.

The Patient Diary

Employment of a daily diary for the patient to record symptoms at home has been used successfully in assessment of patient nausea and vomiting.[24] The investigators placed all the study questions regarding nausea and vomiting into one packet of information for the patients to take home and called it a Patient Diary. The cover page reminded the patient of the times they would receive phone calls; listed definitions of nausea, vomiting, and retching; and specified time-points to record symptoms within the diary. During the Day of Surgery (DOS) through Day 2, the patients were asked to record symptoms at specific time intervals. Patients were asked to rate nausea on day of surgery during drive home, from ride home to dinnertime and dinnertime to bedtime. On Days 1 and 2 patients rated nausea during the night, morning, afternoon and evening. From Days 3 – 7, nausea was rated for a 24-hour period each day. Patients were asked to record the number of times and worst severity of vomiting/retching during the same time periods they recorded nausea. Quality of life questions were included in the Patient Diary and rated once every 24 hours. The Patient Diary also had a space to record all new medications or remedies that the patient took for the past 24-hour period. They were asked to record name of medication or remedy, time of the day, reason for taking and effectiveness of medication.

Incidence and Severity of PDNV— Definitions for terms used in this study were the following: 1) *nausea*--a subjective, unobservable occurrence of the desire to vomit without expulsive muscular movements--an unpleasant sensation experienced in the back of the throat that may or may not end in vomiting; 2) v*omiting*-- the forceful ejection of the contents of the stomach, duodenum, or jejunum through the mouth; and 3) r*etching*--an attempt to vomit with no

stomach contents expelled, otherwise known as dry heaves.[25, 26] These symptoms may occur alone or on their own.[25, 26] Retching usually indicates an empty stomach, but is as unpleasant for the patient as vomiting.[25] Because retching may or may not occur in these patients due to a much lower incidence of retching in the ambulatory surgery population than in the pregnant or cancer population, [27, 28] retching was noted, but combined with vomiting for this study.

The operational definition of PDNV for the purpose of this study was "nausea and/or vomiting that occurs after discharge from the health care facility after outpatient surgery."[2] Nausea is a subjective experience that is defined by the patient and requires a self-report approach.[25, 29] Severity of nausea was measured using an 11-point numerical rating scale where 0 represented "no nausea" and 10 represented "worst nausea imaginable." Categorical rating scales (verbal rating scales, numerical rating scales, visual analog scales) have been found to yield consistent and reliable data when used to measure nausea.[24, 30-34] Incidence and severity of nausea were recorded during the PACU stay at admission, 15, 30, 60, 120 and 240 minutes and discharge; during the ride home; and for 48 hours in 10 study sites and 7 days in two study sites. Incidence was measured as any number greater than 0 on the numerical rating scale, and severe nausea was defined as nausea of 7 or greater on the verbal rating scale.

Vomiting was measured as the number of episodes that occurred at least one minute apart and severe vomiting as three or more emetic episodes. Retching was included with vomiting in the analysis. The PDNV data were collected from the clinical record and patient interview on Days one, two, and seven, and from the Patient Diary.

Pharmacologic and Nonpharmacologic Modalities of Care

Pharmacologic modalities of care were measured by review of the Patient Diary where patients were asked to note the use of any medications during the previous 24-hour period for nausea or vomiting post discharge. Over the counter medications and nutraceuticals (e.g. ginger) that were used by the patient for treatment of PDNV were included as pharmacologic modalities of care. Nonpharmacologic care was measured by description of any nonpharmacologic modality used by the patient as prevention or treatment of PDNV post discharge. The Patient Diary included a question at Day 2 that asked "Did you use any of the following means to prevent or treat nausea or vomiting since your surgery?" The checklist included: acupressure bands, lying still, slow progression of diet to regular diet, drinking carbonated drinks, eating food, not taking pain medication on empty stomach, and a blank line for any other modality the patient wished to specify.[35] These data were captured by review of the Patient Diary.

Outcomes Associated with PDNV

Outcomes were measured by use of investigator developed quality of life (QOL) questions. Quality of life is an important dimension in the postanesthesia experience of the patient.[36] Developing an instrument to measure quality of life is difficult because there is no "gold standard."[37] However, verbal analog scales and visual analog scales have been used for assessment of specific clinical outcomes such as emesis, pain and fatigue.[37]. Any questions that pertain to quality of life should incorporate dimensions of physical functioning, mental health, cognitive functioning, symptoms, role and social functioning, general health perceptions, sleep, and energy, and should include aspects of life that are valued by the patient.[37, 38] A single, global quality of life question has been recommended in clinical trials.[39] Therefore, the investigator-developed questions included a global quality of life question that stated "How much did nausea affect your quality of life yesterday?" and "How much did vomiting affect your quality of life yesterday?" The use of surrogate measures for nausea and vomiting should be considered, e.g. food intake, appetite change, and other measures of well-being.[29] Therefore, other quality of life questions that were included related separately to the effect of nausea and vomiting on the patient's ability to eat and drink, ability to do necessary tasks, enjoyment of leisure, enjoyment of social activities, ability to do normal daily work, and ability to sleep. The QOL questions for this study were measured by an 11-point numeric rating scale where 0 represented "not at all" and 10 represented "most bothersome." Cronbach alpha coefficients for the QOL questions for each 24 hour time period in this study were >.90.

Patients were asked the following question to rate recovery from surgery on a scale of 0 to 10 with 0 "far worse than expected", 5 "as expected", and 10 "far better than expected." At one site, the researchers captured data regarding patient calls to health care providers during the first week after surgery by asking, "Did you call your health care provider during this past week" and "If yes, why?"

Procedure

At the time of consent, participants were informed that an investigator would call to ask questions about nausea, vomiting, and other symptoms that occurred after discharge on Days 1 and 2, and again on Day 7, if applicable. Patients were instructed on use of the Patient Diary (see appendix A). The Patient Diary also contained a space for patients to record medication use each day. At ten sites, the data were collected via phone interview. At two sites where patients reported symptoms for 7 days, data were collected by phone interview on Days 1 and 2, and patients were reminded with a phone call on Day 7 to place the Patient Diary in the mail to the investigator in a self-addressed, stamped envelope. Upon return of the Patient Diary, patients

received a $10 gift card in the mail from the primary investigator site. Patient medical treatment remained fully at the discretion of the treating anesthesia provider and surgeon in order to reflect real-life conditions and current clinical practice in the US.

Data Analysis

Descriptive statistics, including means and standard deviations or frequency distributions, were used to describe the sample, and summarize the data. Bivariate analyses, including two-sample t-tests and chi-square tests of association, were used to determine factors associated with PNDV. One-way analysis of variance (ANOVA) with Tukey HSD post hoc tests were used to determine significant differences in means of nausea between groups. A one-way ANOVA was conducted to look at impact of antiemetic use and nonpharmacologic modalities of care on the mean of nausea (0 = none; 10 = worst). Patients were divided into four groups according to use of pharmacologic and nonpharmacologic modalities (Group 1 = No use of antiemetics, no use of nonpharmacologic modalities of care; Group 2 = No use of antiemetics, Yes use of nonpharmacologic modalities of care; Group 3 = Yes use of antiemetics, No use of nonpharmacologic modalities of care; Group 4 = Yes use of antiemetics, Yes use of nonpharmacologic modalities of care.) A logistic regression was conducted to examine factors relevant for predicting PDNV in days 3 – 7. Significance is set at the $p \leq 0.05$ value.

A power analysis determined that with a sample size of 120 and a PDNV prevalence rate of approximately 30% approximately 36 participants would have this adverse event and the remaining 84 would not. With these group sizes and an alpha level of .05, the power of a two-sample t-test to detect a significant group difference was approximately 84% if the ratio of the difference in means to the standard deviation was as small as 0.6. Cohen[40] considers a difference of this magnitude to be slightly larger than a medium effect size. With a total of 120 subjects and a significance level of .05, the power of the chi-square test of association to detect an odds ratio as small as 4 was approximately 84%. One way to obtain an odds ratio of this magnitude would be if one group had a proportion of cases with a certain attribute of 20% while the other group had a 50% rate. With approximately 36 PDNV cases and 84 participants without this event, assuming a .05 level of significance, the power of the logistic regression to detect a significant odds ratio as small as 2.5 will be approximately 92%; if the odds ratio is as small as 2, the power under these conditions will be approximately 83%. Power estimates were obtained using nQuery Advisor.[41] More subjects were available due to the requirements of the multi-site study, so the data analyses are at least as powerful as determined before data collection.[42] Data analyses were performed with SPSS (version 17.0).

Results

Two thousand four hundred ninety three patients were screened for the multi-site study. Data for the first 48 hours post-surgery were obtained from the 2170 patients who completed the study. Within this group of 2170 was a subset of 260 patients from two centers who also completed data for a 7-day period. Demographic and clinical characteristics for these two groups are included and compared in Table 5-1. The subset of 260 patients was significantly different from the 1910 in the 48-hour sample in age, gender, ethnicity, income level, educational level, previous PONV, type of procedures performed, surgical approach, American Society of Anesthesiologists (ASA) physical status, and operating room (OR) time. There was a significant difference in the presence of PDNV between groups, and significant difference in mean nausea scores between the groups.

Incidence

The overall incidence of nausea for the study was 36.8% and emesis was 12.0% with an overall incidence of PDNV of 37.1%. (Figure 5-1). During the ride home, 21.8% of patients had nausea with 4.6% of patients experiencing emesis. During DOS, after arriving home, nausea increased to the highest of any single day (28.7%) and emesis increased to 8.5%. The next day after surgery (Day 1) the incidence of nausea and vomiting decreased to 18.2% and 3.9%, respectively. The incidence of nausea and vomiting in the 48-hour group is presented in Figure 5-2. On Day 3, the subset of 260 patients reported the incidence of nausea and vomiting at 18.1% and 2.3%. Nausea decreased to 6.3% on Day 7. Emesis was stable Days 5 – 7 at 1.2%. The incidence of nausea and vomiting over a 7-day period is presented in Figure 5-3.

Demographic and clinical characteristics of patients who experienced PDNV and did not experience PDNV are listed in Table 5-2. The presence of PDNV was significantly higher for females than males ($p < 0.001$). There was a significant difference between means of age with younger patients more likely to experience PDNV than younger patients. There was also a significant difference among ethnic groups when analyzing presence of PDNV with Latinos and Asians having a higher percentage of PDNV. No significant differences were found among those with and without nausea in the categories of BMI, educational level, or income.

The clinical characteristics of history of motion sickness, previous PONV, and migraine headaches were all significantly related to the presence of PDNV ($p < 0.001$; Figure 5-4). The use of certain opioids (hydromorphone, $p \leq .024$; morphine, $p \leq .027$) during surgery was significantly related to presence of PDNV, although use of meperidine, remifentanil, and fentanyl during surgery were not significantly related to PDNV. However, the use of certain opioids in the

PACU were significantly related to the presence of PDNV. Use of oxycodone, morphine, meperidine, hydromorphone, and fentanyl in the PACU were related to presence of PDNV while use of codeine and hydrocodone were not related. American Society of Anesthesiologists' physical status classification system rating was significantly different for those patients who experience nausea and those who do not with the healthiest patients (ASA Class I and 2) more likely to experience PDNV than ASA Class 3. There were not enough ASA Class 4 patients in that category (N = 8) to statistically compare although the few patients in that category seemed to follow the same pattern with only 25% experiencing PDNV. Overall OR time was significantly different for those with or without PDNV ($p < 0.01$) with those patients who had a longer OR Time more likely to experience PDNV. Interestingly, patients who received a regional block were more likely to have nausea than those who did not have a regional block ($p < 0.001$). Nitrous oxide had no effect on PDNV.

Patients who experienced nausea and vomiting in the PACU were significantly more likely to experience PDNV ($p < 0.001$). There was a significant difference in pain score means (0 = no pain; 10 = worst pain) for pain during activity between patients who reported PDNV and those who did not ($p = \leq 0.008$) until Day 4 when the difference was non-significant. Mean scores for pain at rest show a significant difference ($p<0.001$) between those with and without nausea until Day 4 ($p = 0.94$), but are significant again on Day 5 only ($p = 0.026$). Those patients with higher pain scores during activity or at rest were more likely to experience PDNV. The use of hydrocodone was significantly related to the presence of PDNV until Day 2. The use of oxycodone after surgery was significantly related to the presence of PDNV until Day 3.

Severity of Nausea

Nausea was rated with an 11-point scale where 0 was no nausea and 10 represented the worst possible nausea. Severe nausea (≥ 7 on scale of 0 to 10) affected 10.2% of patients on day of surgery and continued to affect 2% of patients on Day 7. (Figure 5-5). Of those who were nauseated, 31.2% experienced severe nausea during the drive home increasing to 35.5% of those with nausea during the day of surgery. Of the 6.3 % with nausea on Day 7, almost a third (31.7%) continued to have severe nausea.

Females reported a significantly higher overall mean of nausea (as measured on a 0 – 10 numerical rating scale) than males ($p < 0.001$). When analyzed by day, there was a significant difference in means of nausea scores between males and females until Day 3. (See Figure 5-6). Mean nausea intensity was compared between age groups (≤ 42, 43-57, and ≥ 58). There was a statistically significant difference ($p < 0.001$) between all age groups with the youngest age group

($\leq$ 42) experiencing the highest mean. (Figure 5-7). Using overall mean nausea scores, there no statistically significant differences for ethnicity [F (4, 2147) = 1.465, p = .21].

Type of surgical procedure was significantly related to mean scores of nausea ($p < .001$). (Figure 5-8). Prostate surgery was associated with the lowest nausea mean score (.2821) and cholecystectomy with the highest nausea mean score (1.4386). There were significant differences between general surgery and knee arthroscopy ($p = .013$), breast surgery and knee arthroscopy ($p = .04$), cholecystecomy and prostate surgery ($p < .001$), gynecological and prostate surgery ($p = .037$) and knee arthroscopy and prostate surgery ($p < .001$). The impact of gender and surgical procedure on mean nausea scores was explored. The interaction effect between gender and surgical procedure was significant [F(10, 2126) = 1.943, p = .036]. The type of surgical approach was also related to mean nausea scores with the endoscopic and conventional approach having a lower mean nausea and less likely to have nausea than the arthroscopic and laparoscopic approaches ($p < .007$). (Figure 5-9)

Patients at the lowest risk for anesthesia complications (ASA 1) had a mean nausea score of 1.12 and those with a highest risk (ASA 4) of 0.29. However there were only 8 patients classified as ASA 4, and mean nausea scores were not significantly different than any other group. (Figure 5-10). The ASA 1 ($p < .001$) and ASA 2 ($p < .02$) patients had significantly higher nausea means than ASA 3.

The use of analgesics codeine and hydrocodone in PACU for pain were not significantly associated with mean nausea scores ($p > .58$). The use of morphine ($p \leq 0.001$), meperidine ($p < 0.001$), hydromorphone ($p < 0.001$), fentanyl ($p < 0.001$), and oxycodone ($p \leq .001$) for pain in the PACU were significantly associated with overall mean post discharge nausea scores. When analyzed by post discharge day, the use of opioids in PACU became nonsignificant for PDNV for all opioids by Day 3.

Prediction of Late PDNV

Using the data from this study and completing the primary objective for the multi-site study, Independent risk factors for early PDNV (within 48 hours) were determined: female gender, age less than 50 years, history of PONV, opioids administered in the PACU, and nausea in the PACU.[3] To determine which factors predict the presence or absence of PDNV for days 3-7, we performed a logistic regression analysis with possible factors ethnicity, age, gender, BMI, Previous PONV, previous motion sickness, ASA status, smoking status, OR Time, surgical procedure, surgical approach, use of antiemetics (three variables, one each for use in surgery, PACU, or post-discharge), use of opioids (again three variables, one each for use in surgery,

PACU, or post-discharge), and pain scores (divided into none for pain=0, mild for pain=1,2,3, moderate for pain=4,5,6, or severe for pain=7,8,9,10).

Variable selection was done by backward elimination using approximate likelihood ratio tests (logistic regression is a special case of a generalized linear model, the likelihood ratio tests are a substitute for the F-tests used in ordinary linear regression), at the 0.05 level for the exclusion of variables. Most variables were eliminated resulting in a final model that included a previous history of PONV, OR Time, and pain score. The significance of these variables is described in Table 5-3.

The coefficients of the regression are contained in Table 5-4, with 95% confidence intervals for the odds ratios (note the estimates in a logistic regression provide estimated log odds and must be exponentiated for odds ratios, the confidence intervals for the log odds are symmetric around the estimated logodds).

Note for pain level, all odds ratios are computed relative to “no pain”. Thus, the estimated odds ratios of 10.40 for Moderate Pain is the odds ratio concerning the likelihood of PDNV with moderate pain compared to the likelihood of nausea with no pain. The long upper tails of the odds ratios are due to the fairly minimal number of individuals who had no pain but also had nausea, as seen in table 5.5.

As can be seen in Table 5.5, the observed proportion of individual experiencing PDNV dramatically increases as the pain level increases. Furthermore, of the 70 individuals with “no pain”, only 3 reported nausea. When computing odds ratios relative to “no pain”, this small number of individuals with PDNV produces much variation in the resulting estimates. While we may be quite confident that individuals with pain are sizably more likely to experience PDNV, the exact magnitude of these effects is hard to pin down.

Management Strategies

The most commonly used antiemetics in the OR during surgery were: ondansetron (77.4% of patients); steroids (48.5% of patients); droperidol (12.8% of patients); and dopamine antagonists (12.8% of patients.) After discharge home, 4.2% of patients recorded use of an antiemetic. The antiemetics used by patients were ondansetron (15 patients), a 5HT-3 antagonist; dexamethasone (6 patients), a steroid; diphenhydramine (3 patients), an antihistamine; and promethazine (67 patients), a butyrophenone (Figure 5-11). Only one patient recorded use of metoclopramide, a benzamide.

A wide variety of nonpharmacologic methods were reported by patients in order to relieve nausea. Only 3 patients reported use of acupressure wrist bands (0.1%), while 341

(15.7%) gradually moved from liquids to food, 471 (21.7%) took medication with food, 451 (20.8%) ate food to relieve or prevent nausea, 399 (18.4%) drank carbonated drinks, and 592 (27.3%) lay down to relieve the nausea. Other non-pharmacologic strategies for the relief of nausea that were reported by patients included resting/being still (154), stopping their medication (9), air conditioning or fresh air (16), wet washcloth or cold compress (10), deep breathing, relaxing (11), and letting it "go away by itself (23)."

Patients were divided into four groups according to use of pharmacologic and nonpharmacologic modalities. Of those patients who had severe nausea on the Day of Surgery (DOS), 34.1% were in Group 1 using neither antiemetics or nonpharmacologic means of nausea control. Over half of those with severe nausea on DOS (52.7%) used nonpharmacologic methods of control only, 1.4% used antiemetics only, and 3.2% used antiemetics and nonpharmacologic modalities. (See Table 5-3). By Day 3 the majority of patients with severe nausea were using the combination of antiemetics and nonpharmacologic methods of nausea relief. There was a significant difference in mean nausea scores among the 4 groups divided according to use of pharmacologic and nonpharmacolotic modalities (Figure 5-12). Post hoc comparisons using the Tukey HSD test indicated that the mean nausea score for Group 1 ($M = .4170$, $SD \pm 1.16$) was significantly less than Group 2 ($M = 1.6780$, $SD \pm 1.93$), Group 3 ($M = 2.0159$, $SD \pm 2.05$), and Group 4 ($M = 3.3952$, $SD \pm 2.49$). Less nausea was associated with patients in Group 1 than in Groups 2, 3, or 4. More nausea was associated with Group 4 than Groups 1, 2, or 3. There were no differences in mean nausea scores between Groups 2 and 3.

Outcomes

Quality of Life

Patients were asked to separately rate the effect of both nausea and vomiting on overall QOL. The mean score (0 = not at all and 10= most bothersome) for effect of nausea on overall quality of life for patients was significantly higher ($p \leq 0.002$) for those who did experience PDN than for those who did not. The significance was present on all days (Day of Surgery – Day 6). See Figure 5-13. When patients were asked to rate the effect of vomiting on QOL, the mean score on overall quality of life was significantly higher for those with PDV (meaning more bothersome) than those without PDV ($p < 0.001$). By Day 3, there was no longer a significant difference ($p = 0.164$). See Figure 5-14.

Patients were asked the degree to which nausea affected ability to eat and drink; do necessary activities and tasks; enjoy leisure and recreational activities; enjoy social activities; do normal work; and sleep. The QOL was significantly different based on nausea score in all areas

compared to those without PDN for every day post discharge ($p \leq 0.006$). By Day 6, only normal work ($p = .06$) and sleep ($p = .112$) were non-significant.

Post discharge vomiting significantly affected ($p < 0.001$) ability to eat and drink; do necessary activities and tasks; enjoy leisure and recreational activities; enjoy social activities; do normal work; and sleep until Day 3, when the effect of vomiting on each of these indicators of QOL was non-significant.

To further determine outcomes in patients with PDNV, patient expectation of PDNV, healthcare provider calls during the first week, and patient rating of prevention and treatment of nausea was documented.

Patient Expectation of PDNV

There was a significant difference in rates of nausea and vomiting based on patient expectation of PDNV. Patients were asked to rate the likelihood that they would experience nausea or vomiting (0 = not likely; 10 = likely; Figure 16) Patients who experienced nausea rated themselves before surgery as more likely to experience nausea ($M = 2.57$) than those patients who did not experience nausea ($M = 1.42$). Patients who experienced vomiting, as well, rated the likelihood they would experience vomiting as higher ($M = 2.06$) than those who did not experience it ($M = 1.30$).

Healthcare Provider Calls

Out of the seven day subset of patient ($N = 260$), 180 patients answered the question "Did you call your health care provider during this past week, and if yes, why?" Forty-six patients out of the 180 patients (25%) had called the physician or physician's office during the past week. However, only 2 patients (1.1%) called to report symptoms of nausea and vomiting. No patients were rehospitalized due to nausea and/or vomiting. In contrast 15 patients called regarding pain issues such as continuing pain or problems with the pain medication.

Patient Rating of Prevention and Treatment of Nausea

Patients were asked to compare how their recovery from surgery met their expectations before surgery. When asked to rate prevention and treatment of nausea between 0 and 10 with 0 (far worse than expected), 5 (as expected) and 10 (far better than expected), patient responded with an overall mean of 7.81. Patients without nausea rated treatment as significantly higher than those who did experience nausea ($p < 0.001$; Figure 17). Of patients who reported nausea, 19.5% rated treatment below expectations compared to 1.2% of patients without nausea who rated treatment as below expectations. Of patients who reported nausea, 80.5% rated treatment as expected or better than expected while 98.8% of those who did not report nausea rated treatment as expected or above expectations.

Discussion

The data in this study substantiate the continuing problem of nausea and vomiting after outpatient surgery, a population of patients that has been unrecognized and undertreated. [15, 16] The overall PDN incidence of 36.8%, PDV incidence of 12%, and overall PDNV rate of 37.1% falls within the published range of 30-55%.[4-6, 15, 19] Several demographic and clinical characteristics were significantly related to the PDNV in this study including female gender, use of postoperative opioids, a history of PONV or motion sickness. Some characteristics that are associated with PONV were not associated with this population of patients, e.g. nonsmoking status. We found that severity of PDNV peaks on the day of surgery and gradually decreases over the next 7 days. Sicker patients (higher ASA classification), those who experienced PONV in the PACU, patients with higher pain scores, and younger patients were more likely to experience PDNV. Only a small number of patients manage their symptoms with the use of antiemetics or nonpharmacologic modalties of care such as acupressure. Most patients use minor self-care treatments, e.g. cool cloths, lying down, drinking carbonated fluids, and do not contact a healthcare provider. Both PDN and PDV have a negative effect on the patient's perception of global QOL.

In this study we attempted to provide a real-world incidence of PDNV in a sample of patients who received general anesthesia for outpatient surgery by not excluding by procedure, dictating anesthesia regime, or stratifying by risk. The only high-risk inclusion criterion was use of inhalation anesthesia. This study focused on the ambulatory surgery population over a 7-day period describing incidence, severity, management strategies and quality of life. Without focusing specifically on patients at demographic or procedural high-risk, the overall incidence of PDNV was 37.1%. Other studies have established an overall PDNV incidence of 35.7% over a 5 day period [4], PDN of 57% in a control group versus 20% in a study group and PDV of 20% versus 3% for 5 days post discharge[15], a PDV incidence of 5 – 9% based on risk factor stratification (2 – 4 factors) at 24 – 72 hours[10], 17% PDNV in patients who received inhalation anesthesia and 11% in those with total intravenous anesthesia (TIVA)[43], 32.6% PDN and 14.7% PDV,[5] and in a systematic review and analysis, an overall PDN of 17% with a range of 0 to 55%. [19] Incidences of PDNV across studies are difficult to compare because of the varying patient samples, e.g. high risk patients, specific procedures performed, or using female gender only. Many of the studies that have reported PDNV in the past have reported PDNV as a secondary outcome or only assessed PDNV for the first 24 hours instead of the 7 days post discharge in our study.[15]

The incidences of PDN and PDV during the ride home have seldom been reported in the few studies available on PDNV [44], although Ernst and Thwaites reported 20% with nausea and 4% with vomiting during the ride home.[45] In our study, 21.8% of patients experienced PDN during the ride home and 4.6% experienced PDV. The incidence of PDN and PDV peaks after arrival home on the day of surgery to 28.6% PDN and 12%. After DOS the incidence of PDN and PDV decrease gradually until Day 7 when overall incidence is 6.3% of nausea and 1.2% emesis. Results from this study are similar to those reported in an abstract by Philip, et al.[46] who reported an incidence of PDN of 46% in high-risk patients during the first 24 hours after surgery decreasing to 8% on Day 7, and an incidence of PDV of 12% during the first 24 hours decreasing to 1% on Day 7. It is significant that even a week later some patients were still experiencing the negative symptoms of nausea and vomiting, a symptom that has been described by patients as worse than pain.[20 21]

Apfel et, al. determined that female gender, nonsmoking status, history of PONV or motion sickness, and use of perioperative opioids were strong predictors for PONV.[8] Using the Apfel simplified risk assessment tool, the risk for PONV increased from 10% for no risk factors to 79% if all 4 factors were present. Patients in this study who experienced PDNV were also more likely to be female, had a history of PONV, motion sickness or migraine headaches, undergone laparoscopic surgery, and spent more time in the OR during the procedure. Other differences that were significant were younger age, healthier patient status (ASA 1 status) and cholecystectomy. It is possible that cholecystectomy was significant because of the laparoscopic surgical approach which has been identified as related to PONV.[47]

Interestingly, nonsmoking status, strongly related to PONV,[8, 47] was not related to PDNV experienced in this study. As other studies have found, BMI, educational status, and income are not related to PDNV.[47, 48] Nitrous oxide or use of inhalation agents was not related to PDNV as has been found significantly related to PONV.[47, 49-52] This is more than likely due to the short acting effects of the volatile anesthetics. [50] One interesting finding in this study that has not been identified in other studies is that use of local anesthetic at the surgery site was significantly related to PDNV, and does merit further study. It is possible that more surgeons are using local anesthetics for pain control during surgery, so it may be related to care of the patient. It may be used for the more major surgeries in which we expect more pain, and therefore when it metabolizes in the first 24 hours, the patient experiences a spike in pain. In one study, patients who experienced PONV in the PACU were unlikely to experience PDNV[4], while Wright found that patients who experienced PONV in PACU were more likely to have PDNV.[53] In this study, we found that patients who experienced PONV in the PACU were significantly more likely to

experience PDNV. Use of intravenous opioids in the PACU was significantly related to PDNV until the third day post-surgery, and use of oral opioids was related to the presence of nausea on most days after discharge. This finding is similar to other studies, in which researcher have found postoperative opioids in the PACU linked to PONV.[8, 47] Use of short-acting opioids in the PACU should not be related to delayed PDNV. However, the use of those IV opioids in the PACU may be significant until Day 3 because patients who need IV opioids may continue to need an oral opioid after discharge home. However, use of hydrocodone was not associated with PDNV after Day 2 and oxycodone after Day 3. Patients with higher pain scores, however, were associated with higher pain scores. It is possible that patients who have stopped taking pain medication have higher pain scores and then a resulting increase in PDNV.[54]

Risk factors have not been identified for PDNV until now. Apfel, et al. using the data from this multi-site study recently determined predictors for a simplified assessment tool for early PDNV (48 hours after surgery).[3] The five statistically significant independent risk factors for PDNV for the first 48 hours are female gender, age less than 50 years, history of PONV, opioids administered in the PACU, and nausea in the PACU.[3] In this study, we determined factors that impact the presence of PDNV during Days 3 – 7 using logistic regression analysis. The final model included history of PONV, OR time and pain score. It is possible that the presence of nausea later post discharge has different causes than the PDNV that has resolved over the first 48 hours. Opioids given in the PACU or presence of PONV in the PACU are no longer significant factors. It is also possible that age was not in our final model for late PDNV because it correlated with pain, e.g. the younger the patient, the higher the pain score for those with late PDNV. The odds of having PDNV with severe pain are estimated to be 4.49 times as high as the odds of PDNV with no pain. It is interesting that OR time continues to be a factor for late PDNV. For every one hour of OR time the odds of PDNV are 1.86 times higher. We thought it possible that the more major surgeries were related to the OR time, and the patient may have a longer recovery based on type of surgery. However, even with OR times removed from the model and surgery type and approach added, neither surgery type nor surgical approach were significant. Thus, OR time is not acting simply as a surrogate for surgical procedure. The history of PONV continues as a factor for late PDNV. The odds of nausea are 2.9 times higher when one has a history of PONV.

Management Strategies

In this study, patients with PDNV were likely to use minor self-care strategies to manage symptoms. In the subset of patients who answered the question about calling the healthcare provider, only 2 persons with PDNV contacted a healthcare provider (HCP) for those symptoms. This is in line with results other researchers have found in patients with PDNV. Patients tend to manage symptoms themselves[4], seldom contact a HCP[4, 55], and stop taking pain management medication[16, 56].

Of significance in this study is that only 4.2% of patients recorded use of an antiemetic even though 37.1% recorded evidence of PDNV. Patients with the lowest mean nausea scores did not use antiemetics. Patients who do not have nausea or who have only mild cases of nausea may be less likely to take a pharmacologic modality or use any nonpharmacologic method of nausea control. The mean nausea level (0 – 10) for patients who used nonpharmacologic modalities only (Group 2) and patients who used antiemetics only (Group 3) were not significantly different from each other. Patients who had the highest mean for nausea were more likely to use both antiemetics and nonpharmacologic methods of controlling PDNV. In this study, patients who are experiencing severe nausea were more likely to take antiemetics for their symptoms. We were able to determine that a small percentage of patients who have PDNV actually take antiemetics for control of symptoms. Many studies that have reported incidences of PDNV are interventional studies with anesthetic routine pre-prescribed. It is significant that in a real-time environment only 9.7% of patients who had PDNV actually took an antiemetic.

We do not know the percentage of patients who actually went home with a prescription for an antiemetic. This information should be obtained in any future studies. Also of note is the fact that only 3 patients recorded use of acupressure or acustimulation bands which have been found to decrease incidence of PDNV in studies.[57, 58] Future guidelines for care of the patient with PDNV should suggest appropriate antiemetics for patients at risk for PDNV, and any algorithm for care of the patient with PDNV should include nonpharmacologic methods of nausea control such as acupressure. These patients relied on self-care techniques as shown in other studies, sometimes to the detriment of care, such as stopping pain medication.[16]

Outcomes

We found that nausea was significantly related to overall QOL on every day post discharge and that vomiting was significantly related to overall QOL until Day 3. Other studies have shown a negative relationship of PDNV and QOL. Pan found that 33% of the study group and 60% of the control group were negatively affected by emetic symptoms.[15] Carroll found that patients who experienced PDNV were negatively affected in performing normal daily activities.[4] Few studies have related QOL questions specifically to nausea or vomiting. When quality of recovery is studied, typically QOL is related to a number of outcome measures. For example, the Quality of Recovery Score has nine questions with only one related to nausea and vomiting.[36] The FLIE focuses on nausea and vomiting, but does not incorporate other QOL indicators that would aid in determining the effect of PDNV on patient QOL.[15]

Nausea affected patients' ability to eat and drink; do necessary activities and tasks; enjoyment of leisure and recreational activities; and enjoy of social activities on all 7 days. Ability to do normal work and ability to sleep were affected until Day 6. Vomiting affected all QOL questions until Day 3 which correlates with the decrease in incidence of vomiting. It is clear that some patients are affected by nausea up to one week after surgery.

PDNV does affect patient satisfaction with treatment. Interestingly, though, even the patient with PDNV rated their treatment as 6 on a scale of 0 – 10 (0 as far worse than expected, 5 as expected, and 10 far better than expected). Patients without PDNV had a higher satisfaction with a rating of 8.8. However, even a rating of 6 is better than expected on the scale used by the patient. This could mean that some patients believe that PDNV is to be expected after surgery, or that the PDNV experienced by the patient was less than expected.

Research Implications

Future studies should focus on patient education needs related to PDNV and use of risk assessment tools for PDNV. Future studies should include determination of a detailed patient education program and its effectiveness. More research should be conducted to determine the relationship of pain and PDNV including the association of post discharge opioids. Barriers to patient decision to take pain medication and antiemetic medication should be determined. It is imperative that randomized controlled trials that determine appropriate long-term antiemetics and non-pharmacologic methods to control nausea and vomiting are conducted. Other factors of interest that need to be studied are patient anxiety and how it relates to PDNV, patient comprehension of discharge instructions, and ability to discern appropriate strategies for self-

care. Research should be conducted to determine instruments with validity and reliability to accurately capture the effect of nausea or vomiting on QOL.

Practice Implications

Patients should be screened for risk of PONV and treated according to published guidelines based on risk factors. With further identification of PDNV risk factors, ambulatory surgery patients should be screened for risk of PDNV. Prophylactic interventions for PDNV, such as transdermal scopolamine; longer acting 5HT3 receptor antagonists, such as palonsetron; promethazine suppository; ondansetron dissolving tablet; or NK1 receptor antagonist agent, such as aprepitant should be available and incorporated into any guideline for care. Nonpharmacologic interventions should be available and taught to the patient, such as acupressure. A rescue antiemetic should be prescribed upon discharge as part of the medication regimen for the post discharge patient. Effective pain medication of the patient who is discharged is imperative, as well as assuring that the patient understands the importance of taking the medication. Patient education is imperative. This study did not obtain information that related to the quality of discharge instruction, but adding information on treatment of PDNV to patients before discharge is suggested. The anesthesia department should become a larger partner with the surgeon when determining effective post discharge care of pain and nausea and other anesthesia related symptoms. An appropriate follow-up program should be in place in all healthcare facilities.

Limitations

Limitations to this study include the differences between the 48-hour sample and the 7-day sample. The 48- hour sample was comprised of 2140 patients from 12 sites across the United States. On Day 3, the sample decreased to 260 patients from two sites. The 7-day sample was significantly more likely to experience PDNV. This may be related to the higher percentages of females to males; history of PONV; cholecystectomies performed; and laparoscopic incisional approach which are all risk factors for PDNV. It is also possible that patients were treated differently in the 2 centers preoperatively and intraoperatively that may have contributed to the differences in samples. However, both sites had differing populations; one a university setting, and the other a private hospital. And the smaller sample (N = 260) was powered to detect significant group differences between those with PDNV and those without.

The sample was a convenience sample, although purposeful with consecutive patients who met inclusion criteria recruited for the study. The study could be replicated using random assignment of patients who met inclusion criteria. However, the sample was large and from

multiple centers across the U.S. and should give a real-life picture of the incidence and severity of PDNV, management strategies, and QOL outcomes for a week-long period of time.

Questions used to obtain patient QOL have undergone face validity, but no further validity or reliability testing. The statements were taken from the literature by experts and are similar to statements in other instruments, e.g. modified Osoba module[11, 59], FLIE,[15, 60] but have not specifically been tested in the postoperative population.

Summary

The incidence of PDNV continues to be unacceptably high in a population of patients who until recently have flown beneath the anesthesia, surgical, and perioperative radar. There are some patients who suffer with PDNV up to a week after surgery. The majority of these patients are not taking any antiemetic or using productive nonpharmacologic methods of symptom control. Quality of life is affected by these symptoms for several days after surgery. A directed patient education program may be helpful in instructing patients in medication compliance, how to manage PDNV symptoms as well as other anesthesia outcomes, and informing patients on an appropriate follow-up with the healthcare provider.

Table 5.1 Demographic and Clinical Characteristics

	DOS – 48 hours N = 1910	DOS – 7 days N = 260	*P* value	Total N = 2170
Demographics				
Age				
Mean ± SD	49.19 ± 15.46	51.99 ± 14.71	0.006	49.52 ± 15
Median	49.0	53.5		50
Range	17 - 90	19 - 87		17 - 90
BMI		28.99 ± 6.6	.10	
Mean ± SD	28.24 ± 6.9	27.62		28.33 ± 6.9
Median	26.65	17.6 – 57.7		
Range	14.5 – 63.7			14.5 – 63.7
	N (%)	N (%)		
Gender				
Female	1220 (63.9)	184 (70.8)	0.029	1404 (64.7)
Male	690 (36.1)	76 (29.2)		766 (65.3)
Ethnicity				
African-American	185 (9.7)	24 (9.2)	<0.0001	209 (9.6)
Asian	69 (3.6)	-		69 (3.2)
Caucasian	1371 (71.8)	224 (86.2)		1595 (73.5)
Latino	108 (5.7)	3 (1.2)		111 (5.1)
Other	177 (9.3)	9 (3.5)		186 (8.6)
Educational level				
High school	282 (14.8)	96 (36.9)	<0.001	378 (17.4)
College	764 (40)	139 (53.5)		903 (41.6)
Graduate degree	204 (10.7)	13 (5.0)		217 (10)
None of these	37 (1.9)	5 (1.9)		42 (1.9)
Did not answer	622 (32.6)	7 (2.7)		529 (20)
Income level				
<$25,000	196 (10.3)	32 (12.3)	<0.0001	228 (10.5)
$25, 000 - $50,000	242 (12.7)	58 (22.3)		300 (13.8)
$50,000 - $75,000	202 (10.6)	53 (20.4)		255 (11.8)
$75,000 - $100,000	200 (10.5)	48 (18.5)		248 (11.4)
>$100,000	292 (15.3)	47 (18.1)		339 (15.6)
Did not answer	777 (40.7)	22 (8.5)		799 (36.8)
Clinical Characteristics				
Smoker				
No	1619 (84.8)	221 (85)	.994	1840 (84.8)
Yes	291 (15.2)	39 (15)		330 (30.2)
Previous PONV				
No	1317 (69)	150 (57.7)	<0.0001	1467 (76.6)
Yes	526 (27.5)	110 (42.3)		636 (69.8)
Previous motion sickness				
No	1433 (75)	187 (71.9)	.316	1620 (74.7)
Yes	477 (25)	73 (28.1)		550 (53.1)
History migraine headaches			.987	
No	1462 (76.5)	199 (76.5)		1661 (76.5)
Yes	447 (23.4)	61 (23.5)		508 (46.9

Table 5.1 (Continued) Demographic and Clinical Characteristics

	DOS – 48 hours N = 1910	DOS – 7 days N = 260	*P* value	Total N = 2170
Clinical Characteristics				
Procedures				
General	402 (21)	39 (15)	<0.0001	441(20.3)
Breast	195 (10.2)	28 (10.8)		223(10.3)
Cholecystectomy	61 (3.2)	35 (13.5)		96(4.4)
Cystoscopy	121 (6.3)	10 (3.8)		131 (6.0)
D&C	159 (8.3)	24 (9.2)		183 (8.4)
ENT	169 (8.8)	17 (6.5)		186 (8.6)
Gynecologic	216 (11.3)	22 (8.5)		238(11.0)
Hernia	69 (3.6)	21 (8.1)		90 (4.1)
Knee arthroscopy	190 (9.9)	40 (15.4)		230 (10.6)
Orthopedic	125 (6.5)	7 (2.7)		132 (6.1)
Prostate	75 (3.9)	3 (1.2)		78 (3.6)
Upper extremity	127 (6.6)	14 (5.4)		141 (6.5)
Surgical Approach				
Conventional	1031 (54)	96 (36.9)	<0.0001	1127 (51.9)
Arthroscopic	253 (13.2)	51 (19.6)		304 (14.0)
Endoscopic	409 (21.4)	42 (16.2)		451 (20.8)
Laparoscopic	216 (11.3)	71 (27.3)		287 (13.2)
ASA Status				
ASA 1	388 (20.3)	44 (16.9)	0.037	432 (19.9)
ASA 2	1145 (59.9)	179 (68.8)		1324 (61)
ASA 3	368 (19.3)	37 (14.2)		405 (18.7)
ASA 4	8 (0.4)	-		8 (0.4)
OR Time in Hours				
Mean $\pm$ SD	1.71 + .868	1.40 $\pm$ .723	<0.0001	1.67
Median	1.53	1.18		1.48
Range	0.22 – 11.20	0.48 – 5.15		0.22 – 11.20
Presence of PDNV				
No	1235 (65.5)	107 (43.1)	<0.001	1335 (62.8)
Yes	649 (34.5)	141 (56.9)		790 (37.2)
Mean Nausea Scores				
Mean + SD	.8506 $\pm$ 1.60	1.491 $\pm$ 2.10	<.001	.9274 $\pm$ 1.68
Median	0	.50		0
Range	0 - 10	0 – 8.67		0 - 10

DOS = Day of Surgery; PONV = Postoperative nausea and vomiting; D & C = Dilatation and Curettage; ENT = Ear, Nose, and Throat; ASA = American Society of Anesthesiologists; OR = Operating Room; PACU = Post Anesthesia Care Unit

Table 5.2 Demographic and Clinical Characteristics of Patients with PDNV and without PDNV

	PDNV	No PNDV	*P* value
Demographics			
Age			
Mean ± SD	44.93 ± 14.60	52.29 ± 15.23	<0.001
Median	44.0	53.0	
Range	17 - 88	18 - 90	
BMI			.247
Mean ± SD	28.57 ± 7.05	28.21 ± 6.89	
Median	26.96	26.65	
Range	14.53 – 58.72	15.35 – 63.70	
	N (%)	N (%)	
Gender			
Female	598 (43.4)	780 (56.6)	<0.001
Male	192 (25.5)	562 (74.5)	
Ethnicity			
African-American	76 (37.8)	125 (62.2)	≤0.029
Asian	32 (47.1)	36 (52.9)	
Caucasian	580 (36.9)	992 (63.1)	
Latino	49 (45.0)	60 (55.0)	
Other	53 (29.1)	129 (70.9)	
Educational level			
High school	137 (37.0)	233 (63.0)	.990
College	331 (37.4)	554 (62.6)	
Graduate degree	78 (35.9)	139 (64.1)	
None of these	16 (38.1)	26 (61.9)	
Did not answer	228 (37.0)	389 (63.0)	
Income level			
<$25,000	90 (40.4)	133 (59.6)	.642
$25, 000 - $50,000	113 (38.6)	180 (61.4)	
$50,000 - $75,000	87 (34.7)	164 (65.3)	
$75,000 - $100,000	95 (39.1)	148 (60.9)	
>$100,000	115 (34.4)	219 (65.6)	
Did not answer	290 (36.8)	497 (63.2)	
Clinical Characteristics			
Smoker			
No	662 (36.6)	1145 (63.4)	.345
Yes	128 (39.4)	197 (60.6)	
Previous PONV			
No	469 (32.6)	969 (67.4)	<0.001
Yes	297 (47.3)	331 52.7)	
Previous motion sickness			
No	544 (34.3)	1044 (65.7)	<0.001
Yes	246 (45.2)	298 (54.8)	
History migraine headaches			
No	561 (34.4)	1071 (65.6)	<0.001
Yes	229 (45.9)	270 (54.1)	

Table 5.2. (Continued) Demographic and Clinical Characteristics of Patients with PDNV and without PDNV

Clinical Characteristics			
	PDNV	No PNDV	*P* value
Procedures			
General	140 (32.2)	295 (67.8)	<0.001
Breast	79 (35.9)	141 (67.9)	
Cholecystectomy	62 (66.0)	32 (34.0)	
Cystoscopy	36 (27.5)	95 (76.5)	
D&C	66 (37.3)	111 (62.7)	
ENT	61 (33.5)	121 (66.5)	
Gynecologic	103 (43.6)	133 (56.4)	
Hernia	28 (32.2)	59 (67.8)	
Knee arthroscopy	104 (46.0)	122 (54.0)	
Orthopedic	46 (35.9)	82 (60.6)	
Prostate	11 (14.1)	67 (85.9)	
Upper extremity	54 (39.4)	83 (80.6)	
Surgical Approach			
Conventional	385 (34.8)	720 (65.2)	<0.001
Arthroscopic	131 (43.7)	169 (56.3)	
Endoscopic	126 (28.4)	318 (71.6)	
Laparoscopic	148 (52.5)	134 (47.5)	
ASA Status			
ASA 1	184 (43.3)	241 (47.2)	<0.001
ASA 2	493 (37.9)	807 (62.1)	
ASA 3	111 (35.8)	287 (72.1)	
ASA 4	2 (25)	6 (75)	
OR Time in Hours			
Mean $\pm$ SD	1.74 $\pm$ .913	1.63 $\pm$ .811	<0.01
Median	1.48	1.46	
Range	.42 – 11.20	.22 – 7.15	
Regional Block			
No	603 (34.7)	1137 (65.3)	<0.001
Yes	187 (47.7)	205 (52.3)	
Nitrous oxide			
No	701 (36.5)	1222 (63.5)	.08
Yes	89 (42.6)	89 (42.6)	

DOS = Day of Surgery; PDNV = Post discharge nausea and vomiting; PONV = Postoperative nausea and vomiting; D & C = Dilatation and Curettage; ENT = Ear, Nose, and Throat; ASA = American Society of Anesthesiologist; OR = Operating Room; PACU = Post Anesthesia Care Unit

Table 5.3 Significance Levels for Final Logistic Regression Model

Variable	df	Deviance	Likelihood Ratio	p-value
Intercept		214.715		
Previous PONV	1	224.517	9.802	0.0017
OR Time	1	222.615	7.900	0.0049
Pain Factor	3	241.005	26.290	<0.0001

Table 5.4 Estimated Regression Coefficients

Variable	Estimated Log Odds	Standard Error of Log Odds	Estimated Odds Ratio	Lower CI limit for Odds Ratio	Upper CI limit for Odds Ratio
Previous PONV	1.0662	0.3475	2.90	1.47	5.74
OR Time	0.6209	0.2275	1.86	1.19	2.91
Mild Pain	1.5968	0.6614	4.94	1.35	18.05
Moderate Pain	2.3417	0.6635	10.40	2.83	38.17
Severe Pain	2.9183	0.7230	18.51	4.49	76.35

Table 5.5 Pain Level and Presence/Absence Nausea in Days 3-7

	No late Nausea	Some late Nausea
No Pain	67 (95.7%)	3 (4.3%)
Mild Pain	71 (80.7%)	17 (20.3%)
Moderate Pain	42 (56.0%)	33 (44.0%)
Severe Pain	15 (53.6%)	13 (46.4%)

Table 5.6 Percentages of Patients with Severe Nausea who Used Pharmacologic and Non-Pharmacologic Methods of Nausea Control

Days Post Surgery Severe Nausea (% of Total Severe Nausea)	Group 1 No AE No NP	Group 2 No AE Yes NP	Group 3 Yes AE No NP	Group 4 Yes AE Yes NP
Day of Surgery (12.8%)	30%	55%	1.8%	13.2%
Day 1 (4.6%)	27%	53%	2%	18%
Day 2 (2.8%)	26.2%	50.8%	4.9%	18%
Day 3 (4.5%)	25%	25%	0	50%
Day 4 (2.3%)	0	33.3%	0	66.7%
Day 5 (1.9%)	0	40%	0	60%
Day 6 (2.7%)	0	42.9%	0	57.1%
Day 7 (2%)	20%	0	20%	60%

AE = Antiemetics; NP = Nonpharmacologic modalities

Figure 5.1 Overall Incidence of Patients With PDNV

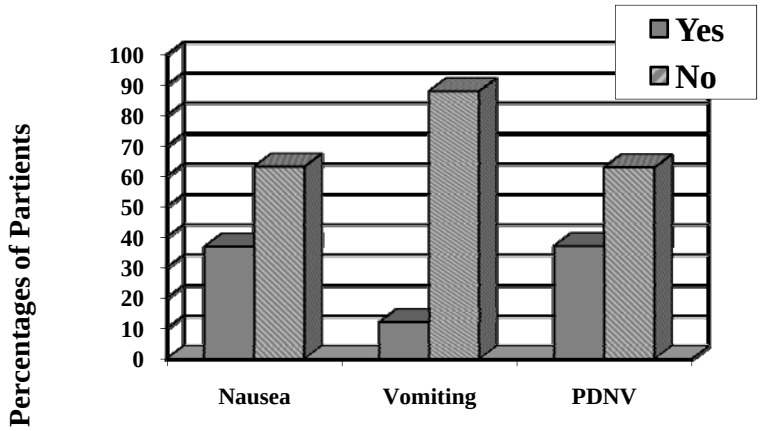


Figure 5.2 Incidence of Patients With Post Discharge Nausea and Vomiting By Day in Overall Study (N = 2170)

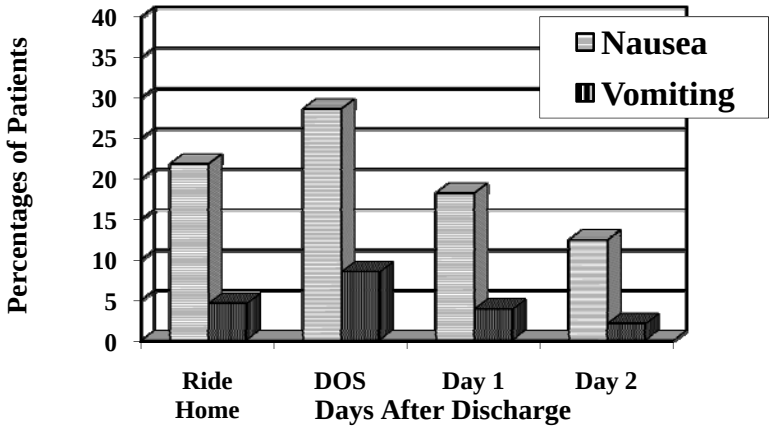


Figure 5.3 Incidence of Post Discharge Nausea and Vomiting in 7-Day Study (N = 260)

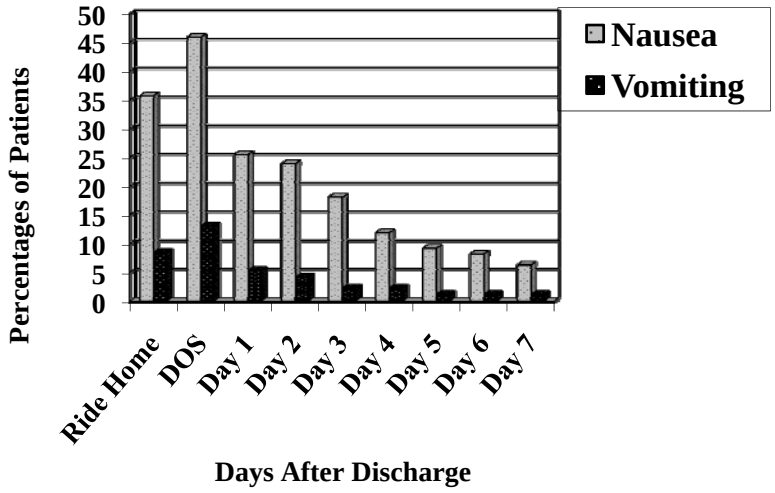


Figure 5.4 History of PONV, Motion Sickness, Or Migraines on Mean Scores of Nausea

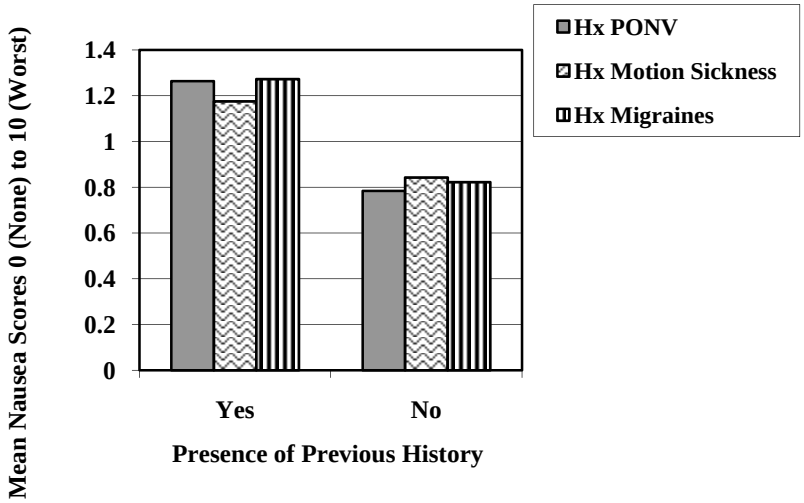


Figure 5.5 Severity of Nausea for 7 Days

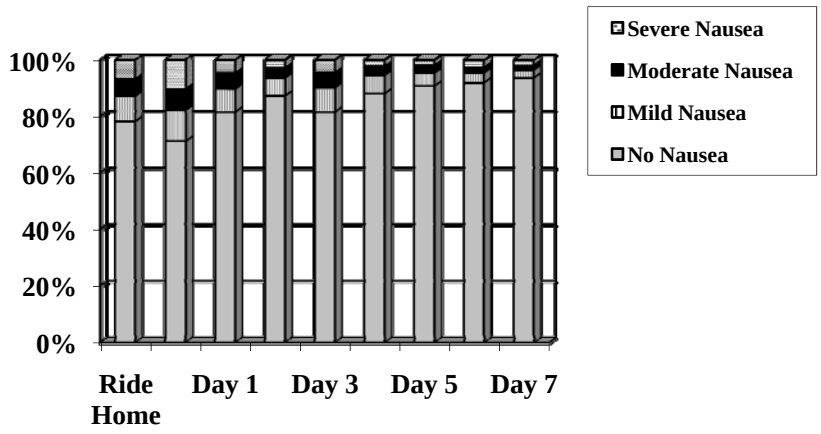


Figure 5.6 Nausea of Males and Females Over 7 Days on a 0 - 10 Scale

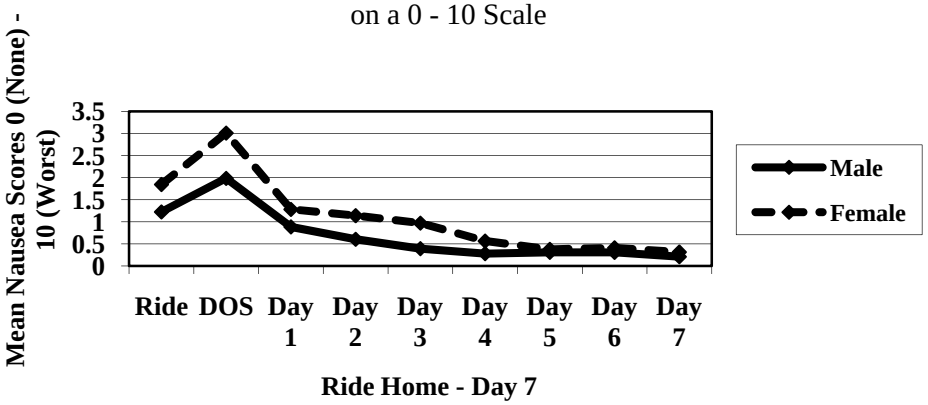


Figure 5.7 Mean Nausea Scores by 3 Age Groups

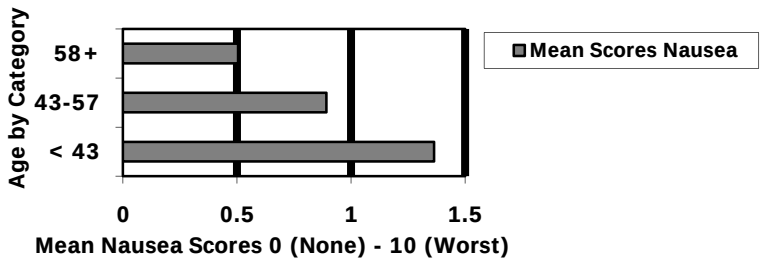


Figure 5.8 Mean Nausea Scores by Surgical Procedure

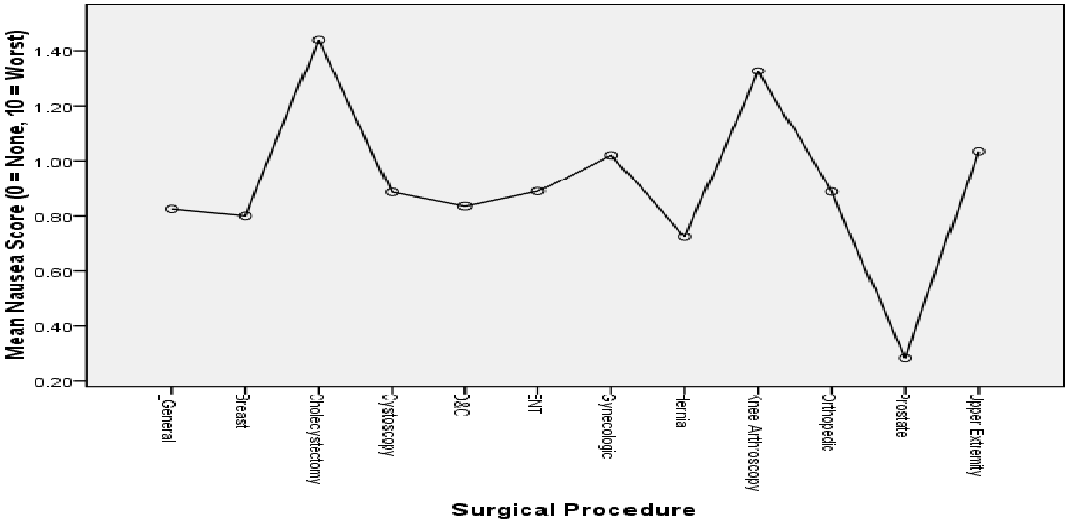
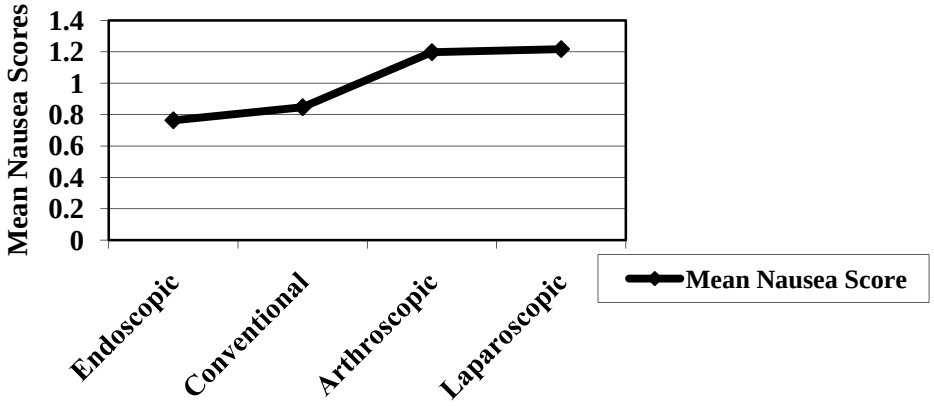


Figure 5.9 Mean Nausea Score by Surgical Approach



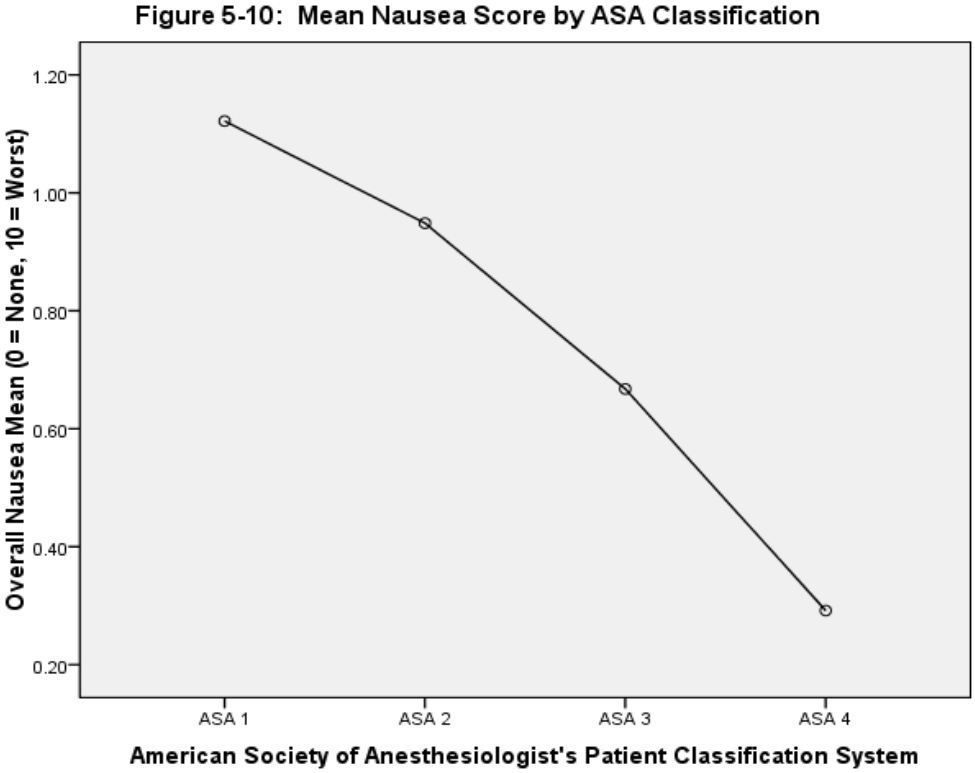
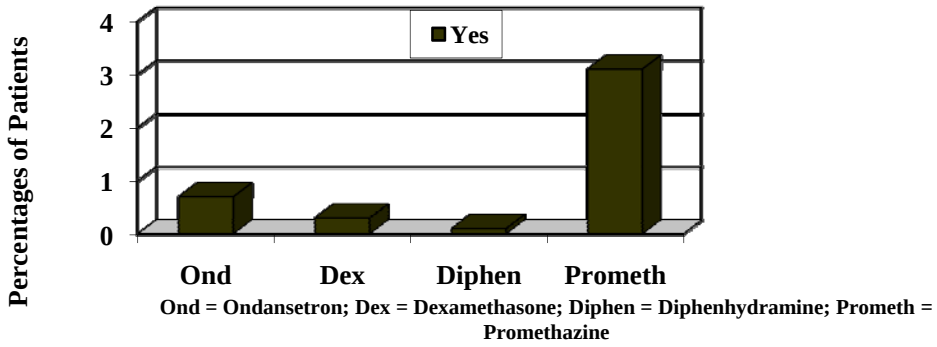


Figure 5.11 Percentages of Antiemetics Used After Discharge



Ond = Ondansetron; Dex = Dexamethasone; Diphen = Diphenhydramine; Prometh = Promethazine

Figure 5-12: Use of Antiemetics (AE) and Nonpharmacologic Modalities of Care on Mean Nausea Score

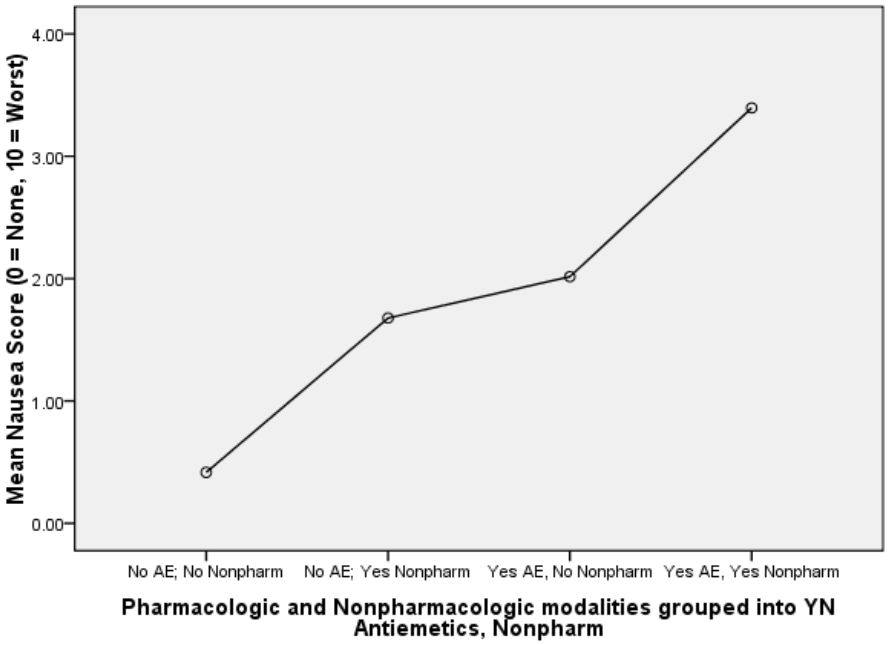


Figure 5.13 Mean Effect of Nausea on Overall Quality of Life
(0 = None, 10 = Most Bothersome)

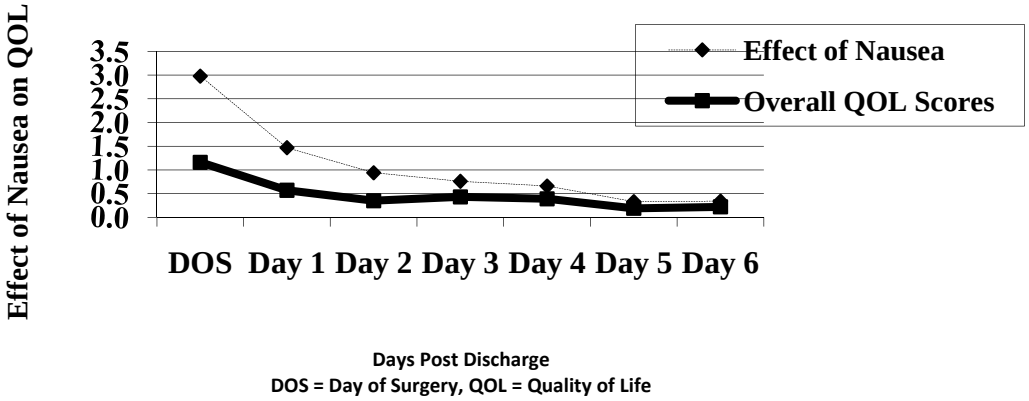


Figure 5.14 Effect of Vomiting on Overall Quality of Life
(QOL) Mean Scores

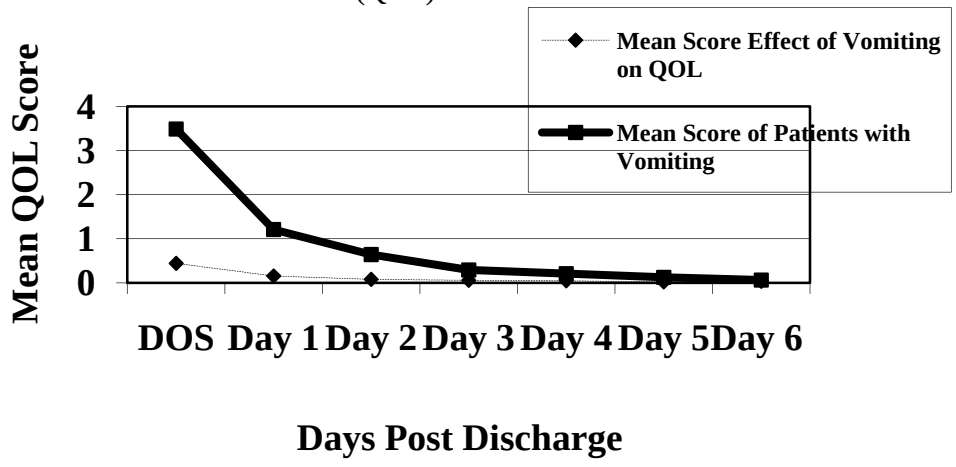


Figure 5.15 Expected Likelihood of Post Discharge Nausea or Vomiting
(0 = Not Likely, 10 = Very Likely)

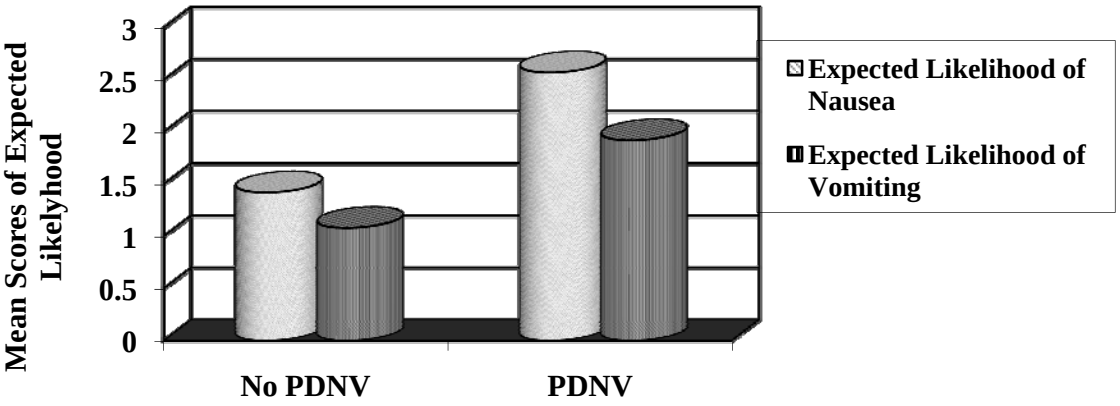
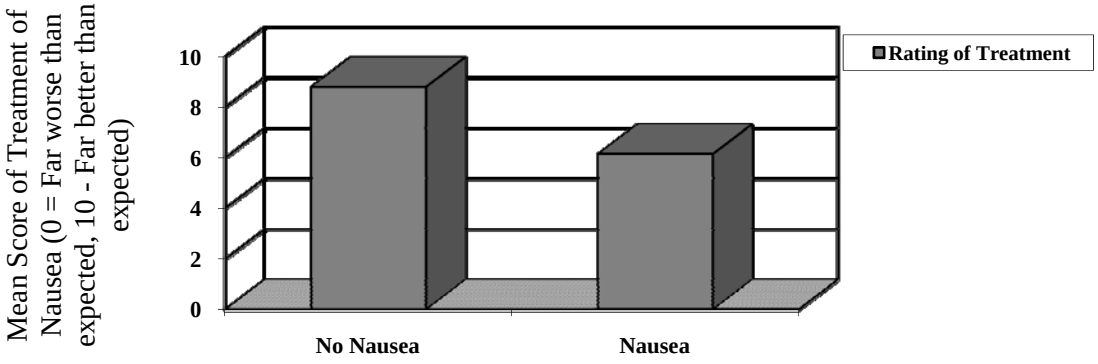


Figure 5.16 Mean Score of Rating of Treatment of Nausea by Those With and Without PDNV



CHAPTER SIX

Conclusions and Discussion

The purposes of this dissertation were to (1) review the current knowledge in the area of post discharge nausea and vomiting; (2) present results of an integrative review of the research literature to determine best evidence for prevention of PDNV in adults or rescue of patients who suffer from post discharge nausea and vomiting (PDNV); (3) present a critical review and analysis of measurement of nausea and vomiting after discharge from outpatient surgery, and (4) present findings of a prospective research study. The purposes of the empirical research study conducted as part of this dissertation were to: 1) describe the incidence and severity of PDNV over a 7-day period in a sample of adult surgical patients undergoing outpatient surgeries under general anesthesia, 2) describe the pharmacologic and nonpharmacologic modalities of care used by patients with PDNV to manage it, 3) compare the incidence and severity of PDNV between those who do and do not use pharmacologic and nonpharmacologic modalities, 4) determine outcomes associated with PDNV, and 5) determine predictions for late (Days 3-7) PDNV.

In this dissertation, four papers are presented, two of which have been published to date. In the first paper, current knowledge of PDNV was systematically reviewed.[2] We found that PDNV had not been assessed and evaluated as thoroughly as postoperative nausea and vomiting (PONV). It was evident from the literature review, that covered a decade of studies, that patients have continued to have problems with nausea and vomiting upon discharge. We do not know how those symptoms impact the patient's recovery, how extensive the delay in recovery is due to the symptoms, or the costs attributable to these symptoms.[3] Suggestions for research based on this systematic review included study of (1) antiemetic efficacy in the post discharge setting, (2) the effectiveness of a detailed education program to manage symptoms for these patients, and (3) economic impact of the symptoms.

In the second paper, interventions for PDNV in the outpatient surgery population were specifically targeted.[4] In the paper an integrative review was presented in which the evidence for prevention of PDNV in adults or for the rescue of patients who suffer from PDNV was reviewed. The evidence included information on the association of anesthetic techniques (e.g. total intravenous anesthesia was associated with decreased PDNV for the first 24 hours, but not 14 days later), antiemetics (e.g. use of transdermal scopolamine as an effective antiemetic for the outpatient), and pain medication (e.g. patients who received morphine in PACU were more likely to have PDNV at 24 hours than those who received fentanyl) with PDNV incidence. The paper also included several studies in which nonpharmacologic methods of controlling nausea and vomiting were included, (e.g. acupuncture/acustimulation and ginger). We found that there was a

paucity of nursing research focused on PDNV. Since physicians have focused on research that requires a treatment regime intraoperatively, we concluded that nurse researchers could conduct studies on the effectiveness of patient or caregiver education, preoperative anxiety, interactions of pain and pain medication, and non-pharmacologic methods of relief. We also suggested that nurse researchers collaborate with medical researchers to determine the best antiemetics for use in the postdischarge setting or the most appropriate medication for pain relief in the postdischarge setting that will alleviate pain, but cause less PDNV.

The third paper was a critical review and analysis of the literature on measurement of patient nausea and vomiting after discharge from outpatient surgery and in which we discussed relevant needs in the area of measurement. In that paper, we determined there was a lack of standardized definitions of PONV and PDNV, of psychometrically sound instruments to measure PONV and PDNV, and a reliance on investigator developed instruments used in only one study. Assessment of nausea and vomiting has been inconsistent throughout studies. For example, there is not only inconsistency with the definition of PONV and PDNV per study, but also differing definitions of the basic terms, nausea, vomiting and retching, with some researchers measuring each entity separately and others considering all as emetic episodes. That inconsistency has contributed to the difficulty comparing study findings. We found that there are no clear and standardized instruments in use to measure the phenomena of PDNV. There were two instruments found with adequate psychometric properties, the ambulatory surgery-inventory of nausea vomiting and retching (AS-INVR) and the functional living inventory-emesis (FLIE), whose use will provide the possibility of standardizing assessment of PDNV symptoms in research studies. Most of the psychometric testing for these instruments was in the chemotherapy population. Although these two instruments both possess strengths, more study is needed to progress the measurement of nausea and vomiting in the post discharge ambulatory surgery patient.

The fourth paper was the results of a research study in which we described the incidence and severity of PDNV in adult outpatients after ambulatory surgery. In the study we also describe the pharmacologic and nonpharmacologic modalities of care used by patients with PDNV to manage it, compare the incidence and severity of PDNV between those who do and do not use pharmacologic and nonpharmacologic modalities, and determine outcomes associated with PDNV.

We found that over one third of ambulatory surgery patients experience PDNV. With over 34 million patients undergoing ambulatory surgery annually in the U.S. alone, that translates to millions of patients who go home after surgery and suffer these post discharge symptoms of

nausea and vomiting. We found that PDNV peaks on the day of surgery and continues to decrease over the week; however, some patients are still experiencing PDNV one week after discharge home. Predictors for early PDNV (48 hours) were determined recently by investigators using data from this study as: female gender, age less than 50 years, history of PONV, opioids administered in the PACU, and nausea in the PACU. We determined that predictors for late PDNV (history of PONV, OR time and pain score) were somewhat different than early predictors.

Even though 37.1% of our patient experienced PDNV, only 4.2% of those patients used antiemetics for management of symptoms. Most patients self-managed at home with lying down, carbonated drink intake, and taking medication with food. Some patients stopped taking their pain medication, and only 3 patients in the study used acupressure bands. Those who did use antiemetics had a higher mean nausea score than those who did not. Only two patients out of 180 who responded to the question called their healthcare provider for PDNV symptoms.

We found that PDNV negatively affected the mean quality of life (QOL) scores. PDNV affected the patients' ability to eat and drink, to sleep, to socialize and to perform activities of daily living. We also found that patients who expected to have nausea or vomiting were more likely to experience nausea and vomiting. Patients with PDNV rated their satisfaction with treatment as lower than patients who did not have PDNV.

Implications for the Future

Nausea and vomiting after surgery has been a long-term problem that began with hospitalized patients after surgery and moved out into the home with the advent of ambulatory surgery. There is a death of literature that describes this phenomenon.[2, 4] In this study we addressed the issue of PDNV with the first long-term multi-site study to focus on a description of this phenomena since Carroll, et al.[5] What we discovered was that over one third of ambulatory surgery patients suffer from PDNV after discharge. That tells us there has been no progress in relieving those symptoms since the first report in 1995 in which 35.7% of participants experienced PDNV.[5]

Research Recommendations

Systematic inquiry to discover appropriate venues of prevention and treatment for patients who suffer from PDNV is needed. Patients with PDNV are typically unseen and unheard. These patients tend not to call a healthcare provider during the week after surgery, but try to manage symptoms with self-care, or they may report the symptoms to the surgeon, and the information never gets back to the anesthesia team.[6] Imperative to further research conducted in

this population of patients is clear definition and measurement of research terms. Inconsistency with assessment and measurement of nausea, vomiting, and retching throughout studies has made it difficult to compare study results in the area of PDNV. PDNV should clearly be defined as nausea and vomiting after discharge from the healthcare facility. Studies of PDNV should follow patients for at least 48 hours after discharge. In this dissertation, we discovered that 6.3% of patients had symptoms of nausea up to a week after surgery, so long-term studies are also needed to further describe this smaller segment of PDNV population.

Reliable and valid instruments are not consistently used in studies with patients who have PDNV, although use of the visual analogue scale (VAS), verbal descriptor scale (VDS), and numerical rating score (NRS) is common, and use of these instruments has been described as valid and reliable by other researchers.[7-10] More studies should be performed using the two established instruments, Ambulatory Surgery-Inventory of Nausea, Vomiting, and Retching (AS-INVR) and Functional Living Index-Emesis (FLIE), to establish normative values, timing needed to complete the instrument, and grade level. The AS-INVR and the FLIE provide the possibility of standardization of outcome for studies with those patients.[11-14] In all studies on PDNV, reliability and validity of instruments should be reported. Researchers should also determine whether it is more effective for the patient to rate PDNV on a daily basis, at 12- hour intervals, or shorter intervals after arrival home.

Further research needs to be conducted into the newer specific drugs that are available for care in the PDNV population. The short-acting antiemetics that are given typically in the PACU before patient discharge do not protect against PDNV once the patient is home. Some work has begun in this area with recent studies on palonosetron, a 5HT-3 receptor antagonist much like ondansetron, but longer-acting.[15,16] Other drugs that possibly will protect against PDNV include transdermal scopolamine,[17] promethazine suppositories,[18] ondansetron dissolving tablets (ODT)[19, 20], and aprepitant, a new NK-1 receptor antagonist.[21, 22] Researchers should focus on nonpharmacologic means to manage symptoms of PDNV including, but not limited to acupressure, acupuncture, [23]acustimulation,[24, 25] imagery, music therapy, distraction, relaxation, aromatherapy, and use of ginger.[26] There is little research to document effectiveness in the PDNV population, but some of the nonpharmacologic methods have shown potential. These nonpharmacologic means of control could work in conjunction with antiemetics to resolve symptoms of PDNV.

Through research, we should develop an algorithm to guide management of PDNV.[6] At the present time, only one practice guideline attempts to guide management of PDNV. An algorithm to guide care for PDNV would use the predictors determined by Apfel, et al. to assess

patients for risk. Then the patient could be assigned treatment based on risk. That same algorithm could make recommendations for anesthesia care based on patient risk as available algorithms for PONV do presently, e.g. total intravenous anesthesia (TIVA) instead of volatile anesthetics.[27, 28] That same algorithm could then drive rescue treatment in the PACU. Assessing patient risk before surgery is extremely important because three of the medications are effective in this population of patients require administration before surgery for adequate prophylaxis (i.e., aprepitant, palonsetron, transdermal scopolamine). Then the algorithm can guide rescue treatment in the PACU and then later at home.

There are other areas of research that could be advanced. Only one group of investigators tested a patient education intervention designed to compare the efficacy of existing generic education instructions with specially designed procedure-specific instructions.[29] Patients in both groups felt they received adequate discharge instructions, so there was no significant difference between groups. However, other researchers have pointed out the need to improve preoperative patient teaching, including topics of drug and nondrug interventions.[30] In PDNV studies, patients have attempted to self-manage symptoms, so research that looked at self-efficacy issues would be appropriate. Genetic and other molecular biological patient characteristics that predispose a patient to PDNV need to undergo research.[31]

Many of the research suggestions mentioned above could be conducted by nurses in a nursing research program. Some of the research suggestions could be conducted with nurses as part of a research team including pharmacy, anesthesia and surgery for the total care of the patient.

Research of PDNV symptoms could be part of a larger program that focuses on all discharge symptoms experienced by the patient after ambulatory surgery. These symptoms include, but are not limited to pain,[32-34], the emetogenic role of opioids in PDNV,[35] somnolence or level of sedation, bleeding, dizziness, fatigue, headache, backache, sore throat, hoarseness, elevated temperature and voiding difficulty. Also of importance is how the patient symptoms affect the quality of recovery including ability to drink liquids, eat, make meals, do recreation/leisure activities, interact with family and friends, affect daily functions, and affect ability to return to work.[36-40] This research has focused on the adult population. Research should also continue in the pediatric population because PDNV affects children as well as adults.

Clinical Recommendations

Specifically for nursing, the preanesthesia nurse in the ambulatory setting is a part of the anesthesia team and can assess the patient for risk, as well as collaborate with the team for management of PONV and PDNV. If the patient has come in for preadmission testing before the day of surgery, this is a perfect opportunity for the nurse to assess the patient early for the risk of PDNV and to also provide specific patient education for management of symptoms at home should they occur. In the PACU, the postanesthesia nurse, also a part of the team, assesses the patient for PONV, and assesses the severity of nausea when it does occur. That nurse is also a vital member of the anesthesia care team and collaborates in making treatment recommendations for the patient. The nurse in the postanesthesia phase II unit prepares the patient for discharge home which includes patient education for the patient and caregiver. This is another point of care where the nurse can provide education and support for management of symptoms should they occur at home. The weak link is after discharge home when the patient may suffer without contacting a health care provider, or with care managed by the surgeon who may or may not be aware of newer medications and techniques for managing symptoms. The anesthesia care team should be more involved in planning patient care for negative anesthesia symptoms at home. An algorithm could guide care for this period of patient recovery and would be an asset for surgeon, anesthesia provider, or nurse who was in contact with the patient.

Summary

PDNV is not a symptom that typically causes mortality, but is a negative symptom that can impact a patient's feeling of well-being, as well satisfaction with care and the healthcare facility.[41] The economic effect of any postdischarge symptom is unclear at the present time, but is related to incidence, impact of the symptom, and delays in return to normal function by the patient.[3] The incidence of PDNV has not changed in the last decade, and it is time that we moved forward with interventions that can affect this group of patients with either prevention or effective treatment. This study is a foundation that tells us where we are and where we should go in the future for care of this negative, uncomfortable, and many times, serious entity.

APPENDIX A: Patient Diary Instruction:

PATIENT DIARY INSTRUCTION **Participant Code: _____**

Thank you for participating in our survey. We hope that by following up with you to better understand difficulties you might have encountered after anesthesia and surgery so that we will be able to treat our patients better in the future.

We will call you on your 1st day after surgery between _____ and __.
We will call again on your 2nd day after surgery between _____ and __.
We will call again on your 7th day after surgery between _____ and __.

For Days 1-2, please fill out your diary at each of the following times (morning, lunchtime, dinnertime and bedtime) so that we can go through questions with you more effectively when we call you.

For Days 3 – 7, please fill out the information when you first wake up in the morning. **After the last page is filled out**, please send back to the researcher in the self-addressed stamped envelope.

For the purposes of this survey, you may find the following definitions of symptoms useful.

Nausea is a sensation of queasiness in your stomach or throat that may lead to vomiting.

Vomiting is bringing up stomach contents due to involuntary muscle contractions.

Retching is similar to vomiting with the exception that no stomach contents come up, it is also known as “dry heaves”.

We will also be asking you to enter your symptoms according to different time intervals. In some instances, the time points might not literally fit. For example, when we talk about bedtime we mean when you decided to try to go to sleep for the night, even if you have actually been in bed all day because of your surgery. Here is a rough definition of the time-points and intervals:

Morning to Lunchtime: From wake-up until just before your lunchtime, e.g. around noon.

Lunchtime to Dinnertime: From start of your lunchtime until just before your dinnertime, e.g. around 6 pm.

Dinnertime to Bedtime: From start of your dinnertime until your bedtime, e.g. around 10 pm.

Bedtime to Morning: From your bedtime until you wake-up the next morning.

Thank you in advance for completing this survey! Your information will help us take better care of patients in the future.

You will receive your $10 gift card in the mail approximately 2-4 weeks after we have received your completed diary.

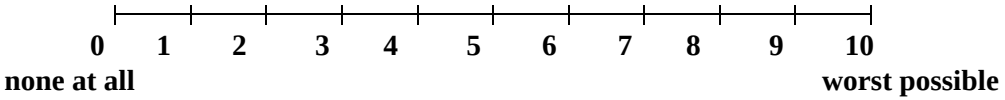
Jan Odom Forren, PhD candidate, MS, RN, CPAN, FAAN; College of Nursing, University of Kentucky, Lexington, KY 40506; email: jan.forren@uky.edu; phone 502.552.8299

DAY OF SURGERY

Symptoms after Surgery

Your self-assessments below are most accurate and useful to us if you complete them near the end of each time interval. For example, you should fill out how you felt during your ride home as soon as you arrive home. If you were asleep at the end of the time interval please complete the assessment as soon as you can.

Please use the 0-10 scale with 0 being "none at all" and 10 being the "worst possible" to rate your symptoms. As the day goes on please fill out each question at the end of each time interval. If you have no symptoms please enter a "0."



Please answer each question below at the **end** of each time interval to the right →	During **Ride Home**	Ride Home to **Dinnertime**	Dinnertime to **Bedtime**
1. What was your severity of **pain at rest**?			
2. What was your severity of **pain during activities**?			
3. What was your **worst** severity of **nausea**?			
4. If you had nausea, for **how long** did you have it?[min]			
5. How many **times** did you have **vomiting/retching**?			
6. What was your **worst** severity of **vomiting/retching**?			

Answer these questions at the **end of each day**.

	Day of Surgery
7. How tired were you during the day (0-10)	
8. How much headache did you have (0-10)	
9. What made your pain worse during the day?	
10. What relieved your pain during the day?	
11. What made your nausea worse during the day?	
12. What relieved your nausea during the day?	
13. What made your vomiting worse during the day?	
14. What relieved your vomiting during the day?	

PLEASE CIRCLE THE ANSWER TO CORRECTLY FILL IN THE BLANKS:

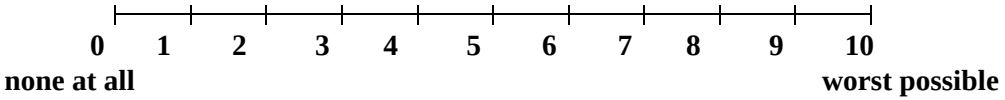
1. In the last 24 hrs, I threw up _____times.	7 or more	5-6	3-4	1-2	I did not throw up
2. In the last 24 hours, from retching or dry heaves I have felt _____distress	No	Mild	Moderate	Great	Severe
3. In the last 24 hours, from vomiting or throwing up, I have felt____distress	Severe	Great	Moderate	Mild	No
4. In the last 24 hours, I have felt nauseated or sick at my stomach____	Not at all	1 hour or less	2-3 hours	4-6 hours	More than 6 hours
5. In the last 24 hours, from nausea/sickness at my stomach, I have felt ____ distress	No	Mild	Moderate	Great	Severe
6. In the last 24 hours, each time I threw up I produced a_____amount.	Very large (3 cups or more)	Large (2-3 cups)	Moderate (½ - 2 cups)	Small (Up to ½ cup)	I did not throw up
7. In the last 24 hours, I have felt nauseated or sick at my stomach ____ times	7 or more	5-6	3-4	1-2	No

1ST DAY AFTER SURGERY

Symptoms after Surgery

Your self-assessments below are most accurate and useful to us if you complete them near the end of each time interval. If you were asleep at the end of the time interval please complete the assessment as soon as you can.

Please use the 0-10 scale with 0 being "none at all" and 10 being the "worst possible" to rate your symptoms. As the day goes on please fill out each question at the end of each time interval. If you have no symptoms please enter a "0."



Please answer each question below at the **end** of each time interval to the right →	Bedtime to **Morning**	Morning to **Lunchtime**	Lunchtime to **Dinnertime**	Dinnertime to **Bedtime**
15. What was your severity of **pain at rest**?				
16. What was your severity of **pain during activities**?				
17. What was your **worst** severity of **nausea**?				
18. If you had nausea, for **how long** did you have it?[min]				
19. How many **times** did you have **vomiting/retching**?				
20. What was your **worst** severity of **vomiting/retching**?				

Answer these questions at the **end of each day**.

	1st Day after Surgery
21. How tired were you during the day (0-10)	
22. How much headache did you have (0-10)	
23. What made your pain worse during the day?	
24. What relieved your pain during the day?	
25. What made your nausea worse during the day?	
26. What relieved your nausea during the day?	
27. What made your vomiting worse during the day?	
28. What relieved your vomiting during the day?	

Please answer questions below when you wake up in the morning on the 1st day after surgery.

29. In the space below, please list all *new* medications or remedies that you took from when you returned home yesterday to when you woke up today. New medications or remedies are those that you did *not* take regularly before your surgery.

Name of new medication or remedy	**Time of the day**	**Strength of doses taken (mg)**	**Reason for taking**	**How effective was it?** 0 = not at all, 10 = completely effective

Below indicate how much nausea, vomiting and pain bothered you during your recovery and please use the 0-10 scale with
0 being “not at all” and 10 being “most bothersome”.

0 1 2 3 4 5 6 7 8 9 10
not at all **most bothersome**

	Nausea	**Vomiting**	**Pain**	
30. How much did				**Affect** your **quality of life** yesterday?
31. How much did				**Affect** your usual ability to **eat and drink** yesterday?
32. How much did				**Affect** your usual **activities and tasks** yesterday?
33. How much did				**Affect** your usual enjoyment of **leisure** and **recreational activities** yesterday (for example: reading, listening to music)?
34. How much did				**Affect** your usual enjoyment of **social activities** yesterday?
35. How much did				**Affect** your usual ability to **do your normal daily work** yesterday?
36. How much did				**Affect** your usual ability to **sleep** yesterday?

PLEASE CIRCLE THE ANSWER TO CORRECTLY FILL IN THE BLANKS:

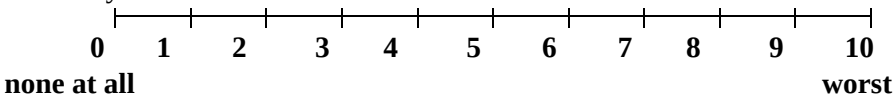
1. In the last 24 hrs, I threw up __times.	7 or more	5-6	3-4	1-2	I did not throw up
2. In the last 24 hours, from retching or dry heaves I have felt ___distress	No	Mild	Moderate	Great	Severe
3. In the last 24 hours, from vomiting or throwing up, I have felt____distress	Severe	Great	Moderate	Mild	No
4. In the last 24 hours, I have felt nauseated or sick at my stomach____	Not at all	1 hour or less	2-3 hours	4-6 hours	More than 6 hours
5. In the last 24 hours, from nausea/sickness at my stomach, I have felt ____ distress	No	Mild	Moderate	Great	Severe
6. In the last 24 hours, each time I threw up I produced a_____amount.	Very large (3 cups or more)	Large (2-3 cups)	Moderate (½ - 2 cups)	Small (Up to ½ cup)	I did not throw up
7. In the last 24 hours, I have felt nauseated or sick at my stomach ____ times	7 or more	5-6	3-4	1-2	No

2ND DAY AFTER SURGERY

Symptoms after Surgery

Your self-assessments below are most accurate and useful to us if you complete them near the end of each time interval. If you were asleep at the end of the time interval please complete the assessment as soon as you can.

Please use the 0-10 scale with 0 being "none at all" and 10 being the "worst possible" to rate your symptoms.



As the day goes on please fill out each question at the end of each time interval. If you have no symptoms please enter a "0."

Please answer each question below at the **end** of each time interval to the right →	Bedtime to **Morning**	Morning to **Lunchtime**	Lunchtime To **Dinnertime**
37. What was your severity of **pain at rest**?			
38. What was your severity of **pain during activities**?			
39. What was your **worst** severity of **nausea**?			
40. If you had nausea, for **how long** did you have it?[min]			
41. How many **times** did you have **vomiting/retching**?			
42. What was your **worst** severity of **vomiting/retching**?			

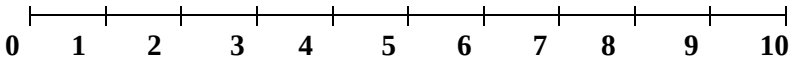
Answer these questions at the **end of each day**.

	2nd Day after Surgery
43. How tired were you during the day (0-10)	
44. How much headache did you have (0-10)	
45. What made your pain worse during the day?	
46. What relieved your pain during the day?	
47. What made your nausea worse during the day?	
48. What relieved your nausea during the day?	
49. What made your vomiting worse during the day?	
50. What relieved your vomiting during the day?	

Please answer the questions below when you wake up in the morning on the 2nd day after surgery.

51. In the space below, please list all *new* medications or remedies that you took yesterday.
New medications or remedies are those you did *not* take regularly before surgery.

Name of new medication or remedy	**Time of the day**	**Strength of doses taken (mg)**	**Reason for taking**	**How effective was it?** 0 = not at all, 10 = completely effective



Below indicate how much nausea, vomiting and pain bothered you during your recovery and please use the 0-10 scale with 0 being “not at all” and 10 being “most bothersome”.

not at all **most bothersome**

	Nausea	Vomiting	Pain	
52. How much did				**Affect** your **quality of life** yesterday?
53. How much did				**Affect** your usual ability to **eat and drink** yesterday?
54. How much did				**Affect** your usual ability to **do necessary activities and tasks** yesterday?
55. How much did				**Affect** your usual enjoyment of **leisure** and **recreational activities** yesterday (for example: reading, listening to music)?
56. How much did				**Affect** your usual enjoyment of **social activities** yesterday?
57. How much did				**Affect** your usual ability to **do your normal daily work** yesterday?
58. How much did				**Affect** your usual ability to **sleep** yesterday?

PLEASE CIRCLE THE ANSWER TO CORRECTLY FILL IN THE BLANKS:

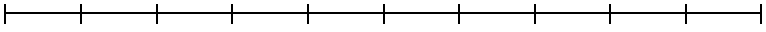
1. In the last 24 hrs, I threw up __times.	7 or more	5-6	3-4	1-2	I did not throw up
2. In the last 24 hours, from retching or dry heaves I have felt ___distress	No	Mild	Moderate	Great	Severe
3. In the last 24 hours, from vomiting or throwing up, I have felt____distress	Severe	Great	Moderate	Mild	No
4. In the last 24 hours, I have felt nauseated or sick at my stomach____	Not at all	1 hour or less	2-3 hours	4-6 hours	More than 6 hours
5. In the last 24 hours, from nausea/sickness at my stomach, I have felt ____ distress	No	Mild	Moderate	Great	Severe
6. In the last 24 hours, each time I threw up I produced a_____amount.	Very large (3 cups or more)	Large (2-3 cups)	Moderate (½ - 2 cups)	Small (Up to ½ cup)	I did not throw up
7. In the last 24 hours, I have felt nauseated or sick at my stomach ____ times	7 or more	5-6	3-4	1-2	No

59. Did you use any of the following means to prevent or treat nausea or vomiting since your surgery?

☐ Yes – No ☐ Wearing acupressure wrist bands (elastic bands that pt pressure on the wrist)
☐ Yes – No ☐ Moving slowly from clear liquids to solid food
☐ Yes – No ☐ Taking medicines with food
☐ Yes – No ☐ Eating food
☐ Yes – No ☐ Drinking carbonated drinks or other fluids
☐ Yes – No ☐ Laying down
Other (please specify)

60. If you are a smoker, when did you resume smoking: Date: _____
and did this cause you some nausea or vomiting? ☐ Yes – No ☐ – N/A ☐

For the following questions, **please compare how your recovery from surgery has lived up to the expectations you had before surgery**. Please use the following scale. Please note that if your recovery went as expected, you would rate it as "5" per the scale below.



0 far worse than expected **1 2 3 4 5 6 7 8 9 as expected** **10 far better than expected**

Compared to what you expected before surgery

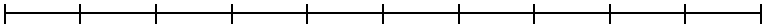
61. …how would you rate your **anesthesia**?	
62. …how would you rate your **pain control**?	
63. …how would you rate your prevention and treatment of nausea?	
64. …how would you rate your prevention and treatment of vomiting?	
65. …how would you rate your **overall medical treatment**?	

66. If there were a drug that could have prevented the **pain** you had but you would have to pay for it out of your own pocket to get it, how much would you be willing to pay for it? $ _____
67. If there were a drug that could have prevented the **nausea** you had but you would have to pay for it out of your own pocket to get it, how much would you be willing to pay for it? $ _____
68. If there were a drug that could have prevented the **vomiting** you had but you would have to pay for it out of your own pocket to get it, how much would you be willing to pay for it? $ _____
69. What is your highest level of education? ☐ High School – ☐ College – ☐ Doctoral Degree – ☐ none of these
70. What is your average annual household income?
☐ under $25,000 – ☐ $25–$50,000 – ☐ $50–$75,000 – ☐ $75–$100,000 – ☐ over $100,000
71. Do you have any suggestions about how we can improve patient recovery in the future?

3RD DAY AFTER SURGERY

Symptoms after Surgery

Please use the 0-10 scale with 0 being "none at all" and 10 being the "worst possible" to rate your symptoms. As the day goes on please fill out each question at the end of each time interval. If you have no symptoms please enter a "0."



none at all **worst possible**

Please answer each question below at the **end** of each time interval to the right →	3rd Day after Surgery
72. What was your severity of **pain at rest**?	
73. What was your severity of **pain during activities**?	
74. What was your **worst** severity of **nausea**?	
75. If you had nausea, for **how long** did you have it?[min]	
76. How many **times** did you have **vomiting/retching**?	
77. What was your **worst** severity of **vomiting/retching**?	

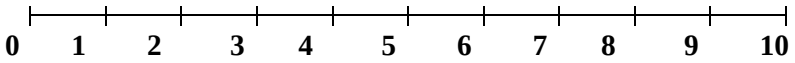
Answer these questions at the **end of each day**.

	3rd Day after Surgery
78. How tired were you during the day (0-10)	
79. How much headache did you have (0-10)	
80. What made your pain worse during the day?	
81. What relieved your pain during the day?	
82. What made your nausea worse during the day?	
83. What relieved your nausea during the day?	
84. What made your vomiting worse during the day?	
85. What relieved your vomiting during the day?	

Please answer the questions below when you wake up in the morning on the 3rd day after surgery.

86. In the space below, please list all *new* medications or remedies that you took yesterday.
New medications or remedies are those you did *not* take regularly before surgery.

Name of new medication or remedy	**Time of the day**	**Strength of doses taken (mg)**	**Reason for taking**	**How effective was it?** 0 = not at all, 10 = completely effective



Below indicate how much nausea, vomiting and pain bothered you during your recovery and please use the 0-10 scale with 0 being “not at all” and 10 being “most bothersome”.

not at all **most bothersome**

	Nausea	Vomiting	Pain	
87. How much did				**Affect** your **quality of life** yesterday?
88. How much did				**Affect** your usual ability to **eat and drink** yesterday?
89. How much did				**Affect** your usual ability to **do necessary activities and tasks** yesterday?
90. How much did				**Affect** your usual enjoyment of **leisure** and **recreational activities** yesterday (for example: reading, listening to music)?
91. How much did				**Affect** your usual enjoyment of **social activities** yesterday?
92. How much did				**Affect** your usual ability to **do your normal daily work** yesterday?
93. How much did				**Affect** your usual ability to **sleep** yesterday?

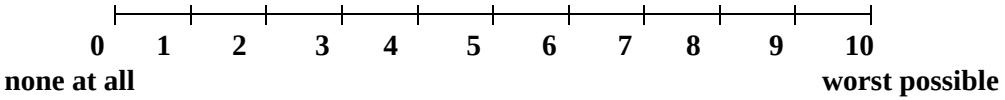
PLEASE CIRCLE THE ANSWER TO CORRECTLY FILL IN THE BLANKS:

1. In the last 24 hrs, I threw up __times.	7 or more	5-6	3-4	1-2	I did not throw up
2. In the last 24 hours, from retching or dry heaves I have felt ___distress	No	Mild	Moderate	Great	Severe
3. In the last 24 hours, from vomiting or throwing up, I have felt____distress	Severe	Great	Moderate	Mild	No
4. In the last 24 hours, I have felt nauseated or sick at my stomach____	Not at all	1 hour or less	2-3 hours	4-6 hours	More than 6 hours
5. In the last 24 hours, from nausea/sickness at my stomach, I have felt ____ distress	No	Mild	Moderate	Great	Severe
6. In the last 24 hours, each time I threw up I produced a_____amount.	Very large (3 cups or more)	Large (2-3 cups)	Moderate (½ - 2 cups)	Small (Up to ½ cup)	I did not throw up
7. In the last 24 hours, I have felt nauseated or sick at my stomach ____ times	7 or more	5-6	3-4	1-2	No

4TH DAY AFTER SURGERY

Symptoms after Surgery

Please use the 0-10 scale with 0 being "none at all" and 10 being the "worst possible" to rate your symptoms. As the day goes on please fill out each question at the end of each time interval. If you have no symptoms please enter a "0."



Please answer each question below at the **end** of each time interval to the right →	4th Day after Surgery
94. What was your severity of **pain at rest**?	
95. What was your severity of **pain during activities**?	
96. What was your **worst** severity of **nausea**?	
97. If you had nausea, for **how long** did you have it?[min]	
98. How many **times** did you have **vomiting/retching**?	
99. What was your **worst** severity of **vomiting/retching**?	

Answer these questions at the **end of each day**.

		4th Day after Surgery
100.	How tired were you during the day (0-10)	
101.	How much headache did you have (0-10)	
102.	What made your pain worse during the day?	
103.	What relieved your pain during the day?	
104.	What made your nausea worse during the day?	
105.	What relieved your nausea during the day?	
106.	What made your vomiting worse during the day?	
107.	What relieved your vomiting during the day?	

Please answer the questions below when you wake up in the morning on the 4th day after surgery.

108. In the space below, please list all *new* medications or remedies that you took yesterday.
New medications or remedies are those you did *not* take regularly before surgery.

Name of new medication or remedy	**Time of the day**	**Strength of doses taken (mg)**	**Reason for taking**	**How effective was it?** 0 = not at all, 10 = completely effective

Below indicate how much nausea, vomiting and pain bothered you during your recovery and please use the 0-10 scale with
0 being "not at all" and 10 being "most bothersome".

0 1 2 3 4 5 6 7 8 9 10
not at all **most bothersome**

	Nausea	**Vomiting**	**Pain**	
109. How much did				**Affect** your **quality of life** yesterday?
110. How much did				**Affect** your usual ability to **eat and drink** yesterday?
111. How much did				**Affect** your usual ability to **do necessary activities and tasks** yesterday?
112. How much did				**Affect** your usual enjoyment of **leisure** and **recreational activities** yesterday (for example: reading, listening to music)?
113. How much did				**Affect** your usual enjoyment of **social activities** yesterday?
114. How much did				**Affect** your usual ability to **do your normal daily work** yesterday?
115. How much did				**Affect** your usual ability to **sleep** yesterday?

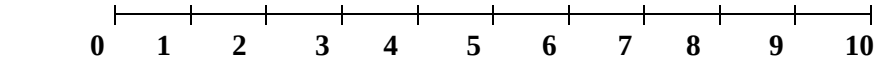
PLEASE CIRCLE THE ANSWER TO CORRECTLY FILL IN THE BLANKS:

1. In the last 24 hrs, I threw up __times.	7 or more	5-6	3-4	1-2	I did not throw up
2. In the last 24 hours, from retching or dry heaves I have felt ___distress	No	Mild	Moderate	Great	Severe
3. In the last 24 hours, from vomiting or throwing up, I have felt____distress	Severe	Great	Moderate	Mild	No
4. In the last 24 hours, I have felt nauseated or sick at my stomach____	Not at all	1 hour or less	2-3 hours	4-6 hours	More than 6 hours
5. In the last 24 hours, from nausea/sickness at my stomach, I have felt ____ distress	No	Mild	Moderate	Great	Severe
6. In the last 24 hours, each time I threw up I produced a_____amount.	Very large (3 cups or more)	Large (2-3 cups)	Moderate (½ - 2 cups)	Small (Up to ½ cup)	I did not throw up
7. In the last 24 hours, I have felt nauseated or sick at my stomach ____ times	7 or more	5-6	3-4	1-2	No

5TH DAY AFTER SURGERY

Symptoms after Surgery

Please use the 0-10 scale with 0 being "none at all" and 10 being the "worst possible" to rate your symptoms. As the day goes on please fill out each question at the end of each time interval. If you have no symptoms please enter a "0."



none at all **worst possible**

Please answer each question below at the **end** of each time interval to the right →	5th Day after Surgery
116. What was your severity of **pain at rest**?	
117. What was your severity of **pain during activities**?	
118. What was your **worst** severity of **nausea**?	
119. If you had nausea, for **how long** did you have it?[min]	
120. How many **times** did you have **vomiting/retching**?	
121. What was your **worst** severity of **vomiting/retching**?	

Answer these questions at the **end of each day**.

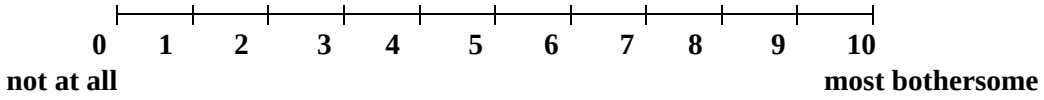
	5th Day after Surgery
122. How tired were you during the day (0-10)	
123. How much headache did you have (0-10)	
124. What made your pain worse during the day?	
125. What relieved your pain during the day?	
126. What made your nausea worse during the day?	
127. What relieved your nausea during the day?	
128. What made your vomiting worse during the day?	
129. What relieved your vomiting during the day?	

Please answer the questions below when you wake up in the morning on the 5th day after surgery.

130. In the space below, please list all *new* medications or remedies that you took yesterday.
New medications or remedies are those you did *not* take regularly before surgery.

Name of new medication or remedy	**Time of the day**	**Strength of doses taken (mg)**	**Reason for taking**	**How effective was it?** 0 = not at all, 10 = completely effective

Below indicate how much nausea, vomiting and pain bothered you during your recovery and please use the 0-10 scale with
0 being "not at all" and 10 being "most bothersome".



	Nausea	**Vomiting**	**Pain**	
131. How much did				**Affect** your **quality of life** yesterday?
132. How much did				**Affect** your usual ability to **eat and drink** yesterday?
133. How much did				**Affect** your usual ability to **do necessary activities and tasks** yesterday?
134. How much did				**Affect** your usual enjoyment of **leisure** and **recreational activities** yesterday (for example: reading, listening to music)?
135. How much did				**Affect** your usual enjoyment of **social activities** yesterday?
136. How much did				**Affect** your usual ability to **do your normal daily work** yesterday?
137. How much did				**Affect** your usual ability to **sleep** yesterday?

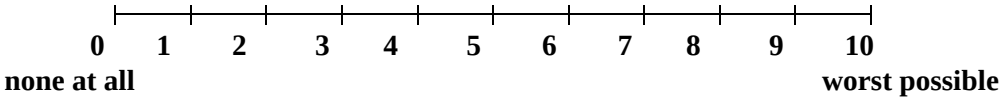
PLEASE CIRCLE THE ANSWER TO CORRECTLY FILL IN THE BLANKS:

1. In the last 24 hrs, I threw up __times.	7 or more	5-6	3-4	1-2	I did not throw up
2. In the last 24 hours, from retching or dry heaves I have felt ___distress	No	Mild	Moderate	Great	Severe
3. In the last 24 hours, from vomiting or throwing up, I have felt____distress	Severe	Great	Moderate	Mild	No
4. In the last 24 hours, I have felt nauseated or sick at my stomach____	Not at all	1 hour or less	2-3 hours	4-6 hours	More than 6 hours
5. In the last 24 hours, from nausea/sickness at my stomach, I have felt ____ distress	No	Mild	Moderate	Great	Severe
6. In the last 24 hours, each time I threw up I produced a_____amount.	Very large (3 cups or more)	Large (2-3 cups)	Moderate (½ - 2 cups)	Small (Up to ½ cup)	I did not throw up
7. In the last 24 hours, I have felt nauseated or sick at my stomach ____ times	7 or more	5-6	3-4	1-2	No

6TH DAY AFTER SURGERY

Symptoms after Surgery

Please use the 0-10 scale with 0 being "none at all" and 10 being the "worst possible" to rate your symptoms. As the day goes on please fill out each question at the end of each time interval. If you have no symptoms please enter a "0."



Please answer each question below at the **end** of each time interval to the right →	6th Day after Surgery
138. What was your severity of **pain at rest**?	
139. What was your severity of **pain during activities**?	
140. What was your **worst** severity of **nausea**?	
141. If you had nausea, for **how long** did you have it?[min]	
142. How many **times** did you have **vomiting/retching**?	
143. What was your **worst** severity of **vomiting/retching**?	

Answer these questions at the **end of each day**.

	6th Day after Surgery
144. How tired were you during the day (0-10)	
145. How much headache did you have (0-10)	
146. What made your pain worse during the day?	
147. What relieved your pain during the day?	
148. What made your nausea worse during the day?	
149. What relieved your nausea during the day?	
150. What made your vomiting worse during the day?	
151. What relieved your vomiting during the day?	

Please answer the questions below when you wake up in the morning on the 6th day after surgery.

152. In the space below, please list all *new* medications or remedies that you took yesterday.
New medications or remedies are those you did *not* take regularly before surgery.

Name of new medication or remedy	**Time of the day**	**Strength of doses taken (mg)**	**Reason for taking**	**How effective was it?** 0 = not at all, 10 = completely effective

Below indicate how much nausea, vomiting and pain bothered you during your recovery and please use the 0-10 scale with
0 being "not at all" and 10 being "most bothersome".

0 1 2 3 4 5 6 7 8 9 10
not at all **most bothersome**

	Nausea	**Vomiting**	**Pain**	
153.	How much did			**Affect** your **quality of life** yesterday?
154.	How much did			**Affect** your usual ability to **eat and drink** yesterday?
155.	How much did			**Affect** your usual ability to **do necessary activities and tasks** yesterday?
156.	How much did			**Affect** your usual enjoyment of **leisure** and **recreational activities** yesterday (for example: reading, listening to music)?
157.	How much did			**Affect** your usual enjoyment of **social activities** yesterday?
158.	How much did			**Affect** your usual ability to **do your normal daily work** yesterday?
159.	How much did			**Affect** your usual ability to **sleep** yesterday?

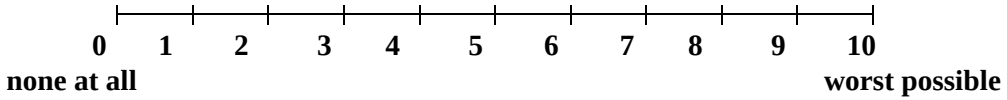
PLEASE CIRCLE THE ANSWER TO CORRECTLY FILL IN THE BLANKS:

1. In the last 24 hrs, I threw up __times.	7 or more	5-6	3-4	1-2	I did not throw up
2. In the last 24 hours, from retching or dry heaves I have felt ___distress	No	Mild	Moderate	Great	Severe
3. In the last 24 hours, from vomiting or throwing up, I have felt____distress	Severe	Great	Moderate	Mild	No
4. In the last 24 hours, I have felt nauseated or sick at my stomach____	Not at all	1 hour or less	2-3 hours	4-6 hours	More than 6 hours
5. In the last 24 hours, from nausea/sickness at my stomach, I have felt ____ distress	No	Mild	Moderate	Great	Severe
6. In the last 24 hours, each time I threw up I produced a_____amount.	Very large (3 cups or more)	Large (2-3 cups)	Moderate (½ - 2 cups)	Small (Up to ½ cup)	I did not throw up
7. In the last 24 hours, I have felt nauseated or sick at my stomach ____ times	7 or more	5-6	3-4	1-2	No

7TH DAY AFTER SURGERY

Symptoms after Surgery

Please use the 0-10 scale with 0 being "none at all" and 10 being the "worst possible" to rate your symptoms. As the day goes on please fill out each question at the end of each time interval. If you have no symptoms please enter a "0."



Please answer each question below at the **end** of each time interval to the right →	7th Day after Surgery
160. What was your severity of **pain at rest**?	
161. What was your severity of **pain during activities**?	
162. What was your **worst** severity of **nausea**?	
163. If you had nausea, for **how long** did you have it?[min]	
164. How many **times** did you have **vomiting/retching**?	
165. What was your **worst** severity of **vomiting/retching**?	

Answer these questions at the **end of each day**.

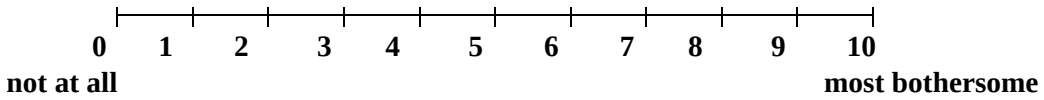
	7th Day after Surgery
166. How tired were you during the day (0-10)	
167. How much headache did you have (0-10)	
168. What made your pain worse during the day?	
169. What relieved your pain during the day?	
170. What made your nausea worse during the day?	
171. What relieved your nausea during the day?	
172. What made your vomiting worse during the day?	
173. What relieved your vomiting during the day?	

Please answer the questions below at dinnertime on the 7th day after surgery.

174. Below, please list all *new* medications or remedies that you took today since waking up.
New medications or remedies are those you did *not* take regularly before surgery.

Name of new medication or remedy	**Time of the day**	**Strength of doses taken (mg)**	**Reason for taking**	**How effective was it?** 0 = not at all, 10 = completely effective

Below indicate how much nausea, vomiting and pain bothered you during your recovery and please use the 0-10 scale with
0 being "not at all" and 10 being "most bothersome".



	Nausea	**Vomiting**	**Pain**	
175. How much did				**Affect** your **quality of life** today?
176. How much did				**Affect** your usual ability to **eat and drink** today?
177. How much did				**Affect** your usual ability to **do necessary activities and tasks** today?
178. How much did				**Affect** your usual enjoyment of **leisure** and **recreational activities** today (for example: reading, listening to music)?
179. How much did				**Affect** your usual enjoyment of **social activities** today?
180. How much did				**Affect** your usual ability to **do your normal daily work** today?

PLEASE CIRCLE THE ANSWER TO CORRECTLY FILL IN THE BLANKS:

1. In the last 24 hrs, I threw up __times.	7 or more	5-6	3-4	1-2	I did not throw up
2. In the last 24 hours, from retching or dry heaves I have felt ___distress	No	Mild	Moderate	Great	Severe
3. In the last 24 hours, from vomiting or throwing up, I have felt____distress	Severe	Great	Moderate	Mild	No
4. In the last 24 hours, I have felt nauseated or sick at my stomach____	Not at all	1 hour or less	2-3 hours	4-6 hours	More than 6 hours
5. In the last 24 hours, from nausea/sickness at my stomach, I have felt ____ distress	No	Mild	Moderate	Great	Severe
6. In the last 24 hours, each time I threw up I produced a_____amount.	Very large (3 cups or more)	Large (2-3 cups)	Moderate (½ - 2 cups)	Small (Up to ½ cup)	I did not throw up
7. In the last 24 hours, I have felt nauseated or sick at my stomach ____ times	7 or more	5-6	3-4	1-2	No

Thank you for filling out and reporting these questions to us. Once our data are complete we will send you a gift card in the mail in approximately 2-4 weeks. Please let us know what kind of gift card you would prefer:
Blockbuster · Borders/Waldenbooks ·Chevy's · Cybelle's Pizza · Jamba Juice · Pasta Pomodoro · Starbucks

APPENDIX B Permission

To Whom It May Concern:

This note is official permission on behalf of the American Society of PeriAnesthesia Nurses (ASPAN) to allow **Jan Odom-Forren**, RN, CPAN, FAAN, PhD Candidate use Figure 1 and Figure 2 from ASPAN's Evidence-Based Clinical Practice Guideline for the Prevention and/or Management of PONV/PDNV, J Perianesth Nurs 2006; 21:233-234 as part of her doctoral dissertation at the University of Kentucky.

Terry Clifford
ASPAN President/Date 8/19/09

Kevin Dill
ASPAN CEO/Date 8/19/09

American Society of PeriAnesthesia Nurses
10 Melrose Avenue- Suite 110
Cherry Hill, NJ 08003-3696
Toll-Free: 877.737.9696
Telephone: 856.616.9600
Fax: 856.616.9601

REFERENCES

Chapter One References

1. Blumfeld J. The prevention of sickness after anesthetics. *Lancet.* 1899;2(833):833-835.

2. Knapp MR, Beecher HK. Postanesthetic nausea, vomiting, and retching; evaluation of the antiemetic drugs dimenhydrinate (dramamine), chlorpromazine, and pentobarbital sodium. *J Am Med Assoc.* Feb 4 1956;160(5):376-385.

3. Kapur PA. The big "little problem". *Anesth Analg.* 1991;73:243-245.

4. Watcha MF, White PF. Postoperative nausea and vomiting. Its etiology, treatment, and prevention. *Anesthesiology.* Jul 1992;77(1):162-184.

5. Korttila K. The study of postoperative nausea and vomiting. *Br J Anaesth.* 1992;69(7 Suppl 1):20S-23S.

6. Odom-Forren J, Moser DK. Postdischarge nausea and vomiting: A review of the literature. *J Ambulatory Surg.* 2005;12:99-105.

7. Joshi GP, Twersky RS. Fast tracking in ambulatory surgery. *J Ambulatory Surg.* 2000;8:185-190.

8. National Center for Health Statistics. *National survey of ambulatory surgery 2006* October 2008.

9. American Society of PeriAnesthesia Nurses. ASPAN'S evidence-based clinical practice guideline for the prevention and/or management of PONV/PDNV. *J Perianesth Nurs.* Aug 2006;21(4):230-250.

10. Pfisterer M, Ernst EM, Hirlekar G, et al. Post-operative nausea and vomiting in patients undergoing day-case surgery: an international, observational study. *Ambul Surg.* Jan 2001;9(1):13-18.

11. Carroll NV, Miederhoff P, Cox FM, Hirsch JD. Postoperative nausea and vomiting after discharge from outpatient surgery centers. *Anesth Analg.* May 1995;80(5):903-909.

12. Gupta A, Wu CL, Elkassabany N, Krug CE, Parker SD, Fleisher LA. Does the routine prophylactic use of antiemetics affect the incidence of postdischarge nausea and vomiting following ambulatory surgery?: A systematic review of randomized controlled trials. *Anesthesiology.* Aug 2003;99(2):488-495.

13. Acalovschi I. Postoperative nausea and vomiting. *Curr Anaesth Crit Care.* 2002;13:37-43.

14. Kovac AL. Prevention and treatment of postoperative nausea and vomiting. *Drugs.* Feb 2000;59(2):213-243.

15. Watcha MF. Postoperative nausea and emesis. *Anesthesiol Clin North America.* Sep 2002;20(3):709-722.

16. Gan TJ. Postoperative nausea and vomiting--can it be eliminated? *Jama.* Mar 13 2002;287(10):1233-1236.

17. Odom-Forren J, Fetzer SJ, Moser DK. Evidence-based interventions for post discharge nausea and vomiting: a review of the literature. *J Perianesth Nurs.* Dec 2006;21(6):411-430.

18. Lichtor JL, Glass PS. We're tired of waiting. *Anesth Analg.* Aug 2008;107(2):353-355.

19. Chinnappa V, Chung F. Post-discharge nausea and vomiting: an overlooked aspect of ambulatory anesthesia? *Can J Anaesth.* Sep 2008;55(9):565-571.

20. Wu CL, Berenholtz SM, Pronovost PJ, Fleisher LA. Systematic review and analysis of postdischarge symptoms after outpatient surgery. *Anesthesiology.* Apr 2002;96(4):994-1003.

21. Scuderi PE. Management of postoperative nausea and vomiting. *Current Reviews for Nurse Anesthetists.* 2004;26:253-264.

22. Fetzer SJ, Hand MA, Bouchard PA, Smith HB, Jenkins MB. Self-care activities for postdischarge nausea and vomiting. *J Perianesth Nurs.* Aug 2005;20(4):249-254.
23. Apfel CC, Philip B, Cakmakkaya OS, et al. A prediction model for post-discharge nausea and vomiting after ambulatory surgery; 2009:1 - 39.
24. Apfel CC, Laara E, Koivuranta M, Greim CA, Roewer N. A simplified risk score for predicting postoperative nausea and vomiting: conclusions from cross-validations between two centers. *Anesthesiology.* Sep 1999;91(3):693-700.
25. 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.* Dec 2006;21(6):377-384.
26. Gan TJ. Risk factors for postoperative nausea and vomiting. *Anesth Analg.* Jun 2006;102(6):1884-1898.
27. Koivuranta M, Laara E, Snare L, Alahuhta S. A survey of postoperative nausea and vomiting. *Anaesthesia.* May 1997;52(5):443-449.
28. Apfel CC, Roewer N. Risk assessment of postoperative nausea and vomiting. *Int Anesthesiol Clin.* Fall 2003;41(4):13-32.
29. American Society of Anesthesiologists. ASA Physical Status Classification System; 2009.
30. Turpin SD. Summary of 2001 state legislative and regulatory activities. *ASA Newsletter*. Vol 65; 2001.
31. Apfel CC, Kranke P, Katz MH, et al. Volatile anaesthetics may be the main cause of early but not delayed postoperative vomiting: a randomized controlled trial of factorial design. *Br J Anaesth.* May 2002;88(5):659-668.
32. Sinclair DR, Chung F, Mezei G. Can postoperative nausea and vomiting be predicted? *Anesthesiology.* Jul 1999;91(1):109-118.
33. Chia Y-Y, Kuo M-C, Liu K, Sun G-C, Hsieh S-W, Chow L-H. Does postoperative pain induce emesis? *Clin J Pain.* 2002;18:317-323.
34. Parlow JL, Meikle AT, van Vlymen J, Avery N. Post discharge nausea and vomiting after ambulatory laparoscopy is not reduced by promethazine prophylaxis. *Can J Anaesth.* Aug 1999;46(8):719-724.
35. Kokinsky E, Thornberg E, Ostlund AL, Larsson LE. Postoperative comfort in paediatric outpatient surgery. *Paediatr Anaesth.* 1999;9(3):243-251.
36. Grenier B, Dubreuil M, Siao D, Meymat Y. Paediatric day case anaesthesia: estimate of its quality at home. *Paediatr Anaesth.* 1998;8(6):485-489.
37. Pan PH, Lee SC, Harris LC. Antiemetic prophylaxis for postdischarge nausea and vomiting and impact on functional quality of living during recovery in patients with high emetic risks: a prospective, randomized, double-blind comparison of two prophylactic antiemetic regimens. *Anesth Analg.* Aug 2008;107(2):429-438.
38. Watt-Watson J, Chung F, Chan VW, McGillion M. Pain management following discharge after ambulatory same-day surgery. *J Nurs Manag.* May 2004;12(3):153-161.
39. Arif AS, Kaye AD, Frost E. Postoperative nausea and vomiting--a review. *Middle East J Anesthesiol.* Jun 2001;16(2):127-154.
40. Nelson TP. Postoperative nausea and vomiting: understanding the enigma. *J Perianesth Nurs.* Jun 2002;17(3):178-187; quiz 187-179.
41. Odom-Forren J. A qualitative description of post discharge nausea and vomiting. *Class project*. Lexington, KY: University of Kentucky; 2005.

Chapter Two References

1. Kapur PA. The big "little problem". *Anesth Analg.* 1991;73:243-245.

2. Acalovschi I. Postoperative nausea and vomiting. *Curr Anaesth Crit Care.* 2002;13:37-43.

3. Kovac AL. Prevention and treatment of postoperative nausea and vomiting. *Drugs.* Feb 2000;59(2):213-243.

4. Watcha MF. Postoperative nausea and emesis. *Anesthesiol Clin North America.* Sep 2002;20(3):709-722.

5. 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.* Jun 10 2004;350(24):2441-2451.

6. Apfel CC, Laara E, Koivuranta M, Greim CA, Roewer N. A simplified risk score for predicting postoperative nausea and vomiting: conclusions from cross-validations between two centers. *Anesthesiology.* Sep 1999;91(3):693-700.

7. Joshi GP, Twersky RS. Fast tracking in ambulatory surgery. *J Ambulatory Surg.* 2000;8:185-190.

8. FASA. The history of ASCs; 2005.

9. Scuderi PE. Management of postoperative nausea and vomiting. *Current Reviews for Nurse Anesthetists.* 2004;26:253-264.

10. Gan TJ. Postoperative nausea and vomiting--can it be eliminated? *Jama.* Mar 13 2002;287(10):1233-1236.

11. Carroll NV, Miederhoff P, Cox FM, Hirsch JD. Postoperative nausea and vomiting after discharge from outpatient surgery centers. *Anesth Analg.* May 1995;80(5):903-909.

12. Wu CL, Berenholtz SM, Pronovost PJ, Fleisher LA. Systematic review and analysis of postdischarge symptoms after outpatient surgery. *Anesthesiology.* Apr 2002;96(4):994-1003.

13. Gupta A, Wu CL, Elkassabany N, Krug CE, Parker SD, Fleisher LA. Does the routine prophylactic use of antiemetics affect the incidence of postdischarge nausea and vomiting following ambulatory surgery?: A systematic review of randomized controlled trials. *Anesthesiology.* Aug 2003;99(2):488-495.

14. Carvalho B, Benton JI, Vickery PJ, Sneyd JR, Davies PRF, Langton JA. Longterm functional recovery following day-case laparoscopic sterilisation: inhalational versus TIVA mainentance. *Journal of Ambulatory Surgery.* 2002;10:45-51.

15. Parlow JL, Meikle AT, van Vlymen J, Avery N. Post discharge nausea and vomiting after ambulatory laparoscopy is not reduced by promethazine prophylaxis. *Can J Anaesth.* Aug 1999;46(8):719-724.

16. Arif AS, Kaye AD, Frost E. Postoperative nausea and vomiting--a review. *Middle East J Anesthesiol.* Jun 2001;16(2):127-154.

17. Nelson TP. Postoperative nausea and vomiting: understanding the enigma. *J Perianesth Nurs.* Jun 2002;17(3):178-187; quiz 187-179.

18. Macario A, Weinger M, Carney S, Kim A. Which clinical anesthesia outcomes are important to avoid? The perspective of patients. *Anesth Analg.* Sep 1999;89(3):652-658.

19. Gan T, Sloan F, Dear Gde L, El-Moalem HE, Lubarsky DA. How much are patients willing to pay to avoid postoperative nausea and vomiting? *Anesth Analg.* Feb 2001;92(2):393-400.

20. Tramer MR. Strategies for postoperative nausea and vomiting. *Best Prac Res Clin Anaesth* 2004;18:693-701.

21. Kokinsky E, Thornberg E, Ostlund AL, Larsson LE. Postoperative comfort in paediatric outpatient surgery. *Paediatr Anaesth.* 1999;9(3):243-251.

22. Grenier B, Dubreuil M, Siao D, Meymat Y. Paediatric day case anaesthesia: estimate of its quality at home. *Paediatr Anaesth.* 1998;8(6):485-489.
23. Watt-Watson J, Chung F, Chan VW, McGillion M. Pain management following discharge after ambulatory same-day surgery. *J Nurs Manag.* May 2004;12(3):153-161.
24. Fetzer SJ, Hand MA, Bouchard PA, Smith HB, Jenkins MB. Self-care activities for postdischarge nausea and vomiting. *J Perianesth Nurs.* Aug 2005;20(4):249-254.
25. Pfisterer M, Ernst EM, Hirlekar G, et al. Post-operative nausea and vomiting in patients undergoing day-case surgery: an international, observational study. *Ambul Surg.* Jan 2001;9(1):13-18.
26. Enever GR, Nunn JH, Sheehan JK. A comparison of post-operative morbidity following outpatient dental care under general anaesthesia in paediatric patients with and without disabilities. *Int J Paediatr Dent.* Jun 2000;10(2):120-125.
27. Ernst EMC, A. TRM. Incidence and impact of pain, nausea and vomiting following discharge from a day surgery unit. *Journal of Applied Therapeutics.* 1997;1:257-263.
28. Amanor-Boadu SD, Soyannwo OA. Complications following day case paediatric surgery. *West Afr J Med.* Oct-Dec 1997;16(4):223-226.
29. Young J, O'Connell B, McGregor S. Day surgery patients' convalescence at home: Does enhanced discharge education make a difference? *Nursing and Health Sciences.* 2000;2:29-39.
30. Waterman H, Leatherbarrow B, Slater R, Waterman C. Post-operative pain, nausea and vomiting: qualitative perspectives from telephone interviews. *J Adv Nurs.* Mar 1999;29(3):690-696.
31. Waterman H, Leatherbarrow B, Slater R, Waterman C, Hillier V. The hydroxyapatite orbital implant: post-operative pain. *Eye.* 1998;12 (Pt 6):996-1000.
32. Kangas-Saarela T, Ohukainen J, Koivuranta M. Patients' experiences of day surgery--an approach to quality control. *Amb Surg.* 1999;7:31-34.
33. Habib AS, Gan TJ. Combination therapy for postoperative nausea and vomiting - a more effective prophylaxis? *Ambul. Surg.* Jul 2001;9(2):59-71.
34. Golembiewski JA, O'Brien D. A systematic approach to the management of postoperative nausea and vomiting. *J Perianesth Nurs.* Dec 2002;17(6):364-376.
35. Ku CM, Ong BC. Postoperative nausea and vomiting: a review of current literature. *Singapore Med J.* Jul 2003;44(7):366-374.
36. Tang J, Watcha MF, White PF. A comparison of costs and efficacy of ondansetron and droperidol as prophylactic antiemetic therapy for elective outpatient gynecologic procedures. *Anesth Analg.* Aug 1996;83(2):304-313.
37. Wright CD, Jilka J, Gentry WB. Efficacy of promethazine suppositories dispensed to outpatient surgical patients. *Yale J Biol Med.* Sep-Oct 1998;71(5):391-395.
38. White PF, Watcha MF. Postoperative nausea and vomiting: prophylaxis versus treatment. *Anesth Analg.* Dec 1999;89(6):1337-1339.
39. White PF, Watcha MF. Has the use of meta-analysis enhanced our understanding of therapies for postoperative nausea and vomiting? *Anesth Analg.* Jun 1999;88(6):1200-1202.
40. Gan TJ, Meyer T, Apfel CC, et al. Consensus guidelines for managing postoperative nausea and vomiting. *Anesth Analg.* Jul 2003;97(1):62-71, table of contents.
41. Butterworth J. What constitutes a "consensus guideline"? *Anesth Analg.* Feb 2004;98(2):550; author reply 550-551.
42. White PF. Consensus guidelines for managing postoperative nausea and vomiting: is there a conflict of interest? *Anesth Analg.* Feb 2004;98(2):550; author reply 550-551.

Chapter Three References

1. Acalovschi I. Postoperative nausea and vomiting. *Curr Anaesth Crit Care.* 2002;13:37-43.

2. Watcha MF. Postoperative nausea and emesis. *Anesthesiol Clin North America.* Sep 2002;20(3):709-722.

3. Odom-Forren J, Moser DK. Postdischarge nausea and vomiting: A review of the literature. *J Ambulatory Surg.* 2005;12:99-105.

4. 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.* Jun 10 2004;350(24):2441-2451.

5. Kovac AL. Prevention and treatment of postoperative nausea and vomiting. *Drugs.* Feb 2000;59(2):213-243.

6. Apfel CC, Laara E, Koivuranta M, Greim CA, Roewer N. A simplified risk score for predicting postoperative nausea and vomiting: conclusions from cross-validations between two centers. *Anesthesiology.* Sep 1999;91(3):693-700.

7. Gupta A, Wu CL, Elkassabany N, Krug CE, Parker SD, Fleisher LA. Does the routine prophylactic use of antiemetics affect the incidence of postdischarge nausea and vomiting following ambulatory surgery?: A systematic review of randomized controlled trials. *Anesthesiology.* Aug 2003;99(2):488-495.

8. Carroll NV, Miederhoff P, Cox FM, Hirsch JD. Postoperative nausea and vomiting after discharge from outpatient surgery centers. *Anesth Analg.* May 1995;80(5):903-909.

9. Joshi GP, Twersky RS. Fast tracking in ambulatory surgery. *J Ambulatory Surg.* 2000;8:185-190.

10. Kapur PA. The big "little problem". *Anesth Analg.* 1991;73:243-245.

11. Apfel CC, Kranke P, Eberhart LH, Roos A, Roewer N. Comparison of predictive models for postoperative nausea and vomiting. *Br J Anaesth.* Feb 2002;88(2):234-240.

12. Pierre S, Benais H, Pouymayou J. Apfel's simplified score may favourably predict the risk of postoperative nausea and vomiting. *Can J Anaesth.* Mar 2002;49(3):237-242.

13. Apfel CC, Roewer N, Korttila K. How to study postoperative nausea and vomiting. *Acta Anaesthesiol Scand.* Sep 2002;46(8):921-928.

14. Paech MJ, Lee BH, Evans SF. The effect of anaesthetic technique on postoperative nausea and vomiting after day-case gynaecological laparoscopy. *Anaesth Intensive Care.* Apr 2002;30(2):153-159.

15. Gupta A, Stierer T, Zuckerman R, Sakima N, Parker SD, Fleisher LA. Comparison of recovery profile after ambulatory anesthesia with propofol, isoflurane, sevoflurane and desflurane: a systematic review. *Anesth Analg.* Mar 2004;98(3):632-641, table of contents.

16. Tang J, Watcha MF, White PF. A comparison of costs and efficacy of ondansetron and droperidol as prophylactic antiemetic therapy for elective outpatient gynecologic procedures. *Anesth Analg.* Aug 1996;83(2):304-313.

17. Coloma M, White PF, Markowitz SD, et al. Dexamethasone in combination with dolasetron for prophylaxis in the ambulatory setting: effect on outcome after laparoscopic cholecystectomy. *Anesthesiology.* Jun 2002;96(6):1346-1350.

18. American Society of PeriAnesthesia Nurses. ASPAN'S evidence-based clinical practice guideline for the prevention and/or management of PONV/PDNV. *J Perianesth Nurs.* Aug 2006;21(4):230-250.

19. Parlow JL, Meikle AT, van Vlymen J, Avery N. Post discharge nausea and vomiting after ambulatory laparoscopy is not reduced by promethazine prophylaxis. *Can J Anaesth.* Aug 1999;46(8):719-724.

20. Gan TJ, Meyer T, Apfel CC, et al. Consensus guidelines for managing postoperative nausea and vomiting. *Anesth Analg.* Jul 2003;97(1):62-71, table of contents.
21. Gan TJ. Postoperative nausea and vomiting--can it be eliminated? *Jama.* Mar 13 2002;287(10):1233-1236.
22. Tramer MR. Strategies for postoperative nausea and vomiting. *Best Prac Res Clin Anaesth* 2004;18:693-701.
23. Golembiewski JA, O'Brien D. A systematic approach to the management of postoperative nausea and vomiting. *J Perianesth Nurs.* Dec 2002;17(6):364-376.
24. Mamaril ME, Ross JM, Krenzischek D, et al. ASPAN's [corrected] EBP conceptual model: framework for perianesthesia practice and research. *J Perianesth Nurs.* Jun 2006;21(3):157-167.
25. Stetler CB, Morsi D, Rucki S, et al. Utilization-focused integrative reviews in a nursing service. *Appl Nurs Res.* Nov 1998;11(4):195-206.
26. Visser K, Hassink EA, Bonsel GJ, Moen J, Kalkman CJ. Randomized controlled trial of total intravenous anesthesia with propofol versus inhalation anesthesia with isoflurane-nitrous oxide: postoperative nausea with vomiting and economic analysis. *Anesthesiology.* Sep 2001;95(3):616-626.
27. Carvalho B, Benton JI, Vickery PJ, Sneyd JR, Davies PRF, Langton JA. Longterm functional recovery following day-case laparoscopic sterilisation: inhalational versus TIVA mainentance. *Journal of Ambulatory Surgery.* 2002;10:45-51.
28. Rothenberg DM, McCarthy RJ, Peng CC, Normoyle DA. Nausea and vomiting after dexamethasone versus droperidol following outpatient laparoscopy with a propofol-based general anesthetic. *Acta Anaesthesiol Scand.* Jul 1998;42(6):637-642.
29. Gan TJ, Franiak R, Reeves J. Ondansetron orally disintegrating tablet versus placebo for the prevention of postdischarge nausea and vomiting after ambulatory surgery. *Anesth Analg.* May 2002;94(5):1199-1200, table of contents.
30. Thagaard KS, Steine S, Raeder J. Ondansetron disintegrating tablets of 8 mg twice a day for 3 days did not reduce the incidence of nausea or vomiting after laparoscopic surgery. *Eur J Anaesthesiol.* Feb 2003;20(2):153-157.
31. Rajeeva V, Bhardwaj N, Batra YK, Dhaliwal LK. Comparison of ondansetron with ondansetron and dexamethasone in prevention of PONV in diagnostic laparoscopy. *Can J Anaesth.* Jan 1999;46(1):40-44.
32. Bailey PL, Streisand JB, Pace NL, et al. Transdermal scopolamine reduces nausea and vomiting after outpatient laparoscopy. *Anesthesiology.* Jun 1990;72(6):977-980.
33. Wright CD, Jilka J, Gentry WB. Efficacy of promethazine suppositories dispensed to outpatient surgical patients. *Yale J Biol Med.* Sep-Oct 1998;71(5):391-395.
34. Claxton AR, McGuire G, Chung F, Cruise C. Evaluation of morphine versus fentanyl for postoperative analgesia after ambulatory surgical procedures. *Anesth Analg.* Mar 1997;84(3):509-514.
35. Lebovits AH, Twersky R, McEwan B. Intraoperative therapeutic suggestions in day-case surgery: are there benefits for postoperative outcome? *Br J Anaesth.* Jun 1999;82(6):861-866.
36. al-Sadi M, Newman B, Julious SA. Acupuncture in the prevention of postoperative nausea and vomiting. *Anaesthesia.* Jul 1997;52(7):658-661.
37. Coloma M, White PF, Ogunnaike BO, et al. Comparison of acustimulation and ondansetron for the treatment of established postoperative nausea and vomiting. *Anesthesiology.* Dec 2002;97(6):1387-1392.
38. White PF, Issioui T, Hu J, et al. Comparative efficacy of acustimulation (ReliefBand) versus ondansetron (Zofran) in combination with droperidol for preventing nausea and vomiting. *Anesthesiology.* Nov 2002;97(5):1075-1081.

39. Pongrojpaw D, Chiamchanya C. The efficacy of ginger in prevention of post-operative nausea and vomiting after outpatient gynecological laparoscopy. *J Med Assoc Thai.* Mar 2003;86(3):244-250.
40. Apfel CC, Kranke P, Katz MH, et al. Volatile anaesthetics may be the main cause of early but not delayed postoperative vomiting: a randomized controlled trial of factorial design. *Br J Anaesth.* May 2002;88(5):659-668.
41. Kranke P, Morin AM, Roewer N, Wulf H, Eberhart LH. The efficacy and safety of transdermal scopolamine for the prevention of postoperative nausea and vomiting: a quantitative systematic review. *Anesth Analg.* Jul 2002;95(1):133-143, table of contents.
42. Jelicic M, Bonke B, Millar K. Effect of different therapeutic suggestions presented during anaesthesia on post-operative course. *Eur J Anaesthesiol.* Sep 1993;10(5):343-347.
43. Golembiewski J, Chernin E, Chopra T. Prevention and treatment of postoperative nausea and vomiting. *Am J Health Syst Pharm.* Jun 15 2005;62(12):1247-1260; quiz 1261-1242.
44. Eberhart LH, Mayer R, Betz O, et al. Ginger does not prevent postoperative nausea and vomiting after laparoscopic surgery. *Anesth Analg.* Apr 2003;96(4):995-998, table of contents.

Chapter Four References

1. Acalovschi I. Postoperative nausea and vomiting. *Curr Anaesth Crit Care.* 2002;13:37-43.

2. Carroll NV, Miederhoff P, Cox FM, Hirsch JD. Postoperative nausea and vomiting after discharge from outpatient surgery centers. *Anesth Analg.* May 1995;80(5):903-909.

3. Odom-Forren J, Fetzer SJ, Moser DK. Evidence-based interventions for post discharge nausea and vomiting: a review of the literature. *J Perianesth Nurs.* Dec 2006;21(6):411-430.

4. Odom-Forren J, Moser DK. Postdischarge nausea and vomiting: A review of the literature. *J Ambulatory Surg.* 2005;12:99-105.

5. 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.* Jun 10 2004;350(24):2441-2451.

6. Apfel CC, Laara E, Koivuranta M, Greim CA, Roewer N. A simplified risk score for predicting postoperative nausea and vomiting: conclusions from cross-validations between two centers. *Anesthesiology.* Sep 1999;91(3):693-700.

7. National Center for Health Statistics. *National survey of ambulatory surgery 2006* October 2008.

8. American Society of PeriAnesthesia Nurses. ASPAN'S evidence-based clinical practice guideline for the prevention and/or management of PONV/PDNV. *J Perianesth Nurs.* Aug 2006;21(4):230-250.

9. Pfisterer M, Ernst EM, Hirlekar G, et al. Post-operative nausea and vomiting in patients undergoing day-case surgery: an international, observational study. *Ambul Surg.* Jan 2001;9(1):13-18.

10. Gupta A, Wu CL, Elkassabany N, Krug CE, Parker SD, Fleisher LA. Does the routine prophylactic use of antiemetics affect the incidence of postdischarge nausea and vomiting following ambulatory surgery?: A systematic review of randomized controlled trials. *Anesthesiology.* Aug 2003;99(2):488-495.

11. Knapp MR, Beecher HK. Postanesthetic nausea, vomiting, and retching; evaluation of the antiemetic drugs dimenhydrinate (dramamine), chlorpromazine, and pentobarbital sodium. *J Am Med Assoc.* Feb 4 1956;160(5):376-385.

12. Rhodes VA. Nausea, vomiting, and retching. *Nursing Clinics of North America.* 1990;25:885-900.

13. Olver IN, Simon RM, Aisner J. Antiemetic studies: a methodological discussion. *Cancer Treat Rep.* May 1986;70(5):555-563.

14. Ponce de Leon S, Lara-Munoz C, Feinstein AR, Wells CK. A comparison of three rating scales for measuring subjective phenomena in clinical research. II. Use of experimentally controlled visual stimuli. *Arch Med Res.* Mar-Apr 2004;35(2):157-162.

15. Morrow GR. Methodology and assessment in clinical anti-emetic research: A meta-analysis of outcome parameters. *British J Cancer.* 1992;66(Suppl XIX):S38-S41.

16. Del Favero A, Roila F, Basurto C, et al. Assessment of nausea. *Eur J Clin Pharmacol.* 1990;38(2):115-120.

17. Tonato M, Roila F, Del Favero A. Methodology of antiemetic trials: a review. *Ann Oncol.* Feb 1991;2(2):107-114.

18. Boogaerts JG, Vanacker E, Seidel L, Albert A, Bardiau FM. Assessment of postoperative nausea using a visual analogue scale. *Acta Anaesthesiol Scand.* Apr 2000;44(4):470-474.

19. de Boer AG, van Lanschot JJ, Stalmeier PF, et al. Is a single-item visual analogue scale as valid, reliable and responsive as multi-item scales in measuring quality of life? *Qual Life Res.* Mar 2004;13(2):311-320.

20. McDaniel RW, Rhodes VA. Measuring nausea, vomiting, and retching. In: Frank-Stromborg M, Olsen SJ, eds. *Instruments for clinical health-care research*. 3 ed. Sudbury, MA: Jones and Bartlett; 2004:583-592.

21. Coloma M, White PF, Ogunnaike BO, et al. Comparison of acustimulation and ondansetron for the treatment of established postoperative nausea and vomiting. *Anesthesiology.* Dec 2002;97(6):1387-1392.

22. Fetzer SJ, Hand MA, Bouchard PA, Smith HB, Jenkins MB. Self-care activities for postdischarge nausea and vomiting. *J Perianesth Nurs.* Aug 2005;20(4):249-254.

23. Gan TJ, Franiak R, Reeves J. Ondansetron orally disintegrating tablet versus placebo for the prevention of postdischarge nausea and vomiting after ambulatory surgery. *Anesth Analg.* May 2002;94(5):1199-1200, table of contents.

24. Monagle J, Barnes R, Goodchild C, Hewitt M. Ondansetron is not superior to moderate dose metoclopramide in the prevention of post-operative nausea and vomiting after minor gynaecological surgery. *Eur J Anaesthesiol.* Nov 1997;14(6):604-609.

25. Paech MJ, Lee BH, Evans SF. The effect of anaesthetic technique on postoperative nausea and vomiting after day-case gynaecological laparoscopy. *Anaesth Intensive Care.* Apr 2002;30(2):153-159.

26. Pan PH, Lee SC, Harris LC. Antiemetic prophylaxis for postdischarge nausea and vomiting and impact on functional quality of living during recovery in patients with high emetic risks: a prospective, randomized, double-blind comparison of two prophylactic antiemetic regimens. *Anesth Analg.* Aug 2008;107(2):429-438.

27. Rajeeva V, Bhardwaj N, Batra YK, Dhaliwal LK. Comparison of ondansetron with ondansetron and dexamethasone in prevention of PONV in diagnostic laparoscopy. *Can J Anaesth.* Jan 1999;46(1):40-44.

28. White PF, Issioui T, Hu J, et al. Comparative efficacy of acustimulation (ReliefBand) versus ondansetron (Zofran) in combination with droperidol for preventing nausea and vomiting. *Anesthesiology.* Nov 2002;97(5):1075-1081.

29. White PF, Tang J, Hamza MA, et al. The use of oral granisetron versus intravenous ondansetron for antiemetic prophylaxis in patients undergoing laparoscopic surgery: the effect on emetic symptoms and quality of recovery. *Anesth Analg.* May 2006;102(5):1387-1393.

30. Zarate E, Watcha MF, White PF, Klein KW, Sa Rego M, Stewart DG. A comparison of the costs and efficacy of ondansetron versus dolasetron for antiemetic prophylaxis. *Anesth Analg.* Jun 2000;90(6):1352-1358.

31. Mattila K, Toivonen J, Janhunen L, Rosenberg PH, Hynynen M. Postdischarge symptoms after ambulatory surgery: first-week incidence, intensity, and risk factors. *Anesth Analg.* Dec 2005;101(6):1643-1650.

32. Parlow JL, Meikle AT, van Vlymen J, Avery N. Post discharge nausea and vomiting after ambulatory laparoscopy is not reduced by promethazine prophylaxis. *Can J Anaesth.* Aug 1999;46(8):719-724.

33. Grimsehl K, Whiteside JB, Mackenzie N. Comparison of cyclizine and ondansetron for the prevention of postoperative nausea and vomiting in laparoscopic day-case gynaecological surgery. *Anaesthesia.* Jan 2002;57(1):61-65.

34. Tang J, Watcha MF, White PF. A comparison of costs and efficacy of ondansetron and droperidol as prophylactic antiemetic therapy for elective outpatient gynecologic procedures. *Anesth Analg.* Aug 1996;83(2):304-313.

35. Waterman H, Slater R, Leatherbarrow B, Waterman C, Hillier V. Post-operative nausea and vomiting following orbital hydroxyapatite implant surgery. *Eur J Anaesthesiol.* Sep 1998;15(5):590-594.

36. Claxton AR, McGuire G, Chung F, Cruise C. Evaluation of morphine versus fentanyl for postoperative analgesia after ambulatory surgical procedures. *Anesth Analg.* Mar 1997;84(3):509-514.
37. Coloma M, White PF, Markowitz SD, et al. Dexamethasone in combination with dolasetron for prophylaxis in the ambulatory setting: effect on outcome after laparoscopic cholecystectomy. *Anesthesiology.* Jun 2002;96(6):1346-1350.
38. Ernst EMC, A. TRM. Incidence and impact of pain, nausea and vomiting following discharge from a day surgery unit. *Journal of Applied Therapeutics.* 1997;1:257-263.
39. Fish WH, Hobbs AJ, Daniels MV. Comparison of sevoflurane and total intravenous anaesthesia for daycase urological surgery. *Anaesthesia.* Oct 1999;54(10):1002-1006.
40. Hache JJ, Vallejo MC, Waters JH, Williams BA. Aprepitant in a multimodal approach for prevention of postoperative nausea and vomiting in high-risk patients: is there such a thing as "too many modalities"? *ScientificWorldJournal.* 2009;9:291-299.
41. Rothenberg DM, McCarthy RJ, Peng CC, Normoyle DA. Nausea and vomiting after dexamethasone versus droperidol following outpatient laparoscopy with a propofol-based general anesthetic. *Acta Anaesthesiol Scand.* Jul 1998;42(6):637-642.
42. Thagaard KS, Jensen HH, Raeder J. Analgesic and antiemetic effect of ketorolac vs. betamethasone or dexamethasone after ambulatory surgery. *Acta Anaesthesiol Scand.* Mar 2007;51(3):271-277.
43. White H, Black RJ, Jones M, Mar Fan GC. Randomized comparison of two anti-emetic strategies in high-risk patients undergoing day-case gynaecological surgery. *Br J Anaesth.* Apr 2007;98(4):470-476.
44. Moore JK, Elliott RA, Payne K, et al. The effect of anaesthetic agents on induction, recovery and patient preferences in adult day case surgery: a 7-day follow-up randomized controlled trial. *Eur J Anaesthesiol.* Nov 2008;25(11):876-883.
45. Zarate E, Mingus M, White PF, et al. The use of transcutaneous acupoint electrical stimulation for preventing nausea and vomiting after laparoscopic surgery. *Anesth Analg.* Mar 2001;92(3):629-635.
46. Fetzer SJ, Hand MC, Bouchard PA, Smith H, Jenkins MB. Evaluation of the Rhodes Index of Nausea and Vomiting for ambulatory surgery patients. *J Adv Nurs.* Jul 2004;47(1):74-80.
47. Rhodes VA, Watson PM, Johnson MH. Development of reliable and valid measures of nausea and vomiting. *Cancer Nurs.* Feb 1984;7(1):33-41.
48. Rhodes VA, Watson PM, Johnson MH. Patterns of nausea and vomiting in chemotherapy patients: a preliminary study. *Oncol Nurs Forum.* May-Jun 1985;12(3):42-48.
49. Rhodes VA, Watson PM, Johnson MH. Association of chemotherapy related nausea and vomiting with pretreatment anxiety. *Oncol Nurs Forum.* Jan-Feb 1986;13(1):41-47.
50. Rhodes VA, Watson PM, Johnson MH, Madsen RW, Beck NC. Patterns of nausea, vomiting, and distress in patients receiving antineoplastic drug protocols. *Oncol Nurs Forum.* Jul-Aug 1987;14(4):35-44.
51. Zhou Q, O'Brien B, Soeken K. Rhodes Index of Nausea and Vomiting--Form 2 in pregnant women. A confirmatory factor analysis. *Nurs Res.* Jul-Aug 2001;50(4):251-257.
52. Rhodes VA, McDaniel RW. The Index of Nausea, Vomiting, and Retching: a new format of the lndex of Nausea and Vomiting. *Oncol Nurs Forum.* Jun 1999;26(5):889-894.
53. Ming JL, Kuo BI, Lin JG, Lin LC. The efficacy of acupressure to prevent nausea and vomiting in post-operative patients. *J Adv Nurs.* Aug 2002;39(4):343-351.
54. Fu MR, Rhodes V, Xu B. The Chinese translation of the Index of Nausea, Vomiting, and Retching. *Cancer Nurs.* Apr 2002;25(2):134-140.
55. Lindley CM, Hirsch JD, O'Neill CV, Transau MC, Gilbert CS, Osterhaus JT. Quality of life consequences of chemotherapy-induced emesis. *Qual Life Res.* Oct 1992;1(5):331-340.

56. Martin AR, Pearson JD, Cai B, Elmer M, Horgan K, Lindley C. Assessing the impact of chemotherapy-induced nausea and vomiting on patients' daily lives: a modified version of the Functional Living Index-Emesis (FLIE) with 5-day recall. *Support Care Cancer.* Aug 2003;11(8):522-527.

57. Morrow GR. A patient report measure for the quantification of chemotherapy induced nausea and emesis: psychometric properties of the Morrow assessment of nausea and emesis (MANE). *Br J Cancer Suppl.* Dec 1992;19:S72-74.

58. Macario A, Claybon L, Pergolizzi JV. Anesthesiologists' practice patterns for treatment of postoperative nausea and vomiting in the ambulatory Post Anesthesia Care Unit. *BMC Anesthesiol.* 2006;6:6.

59. Khamales S, Bethune-Volters A, Chidiac J, Bensaoula O, Delgado A, Di Palma M. A randomized, double-blind trial assessing the efficacy and safety of sublingual metopimazine and ondansetron in the prophylaxis of chemotherapy-induced delayed emesis. *Anticancer Drugs.* Feb 2006;17(2):217-224.

60. Morrow GR. The assessment of nausea and vomiting: Past problems, current issues, and suggestions for future research. *Cancer.* 1984;53(10 Supplement):2267-2280.

61. Apfel CC, Roewer N, Korttila K. How to study postoperative nausea and vomiting. *Acta Anaesthesiol Scand.* Sep 2002;46(8):921-928.

62. Candiotti KA, Kovac AL, Melson TI, Clerici G, Joo Gan T. A randomized, double-blind study to evaluate the efficacy and safety of three different doses of palonosetron versus placebo for preventing postoperative nausea and vomiting. *Anesth Analg.* Aug 2008;107(2):445-451.

Chapter Five References

1. National Center for Health Statistics. *National survey of ambulatory surgery 2006* October 2008.

2. American Society of PeriAnesthesia Nurses. ASPAN'S evidence-based clinical practice guideline for the prevention and/or management of PONV/PDNV. *J Perianesth Nurs.* Aug 2006;21(4):230-250.

3. Apfel CC, Philip B, Cakmakkaya OS, et al. A prediction model for post-discharge nausea and vomiting after ambulatory surgery; 2009:1 - 39.

4. Carroll NV, Miederhoff P, Cox FM, Hirsch JD. Postoperative nausea and vomiting after discharge from outpatient surgery centers. *Anesth Analg.* May 1995;80(5):903-909.

5. Gupta A, Wu CL, Elkassabany N, Krug CE, Parker SD, Fleisher LA. Does the routine prophylactic use of antiemetics affect the incidence of postdischarge nausea and vomiting following ambulatory surgery?: A systematic review of randomized controlled trials. *Anesthesiology.* Aug 2003;99(2):488-495.

6. Odom-Forren J, Moser DK. Postdischarge nausea and vomiting: A review of the literature. *J Ambulatory Surg.* 2005;12:99-105.

7. Joshi GP, Twersky RS. Fast tracking in ambulatory surgery. *J Ambulatory Surg.* 2000;8:185-190.

8. Apfel CC, Laara E, Koivuranta M, Greim CA, Roewer N. A simplified risk score for predicting postoperative nausea and vomiting: conclusions from cross-validations between two centers. *Anesthesiology.* Sep 1999;91(3):693-700.

9. Glass PSA, White PF. Practice guidelines for the management of postoperative nausea and vomiting: Past, present, and future. *Anesth Analg.* 2007;105(6):1528-15529.

10. White PF, O'Hara JF, Roberson CR, Wender RH, Candiotti KA. The impact of current antiemetic practices on patient outcomes: a prospective study on high-risk patients. *Anesth Analg.* Aug 2008;107(2):452-458.

11. Candiotti KA, Kovac AL, Melson TI, Clerici G, Joo Gan T. A randomized, double-blind study to evaluate the efficacy and safety of three different doses of palonosetron versus placebo for preventing postoperative nausea and vomiting. *Anesth Analg.* Aug 2008;107(2):445-451.

12. Kapur PA. The big "little problem". *Anesth Analg.* 1991;73:243-245.

13. Kovac AL, Eberhart LH, Kotarski J, Clerici G, Apfel CC, Palonosetron 04-07 Study Group. A randomized, double-blind study to evaluate the efficacy and safety of three different doses of palonosetron versus placebo in preventing postoperative nausea and vomiting over a 72-hour period. *Anesth Analg.* 2008;107:439-444.

14. Odom-Forren J, Fetzer SJ, Moser DK. Evidence-based interventions for post discharge nausea and vomiting: a review of the literature. *J Perianesth Nurs.* Dec 2006;21(6):411-430.

15. Pan PH, Lee SC, Harris LC. Antiemetic prophylaxis for postdischarge nausea and vomiting and impact on functional quality of living during recovery in patients with high emetic risks: a prospective, randomized, double-blind comparison of two prophylactic antiemetic regimens. *Anesth Analg.* Aug 2008;107(2):429-438.

16. Fetzer SJ, Hand MA, Bouchard PA, Smith HB, Jenkins MB. Self-care activities for postdischarge nausea and vomiting. *J Perianesth Nurs.* Aug 2005;20(4):249-254.

17. Lichtor JL, Glass PS. We're tired of waiting. *Anesth Analg.* Aug 2008;107(2):353-355.

18. Chinnappa V, Chung F. Post-discharge nausea and vomiting: an overlooked aspect of ambulatory anesthesia? *Can J Anaesth.* Sep 2008;55(9):565-571.

19. Wu CL, Berenholtz SM, Pronovost PJ, Fleisher LA. Systematic review and analysis of postdischarge symptoms after outpatient surgery. *Anesthesiology.* Apr 2002;96(4):994-1003.

20. Macario A, Weinger M, Carney S, Kim A. Which clinical anesthesia outcomes are important to avoid? The perspective of patients. *Anesth Analg.* Sep 1999;89(3):652-658.
21. Lee A, Gin T, Lau AS, Ng FF. A comparison of patients' and health care professionals' preferences for symptoms during immediate postoperative recovery and the management of postoperative nausea and vomiting. *Anesth Analg.* Jan 2005;100(1):87-93.
22. Gan T, Sloan F, Dear Gde L, El-Moalem HE, Lubarsky DA. How much are patients willing to pay to avoid postoperative nausea and vomiting? *Anesth Analg.* Feb 2001;92(2):393-400.
23. Tramer MR. Strategies for postoperative nausea and vomiting. *Best Prac Res Clin Anaesth* 2004;18:693-701.
24. Tonato M, Roila F, Del Favero A, Ballatori E. Methodology of trials with antiemetics. *Support Care Cancer.* Jul 1996;4(4):281-286.
25. Apfel CC, Roewer N, Korttila K. How to study postoperative nausea and vomiting. *Acta Anaesthesiol Scand.* Sep 2002;46(8):921-928.
26. Rhodes VA. Nausea, vomiting, and retching. *Nursing Clinics of North America.* 1990;25:885-900.
27. Fetzer SJ, Hand MC, Bouchard PA, Smith H, Jenkins MB. Evaluation of the Rhodes Index of Nausea and Vomiting for ambulatory surgery patients. *J Adv Nurs.* Jul 2004;47(1):74-80.
28. Ming JL, Kuo BI, Lin JG, Lin LC. The efficacy of acupressure to prevent nausea and vomiting in post-operative patients. *J Adv Nurs.* Aug 2002;39(4):343-351.
29. Morrow GR. Methodology in behavioral and psychosocial cancer research. The assessment of nausea and vomiting. Past problems, current issues and suggestions for future research. *Cancer.* May 15 1984;53(10 Suppl):2267-2280.
30. Morrow GR. Methodology and assessment in clinical anti-emetic research: A meta-analysis of outcome parameters. *British J Cancer.* 1992;66(Suppl XIX):S38-S41.
31. Tonato M, Roila F, Del Favero A. Methodology of antiemetic trials: a review. *Ann Oncol.* Feb 1991;2(2):107-114.
32. Del Favero A, Tonato M, Roila F. Issues in the measurement of nausea. *Br J Cancer Suppl.* Dec 1992;19:S69-71.
33. Del Favero A, Roila F, Basurto C, et al. Assessment of nausea. *Eur J Clin Pharmacol.* 1990;38(2):115-120.
34. Boogaerts JG, Vanacker E, Seidel L, Albert A, Bardiau FM. Assessment of postoperative nausea using a visual analogue scale. *Acta Anaesthesiol Scand.* Apr 2000;44(4):470-474.
35. Mamaril ME, Windle PE, Burkard JF. Prevention and management of postoperative nausea and vomiting: a look at complementary techniques. *J Perianesth Nurs.* Dec 2006;21(6):404-410.
36. Myles PS, Reeves MD, Anderson H, Weeks AM. Measurement of quality of recovery in 5672 patients after anaesthesia and surgery. *Anaesth Intensive Care.* Jun 2000;28(3):276-280.
37. Herrera FJ, Wong J, Chung F. A systematic review of postoperative recovery outcomes measurements after ambulatory surgery. *Anesth Analg.* Jul 2007;105(1):63-69.
38. Wu CL, Richman JM. Postoperative pain and quality of recovery. *Curr Opin Anaesthesiol.* Oct 2004;17(5):455-460.
39. de Boer AG, van Lanschot JJ, Stalmeier PF, et al. Is a single-item visual analogue scale as valid, reliable and responsive as multi-item scales in measuring quality of life? *Qual Life Res.* Mar 2004;13(2):311-320.
40. Cohen J. *Statistical Power Analysis for the Behavioral Sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates; 1988.
41. Elashof J. *nQuery Advisor*. Sangus, MA: Statistical Solutions; 1995-2005.
42. Hoenig JM, Heisey DM. The abuse of power: The pervasive fallacy of power

calculations for data analysis. *The American Statistician.* 2001;55(1):1-6.

43. Visser K, Hassink EA, Bonsel GJ, Moen J, Kalkman CJ. Randomized controlled trial of total intravenous anesthesia with propofol versus inhalation anesthesia with isoflurane-nitrous oxide: postoperative nausea with vomiting and economic analysis. *Anesthesiology.* Sep 2001;95(3):616-626.

44. Waterman H, Leatherbarrow B, Slater R, Waterman C. Post-operative pain, nausea and vomiting: qualitative perspectives from telephone interviews. *J Adv Nurs.* Mar 1999;29(3):690-696.

45. Ernst EMC, A. TRM. Incidence and impact of pain, nausea and vomiting following discharge from a day surgery unit. *Journal of Applied Therapeutics.* 1997;1:257-263.

46. Phillip BK, Chen YT, Gan TJ, Ma L, Hu HX. Post-Operative Nausea/Vomiting after High-Risk Ambulatory Surgeries. *Anesthesiology.* 2007;107:A40.

47. Gan TJ. Risk factors for postoperative nausea and vomiting. *Anesth Analg.* Jun 2006;102(6):1884-1898.

48. Kranke P, Apefel CC, Papenfuss T, et al. An increased body mass index is no risk factor for postoperative nausea and vomiting. A systematic review and results of original data. *Acta Anaesthesiol Scand.* Feb 2001;45(2):160-166.

49. 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.* Jun 10 2004;350(24):2441-2451.

50. Apfel CC, Kranke P, Katz MH, et al. Volatile anaesthetics may be the main cause of early but not delayed postoperative vomiting: a randomized controlled trial of factorial design. *Br J Anaesth.* May 2002;88(5):659-668.

51. Habib AS, White WD, Eubanks S, Pappas TN, Gan TJ. A randomized comparison of a multimodal management strategy versus combination antiemetics for the prevention of postoperative nausea and vomiting. *Anesth Analg.* Jul 2004;99(1):77-81.

52. Tramer M, Moore A, McQuay H. Omitting nitrous oxide in general anaesthesia: meta-analysis of intraoperative awareness and postoperative emesis in randomized controlled trials. *Br J Anaesth.* Feb 1996;76(2):186-193.

53. Wright CD, Jilka J, Gentry WB. Efficacy of promethazine suppositories dispensed to outpatient surgical patients. *Yale J Biol Med.* Sep-Oct 1998;71(5):391-395.

54. Andersen R, Krohg K. Pain as a major cause of postoperative nausea. *Can Anaesth Soc J.* Jul 1976;23(4):366-369.

55. Kolodzie K, Apfel CC. Nausea and vomiting after office-based anesthesia. *Curr Opin Anaesthesiol.* Aug 2009;22(4):532-538.

56. Watt-Watson J, Chung F, Chan VW, McGillion M. Pain management following discharge after ambulatory same-day surgery. *J Nurs Manag.* May 2004;12(3):153-161.

57. White PF, Issioui T, Hu J, et al. Comparative efficacy of acustimulation (ReliefBand) versus ondansetron (Zofran) in combination with droperidol for preventing nausea and vomiting. *Anesthesiology.* Nov 2002;97(5):1075-1081.

58. Coloma M, White PF, Ogunnaike BO, et al. Comparison of acustimulation and ondansetron for the treatment of established postoperative nausea and vomiting. *Anesthesiology.* Dec 2002;97(6):1387-1392.

59. Osoba D, Zee B, Warr D, Kaizer L, Latreille J, Pater J. Quality of life studies in chemotherapy-induced emesis. *Oncology.* Jun 1996;53 Suppl 1:92-95.

60. Martin AR, Pearson JD, Cai B, Elmer M, Horgan K, Lindley C. Assessing the impact of chemotherapy-induced nausea and vomiting on patients' daily lives: a modified version of the Functional Living Index-Emesis (FLIE) with 5-day recall. *Support Care Cancer.* Aug 2003;11(8):522-527.

Chapter Six References

1. Apfel CC, Philip B, Cakmakkaya OS, et al. A prediction model for post-discharge nausea and vomiting after ambulatory surgery; 2009:1 - 39.

2. Odom-Forren J, Moser DK. Postdischarge nausea and vomiting: A review of the literature. *J Ambulatory Surg.* 2005;12:99-105.

3. Wu CL, Berenholtz SM, Pronovost PJ, Fleisher LA. Systematic review and analysis of postdischarge symptoms after outpatient surgery. *Anesthesiology.* Apr 2002;96(4):994-1003.

4. Odom-Forren J, Fetzer SJ, Moser DK. Evidence-based interventions for post discharge nausea and vomiting: a review of the literature. *J Perianesth Nurs.* Dec 2006;21(6):411-430.

5. Carroll NV, Miederhoff P, Cox FM, Hirsch JD. Postoperative nausea and vomiting after discharge from outpatient surgery centers. *Anesth Analg.* May 1995;80(5):903-909.

6. Fetzer SJ, Hand MA, Bouchard PA, Smith HB, Jenkins MB. Self-care activities for postdischarge nausea and vomiting. *J Perianesth Nurs.* Aug 2005;20(4):249-254.

7. de Boer AG, van Lanschot JJ, Stalmeier PF, et al. Is a single-item visual analogue scale as valid, reliable and responsive as multi-item scales in measuring quality of life? *Qual Life Res.* Mar 2004;13(2):311-320.

8. Ponce de Leon S, Lara-Munoz C, Feinstein AR, Wells CK. A comparison of three rating scales for measuring subjective phenomena in clinical research. II. Use of experimentally controlled visual stimuli. *Arch Med Res.* Mar-Apr 2004;35(2):157-162.

9. Tonato M, Roila F, Del Favero A, Ballatori E. Methodology of trials with antiemetics. *Support Care Cancer.* Jul 1996;4(4):281-286.

10. Boogaerts JG, Vanacker E, Seidel L, Albert A, Bardiau FM. Assessment of postoperative nausea using a visual analogue scale. *Acta Anaesthesiol Scand.* Apr 2000;44(4):470-474.

11. Martin AR, Pearson JD, Cai B, Elmer M, Horgan K, Lindley C. Assessing the impact of chemotherapy-induced nausea and vomiting on patients' daily lives: a modified version of the Functional Living Index-Emesis (FLIE) with 5-day recall. *Support Care Cancer.* Aug 2003;11(8):522-527.

12. Fetzer SJ, Hand MC, Bouchard PA, Smith H, Jenkins MB. Evaluation of the Rhodes Index of Nausea and Vomiting for ambulatory surgery patients. *J Adv Nurs.* Jul 2004;47(1):74-80.

13. Martin AR, Carides AD, Pearson JD, et al. Functional relevance of antiemetic control. Experience using the FLIE questionnaire in a randomised study of the NK-1 antagonist aprepitant. *Eur J Cancer.* Jul 2003;39(10):1395-1401.

14. Myles PS, Reeves MD, Anderson H, Weeks AM. Measurement of quality of recovery in 5672 patients after anaesthesia and surgery. *Anaesth Intensive Care.* Jun 2000;28(3):276-280.

15. Candiotti KA, Kovac AL, Melson TI, Clerici G, Joo Gan T. A randomized, double-blind study to evaluate the efficacy and safety of three different doses of palonosetron versus placebo for preventing postoperative nausea and vomiting. *Anesth Analg.* Aug 2008;107(2):445-451.

16. Kloth DD. New pharmacologic findings for the treatment of PONV and PDNV. *Am J Health Syst Pharm.* Jan 1 2009;66(1 Suppl 1):S11-18.

17. Gan TJ, Sinha AC, Kovac AL, et al. A randomized, double-blind, multicenter trial comparing transdermal scopolamine plus ondansetron to ondansetron alone for the prevention of postoperative nausea and vomiting in the outpatient setting. *Anesth Analg.* May 2009;108(5):1498-1504.

18. Wright CD, Jilka J, Gentry WB. Efficacy of promethazine suppositories dispensed to outpatient surgical patients. *Yale J Biol Med.* Sep-Oct 1998;71(5):391-395.

19. Gan TJ, Franiak R, Reeves J. Ondansetron orally disintegrating tablet versus placebo for the prevention of postdischarge nausea and vomiting after ambulatory surgery. *Anesth Analg.* May 2002;94(5):1199-1200, table of contents.
20. Thagaard KS, Steine S, Raeder J. Ondansetron disintegrating tablets of 8 mg twice a day for 3 days did not reduce the incidence of nausea or vomiting after laparoscopic surgery. *Eur J Anaesthesiol.* Feb 2003;20(2):153-157.
21. Diemunsch P, Joshi GP, Brichant JF. Neurokinin-1 receptor antagonists in the prevention of postoperative nausea and vomiting. *Br J Anaesth.* Jul 2009;103(1):7-13.
22. Chinnappa V, Chung F. Post-discharge nausea and vomiting: an overlooked aspect of ambulatory anesthesia? *Can J Anaesth.* Sep 2008;55(9):565-571.
23. al-Sadi M, Newman B, Julious SA. Acupuncture in the prevention of postoperative nausea and vomiting. *Anaesthesia.* Jul 1997;52(7):658-661.
24. White PF, Issioui T, Hu J, et al. Comparative efficacy of acustimulation (ReliefBand) versus ondansetron (Zofran) in combination with droperidol for preventing nausea and vomiting. *Anesthesiology.* Nov 2002;97(5):1075-1081.
25. Coloma M, White PF, Ogunnaike BO, et al. Comparison of acustimulation and ondansetron for the treatment of established postoperative nausea and vomiting. *Anesthesiology.* Dec 2002;97(6):1387-1392.
26. Pongrojpaw D, Chiamchanya C. The efficacy of ginger in prevention of post-operative nausea and vomiting after outpatient gynecological laparoscopy. *J Med Assoc Thai.* Mar 2003;86(3):244-250.
27. Paech MJ, Lee BH, Evans SF. The effect of anaesthetic technique on postoperative nausea and vomiting after day-case gynaecological laparoscopy. *Anaesth Intensive Care.* Apr 2002;30(2):153-159.
28. Carvalho B, Benton JI, Vickery PJ, Sneyd JR, Davies PRF, Langton JA. Longterm functional recovery following day-case laparoscopic sterilisation: inhalational versus TIVA mainentance. *Journal of Ambulatory Surgery.* 2002;10:45-51.
29. Young J, O'Connell B, McGregor S. Day surgery patients' convalescence at home: Does enhanced discharge education make a difference? *Nursing and Health Sciences.* 2000;2:29-39.
30. Juarez G, Cullinane CA, Borneman T, et al. Management of pain and nausea in outpatient surgery. *Pain Manag Nurs.* Dec 2005;6(4):175-181.
31. Gan TJ. Risk factors for postoperative nausea and vomiting. *Anesth Analg.* Jun 2006;102(6):1884-1898.
32. Andersen R, Krohg K. Pain as a major cause of postoperative nausea. *Can Anaesth Soc J.* Jul 1976;23(4):366-369.
33. Chia Y-Y, Kuo M-C, Liu K, Sun G-C, Hsieh S-W, Chow L-H. Does postoperative pain induce emesis? *Clin J Pain.* 2002;18:317-323.
34. Watt-Watson J, Chung F, Chan VW, McGillion M. Pain management following discharge after ambulatory same-day surgery. *J Nurs Manag.* May 2004;12(3):153-161.
35. Gupta A, Wu CL, Elkassabany N, Krug CE, Parker SD, Fleisher LA. Does the routine prophylactic use of antiemetics affect the incidence of postdischarge nausea and vomiting following ambulatory surgery?: A systematic review of randomized controlled trials. *Anesthesiology.* Aug 2003;99(2):488-495.
36. Myles PS, Hunt JO, Nightingale CE, et al. Development and psychometric testing of a quality of recovery score after general anesthesia and surgery in adults. *Anesth Analg.* Jan 1999;88(1):83-90.
37. Osoba D, Zee B, Warr D, Kaizer L, Latreille J, Pater J. Quality of life studies in chemotherapy-induced emesis. *Oncology.* Jun 1996;53 Suppl 1:92-95.
38. Herrera FJ, Wong J, Chung F. A systematic review of postoperative recovery outcomes measurements after ambulatory surgery. *Anesth Analg.* Jul 2007;105(1):63-69.

39. Garratt A, Schmidt L, Mackintosh A, Fitzpatrick R. Quality of life measurement: bibliographic study of patient assessed health outcome measures. *Bmj.* Jun 15 2002;324(7351):1417.

40. Pan PH, Lee SC, Harris LC. Antiemetic prophylaxis for postdischarge nausea and vomiting and impact on functional quality of living during recovery in patients with high emetic risks: a prospective, randomized, double-blind comparison of two prophylactic antiemetic regimens. *Anesth Analg.* Aug 2008;107(2):429-438.

41. Pavlin DJ, Chen C, Penaloza DA, Buckley FP. A survey of pain and other symptoms that affect the recovery process after discharge from an ambulatory surgery unit. *J Clin Anesth.* May 2004;16(3):200-206.

VITA

Author's Name - Jan Odom-Forren

Birthplace – Columbia, MS

Birthdate – September 21, 1952

Education

Institution	Degree	Date Conferred	Field(s) of Study
Mississippi College	BSN	1975, May	Nursing
University of Southern Mississippi	MS	1989, May	Nursing Administration

Certifications and Licensure

Kentucky License # 1034247
1986 to present: Certified Post Anesthesia Nurse (CPAN)
BLS certification 2008-2010
ACLS certification 2008-2010
PALS certification 2008-2010

Professional Experience

Dates	Institution and Location	Academic Position
August 2008-present	University of Kentucky College of Nursing, Lexington, KY	Instructor

Dates	Institution and Location	Clinical Position
August 2007 – present	Baptist Hospital East, Louisville, KY	PRN Staff RN, Phase II Recovery
July 2001 – present	American Society of PeriAnesthesia Nurses, Cherry Hill, NJ	Co-Editor, Journal of PeriAnesthesia Nursing
1993 – present	Louisville, KY	Perianesthesia consultant/educator
2002 - 2003	Forrest General Hospital, Hattiesburg, MS	Director, Surgical Services
2001 - 2002	Forrest General Hospital, Hattiesburg, MS	Patient Care Manager, PACU

1990-2001	Forrest General Hospital, Hattiesburg, MS	Clinical Nurse Specialist, Surgical Services
1989 – 1990	Forrest General Hospital, Hattiesburg, MS	Clinical Director, Maternal-Child Nursing
1986 – 1989	Forrest General Hospital, Hattiesburg, MS	Staff RN, Outpatient Surgery, Open Heart Recovery, and NICU
1982 – 1986	Humana Hospital Audubon, Louisville, KY	Nurse Manager, PACU
1980-1981	Gulf Coast Community Hospital, Panama City, FL	Staff Nurse, Newborn Nursery
1977-1980	St. Joseph Infirmary, Louisville, KY	Nurse Manager, Intensive Care Nursery
1975-1977	St. Joseph Infirmary, Louisville, KY	Staff Nurse, Intensive Care Nursery
1975	Marion County General Hospital, Columbia, MS	Staff Nurse, Medical Surgical Unit

Awards and Honors

2009 AJN Book of the Year Award for *Perianesthesia Nursing: A Critical Care Approach (5th edition)*
2009 Golden Key Honour Society
2008 Mary Hanna Memorial Journalism Award, First Place—Clinical Article Category for "Evidence-Based Interventions for Post Discharge Nausea and Vomiting: A Review of the Literature"
2006 ASPAN Scholarship for Doctoral Studies
2005 University of Kentucky, Graduate School Academic Year Fellowship
2005 AJN Book of the Year Award for *Practical Guide to Moderate Sedation/Analgesia (2nd edition)*
2002 Mississippi Society of PeriAnesthesia Nurses, President's Award
2000 Mississippi Nurses' Association Perioperative Nurse of the Year
1998 Fellow, American Academy of Nursing, Induction
1998 Mississippi College School of Nursing, Alumna of the Year
1997 ASPAN's Outstanding Achievement Award
1993 Mississippi Nurses' Association Clinical Nurse Specialist of the Year
1989 Phi Kappa Phi
1989 Sigma Theta Tau, Gamma Lambda Chapter

Research Activities and Research Funding

February 2008 – present	Post Discharge Nausea and Vomiting: Incidence and Management Strategies. Grant provided by University of California, San Francisco
September 1988- May 1989	The relationship of nurse manager leadership style as perceived by staff nurses and job satisfaction of critical care RN staff nurses. Unpublished thesis, University of Southern Mississippi.

Publications

Books

Drain CB & **Odom-Forren J**: *Perianesthesia Nursing: A Critical Care Approach (5th ed)*. St Louis, Mosby/Elsevier, 2009.

Odom-Forren J & Watson D (eds.): *Practical Guide to Moderate Sedation/Analgesia.* St. Louis, Mosby/Elsevier, 2005.

Journal articles and Monographs (* if peer reviewed)

Odom-Forren J. Perioperative patient safety and procedural sedation. *Perioperative Nursing Clinics.* 2008; 3:355-366.

*Lennie T A, Worrall-Carter L, Hammash M, **Odom-Forren J**, Roser L P, Smith C S, Trupp R, Chung M L, Moser D K. Relationship of heart failure patients' knowledge, perceived barriers, and attitudes regarding low-sodium diet recommendations to adherence. *Prog Cardiovasc Nurs.* 2008; 23(1): 6-11.

***Odom-Forren J,** Fetzer, SJ, Moser DK. Evidence-Based Interventions for Post Discharge Nausea and Vomiting: A Review of the Literature. *Journal of PeriAnesthesia Nursing*. 2007;21:6, 411-430.

Odom-Forren J. Preventing Surgical Site Infections. *Nursing 2006*; 36:6, 58-64.

***Odom-Forren, J.** & Hahn EJ**.** Mandatory Reporting of Health Care-Associated Infections: Kingdon's Multiple Streams Approach. *Policy, Politics, and Nursing Practice*. 2006; 7,64-72.

***Odom-Forren J,** Moser D. Post Discharge Nausea and Vomiting: A Current Review of the Literature. *Journal of Ambulatory Surgery*. 2005; 12, 99-105.

Odom-Forren J. The Reality of Surgical Site Infection. *Nursing Management*. 2005; 36:11(suppl),16-20.

***Odom-Forren J.** The Evolution of Nurse Monitored Sedation. *Journal of PeriAnesthesia Nursing*. 2005;20:6:385-398.

Katariya K, Robinson S, Sessler D, Kurz A, Hodges WE, **Odom-Forren J.** Roundtable Summary: Perioperative Temperature Management. *Special Report. McMahon Publishing Group*, 2005.

Odom-Forren J. Watch that incision: Thwart surgical site infections with antimicrobial prophylaxis. *Nursing Management* . 2004;35:11(suppl),16-21.

Odom-Forren J. Moderate Sedation/Analgesia. Study Guide. *STERIS Corporation*. Mentor, OH, 2004.

Odom-Forren J. RN Oversight of Moderate Sedation: Seven Tips for Playing it Safe. *Outpatient Surgery Magazine*. October 2003.

Odom J. Legal Issues of Perianesthesia Nursing. *The Dissector: The Journal of the Perioperative Nurses College of New Zealand Nurses Organization*. 2003; 10:4.

Odom J. Nursing Shortage: Impending Doom or Challenging Opportunity. *Journal of PeriAnesthesia Nursing*, 2000;15:5.

*Mahoney CB & **Odom J:** Maintaining intraoperative normothermia: A meta-analysis of outcomes with costs. *AANA.* 1999; 67:2, 155-164.

Odom J. Elevators and Patient Confidentiality. *The MSPAN Arouser*, May 1998.

Odom J. Conscious sedation in the ambulatory setting. *Critical Care Nursing Clinics of North America*. 1997;9:3.

Odom J. Tips on administering IV conscious sedation. *Today's Surgical Nurse*, 1996; 18:5**.**

Odom J. Postanesthesia nursing can be exciting, varied, and rewarding. *Mississippi Medical News*,1995; 5:8

Odom J. Airway emergencies in the PACU. *Nursing Clinics of North America*, 1993;8:5.

***Odom J.** The emerging role of risk management. *Journal of Post Anesthesia Nursing*, Vol. 5, No. 2, April 1990.

Editorials

Odom-Forren J. Health care reform: The time is now. *J Perianesth Nurs*. 2009; 24:4, 213-215.

Odom-Forren J. Workplace aggression and violence. *J Perianesth Nurs*. 2009; 24:2, 69-70.

Odom-Forren J. A new year of hope. *J Perianesth Nurs*. 2009; 24:1, 67-68.

Odom-Forren J. The mysterious life and work of a nurse editor. *J Perianesth Nurs*. 2008; 23:6, 367-370.

Odom-Forren J. Voting: A right, a privilege, and a responsibility. *J Perianesth Nurs.* 2008; 23:5, 364-366.

Odom-Forren J. Never events: A patient safety imperative. *J Perianesth Nurs.* 2008; 23:4, 223-225.

Odom-Forren J. Moving forward. *J Perianesth Nurs*. 2008; 23:2, 75-76.

Odom-Forren J. A new year. *J Perianesth Nurs.* 2008; 23:1, 73-74.

Odom-Forren J. Patient safety: Nursing priority. *J Perianesth Nurs* . 2007; 22:6, 446-448

Odom-Forren J. Back in the saddle again. *J Perianesth Nurs*. 2007; 22:5, 363-364

Odom-Forren J. Accurate patient handoffs: Imperative for patient safety. *J Perianesth Nurs*. 2007; 22:4, 233-234.

Odom-Forren J. Nurses: Angels of mercy or competent professionals. *J Perianesth Nurs.* 2007; 22:2,81-83.

Odom-Forren J. My new year's wish list. *J Perianesth Nurs*. 2007; 22:1,73-75.

Odom-Forren J. The perianethesia nurse as researcher. *J Perianesth Nurs*. 2006; 21:6, 447-449.

Odom-Forren J. A tragedy unfolds: Lessons to learn. *J Perianesth Nurs*. 2006; 21:5, 367-369.

Odom-Forren J. Staying on top of the issues: Nausea, vomiting, and anesthetic awareness. *J Perianesth Nurs*. 2006; 21(4):225-227**.**

Odom-Forren J. The propofol debate continues. *J Perianesth Nurs*. 2006; 21:2, 77-78.

Odom-Forren J. A new beginning. *J Perianesth Nurs*. 2006; 21:1, 74-75**.**

Odom-Forren J. Hurricane Katrina. *J Perianesth Nurs* 2005; 20:5, 303-304.

Odom-Forren J. Watch your back! *J Peranesth Nurs*. 2005; 20:4, 233-235.

Odom-Forren J. Cultural competence: A call to action. *J Perianesth Nurs.*. 2005; 20:2, 79-91.

Odom-Forren J. The rules have changed. *J Perianesth Nurs.* 2005; 20:1, 72-73

Odom-Forren J. The melodious bell: The joy of work. *J Perianesth Nurs*. 2004;19:6, 443.

Odom-Forren J. Nurses, caring, and politics: Care enough to vote. *J Perianesth Nurs.* 2004; 19:5, 369-370.

Odom-Forren J. Do we assume too much? *J Perianesth Nurs.* 2004; 19:4, 225-227.

Odom-Forren J. A richer experience. *J Perianesth Nurs.* 2004; 19:2, 68-69.

Odom-Forren J. The essence of perianesthesia nursing. *J Perianesth Nurs.* 2004; 19:1, 62-63.

Odom-Forren J. The PACU as critical care unit. *J Perianesth Nurs.* 2003;18:6, 431-433.

Odom-Forren J. In the midst of change. *Journal of PeriAnesthesia Nursing.* 2003; 18:5, 374-375.

Odom J. The perianesthesia nurse: Standard bearer. *J Perianesth Nurs*. 2003; 18:4, 225-226.

Odom J: The nurse as mentor. *J Perianesth Nurs.* 2003; 18:2, 143-144.

Odom J: Disparity in health care. *J Perianesth Nurs*. 2003; 18:1, 72-74.

Odom J: Lessons learned. *J Perianesth Nurs.* 1002; 17:6, 437-438.

Odom J: Where have all the ethics gone. *J Perianesth Nurs.* 2002; 17:5, 361-362.

Odom J: We are family. *Journal of PeriAnesthesia Nursing.* 2002; 17: 4, 223-224.

Odom J. The nurse as patient advocate. *J Perianesth Nurs.* 2002; 17:2, 75-76.

Odom J. The pain of surgery: The agony of undermedication. *J Perianesth Nurs*. 2002; 17:1, 1-2.

Odom J. A sharp contrast. *J Perianesth Nurs,* 2001; 16:6, 434-435.

Odom J: Patient safety: To do no harm. *J Perianesth Nurs,* 2001; 16:4, 243-245.

Odom J: Change: A matter of survival. *J Perianesth Nurs,* 2001; 16:2, 67-68.

Odom J: Accepting the challenge. *J Perianesth Nurs,* 2001; 16:1, 62.

Odom J: The role of the advanced practice nurse in research. *Breathline,*

17: January 1997**.**

Odom J: The research process. *Breathline*, 16:2, March 1996.

Odom J: Research and you. *Breathline*, 13:1, January 1993.

Odom J: A goldmine of knowledge. *Breathline*. 13:3, March 1993.

Odom J: Mentors, cathedrals, and mermaids. *Journal of Post Anesthesia Nursing*, 1993; 8:4.

Odom J: A vision for the future. *Journal of Post Anesthesia Nursing*, 1992; 7:1.

Odom J: Post anesthesia: The future's in your hands. *Breathline*, 12:3, May 1992.

Odom J: Health care reform. *Breathline*, 12: 4, July 1992.

Odom J: Defining collaboration. *Breathline* 12:5, September 1992.

Odom J: A commitment to excellence. *Breathline* 12:6, November 1992.

Odom J: Join ASPAN...why?: A guest editorial. *Breathline*, 9:6, November 1989

Book Chapters

Odom-Forren J. Postanesthesia recovery. In Nagelhout JJ, Plaus KL: *Nurse Anesthesia* (3rd ed.). St. Louis, Saunders/Elsevier, 2010.

Odom-Forren J: Post operative pain care and complications, in Rothrock J., Meeker B. (eds.), *Alexander's Care of the Patient in Surgery* St. Louis, Mosby, 1995, 1998, 2003, 2006, 2010

Odom-Forren J, Clifford T. Evolution of .Perianesthesia care. In Schick L, Windle P. (Eds): *PeriAnesthesia Nursing Core Curriculum: Preoperative, Phase I and Phase II PACU Nursing*. St. Louis, Saunders, 2010.

Odom-Forren J. Legall Issues and Moderate Sedation. In Schick L, Windle P. (Eds): *PeriAnesthesia Nursing Core Curriculum: Preoperative, Phase I and Phase II PACU Nursing*. St. Louis, Saunders, 2010.

Odom-Forren J: Critical care patients with special needs: Sedation in critically ill patients. In Alspach JG (Ed): *Core Curriculum for Critical Care Nursing.* St Louis, SaundersElsevier, 2006.

Odom-Forren, J: Evolution of Perianesthesia Care and Legal Issues. In Quinn, DMD, Schick, L (eds): *PeriAnesthesia Nursing Core Curriculum: Preoperative, Phase I and Phase II PACU Nursing*. St. Louis, Saunders, 2004**.**

Hooper, V & **Odom, J:** Perioperative Pain Management. In Spry, C (ed.): Perioperative Management. Aspen Publications, 2003, 2009.

Odom J: Conscious sedation/analgesia, in Burden, N. *Ambulatory Surgical Nursing* (2nd ed.), Philadelphia, Saunders, 2000**.**

Burden, N & **Odom J:** The Special Needs Patient, in Burden, N. *Ambulatory Surgical Nursing* (2nd ed.), Philadelphia, Saunders, 2000.

Odom J: Implementation of nursing standards, in Quinn, D. (ed.), *Ambulatory Surgical Nursing Practice Core Curriculum*, Philadelphia, Saunders, 1999.

Odom J: Legal and ethical issues, in Quinn D. (ed.), *Ambulatory Surgical Nursing Practice Core Curriculum*, Philadelphia Saunders, 1999.

Odom J: Management and policies, in Drain, C. (ed.), *The Post Anesthesia Care Unit: A Critical Care Approach to Post Anesthesia Nursing* (3rd ed.), Philadelphia, Saunders, 1995.

Odom J: Evolution of post anesthesia care, in Litwack K. (ed.), *Core Curriculum for Post Anesthesia Nursing Practice* (3rd ed. & 4th ed.), Philadelphia, Saunders, 1995, 1999.

Video Media

Odom J. *Conscious Sedation/Analgesia: Legal, Quality, and Competency Issues*. VHA/AORN Teleconference, Dallas, TX, December 2000**.**

Odom J: *Conscious Sedation/Analgesia: Clinical Practice Issues*. VHA/AORN Teleconference, Dallas, TX, November 2000.

Odom J, Watson D: *Legal Issues in Perioperative Nursing*. RTN Video Teleconference, Pittsburgh, PA, July 1999.

Odom J, Watson, D: *Conscious Sedation, Part II.* RTN Video Teleconference, Pittsburgh, PA, October 1998.

Odom J, Watson D: *Conscious Sedation, Part I.* RTN Video Teleconference, Pittsburgh, PA, August 1998**.**

Odom J, Rehab Training Network: *Preoperative, Intraoperative, and Postoperative Care of Special Needs Patients.* Video Teleconference, Reuters Studio, Washington D.C., 1997.

Odom J, Hoffman LaRoche, Inc.: *Antagonism of Benzodiazepine Sedation in the PACU: The Use of Roma*zicon, 1994.

Editorial Services

*Journal of PeriAnesthesia Nursing***,** Philadelphia, PA, Elsevier/Saunders

Editorial Consultant
Editorial Advisory Board
2001-present Co-Editor

Today's Surgical Nurse, Thorofare, NJ, SLACK, Inc.

1996-1999 Member, Editorial Board