

**Non-pharmacological nursing
interventions in Post-Operative
Nausea and Vomiting treatment.
A Literature Review**

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<p>Abstract</p> <p>Background: Post-operative nausea and vomiting (PONV) is one of the most common complications after surgery, causing patient discomfort, longer stays at hospital settings and other complication after surgery such as electrolyte imbalance, hemorrhage and risk of wound opening. Currently many pharmacological interventions are available but they show little efficacy and they count with many serious side-effects and are very costly treatments.</p> <p>Task and objectives: The objective of this paper is to conduct a research on non-pharmacological interventions to mitigate PONV that can be conducted by nurses.</p> <p>Implementation method: This is a literature review, we have used two databases; Medline and Cinahl. Articles were selected according to the inclusion criteria and their quality was assessed using the assessment score from Hawker & Payne by two researchers. The data analysis was conducted using content analysis methodology.</p> <p>Results: Research conducted found that nurses can implement subjective and/or objective treatments. Subjective treatments are based on patient trust and interventions without and object. Objective treatment includes: GRS (Go-rei-San) herbal compound, fluid therapy, aromatherapy, acupressure, Transcutaneous Electrical Acupoint Stimulation TEA P6 and Chewing Gum</p> <p>Conclusions: Several options as non-pharmacological treatment are available, however, more research needs to be done in that field as there are many factors to consider like, type of surgery, length of surgery, anesthesia type, gender.</p>		
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1 Introduction

Post-Operative Nausea and Vomiting (PONV) is one of the most common complications after surgery, it affects patient's time recovering and it brings them discomfort including: pain, electrolytes imbalances, dehydration, risk of aspiration, risk of wound opening and hemorrhage. (Kazuyoshi, Tetsuro, Hiroshi, Haruka, Toshihiko & Toshiaki, 2013; Kiberd, Clarke, Chorney, Eon & Wright, 2016; Kabalc, Akcay, Akcay & Gogus, 2005). Due to the mentioned complications, the prevention of PONV becomes more important than the treatment of postoperative pain (Kazuyoshi et. al., 2013).

It is estimated than about 75 million patients suffer from PONV annually (Quinlan-Woodward, Gode, Dusek, Reinstein, Johnson & Sendelbach, 2016; Collins, 2011). There are currently pharmacological solutions like 5HT3 antagonists, corticosteroids and neurokinin-1 antagonist to avoid PONV, however the studies suggest that even if the patient is taking the anti-emetics previously mentioned they have an incidence of about 30% to 45% to suffer from PONV (Kazuyoshi et. al., 2013; Streitberger, Diefenbacher, Bauer, Conradi, Bardenheuer, Martin, Schneider & Unnebrink, 2004)) and the number raises to 79% to risk patients (Streitberger et. al., 2004).

The need to research for alternatives to a pharmacological treatment emerges from the serious side effects that anti-emetic drugs can cause (Kabalc et. al., 2005), in some cases drugs like *droperidol* have received a warning from FDA (Food and Drug Administration) as not recommended as primary treatment (Streitberger et. al., 2004). Currently only approximately 13% of anesthesiologists prefer non-pharmacological interventions in prevention and treatment of PONV (Kabalc et. al., 2005).

The aim of this study is to conduct a literature review on studies that suggest non-pharmacological interventions for PONV based on nurses experiences. The purpose

of this study is to bring awareness to the nurses, about possibilities of treatment to the patient with no side effects and less invasive.

2 Post-Operative Nausea and Vomiting (PONV)

Theoretical background in PONV

Etiology, Physiology and incidence of PONV

PONV is one of the most common complications after surgery. It is categorized as minor complication but when a vomit occurs it increases the pressure in several organs causing major complications (Tate & Cook, 1996). Nausea and vomiting are two different concepts; Nausea is related to a subjective patient experience and not always leads to vomit, vomiting is an objective patient experience (Kovak, 2000) involving the expulsion of the gastric contents through the mouth. This action involves the squeezing of the stomach between diaphragm and abdominal muscles (Tortora & Derrickson, 2014) resulting in a non-comfortable experience. The action of nausea and vomiting are controlled by the emetic or vomiting center located on the brainstem (See Figure 1), The vomiting center can be stimulated by the peripheral Nervous System (PNS), central nervous system (CNS) and chemoreceptors trigger zone (CTZ). (Kovak, 2000; Tate & Cook, 1996). The PNS involves; oropharynx, renal system, gastro intestinal system, reproductive system, mediastinum, peritoneum. CNS includes the cerebral cortex, vestibular apparatus (inner ear). CTZ controls the emetic neurotransmitters that will trigger vomiting.

There are four principal neurotransmitters involved in the action of vomiting; Serotonin (5-HT₃), dopamine (D₂), histamine (H₁) and acetylcholine. These are stimulated by chemicals, metabolites, drugs and electrolytes causing the action of vomiting (Kovak, 2000; Tate & Cook, 1996). Blocking the receptors for the mentioned neurotransmitters is the objective of any pharmacological treatment for PONV (Kovak, 2000; Tate & Cook, 1996).

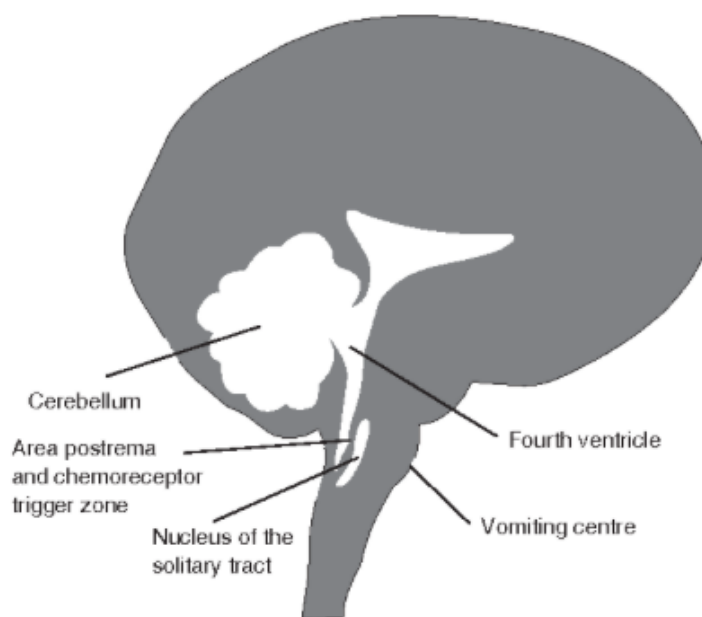


Figure 1 Vomiting center location (Kovac, 2007)

Several studies indicate that the incidence of PONV did barely change since 1980 being on one third of the surgical patients affected (Hambrige, 2013). In numbers; PONV affects to the 30% to 45% of surgical patients (Kazuyoshi et. al., 2013; Streitberger et. al., 2004) and the number raises to 79% to risk patients (Streitberger et. al., 2004; Kovak, 2000).

Risk Factors of PONV

Patient related factors such as; Age, gender, BMI, past medical history/motion sickness, smoking and gastroparesis increase the possibilities to experience PONV.

Age: Patients between 6 to 16 years old are more prone to experience PONV. The infancy period is the lowest with only 5% of the patients affected. PONV incidence tend to diminish reaching adulthood and after 50 years old the incidence reduces 13% every 10 years age increase (Hambrige, 2013; Kovak, 2000; Tate & Cook, 1996).

Gender: Females are at highest risk to vomit after surgery, they have 2 to 3 times more possibilities than males. Some studies suggest that the etiology of this

phenomena is linked to hormonal factors and menstruation cycles, but this theory is still controversial (Collins, 2011; Hambrige, 2013; Kovak, 2000; Tate & Cook, 1996).

BMI: Patients undergoing surgery with a BMI over 30 show higher incidence of PONV. The pharmacokinetics of the drugs used during anesthesia are the main responsible to provoke that condition. These drugs are fat-soluble causing more accumulation on obese patients and making difficult their excretion, so therefore the side-effects of these drugs also stay longer. (Hambrige, 2013; Kovak, 2000; Tate & Cook, 1996).

Past medical history / motion sickness: Patients with past PONV history or motion sickness show lower levels of threshold and have an increase 3-fold incidence to nausea and vomiting (Hambrige, 2013; Kovak, 2000; Tate & Cook, 1996). The origin is questionable; Some studies support the idea that the patient has developed the vomit arc reflex (Tate & Cook, 1996) while others point to Catecholamine higher secretion in patients with past PONV, which is acts as a stimuli for the emetic center (Hambrige, 2013).

Smoking: Smokers metabolize faster the drugs used for anesthesia. Therefore, they show less incidence to suffer that condition. The reason is that smoking changes the enzymes in the liver affecting the way that the anesthetic drug is metabolized (Collins, 2011; Hambrige, 2013).

Gastroparesis: Patients suffering from any condition that may delay the emptying of the stomach, are at higher risk of suffering PONV. These conditions can be: pregnancy, GI obstruction, chronic cholecystitis, raised intracranial pressure, myopathies, uremia, neuropathies, pyloric stenosis, collagen vascular disorders and endocrinopathies (Tate & Cook, 1996; Hambrige, 2013).

There are five factors related to the anesthesia that increase PONV: Fasting, anesthesia drugs, duration, pain and orthostatic hypotension

Pre-operative fast: Guidelines emphasize that in order to minimize risk of aspiration pre-operative fast between 6 to 8 hours is needed before inducing anesthesia (Practice Parameter, 2017; Kovak, 2000). However, that is not the only reason why patients are set to fasting, food can stimulate the emetic center due to bowel movements and hormones released during digestion (Kovak, 2000; Tate & Cook, 1996,).

Anesthesia drugs: Anesthesia uses four main groups of drugs; anesthetic gases, opioids, anesthetic agents and muscle relaxants.

The anesthetic gases are often pointed to be the main responsible to trigger PONV (Collins, 2011; Hambrige, 2013). There have been many efforts on developing new volatile agents like sevoflurane or desflurane that will show less incidence however studies show no significant difference compared to old volatile agents like cyclopropane (Kovak, 2000; Tate & Cook, 1996). Moreover, when inhalation agents are eliminated completely, PONV incidence does not reduce (Kovak, 2000).

Many studies suggest that the usage of opioids during surgery or as pre-medication stimulates vomiting center (Collins, 2011; Hambrige, 2013; Kovak, 2000; Tate & Cook, 1996). The same type of drug used in postoperative pain multiplies per two the risk of suffering nausea and vomiting (Hambrige, 2013). Opioids mechanism stimulates the 5HT3 neurotransmitter and vasopressin hormone release, both identified as responsible for emetic stimuli, it also slows gastric motility delaying the emptying of the stomach, sensitize the emetic arc reflex, and increase sensitivity in at vestibular apparatus. (Tate & Cook, 1996, Kovak, 2000). PONV tend to decrease after 6 hours of opioids administration (Kovak, 2000).

Depending on the type of anesthesia to be induced, the anesthetics agents and procedure will be different. Studies has shown that general anesthesia has 11 times more risk to provoke PONV than regional anesthesia, (Collins, 2011; Hambrige, 2013). Factors such intubation and intravenous induction agents like thiopentone, which has 12% higher incidence rate than propofol, increase the possibilities of PONV (Hambrige, 2013; Tate & Cook, 1996).

Usage of muscle relaxants itself does not increase the incidence of PONV (Kovak, 2000; Tate & Cook, 1996) however the usage of antagonist to reverse muscle relaxation shows the opposite (Kovak, 2000).

Long surgeries increase the incidence of PONV (Hambrige, 2013; Kovak, 2000; Tate & Cook, 1996). It is estimated that every 30 minutes of anesthesia the risk increase 59% (Hambrige, 2013). The etiology of this condition relays on the nature of the anesthetic drugs, longer exposure will accumulate higher amounts of drug making it more difficult to the body to eliminate (Hambrige, 2013; Kovak, 2000; Tate & Cook, 1996).

Pain is common after surgical procedures, the risk of PONV increases when the pain is originated in the pelvis or visceral area. The usage of the opioids to release the pain doesn't help to decrease the PONV incidence (Hambrige, 2013; Kovak, 2000).

A patient who under anesthesia decreases his systolic pressure more than 35% is more prone to suffer from PONV (Collins, 2011). Orthostatic hypotension can be caused by the long fasting periods or poor fluids administration during surgery (Kovak, 2000; Tate & Cook, 1996).

During surgery organs are touch, disturbed and manipulated by instruments, these actions stimulate the vomiting center via the parasympathetic system (Collins, 2011). Surgical factors related include the area that has been gone through surgery; Surgeries on abdominal area, gynecological, obstetric, ENT (ear nose and throat), eyes, neurosurgery, laparoscopy, oral, plastic are showing higher risk than other surgical sites. (Hambrige, 2013; Kovak, 2000; Tate & Cook, 1996).

Assessment & Impacts of PONV

There are two tools, the "Apfel risk score" and the "Koivuranta risk score", that have been developed to measure the risk of suffering PONV. These tools only provide an estimate and not an accurate measurement. However, the estimate allows physicians to proactively consider administration of an antiemetic therapy. The Apfel

score is based in four main factors: female gender, past PONV/motion sickness, non-smoking and post-operative opioids. The Koivuranta score uses five factors: female gender, past PONV, history of motion sickness, non-smoking and surgery longer than one hour. Each positive factor gets one point in the score and one point score is between 18% to 22% likelihood to develop nausea and vomiting after surgery (Gan, Diemunsch, Habib, Kovac, Kranke, Meyer, Watcha, Chung, Angus, Apfel, Bergese, Candiotti, Chan, Davis, Hooper, Lagoo-Deenadayalan, Myles, Nezat, Philip & Tramèr. 2014; Hambrige, 2013).

Factors	Answer	Score	% Incidence of PONV
Female gender	Yes	1	18% to 22%
Past PONV/motion sickness	Unknown	0	0%
non-smoking	Yes	1	18% to 22%
post-operative opioids	Yes	1	18% to 22%
Total Score		3	54% to 66%

Figure 2 Apfel Risk Score tool.

Major impacts related to PONV can be classified in; Medical-surgical, psychological and economic. (Hambrige, 2013; Kovak, 2000).

Medical-surgical complications include but not limited to: dehydration, electrolytes imbalance, hypotension, delay on fluid and food intake, impossibility to administer oral drugs, wound tear, wound bleeding, hematoma, increase intracranial pressure, tachycardia, increased intraocular pressure, esophagus distress, risk of aspiration pneumonia (Hambrige, 2013).

Psychological complications consider patients feelings, including shame, embarrassing, undignified. PONV ranks first than pain in patient fears surgery related surveys. It also linked to low patient satisfaction (Hambrige, 2013).

PONV causes longer hospitalization periods and unexpected hospitalizations for those who were elected for day surgery but need to stay overnight, therefor the economic impact is clear. The economic reasons not also consider hospitalization but all the resources like personnel, drugs and instruments. (Hambrige, 2013; Kovak, 2000).

2.1 Non-Pharmacological treatment

We consider as non-pharmacological treatment any action that does not involve chemical drug intake in any kind of administration route.

It is a common practice to prescribe prophylaxis anti-emetic drugs even if patient is in lower risk factors. These drugs are very expensive, and they lack efficiency, drugs are made of histamines, benzamides, anticholinergics, which are known to have strong sides effects. In fact, various studies show that these drugs are more harmful than beneficial; they are link to ECG abnormalities, such as QT prolonged intervals or fatal arrhythmias, headache, neuroleptic syndrome, constipation and agitation. Moreover in US these drugs have been marked with the black box waring according to US Food and Administration organism (Trueman, 2011;Hickman, Bell & Preston, 2005) Nowadays there are a new developed set of drugs that includes corticosteroids, dopamine antagonist serotonin blockers, they have been showing better results but the mechanism how they work is unknown therefore there is lack of knowledge on side effects together with lack of more detail research (Trueman, 2011)

In this literature review we consider as non-pharmacological treatment any action, any experience that the patient had and helped to reduce his/hers PONV symptoms conducted by his/her nurse. This treatment doesn't not consider the common anti-

emetic drugs, they can be actions, like open the window, drinking ginger tea, aromatherapy and others.

3 Aim purpose and research questions

The aim of this study is to conduct a literature review on studies that suggest non-pharmacological interventions for PONV based on nurses experiences. The purpose of this study is to bring awareness to the nurses, about possibilities of treatment to the patient with no side effects and less invasive.

The research question is: What kind of non-pharmacological interventions for PONV can be used by nurses?

4 Methodology

4.1 Literature Review

Literature review it is a type of research where data of different empirical researches on a given topic are used, combined and analyzed (Booth, Rees & Beecroft, 2013; Rew, 2010; Knalf & Whittemore, 2005). Benefits of this research type include: an easy view of compiled large amounts of information in one article. Comparison of different studies in one paper. Reduced bias by proper selection of the studies. Conclusions are more trustable. (Booth et.al., 2013).

For this thesis next steps have been followed in order to conduct a reliable literature research: Defined a research protocol including: aims, research question, inclusion (PICO) criteria, search terms, relevant database. Conducted the search and select relevant studies according to search protocol. Evaluated the quality of the articles. Selected the key information, Summarized and wrote the findings (Review (Booth, Rees & Beecroft, 2013; Rew, 2010)

4.2 Literature Search Protocol

The articles used to conduct this literature review have been selected from two databases; Cinahl Plus full-text (Ebsco) and Medline Library. For the research a PICO table (see figure 3) was used. PICO table is a tool for inclusion criteria that helps to find relevant evidence-based literature. This thesis focused in recent studies from 2008 to actual date with Nursing interventions or strategies or best practices or treatment or therapy for ponv or post-operative nausea vomiting. After the results the articles have been filtered by relevant title; excluding any article that suggest pharmacological interventions and excluding articles that are not an empirical research or clinical research (See Figure 4).

Inclusion Criteria	
Population	post-operative or post-operative or postoperative or post-surgery
Phenomena of Interest	Nursing interventions or strategies or best practices or treatment or therapy
Context	ponv or post-operative nausea vomiting
Types of studies	Peer reviewed, English, Spanish, 2008-to actual date

Figure 3 Inclusion criteria

In order to ensure a good quality of the research, every article has been evaluated using the assessment score from Hawker & Payne of his article *Appraising the Evidence: Reviewing Disparate Data Systematically* (Hawker & Payne, 2002). The maximum score that can be achieved is 36 points, this will place the article as “good quality, to minimize bias only articles that score above 30 points have been selected.

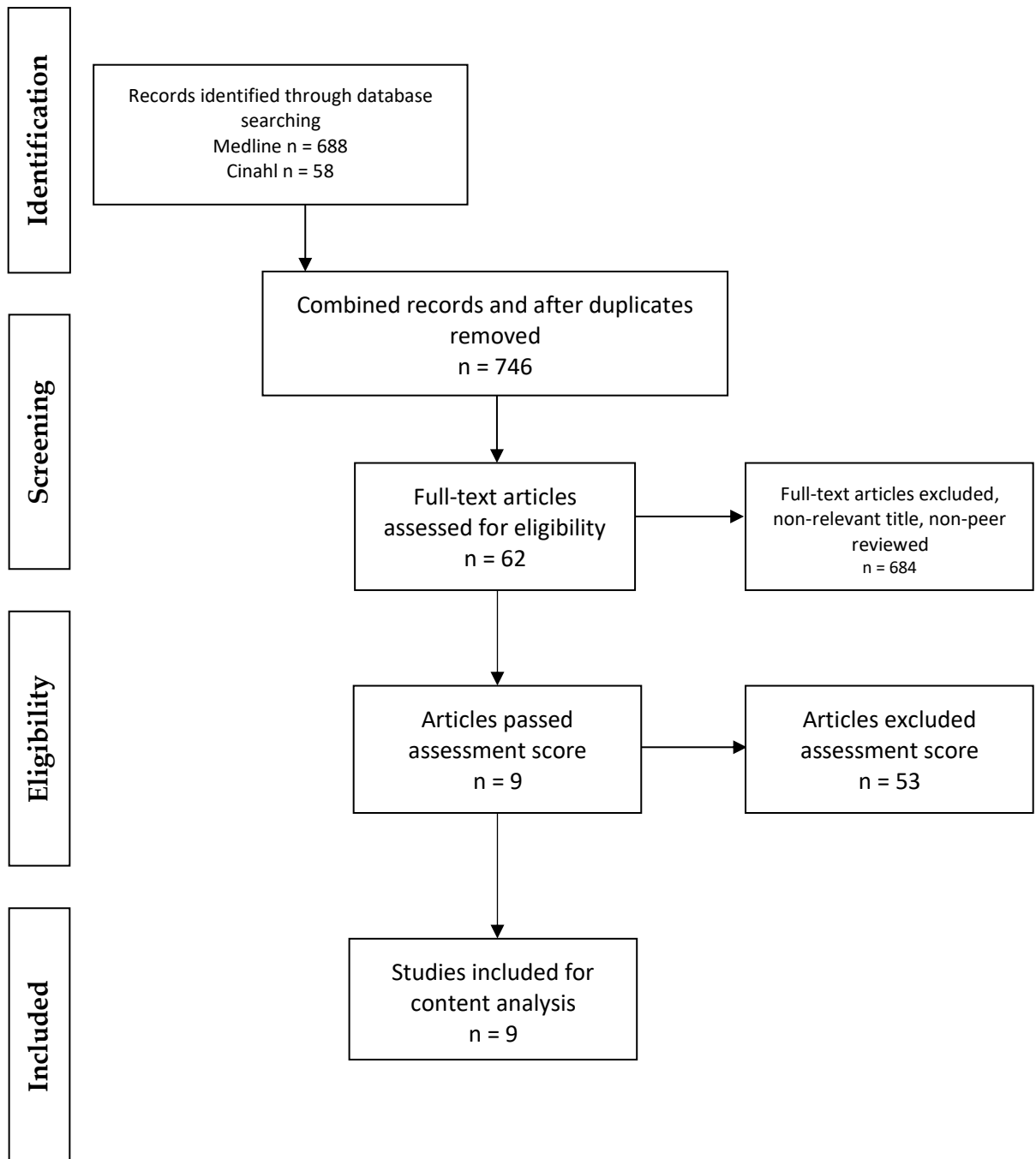


Figure 4 Data Analysis Results

From the total of articles that have been through the assessment score process the maximum score was 36 the minimum 14 and an average of 28,3 score. Five articles were excluded for being literature review, three articles required financial access, one was a pharmacological intervention and one was a study conducted only in one patient. Additionally, to my assessment score review another researcher conducted

the same process with the next results; maximum score 36, minimum 28 and an average of 32 score.

4.3 Data analysis

The data extracted have been analyzed using a content analysis method, this method allows a comprehensive review from empirical articles from experimental and non-experimental research, it also allows to give a new perspective from the researches and collect them in once single article (Knalf & Whittemore, 2005).

The data have been sorted, categorized, coded and synthetized. Data extracted are read and relevant information selected. These data have been combined together in a matrix and reduced using main groups and subgroups. The categorization (Figure 7) was done in two main groups “Subjective treatment” and Objective treatment” Inside subjective treatment another set of subcategories was done; improve Patient satisfaction or comfort, build nurse-patient trust and implement nurse beliefs. Inside the objective treatment set of subcategories was: GRS (Go-rei-San) herbal compound, fluid therapy, aromatherapy, acupressure, TEA P6 and Chewing Gum, each of them where again subcategorized in how to apply, when to apply.

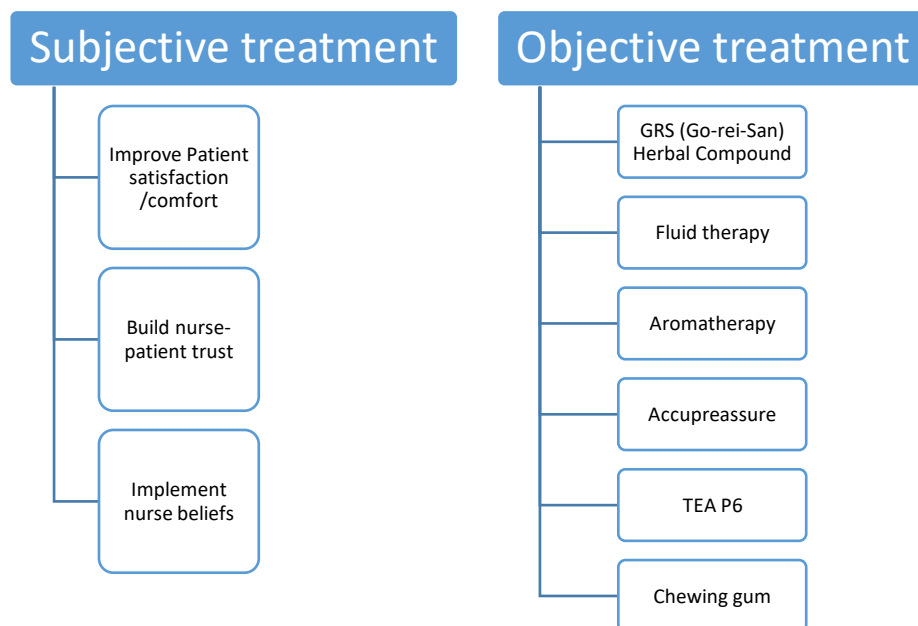


Figure 5 Data Analysis Categories

Next step was to analyze the extractions and synthesize the content. Finally, the results have been written and concluded. (Knalf & Whitemore, 2005).

5 Results

Once conducted the literature review research, results suggested there are many actions that a nurse can do to mitigate PONV and these actions do not limit only to technical skills but also holistic factors. More details can be found in Annex 1

5.1 Subjective Treatment

Subjective treatment includes actions to improve patient satisfaction and comfort, build trust with patient and implement nurse beliefs. One study suggests that just with mere presence of the nurse in the room, the healing touch and holding wrists patient while telling him this will reduce nausea may have a positive effect because of their trust-based relationship (Gilbert, Farish, Bergland, Conaway, Hance, Ketcham & Spry, 2017). Other study supports the idea that nurses believe that just by not asking the patient about nausea will help them to ignore the fact, so therefore they think is not appropriate to assess PONV (Hofmann, Murray, Beck & Homann, 2017). Patients satisfaction and comfort can be achieved by applying aromatherapy gauzes (Kiberd et. al., 2016), apply an acupuncture wrist band (Gilbert et.al., 2017; Yusheng, Qiuyan, Cansheng, Yihuan, Ying, Liangcheng & Yanqing, 2015) and chew chewing gum (Darvall, J. N., Handscombe, M., & Leslie, K, 2017).

5.2 Objective Treatment

Next possible objective treatments have been found: GRS (Go-rei-San) herbal compound, fluid therapy, aromatherapy, acupuncture, TEA P6 and Chewing Gum.

GRS is an herbal compound with five herbal ingredients, it is normally used for motion sickness but according to the study from Kori, Oikawa, Odaguchi, Omoto, Hanawa & Minami, 2013. GRS reduces safely PONV as well as frequency in vomiting.

GRS was administered with 7,5 grams one day before surgery to patients undergoing general anesthesia.

Fluid Therapy or IV fluid supplementation; there are many studies that support that early post-operative hydration and late post-operative hydration reduces PONV. All of them agree on using colloids or crystalloids, as there is no evidence of one being superior to the other one. (Ali, Taguchi, Holtmann & Kurz A, 2003; Cook, Anderson, Riseborough, & Blogg, 1990; Magner, McCaul, Carton, Gardiner, Buggy, 2004). The study from Chaudhary, Sethi, Motiani & Adatia, 2008 showed significant low values on incidence of PONV, the intervention was to use ringer lactate (crystalloid) 12 ml/kg -15 mins or 4.5% hydroxyethylstarch Hetastarch (colloid) 15 mins prior Anesthesia in female patients with general anesthesia undergoing open cholecystectomy.

Aromatherapy, while the study from Kiberd et. al., 2016 found Aromatherapy not relevant to treat PONV, the study from Karaman, Karaman, Tapar, Dogru & Suren, 2019 found that lavender and ginger oil reduce PONV and incidence of vomiting. These two oils were administered to patients undergoing general anesthesia. Two drops of either ginger or lavender oil in a gauze of 5X5 cm were given to patient to inhale in intervals of 5 mins, 15 mins and 40 mins after they arrived to post recovery room.

Acupressure and TEA P6 are two of the most researched methods for PONV. Both methods involve the stimulation of the acupuncture point P6 Neiguan situated 3 fingers from the wrist in a transverse plan. Acupressure according to study from Hofmann, Murray, Beck & Homann, 2017, lowers the incidence of PONV during all postoperative phases. The study was conducted in ambulatory patient in high risk of PONV. Acupressure patches were administered prior the induction to general anesthesia for 30 to 60 minutes. Another study conducted in women with a thyroidectomy surgery under general anesthesia showed that application of acupressure wrists band for 30 minutes before the anesthesia relieves PONV but not vomiting and retching. (Jung-Hee, Yeonghee, & Hee-Soon, 2016.) TEA treatment differs from acupressure by using electrical stimulation in P6 Neiguan acupuncture

point rather than pressure. TEA showed positive results on reducing PONV on all postoperative phases. The application was on female patients with general anesthesia undergoing gynecological laparoscopy for 30 mins before anesthesia with a disperse frequency of 2/10 Hz and intensity of 6–9mA. (Yusheng, Qiuyan, Cansheng, Yihuan, Ying, Liangcheng & Yanqing, 2015)

Chewing gum; the simple act of chewing a gum showed non-inferior effects as pharmaceutical treatment with ondansetron for PONV. Female patients with general anesthesia undergoing gynecological laparoscopy or breast surgery were given a peppermint flavor chewing gum to chew for 15 minutes at the post anesthesia care unit (Darvall, Handscombe & Leslie, 2017.)

6 Ethics & Discussion

6.1 Ethics

Literature reviews, as they gather information, do not need consent of participants (Vergnes, J-N., Marchal-sixou, C., Nabet, C., Maret D., Hamel, O. 2010). However, the selected articles have been exhaustively appraised using the assessment score from Hawker & Payne of his article *Appraising the Evidence: Reviewing Disparate Data Systematically* (Hawker & Payne, 2002), only articles scoring above 30 points have been selected being the maximum 36. In order to ensure that the source of the information is reliable only evidence-based databases have been used and only empirical quantitative studies have been selected moreover special emphasis have been done during the appraisal in checking if they gather the data in an ethical manner and summarizing it in a table (Vergnes et.al., 2010)

Plagiarism have been avoided by presenting the results without changing or misinterpreting the findings, this thesis has been also sent to Urkund. In order to minimize bias, all articles have followed strictly the research protocol and each step has been clearly documented.

This thesis has also encountered some limitations we had to discard some articles because of language restrictions and also because some articles required financial support.

6.2 Discussion

It is positive to see that, nowadays that many efforts have been done to research in non-pharmaceutical methods to treat PONV and that there are already several possibilities to treat. However, it is very difficult to research on that topic as there are many aspects to consider such as; type of surgery, type of patient, type of anesthesia, length of the study.

One of the most researched topic is acupuncture with many studies that support different scenarios, it seems to be in my opinion one of the most reliable non-pharmacological treatments. Acupuncture it is also cheap, accessible to everybody, easy to administer and without the possible side effects of a pharmacological treatment.

Inside the nursing frame this research brings benefits to all of the four points; clinical practice, education, research, administration. Inside the clinical practice it opens new possibilities to treat patients safely, in frame of administration, non-pharmacological treatment are often cheaper and when succeed the discharge of the patient is earlier and has less complications, for education it opens new possibilities to teach, and at last for research it is still a lot of open fields to research, it would be good to have big scale research in that topic.

As a conclusion; there are several possibilities to treat nausea and vomiting without pharmacological interventions supported by many studies, acupuncture shows the best results, but we cannot forget about nurse-patient trust role.

Appendices

Appendix 1 details on subjective treatment

Details on how to use non-pharmacological interventions for PONV on subjective treatment

What kind of non-pharmacological interventions for PONV can be used by nurses?			
Subjective treatment			
WHAT	HOW	WHEN	FINDING
Improve Patient satisfaction /comfort	Aromatherpy gauzes	Nurse decision	Aromatherapy had unmeasured effect on patient comfort. This effect may be a reduction in anxiety
	Apply accupressure Wristband Apply TEAS	Nurse decision	Merely wearing the band could cause a placebo antiemetic effect / Minimal Risk and low cost / Patient satisfaction
	Chewing gum	Nurse decision	Familiar to patient, easy to administer and complete acceptance by the patient
Build nurse-patient trust	Holding a patient's wrist and telling him or her that applying pressure may soothe nausea	Nurse decision	May be a resulting effect because the patient trusts the nurse and believes what he or she says
	Mere presence of the nurse	Nurse decision	May lead to a calming and therapeutic effect in and of itself
	Healing touch	Nurse decision	May be a resulting effect because the patient trusts the nurse and believes what he or she says
Implement nurse beliefs	Not assessing PONV/ Not saying the word "Nausea"	Anytime	perhaps patients would not complain or by mentioning it would cause the phenomenon.

Appendix 2 details on objective treatment

Details on how to use non-pharmacological interventions for PONV on objective treatment

What kind of non-pharmacological interventions for PONV can be used by nurses?			
Objective treatment			
WHAT	HOW	WHEN	FINDING
GRS (Go-rei-San) Herbal Compound	Administer 7,5g before the day of surgery	Female Patients with general Anesthesia undergoing gynecological laparoscopy	GRS reduces PONV
Fluid therapy	Administer fluid supplementation -Ringer lactate (crystalloid) 12 ml/kg -15 mins prior Anesthesia	Female Patients with general Anesthesia undergoing open cholecystectomy	Crystalloids and colloids results in significantly decreased incidence of PONV
	Administer fluid supplementation -4.5% hydroxyethylstarch (Hetastarch) (colloid) -15 mins prior Anesthesia	Female Patients with general Anesthesia undergoing open cholecystectomy	Crystalloids and colloids results in significantly decreased incidence of PONV
Aromatherapy	Drop two drops of ginger, lavender in a 5 x 5 cm impermeable gauze pad. Give it to patient, ask for inhale at 5 mins, 15 mins and 40 mins. Treatment is done at post operative recovery nurse	Patients with general Anesthesia	Ginger and lavender oil treatments reduced the PONV scores and vomiting incidences
Accupressure	Accupressure with beads/patc in P6 Chinese medicine point 30 to 60 minutes before induction of general anesthetic.	Patients in ambulatory surgical patients at high risk for PONV	Accupressure patches lowered PONV scores in all three phases (Phase I (PACU), Phase II (predischage), and Phase III (24 hours postdischarge).
	Apply wristband accupressure for 30 mins before Anesthesia	Female Patients with general Anesthesia undergoing thyroidectomy	P6 accupressure has the short-term effect of relieving nausea but not vomiting and retching
TEA P6	Application of TEAS for 30 minutes on dense-disperse frequency of 2/10 Hz at intensity of 6-9mA 30 mins before surgery. Apply TEAS in four pairs of acupoints: bilateral Hegu(LI4), Neiguan(PC6), Zusanli(ST36), and Sanyinjiao(SP6).	Female Patients with general Anesthesia undergoing gynecological laparoscopy	TEAS reduces the incidence of general anesthesia induced side effects, such as dizziness, nausea, and vomiting, shortens the duration of PACU stay
Chewing Gum	In Pacu, give patient a gum chewing - (Wrigley's Extra Sugarfree GumVR peppermint flavour). Chew for 15 mins	Female patients with general Anesthesia undergoing laparoscopic or breast surgery	Chewing gum was not inferior to ondansetron in the treatment of PONV in

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Medicine (ECAM), Pages 1–6

Selected Articles

No	Author(s)	Title	Aim(s) & Purpose	Sample(n)	Methods/Instruments	Key Findings	Quality Assessment
1	Kori, Kazuyoshi; Oikawa, Tetsuro; Odaguchi, Hiroshi; Omoto, Haruka; Hanawa, Toshihiko; Minami, Toshiaki	Go-rei-San, a Kampo Medicine, Reduces Postoperative Nausea and Vomiting: A Prospective, Single-Blind, Randomized Trial	The objective of this study was to determine the efficacy of Go-rei-San (GRS), a Kampo medicine, in the treatment of postoperative nausea, vomiting, or both (PONV).	100	Design: The study was a randomized, controlled, single-blind study of two groups of adult female patients who were scheduled to undergo benign gynecological laparoscopic surgery under general anesthesia. Patients in each group possessed an American Society of Anesthesiologists physical status of 1 (normal, healthy patient) to 2 (patient with a mild systemic disease). Patients were randomly assigned to the GRS group or the no-intervention group. Intervention: Patients in the GRS group were given 7.5 g of GRS orally the day before surgery. Outcome Measures: The primary outcome measure was the severity of nausea at	Results: The severity of nausea, frequency of vomiting, and incidence of vomiting were significantly lower in the GRS group than in the no-intervention group. Conclusions: This study suggests that GRS may be effective for the reduction of PONV.	34

No	Author(s)	Title	Aim(s) & Purpose	Sample(n)	Methods/Instruments	Key Findings	Quality Assessment
					0-3 h and 0-24 h after tracheal extubation. The secondary outcome measures were the incidence of vomiting at 0-3 h and 0-24 h and the frequency of vomiting at 0-24 h. The severity of nausea was measured by the patient, who used an 11-point verbal scale to indicate her strongest nausea.		
2	Chaudhary S; Sethi AK Motiani P Adatia C	Pre-operative intravenous fluid therapy with crystalloids or colloids on post-operative nausea & vomiting.	Post-operative nausea and vomiting (PONV) is a frequent complication and may be a reason for increased morbidity and cost of treatment. Following elective surgery, it is believed to result from gut ischemia consequent to hypovolemia from overnight fasting. This study was carried out to	60	In this prospective randomized clinical trial, 60 female patients undergoing elective open cholecystectomy were randomly allocated to three equal groups A, B and C. All patients received preoperative fluid supplementation. Group A patients received 2 ml/kg Ringer lactate iv (intravenously) and served as control, Group B patients received 12 ml/kg Ringer	Pre-operative intravenous fluid supplementation using crystalloids and colloids results in significantly decreased incidence of PONV. Both, crystalloids as well as colloids were found to be equally effective in preventing PONV.	31

No	Author(s)	Title	Aim(s) & Purpose	Sample(n)	Methods/Instruments	Key Findings	Quality Assessment
			study the effects of pre-operative intravenous fluid supplementation, either crystalloids or colloids, on PONV.		lactate iv whereas Group C patients received 12 ml/kg of 4.5 per cent hydroxyethylstarch (Hetastarch) iv. All patients underwent cholecystectomy under standard anesthesia technique with intraoperative fluid replacement by Ringer's lactate (6 ml/kg/h). An independent blinded observer assessed PONV during first 24 h following surgery using visual analogue scale (VAS) score (0 = no nausea, 10 = worst imaginable nausea or vomiting). Rescue antiemetic was given whenever VAS was > 5.		

No	Author(s)	Title	Aim(s) & Purpose	Sample(n)	Methods/Instruments	Key Findings	Quality Assessment
3	Mathew B. Kiberd, Suzanne K. Clarke, Jill Chorney, Brandon d'Eon and Stuart Wright 2016	Aromatherapy for the treatment of PONV in children: a pilot RCT	Postoperative nausea and vomiting (PONV) is one of the most common postoperative complications of general anesthesia in pediatrics. Aromatherapy has been shown to be effective in treating PONV in adults. Given the encouraging results of the adult studies, we planned to determine feasibility of doing a large-scale study in the pediatric population.	n=162	Our group conducted a pilot randomized controlled trial examining the effect of aromatherapy on post-operative nausea and vomiting in patients 4–16 undergoing ambulatory surgery at a single center. Nausea was defined as a score of 4/10 on the Baxter Retching Faces Scale (BARF scale). A clinically significant reduction was defined as a two-point reduction in Nausea. Post operatively children were administered the BARF scale in 15 min intervals until discharge home or until nausea score of 4/10 or greater. Children with nausea were randomized to saline placebo group or aromatherapy QueaseEase™ (Soothing Scents, Inc., Enterprise, AL: blend of ginger, lavender, mint and spearmint).	Aromatherapy had a small non-significant effect size in treating postoperative nausea and vomiting compared with control. A large-scale randomized control trial would not be feasible at our institution and would be of doubtful utility.	30

No	Author(s)	Title	Aim(s) & Purpose	Sample(n)	Methods/Instruments	Key Findings	Quality Assessment
					Nausea scores were recorded post intervention.		
4	Gilbert, Rebecca T.; Farish, Nancy; Bergland, Eleanor; Conaway, Mark; Hance, Jill; Ketcham, Susan; Letzkus, Lisa; Manz, Marie; Podgorski, Kathy; Quatrara,	The Use of Short-Term Acupressure to Prevent Long-Term PONV: Was This a Case of Too Little, Too Late?	Purpose Postoperative nausea and vomiting (PONV) is a common surgical complication that contributes to poor patient outcomes. The purpose of this study was to determine if acupressure to the P6 pressure point during the immediate postoperative period decreased PONV for the		This was a double-blind, randomized study. Methods Experimental group participants wore a wristband, which administered acupressure to the P6 pressure point of one wrist. Control group wristbands were malposition. Bands remained on until patients were discharged from the post anesthesia care unit or up to a maximum of 2 hours. Data on nausea, vomiting, and antiemetic use were tracked	There were no statistically significant between-group differences in PONV or antiemetic use. Conclusions Short-term postoperative acupressure to one wrist did not lead to a 24-hour decrease in nausea, vomiting, or antiemetic use.	31

No	Author(s)	Title	Aim(s) & Purpose	Sample(n)	Methods/Instruments	Key Findings	Quality Assessment
	Beth; Ryman, Ruth; Spry, Anika		first 24 postoperative hours.		for the first 24 postoperative hours.		
5	Hofmann, Debra; Murray, Carrie; Beck, Janet; Homann, Rebecca	Acupressure in Management of Postoperative Nausea and Vomiting in High-Risk Ambulatory Surgical Patients.	The purpose of this randomized blinded placebo-controlled research study was to investigate the effect of acupressure over 24 hours postoperatively for ambulatory surgical patients who are identified as high risk for PONV	n=24	A randomized blinded placebo-controlled study design was implemented. Methods: Study enrollment criteria included four of five risk factors as defined in 2006 by American Society of PeriAnesthesia Nurses PONV/post discharge nausea and vomiting guidelines: female, PONV history or motion sickness, nonsmoker, and volatile gas general anesthetic. One hundred ten patients were randomly assigned to an intervention (N = 57)	Acupressure is an effective minimal risk and low-cost adjunctive therapy for prevention and treatment in ambulatory surgical patients at high risk for PONV Further studies using other acupressure points should be conducted.	32

No	Author(s)	Title	Aim(s) & Purpose	Sample(n)	Methods/Instruments	Key Findings	Quality Assessment
					<p>acupressure bead patch or control (N = 53) sham acupressure patch group. Patients rated PONV on scale (0 to 10). Findings: Acupressure use at P6 preoperatively was statistically significant in reducing PONV in all three postoperative phases. One hundred ten patients were enrolled; 93 patients finished the study's three phases and nine were admitted postoperatively.</p>		
6	Yusheng Yao; Qiuyan Zhao; Cansheng Gong; Yihuan Wu; Ying Chen; Liangcheng Qiu; Xiaodan	Transcutaneous Electrical Acupoint Stimulation Improves the Postoperative Quality of Recovery and Analgesia after Gynecological	We conducted this prospective, randomized, double-blind, placebo-controlled study to evaluate the effects of transcutaneous electric acupoint stimulation (TEAS) on the quality of recovery (QoR) and	n=74	Methods. 74 American Society of Anesthesiologists physical status (ASA) I or II patients undergoing gynecological laparoscopic surgery were randomly allocated to TEAS or control groups	The TEAS group had higher QoR scores than control group upon 24 h after surgery (177 versus 165; P < 0.001). Compared with the control group, postoperative pain scores and the cumulative number of opioids administered were lower in the TEAS	31

No	Author(s)	Title	Aim(s) & Purpose	Sample(n)	Methods/Instruments	Key Findings	Quality Assessment
	Wu; Yanqing Chen	Laparoscopic Surgery: A Randomized Controlled Trial.	postoperative analgesia after gynecological laparoscopic surgery			<p>group patients (P = 0.04). TEAS reduced the incidence of PONV and dizziness, as well as duration of PACU stay. Simultaneously, the patient's satisfaction scores were higher in the TEAS group (P = 0.002).</p> <p>Conclusion. Preoperative TEAS enhance QoR, improves postoperative analgesia and patient's satisfaction, alleviates postoperative side effects, and accelerates discharge after general anesthesia for gynecological laparoscopic surgery.</p>	

No	Author(s)	Title	Aim(s) & Purpose	Sample(n)	Methods/Instruments	Key Findings	Quality Assessment
7	Jung-Hee Kwon; Yeonghee Shin; Hee-Soon Juon	Effects of Nei-Guan (P6) Acupressure Wristband.	The aim of this study is to examine the effect of the Nei-Guan (P6) acupressure wristband for PONV among patients undergoing thyroidectomy.	n=60	Sixty Korean female participants were assigned to 1 of 3 groups (n = 20 each). The control group received usual care without the wristband. The placebo group received usual nursing care plus a wristband at the non-P6 site. The treatment group received usual care plus a wristband at the P6 acupoint 30 minutes before anesthesia; the wristband was removed before leaving the recovery room. Data were collected at 3 periods: in the recovery room and at 6 and 24 hours after surgery.	The nausea scores of the treatment group were significantly lower than the scores of the placebo or control groups in the recovery room (F = 6.229, P = .044). There were no significant differences in vomiting or retching among the groups. Conclusions: The P6 stimulation with wristband suppressed nausea right after thyroidectomy in the recovery room but did not suppress subsequent vomiting or retching. Implication for Practice: The findings indicate that P6 acupressure has the short-term effect of relieving nausea but not vomiting and retching. Use of P6 wristband holds promise and suggests the need for	36

No	Author(s)	Title	Aim(s) & Purpose	Sample(n)	Methods/Instruments	Key Findings	Quality Assessment
						further testing in a larger randomized clinical trial. Identifying other acupoints is recommended to achieve successful management of PONV.	
8	Darvall, J. N.; Handscombe, M.; Leslie, K.	Chewing gum for the treatment of postoperative nausea and vomiting: a pilot randomized controlled trial.	A novel treatment, chewing gum, may be non-inferior to ondansetron in inhibiting postoperative nausea and vomiting (PONV) in female patients after laparoscopic or breast surgery. In this pilot study, we tested the feasibility of a large randomized controlled trial	n=94	We randomized 94 female patients undergoing laparoscopic or breast surgery to ondansetron 4 mg i.v. or chewing gum if PONV was experienced in the post anesthesia care unit (PACU).	Postoperative nausea and vomiting in the PACU occurred in 13 (28%) ondansetron patients and 15 (31%) chewing gum patients (P=0.75). Three chewing gum patients could not chew gum when they developed PONV. On a per protocol basis, full resolution of PONV occurred in five of 13 (39%) ondansetron vs nine of 12 (75%) chewing gum patients [risk difference 37% (6.3-67%), P=0.07]. There was no difference in	32

No	Author(s)	Title	Aim(s) & Purpose	Sample(n)	Methods/Instruments	Key Findings	Quality Assessment
						secondary outcomes between groups.	
9	Karaman, Serkan; Karaman, Tugba; Tapar, Hakan; Dogru, Serkan; Suren, Mustafa	A randomized placebo-controlled study of aromatherapy for the treatment of postoperative nausea and vomit	The purpose of this study was to compare the aromatherapy treatment effects on PONV patients using ginger, lavender and rose oils and a placebo.	n=184	A randomized 4-armed placebo-controlled study. Setting: Gaziosmanpasa University, School of Medicine, Health Research and Application Center. Intervention: The total of 184 patients were randomized into 4 groups: Aromatherapy with lavender essential oil (Lavender group), with rose essential oil (Rose group), with ginger essential oil (Ginger group) or with pure water (Placebo group).	The aromatherapy can be used as an alternative or complementary method for managing PONV. Specifically, the ginger and lavender essential oils were superior to the rose oil and pure water for the aromatherapy treatments. However, further studies with larger sample sizes are necessary to confirm these results.	31