Abstract of thesis entitled

“Effectiveness of aromatherapy in relieving postoperative nausea and vomiting for adult patients in post-anesthesia care unit (PACU)”

Submitted by

Wong Yin Ling

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Postoperative nausea and vomiting (PONV) is a common complication for patients undergoing operation. It causes both the physical and psychological distress to the patients as it involves uncontrolled vigorous contraction of muscle; which induces potential adverse effects such as aspiration, dehydration, electrolyte disturbance and surgical site disruption. The increase in risk of adverse effects can give rise to additional treatment, monitoring and nursing care, thus the duration of hospital stay and medical expenses can increase in result.
Pharmacological treatment by administration of antiemetic is the most common strategy to relieve PONV, but it usually leads to the side effects of antiemetic like fatigue, hypotension and dizziness. Moreover, pharmacological treatment requires a significant cost and extra management and nursing care, and hence probable lengthening the hospitalization day. Non-pharmacological treatment is suggested to be another way out for the patient with PONV. One of the possible ways to relieve PONV is using aromatherapy, which require patients to breath with the vapour of certain essential oils, for example, isopropyl alcohol, ginger and peppermint. Recently, it is recommended by many researchers as it is a simple, cost-effective and complication-free treatment.

Although, many published studies have been reported the potential use of aromatherapy for relieving PONV, there is still lacking of an evidence-based guideline to facilitate the use of aromatherapy in post-operative care setting.

Hence, this translational nursing research aims to review the current available evidence on the effectiveness of using aromatherapy for managing adult patients with PONV in post-anesthesia care unit so as to identify the best evidence to formulate an evidence-based guideline to direct clinical practice. Other than that, the implementation potential of the guideline will be evaluated, and then followed by developing an implementation and evaluation plan as well. The ultimate goal of this translational research is to use the best available evidence on aromatherapy to reduce the severity of post-operative nausea and vomiting after general anesthesia and IV sedation in post-anesthesia care unit.

In order to achieve the ultimate goal, a comprehensive systematic review was conducted from 1st June 2014 to 25th September 2014. After keywords, abstract and title search from five electronic bibliographic databases, seven eligible papers were identified according to particular exclusion and inclusion criteria. Critical appraisal was performed to assess the
quality and validity of the evidence. Evidences from the selected papers was then summarized and synthesized into useful information for developing the clinical guideline. To ensure the identified evidences was congruent with the local setting, transferability, feasibility and cost-benefit ratio was assessed. The assessment found that transferability was high and it is feasible to implement the innovation in the target setting. Also, the cost of using 70% isopropyl alcohol prep ($0.03) is much lower than that of using the intravenous antiemetic such as metoclopramide ($2.35) and ondansetron ($24.88). Besides, there is no need to equipment any new apparatus in the implementation process.

The identified evidence provided useful recommendations to develop evidence-based guideline of using aromatherapy in clinical setting. To facilitate the actual implementation of using aromatherapy, communication with identified stakeholders and a pilot study was planned. A pilot study will be conducted from 1st November 2015 to 30th November 2015 for testing the workability of the evidence-based guideline on 160 recruited patients. During the pilot study, severity of PONV and staff compliance would be assessed. The feedbacks from the pilot study would help to refine the guideline for actual implementation. After six months actual implementation, an evaluation plan will be developed to access the room for improvement and protocol enhancement.

Using aromatherapy in treating PONV is worthy of attention in the post-anesthesia care unit to reduce severity of PONV. It can not only provide more options of treatment, but also reduce hospital expenses.
Effectiveness of aromatherapy in relieving postoperative nausea and vomiting for adult patients in post-anesthesia care unit (PACU)

By

WONG YIN LING
BNurs. (Poly U); RN. (HK)

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Declaration

I declare that this dissertation represents my own work, except where due acknowledge is made, and that it has not been previously included in a thesis, dissertation or report submitted to this University or to any other institution for a degree, diploma or other qualifications.

Signed: _________________________________

WONG YIN LING
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CHAPTER 1: INTRODUCTION

Postoperative nausea and vomiting (PONV) is a pervasive complication of general anesthesia, commonly feared by patients undergoing surgery (Site et al., 2014). Nausea is an unpleasant feeling that frequently precedes the imminent need to vomit. Vomiting is an involuntary, forceful expulsion of the contents of the stomach through the mouth or even nose. PONV not only causes undesirable postoperative discomfort but can also increase risk of adverse effect such as pulmonary aspiration, dehydration and wound dehiscence (Apfel et al., 2004; Mamaril et al., 2006; Tinsley & Barone, 2013).

Perioperative nurses serve as caregivers who manage and maintain comfort and safety in the operating theatre (Boyle, 2005). In general, pharmacological treatments, including metoclopramide, promethazine and ondansetron, are the typical strategies used by health care professionals to deal with PONV. However, medication can only be prescribed by doctors. Besides, antiemetics have potential side effects like increased myocardial electrical instability, hypotension, fatigue, dry mouth and neurological problems (Apfel et al., 2004; Geiger, 2005; Hodge et al, 2014; Pellegrini et al., 2009).

Apart from this, using antiemetics involves a significant direct and indirect cost to the health care system (Winston et al., 2003). Winston and colleagues stated that direct cost stemmed from the supply of medication. Indirect cost was counted by the extra time required for monitoring after administering antiemetics in the postanesthesia care unit.

Rather than pharmacological treatment, aromatherapy has recently been recommended by perianesthesia nurses in America as an alternative treatment for relieving PONV during phase I and phase II post-anesthesia care (Site et al, 2014). It is a rescue therapy for patients
with PONV involving the inhalation of the vapours of essential oils. Although numerous studies have been conducted to investigate the effectiveness of using aromatherapy in alleviating PONV, the findings have not yet been translated into clinical practice.

1.1 Background

PONV affects approximately 25 million postoperative patients yearly (Apfel et al., 2004). The American Society of Peri-Anesthesia Nurses (2008) states that the incidence of PONV ranges from 10% to over 80% in patients undergoing surgery with general anesthesia. The etiology of PONV is related to both patient factors and surgical factors. The former include age, sex, weight, a history of kinetosis, smoking status and previous history of PONV, while the surgical factors encompass general anesthesia longer than one hour, laparoscopic surgery, gynaecological surgery, a history of hypertension, the level of postoperative pain and use of opioids (Cotton et al., 2007). The incidence rate of PONV can be up to 70% after laparotomy, 58% after gynecological surgery and 40% to 77% after laparoscopy surgery. The incidence in females may be 2 to 4 times more than in male patients. (Winston et al., 2003). For high risk patients with multiple predisposing risk factors of PONV like general anesthesia for more than one hour, female, non-smoker, history of PONV and kinetosis, the occurrence rate of PONV can be as high as 70-80% (Murphy et al., 2006). It has been found that the more the risk factors the patient has, the higher the incidence rate of PONV. The incidence increases exponentially from 16% for patients with no risk factors to 87% for patients with all risk factors (Pellegrini et al., 2009).

Nausea and vomiting is controlled and mediated by the vomiting center and the chemoreceptor trigger zone (CTZ) in the medulla of the brain. There are several neural pathways that can stimulate the vomiting center. These include afferent nerve impulses from higher cortical areas, peripheral areas, visual and vestibular areas (Golembiewski et al., 2005).
Hypoxia, hypotension, pain and increased intracranial pressure during surgery can activate cortical afferent nerves, whereas stimulation of vagal and glossopharyngeal afferents from the gastrointestinal tract can initiate visceral reflexes. The receptors in the CTZ can also be activated by neurotransmitters, such as serotonin, histamine, dopamine, and muscarinic agents such as acetyl choline etc. (Horn et al., 2014). Rapid changes in position of the patient’s body during surgery may disturb the vestibular system by activating acetyl choline and histamine receptors, while preoperative fasting, gastrointestinal tract mobilization during surgery and the process of post-operative extubation can induce dopamine and serotonin secretion. All these alterations in the levels of neurotransmitters during surgery may induce PONV. In addition, chemicals can activate the CTZ easily due to the lack of an effective blood-brain barrier, so the use of opioids and volatile agents during surgery can also increase the occurrence of PONV (Golembiewski et al., 2005; Tinsley & Barone, 2013).

PONV not only causes physical and psychological discomfort, but may also lead to other adverse effects such as aspiration, electrolyte imbalance, dehydration and wound dehiscence (Mamaril et al., 2006). Caring for patients with PONV requires a longer period of post-operative monitoring in the post-anaesthesia care unit (PACU). It has been stated that the time of stay in PACU can increase from 47 to 61 minutes (Winton et al., 2003). PONV can also decrease patient satisfaction, prolong hospitalization, increase chances of unexpected readmission, increase patients’ dissatisfaction and delay their return to work. (Cotton et al., 2007; Hodge et al., 2014; Kovac, 2000; Myles, et al., 2000).

Pharmacological treatment is the most common strategy for preventing PONV, but it usually comes with certain adverse effects (Radford et al, 2011). The anesthetists usually administer antiemetics, such as ondansetron, promethazine and metoclopramide to relieve PONV. Ondansetron is a serotonin antagonist, promethazine is an anticholinergic agent, while metoclopramide is a dopaminergic blocker (Golembiewski et al., 2005). The side effects
of antiemetics include sedation, dry mouth, headache, drowsiness, hypotension and extrapyramidal reactions (Hodge et al., 2014). It is reported that promethazine may increase the chance of phlebitis. Ondansetron has not been proven to be safe for breastfeeding mothers (Lane et al., 2012; Winston et al., 2003).

Considering the side effects mentioned above, non-pharmacological alternative treatments to ease the problem of PONV may be advantageous. Aromatherapy has been suggested as one possibility, as it is a non-invasive, simple, inexpensive and harmless treatment (Hunt et al., 2013). For thousand of years in Egypt and India, aromatherapy had been used for relieving gastrointestinal discomfort (Lua & Zakaria, 2012; Ebadi, 2002). Aromatherapy can be used for different purposes such as cosmetic, holistic and clinical therapy (Lane et al., 2012). Clinical use of aromatherapy is usually sporadic, focusing on specific areas of discomfort. It works by interacting with the olfactory system, triggering the receptors in the nasal epithelium and stimulating the limbic system and the thalamus to release endorphins and serotonin (Freeman, 2009).

There are many different aromatic substances in the market, for example, ginger, peppermint and Isopropyl alcohol (IPA). Anderson & Gross (2004) suggested that aromatherapy with peppermint oil or IPA may improve postoperative nausea, whereas aromatherapy with IPA is a very well known complementary folk remedy for nausea in South America as it may influence neurotransmitition that activate the CTZ (Conway, 2009; Mamaril et al., 2006). IPA can be easily found in the “alcohol prep-pads” in all clinical areas, and it has been widely used in postanesthesia care units (PACU) to alleviate PONV (Cotton et al., 2004; Merritt et al., 2002; Pellegrini et al., 2009; Winston et al., 2003)
1.2 Affirming the needs

PONV is the most common complication in postoperative patients with high incidence rate. Early and late PONV could occur at any time within 24hrs after surgery. It is also the most common worry by the surgical patients with elective surgery (American society of periAnesthesia Nurses, 2006). This problem can increase the financial burden by up to several million dollars a year, as PONV is the strongest cause of delayed discharge and unanticipated readmission. Therefore, PONV is a major concern in surgical patients and ineffective treatment may cause serious or even lethal complications.

Although using a pharmacological approach to treat PONV is effective, it may induce significant adverse effects on the patient. Aromatherapy has been suggested as an alternative treatment for PONV, and it has advantages such as rapid onset of effect, simple administration, economy, and absence of adverse effects (Andersen & Gross, 2004). It is recommended by expert opinion from the American Society of PeriAnesthesia Nurses (2006). Moreover, many studies support the use of peppermint oil vapour for relieving PONV for patients after gynecology surgery, and some researchers suggest ginger oil for lower extremity surgery patients (Hodge et al., 2014). Although, many published studies have been investigated the effectiveness of using aromatherapy for relieving PONV, there is little translation into real practice and no specific evidence-based guidelines on using it have been introduced so far. Aromatherapy is still not given as routine standard nursing care to the patient.

I am currently working in an operating theatre in a sub-acute hospital in Hong Kong. There are five operating rooms in the department, which manages around 1900 general anesthesia and intravenous (IV) sedation cases yearly. In review of the current practice, there are no standard guidelines or protocols for assessing and managing patients with PONV.
Usually, nurses may help the patients by relaxation, controlled breathing, repositioning and then informing the anaesthetists for prescribing of intravenous antiemetics. Antiemetics such as metoclopramide and ondansetron are the standard treatments in the department and the choice of medication is dependent on the anesthesiologist’s preference as well as the availability of medication on hand. After administration, patients are required to stay in PACU for further observation, so duration of hospitalization is prolonged (Winston et al, 2003).

Although, pharmacological treatment is a very effective conventional solution for PONV, it causes additional side effects and affects patient satisfaction. Also, it involves a significant direct and indirect cost impact to the whole health care system. Therefore the use of aromatherapy may offer an alternative safety and cost effective treatment for postoperative patients. Developing evidence-based guidelines on using aromatherapy may help to improve patient care by relieving severity of PONV. These guidelines may also raise levels of awareness in other health care professions and encourage standardization in the administration of aromatherapy. The ultimate goal of the guidelines will be to improve service quality by promoting patient comfort and decreasing postoperative complications.

1.3 Research question

The research question is, “whether using aromatherapy can reduce postoperative nausea and vomiting in adult patients undergoing elective surgery in post anaesthetic care unit?”

PICO

The patients (P), intervention (I), Comparison(C), and outcome (O) are shown below:

*Patients: postoperative* adult patients after general anesthesia or IV sedation

*Intervention: use of aromatherapy incorporating various scents*
Comparison: standard treatment / placebo

Outcome: severity of nausea and vomiting

1.4 Aim

The aim of the guideline is to incorporate the best evidence of the effects of aromatherapy into usage in a practical hospital setting for improving service quality.

1.5 Objectives

To conduct a comprehensive search of available literatures on using aromatherapy, mainly focusing on adult patients undergoing surgery with general anesthesia or IV sedation, and then to extract and critique the information from the chosen literatures and establish a table of evidence.

1. To gather empirical evidence on administering aromatherapy to post general anesthesia and sedated patients
2. To develop a recommended protocol for using aromatherapy
3. To develop implementation strategies of the proposed guidelines in the PACU
4. To assess the implementation potential of the proposed guideline
5. To develop a clear plan for implementation
6. To evaluate the effectiveness and compliance of the guideline

1.6 Significance of the guideline

Since aromatherapy is believed to be effective in reducing PONV and reduce hospital expenses, so we have an opportunity to see whether using aromatherapy to manage PONV in PACU is effective and safe in implementation. A systematic way of examining the latest evidence allows nurses to apply up-to-date knowledge to current practice and ultimately to
improve that practice. By using standard protocols, health care professionals might gain a consensus in managing PONV. Hopefully, better service quality with more side-effect free treatment options can be found by continuous reviewing of the latest evidence.
CHAPTER 2: CRITICAL APPRAISAL

Given a need to test the effectiveness of aromatherapy in relieving PONV in adult patients in PACU, and the need to develop an evidence-based guideline on using aromatherapy for patients undergoing general anesthesia or IV sedation, an integrative review of the associated literatures is thus reported in this chapter.

2.1 Search Strategies

2.1.1 Search methodology

A critical systematic review focusing on using aromatherapy in adult patients for relieving PONV in PACU was conducted between 1st June 2014 and 25th September 2014. Five electronic bibliographic databases including British Nursing Index [BNI], Cumulative Index to Nursing and Allied Health Literature [CINAHL] Plus, Medline, Excerpta Medica database [EMBASE] and PubMed were searched. All these databases included journals especially relating to nursing pharmacy, medicine and health care, so searching results could be more focused and specifically related to nursing.

2.1.2 Keywords, abstract and title search

The first step of the search is through a keywords search for relevant publications. The keywords including 1) aromatherapy, 2) isopropyl alcohol, 3) peppermint, 4) alternative method, 5) post operative nausea, 6)postoperative nausea, 7) postoperative vomiting, 8) post operative vomiting, 9) PONV were searched separately for paper identification. Two combine searching of the above keywords from 1-4 and 5-9 were performed by using the “or” builder key in the search engines to expand the pool of possible relevant papers. Then, these two results were combined again by using the “and” builder key in the search engine to
narrow down the relevant studies. Finally, combined result was searched again with the criteria of limiting to randomized control trial (RCT) in the search field.

After the identification process, screening was completed on the titles and abstracts for checking relevance and duplication. Next, eligibility was checked by matching with the predetermined inclusion and exclusion criteria. Then, a condensed list of relevant papers was retrieved, the reference list of the papers in the list was reviewed to identify for additional related articles. The search was conducted in a comprehensive manner and presented by using a table (Appendix 1 & 2).

2.1.3 Selection criteria

Papers under the following preset criteria are included.

Type of study:

All randomized controlled trials (RCT) which explored the effect of aromatherapy for relieving PONV were considered. The papers included have not been limited in date of publishing since aromatherapy is a traditional therapy. Only papers in English with full text articles were included. Aromatherapy can be delivered through inhalation by any means. The studies design can be by intervention group comparing either placebo (saline/sterile water), or control group. The control group can involve standard treatment of controlled breathing or standard treatment of using any antiemetic (metoclopramide, promethazine and ondansetron).

Inclusion criteria:

Patients aged over 18 years old, in any gender with any type of elective operations under general anesthesia or IV sedation were included. Only studies involved application of aromatherapy in PACU were selected. The primary outcome measure comprised the severity of PONV.
Exclusion criteria:

Patients who received pre-anesthesia prophylactic aromatherapy were excluded. Patients with nasal surgery, caesarean section and allergy history to aromatic agents were excluded. Cases with caesarean section were excluded because their cause of PONV was attributed to extra causes such as vagal or sympathetic stimuli, severe pain and visceral trauma.

2.1.4 Search result

After keywords, abstract and title search in five electronic databases, three hundred and seventy-nine papers were retrieved. When searching limited to randomized control trials, there were 2 papers from BNI, 7 papers from CINHAL, 171 papers from Medline, 22 papers from EMBASE and 177 papers from PubMed. Twenty-nine papers were included after reviewing the title, abstract and full text of the studies, 2 papers selected from BNI, 5 papers from CINHAL, 9 papers from Medline, 4 papers from EMBASE and 9 papers from PubMed. Two papers were removed from search in CINHAL since the study involved treatment of pre-ventilation aromatherapy and one paper was excluded since the intervention was delivered in the mother/baby unit rather than PACU (Lane et al., 2012; Radford et al., 2011; Radford et al., 2009). Finally, seven papers were selected after removal of duplicated articles from five databases (Anderson & Gross, 2004; Cotton et al., 2007; Hodge et al., 2014; Hunt et al., 2013; Pellegrini et al., 2009; Sites et al., 2014; Winston et al., 2003). The characteristics of the included studies were presented by using the table of evidence (Appendix 7).

A Cochrane systematic review on aromatherapy for PONV was found (Hines et al., 2012). However, this review included publications with both randomized control trials (Anderson & Gross, 2004; Cotton et al., 2007; Kamaliopour et al., 2002; Pellegrini et al., 2009; Wang, 1999; Winston et al., 2003) and clinical control trials (Langevin et al., 1997, Meritt et al., 2002; Tate, 1997; Wang, 1999). Studies with clinical control trial were not
included in this systematic review because these studies lack of randomization in subjects’ allocation, the quality of the evidence might be affected by the any occurrence of selection bias. Besides, the Cochrane review focused on both adult and juvenile subjects (Wang et al., 1999), so the finding may not be specific enough to represent a focus group of patients. The paper from Kamaliopour et al. (2002) was also not included in this systematic review because it was an unpublished abstract without detail demographic data of patient’s age. In addition, the review’s literature search had been discontinued in August 2011 and publications after 2011 were not included (Hodge et al., 2014; Hunt et al., 2013). Since new research evidence on the use of aromatherapy was available, we thus had more updated knowledge on using aromatherapy for relieving PONV for adult patients in PACU.

2.2 Quality Assessment

The level of evidence was listed according to the methodology checklist for randomized controlled trials from the Scottish Intercollegiate Guideline Network (SIGN) in (Appendices 5 & 6). With grading from “1++” to “4” to represent the highest to the lowest level of evidence (Appendix 3). The appraisal considered the key question of the study, study design, methodology, statistical power and risk of potential bias. The standard checklist was shown in (Appendix 4).

2.3 Appraisal result

All the seven selected studies are randomized controlled trials. All the seven studies are graded as“ 1+” level of evidence, it means that the RCTs are well conducted with low risk of bias (Sites et al., 2014; Hodge et al., 2014; Hunt et al., 2013; Pellegrini et al., 2009; Cotton et al., 2007; Anderson & Gross, 2004; Winston et al., 2003)(Appendix 6) .
All selected studies addressed the same focused question. Their research question, intervention, comparison and outcome measures were clearly stated at the beginning of the research.

When looking into the method of randomization, six of the studies used computerized random numbers to assign the subject into treatment groups (Cotton et al., 2007; Hodge et al., 2014; Hunt et al., 2013; Pellegrini et al., 2009; Sites et al., 2014; Winston et al., 2003). And one stated that their randomization was done by using “blocked” systematic random numbers (Anderson & Gross, 2004). Therefore, the risks of selection bias of all studies are low (Appendix 5).

In reviewing methods of concealment and blinding, five studies showed adequate concealment in study design as the groupings were completed by an independent party who was not involved in the process of data collection (Anderson & Gross, 2004; Cotton et al., 2007; Hunt et al., 2013; Pellegrini et al., 2009; Winston et al., 2003), Two studies were categorised as “Can’t Say” as they did not mention the concealment method (Sites et al., 2014; Hodge et al., 2014).

Two studies minimized the risk of performance bias by using blinding in treatment allocation, one study kept single blinded to patient (Sites et al., 2014), one study kept double blinded (Anderson & Gross, 2004), two of them involved no blinding (Hunt et al., 2013; Winston et al., 2003) and the final two did not mention blinding (Cotton et al., 2007; Hodge et al., 2014). Although, two studies mentioned sample blinding in the treatment allocation, the nature of the study limited the blinding effect, actually, it is nearly impossible to prevent performance bias since every aromatherapy has its own special odour.

For the primary outcome measure, all the studies measured the intervention effectiveness by measuring the severity of PONV. For secondary outcome, four studies measured the
efficacy of aromatherapy by reporting the need for rescue antiemetics. (Cotton et al., 2007; Hunt et al., 2013; Pellegrini et al., 2009; Sites et al., 2014). Four studies reported the level of patients' satisfaction in their research studies (Anderson & Gross, 2004; Cotton et al., 2007; Hodges et al., 2014; Pellegrini et al., 2009). Only Winston et al. (2003) reported length of stay in the outcome measure.

The attrition rate of all the studies was clearly reported from 40% to 0%. The dropout rate below 40% is regarded as acceptable. There were only two studies with the dropout rate higher than 20% (Cotton et al., 2007; Sites et al., 2014). Therefore, special caution is needed when looking at the study design, however the authors of the above studies clearly reported the reason for dropping out. Information gained can give insight for better research study design in the future (Appendix 5).

All studies adopted the principle of intention-to-treat in the research analysis, as their interventions were given according to initial treatment assignment by randomization and not on the treatment eventually received. Although missing values were seen in five studies, the authors had clearly stated their reasons for dropout. (Cotton et al., 2007; Hodge et al., 2014; Hunt et al., 2013; Pellegrini et al., 2009; Sites et al., 2014).

When taking clinical considerations into account, all studies involved statistical power analysis in data analysis and subject recruitment. And all the studies adopted a measuring tool for measuring severity of PONV, to reduce risk of reporting bias by using objective data. The most common one was Verbral Numeric Rating Scale (VNRS) from 0-10 (Cotton et al., 2007; Pellegrini et al., 2009; Winston et al., 2003). The other four studies used either one of the followings: Descriptive ordinal scale (DOS), 10 Point Likert-type Scale, 4-Point scale and 0-100 Visual Analogue Scale (VAS) (Anderson & Gross, 2004; Hodge et al., 2014; Hunt et
Although, the measuring tool varied in different studies, the power analysis could be used to interpret the result.

### 2.4 Summary of data and Synthesis

#### 2.4.1 Patients’ Characteristics

Altogether 2054 adult subjects were recruited in these selected studies. Three studies only recruited female subjects (Pellegrini et al. 2009; Cotton et al. 2007; Winston et al. 2003). All the patients underwent surgery with general anesthesia or IV sedation. Types of surgery in the selected studies included laparoscopic, orthopedic, laparotomy, plastic surgery, gynecologic surgery, thyroid surgery, general surgery and vascular surgery (Anderson & Gross, 2004; Hodge et al., 2014; Hunt et al., 2013; Sites et al., 2014).

Across the seven studies, the common reasons for excluding subjects are listed below:

1. Patients with allergy history to menthol, peppermint, lavender spearmint, ginger, cardamom or alcohol, ondansetron, promethazine, or metoclopramide were excluded in five studies (Hodge et al., 2014; Hunt et al., 2013; Pellegrini et al., 2009; Sites et al., 2014). Allergies may induce life-threatening complications, so exclusion is performed for safety reasons.

2. Two studies excluded patients with a persistent vomiting problem. Should those patients be included, the study result might be affected and subjected to selection bias (Cotton et al., 2007; Sites et al., 2014; Winston et al., 2003).

3. Patients with special medical status were excluded. Three studies excluded pregnant women from their studies because the safety of using aromatherapy has not been proven (Cotton et al., 2007; Pellegrini et al., 2009; Sites et al., 2014). Patients with alcoholism were also excluded from the studies on aromatherapy with IPA because it might increase
selection bias and reporting bias as the alcohol scent was familiar (Sites et al., 2014; Winston et al., 2003). Patients with clotting disorder and who were on anticoagulants were excluded from the study of aromatherapy with ginger because ginger may react with the anticoagulation medication (Hunt et al., 2013). Besides, patents requiring emergency surgery, those with migraine headaches and inability to breathe through the nose were also excluded since their medical condition was not considered suitable for inclusion (Cotton et al., 2007; Pellegrini et al., 2009; Sites et al., 2014).

4. Patients on special medications: disulfiram, cefoperazone and metronidazole were excluded from three studies (Cotton et al., 2007; Pellegrini et al., 2009; Sites et al., 2014) because using aromatherapy may affect the medication effect.

2.4.2 Summary of intervention

Among the seven selected articles, five of them evaluated the effectiveness of aromatherapy with a single flavour (Cotton et al., 2007; Pellegrini et al., 2009; Sites et al., 2014; Winston et al., 2003). One of them examined the effects of aromatherapy with an aromatic inhaler with blends of aroma (Hodge et al., 2014). One of them involved interventions of aromatherapy with two different flavours (Anderson & Gross, 2004). The final one compared the effect of aroma in three different types (Hunt et al., 2013).

Aromatherapy with peppermint spirit was used in three studies (Anderson & Gross, 2004; Sites et al., 2014; Hunt et al, 2013). Five examined the effect of aromatherapy with 70% isopropyl alcohol (IPA) (Anderson & Gross, 2004; Cotton et al., 2007; Hunt et al., 2013; Pellegrini et al., 2009; Winston et al., 2003). One studied the effect of aromatherapy with essential oil of ginger (Hunt et al., 2013). One study used aromatherapy with blended flavour of ginger, spearmint, peppermint and cardamom, and the other study involved a commercial aromatic inhaler with blended favour of lavender, peppermint, ginger oil and spearmint oil
(Hodge et al., 2014; Hunt et al., 2013). The commercial aromatic inhaler with blended favour was invented by a nurse, it was claimed that aromatherapy with blended flavours of essential oil can produce a synergistic effect, as ginger, peppermint and spearmint are recommended for relieving nausea and vomiting and lavender may produce anxiolytic and antispasmodic effects. The combination of effects may contribute to alleviating the perception of nausea (Soothing Scent, 2014).

Six studies shared the same method of giving aromatherapy by instructing the patient to inhale through the nose and exhale through the mouth to the count of 3 (Anderson & Gross, 2004; Cotton et al., 2007; Hunt et al., 2013; Pellegrini et al., 2009; Sites et al., 2014; Winston et al., 2003). Only one study with the commercial aroma inhaler did not mention the exact count of inhalation (Hodge et al., 2014). There are three studies using single inhalation in the intervention group (Anderson & Gross, 2004; Hodge et al., 2014; Hunt et al., 2013), while the others allow up to two to three inhalation of aroma (Cotton et al., 2007; Pellegrini et al., 2009; Sites et al., 2014; Winston et al., 2003). The modes of giving aromatherapy were different; three studies used soaked cotton or gauze, while three studies used an IPA pad and one used a commercial inhaler (Cotton et al., 2007; Pellegrini et al., Winston et al., 2013) (Appendix 8).

2.4.3 Summary of comparison

Four studies compared the effects of aromatherapy with standard treatment (Control). Among them one compared with the standard treatment of controlled breathing (Sites et al., 2014) and three studies were compared with administration of antiemetics including ondansetron, promethazine, or metoclopramide (Cotton et al., 2007; Pellegrini et al., 2009; Winston et al., 2003). Three studies included comparisons between aromatherapy with
placebo of unscented inhalant, saline or sterile water (Anderson & Gross, 2004; Hodge et al., 2014; Hunt et al., 2013).

2.4.4 Outcome measures

The studies by Sites et al (2014) were subject to a high attrition rate of 40%. The main reason was inadequate manpower to implement the study protocol and inadequate training causing protocol deviation (Site et al., 2014). Similarly, protocol deviation contributed to subject dropout in three other studies (Cotton et al; Hodge et al., 2014, Hunt et al., 2013). Other than the reasons of unplanned admission, self-withdrawal and self-request of antiemetic, dropout caused by inadequate manpower and protocol deviation is actually preventable.

The primary outcome measures of all the selected studies were the severity of PONV by using standard tool assessment. These standard tools facilitated comparison of subjective data. Other secondary measures included usage of rescue antiemetics (Sites et al., 2014; Hunt et al., 2013; Pellegrini et al 2009; Cotton et al., 2007), time to reduce 50% PONV score (Cotton et al., 2007; Pellegrini, et al., 2009; Winston et al., 2003), patient satisfaction (Cotton et al., 2007; Anderson & Gross, 2004; Hodge et al., 2014) and length of stay in PACU (Winston et al., 2003).

For the assessment, all studies assessed the initial level of nausea and vomiting when the patient complained of the first episode of PONV, but the time of assessment after treatment showed a large discrepancy from 2 minutes to 15 minutes interval (Appendix 9).

2.4.5 Summary of effect size

In Sites et al (2014) articles, the author measured the intervention efficacy by evaluating the usage of rescue antiemetics, whereas the efficacies of control group and aromatherapy
group were 62.5% versus 57.7% without significant difference (p=0.76). Meanwhile, the PONV score at 10 minutes was used to reflect the effectiveness of the intervention. Results showed that patients in the aromatherapy group registered a higher PONV score than control group of control breathing, but the effectiveness rate in aromatherapy and control groups were 38.1% and 40% respectively without significant statistical difference (p=0.61).

In Hodge et al (2014) study, the outcome measures reported that both aromatherapy and placebo treatment also showed a significant decrease in PONV score (p<0.01). The perceived effectiveness score of aromatherapy group (mean: 5.72±3.26) was significantly higher than that in the placebo group (mean: 2.72±3.12) with p-value smaller than 0.001, but the independent t-test showed no difference in the overall satisfaction rate.

The first findings from Hunt and co-workers (2013) showed aromatherapy with ginger essential oil or blended essential oil contributed to a significant change in PONV score when compared to the placebo group with p<0.001 and p=0.002 respectively. The second result reported that aromatherapy with blended flavours was statistically better than the aromatherapy group with ginger oil (p=0.03), while ginger and blend were statistically better than IPA and placebo (p<0.05). Aromatherapy with blended flavour could improve PONV by 42.7% when compared with saline placebo (p<0.001). The third findings stated that aromatherapy with blended flavour or ginger could significantly reduce the need of rescue antiemetic when compared with saline placebo and IPA group (p<0.05).

Pellegrini et al. (2009) supported aromatherapy with IPA could significantly reduce the median dose of antiemetic in PACU (p<0.02). Besides, aromatherapy group with IPA showed a significant faster effect to reduce PONV than antiemetic (p<0.002). Patient satisfaction between two groups are similar without significant difference (p>0.05).
Cotton and collaborators (2007) examined the effect of aromatherapy with IPA by measuring the time to reduce 50% of PONV score after the 1st and 2nd treatments. The result show that aromatherapy with alcohol contributed to a significantly faster effect in reducing PONV than using an antiemetic in both the first (p=0.11) and second treatments (p=0.13). The mean time to achieve 50% reduction in PONV score in aromatherapy group was 15mins, while the antiemetic group required 33mins to reach the same effect, and the finding was statistically significant with p=0.011. Although, length of stay in PACU in IPA group (63.23mins) was longer than that in antiemetic group (62.6mins), the finding was statistically insignificant (p=0.909).

Anderson & Gross also measured the outcome in two different time frames, 2mins and 5mins after treatment. The result showed that PONV score was significantly decreased at both time frames (p<0.05). In addition, the effect of aromatherapy on increasing overall satisfaction score was significant with over 85% (p<0.05).

In Winston et al, the outcomes were measured at different time frames at 5mins, 10mins, 15mins, 30mins, 40mins and 60mins after treatment. The result showed that aromatherapy with IPA caused significant reduction in PONV score at 5 to 10mins (p<0.05). The authors also measured the time to reduce to 50% of PONV score when compared with the use of antiemetic, it showed that aromatherapy had a significant faster effect in reducing PONV than the antiemetic (p<0.05). The mean time was 6.3mins in IPA group and 27.7minutes in antiemetic group. Regarding the measure of length of stay at PACU, though the result was shorter in the aromatherapy group (58.4mins) than in the antiemetic group (60.3mins) it was statistically insignificant (p=0.498).
2.4.6 Synthesis result

All the selected studies were randomized control trials with 1+ level of evidence. All articles concluded that aromatherapy is effective in relieving PONV. Data summarized from the selected papers is presented in below:

For patient selection, patients should be selected carefully when using aromatherapy. The selected studies mentioned patients with the following conditions were not suitable for using aromatherapy: known allergy history to certain aromatic substances, history of persistence vomiting, pregnancy status, history of migraine headache, suffering from clotting disorder and inability to breathe through the nose. Patients on disulifirum, cefoperazone and metronidazole were also excluded from using aromatherapy.

For the selection of aromatherapy, there was no typical aroma that had been selected as a uniform choice. The type of aroma choice in the studies included peppermint, blended aroma, ginger and IPA. In reviewing use of peppermint spirit in two studies, although it was shown to be effective, one study had a high attrition rate and the other had a small sample size of 33 subjects (Anderson & Gross, 2004; Sites et al., 2014). When looking at the use of ginger, a 4-arm comparison showed that both blend and ginger are more effective than IPA. However, this study did not involve comparison with treatment with standard antiemetics, so conclusions cannot be draw from that particular study (Hunt et al., 2013). Two studies examined aromatherapy with blended aromas, but the formulae of the blended aromas were not mentioned, also the conclusions were made by comparison with placebo only (Hodge et al, 2014; hunt et al, 2013). In considering IPA, there were five studies examining use of isopropyl alcohol and three of them were conducted in comparison with standard treatment (Cotton et al., 2007; Pellegrini et al., 2009; and Winston et al, 2003). Therefore, use of aromatherapy with IPA is adopted in the new innovation.
Regarding mode of delivery, the studies used methods like soaked gauze or cotton, commercial “prep pad” and commercial inhaler to provide treatment. However, the methods of using soaked gauze were not uniform among studies, there was no standard size in the gauze and cotton, and also the amounts of essential oils used were different (Anderson & Gross, 2014; Hunt et al., 2013; Sites et al., 2014). In the study by Hunt et al (2013), the container of the aromatherapy was modified during the study process because the aromatherapy was found to be oxidized with changed odor after repeated use. Only one study suggested the use of a commercial inhaler, but the number of inhalations for each application was unclear (Hodge et al; 2014). Three studies used a single packing commercial 70% IPA pad, their application method was consistent, folding the pad into half and placing at 0.5 inches from the patient’s nose(Cotton et al., 2007; Pellegrini et al., 2009; and Winston et al, 2003). Clinically, the 70% IPA pad is very easy accessible, as it is used for skin preparation before giving injections. In studies using IPA pads, their treatment doses vary from 2 to 3 separate inhalations (Cotton et al, 2007; Pellegrini et al, 2009; Winston et al, 2003).

In considering intervention application, all the studies provided aromatherapy by instructing patients to take three deep breathe in each time inhalation dose. Although different types of aromatherapy were used in the selected studies, they were all showed to be significantly effective for relieving PONV.

When looking into the time to effect, although the time frames of assessing the PONV scores after treatment vary from 2mins to 15mins in the studies, the results regarding the time to reduced 50% of PONV score gave an insight on speed of effect. Winston et al. (2003) found that aromatherapy could cause a reduced PONV score at 5 to 10mins and reduce the PONV score by 50% in 6.3mins to 7mins, while a standard antiemetic would take about
20mins to 27mins to reach the same effect. There was no standard recommendation of the duration of effect of aromatherapy, but the studies showed that aromatherapy could produce a quick effect in 5 to 10mins.

Six of the selected trials included rescue antiemetics in their study protocols (Anderson & Gross, 2004; Cotton et al., 2007; Hunt et al., 2013; Pellegrini et al., 2009; Site et al, 2014; Winston et al., 2003). If the subjects in aromatherapy group did not get relief from aromatherapy treatment, rescue antiemetic would be provided. Approximately, 27% of subjects received a rescue antiemetic after 3 treatments of IPA treatment in the study from Winston et al. (2003), and 52% of subjects required rescue treatment in the study by Anderson & Gross (2004). Among the six trials, two of them reported no subjects require rescue antiemetic in aromatherapy group (Pellegrini et al., 2009; Site et al., 2014), one of them reported a significant reduce in the use of rescue antiemetic in aromatherapy group with comparing with saline placebo group (p<0.05)(Hunt et al., 2013). Only one study mentioned no significant different in the need of rescue treatment between aromatherapy group and control group (Cotton et al., 2007).

Assessment methods of PONV score were different in the selected studies, five of them used a 0-10 scale with “0” being none and “10” being the worst (Cotton et al., 2007; Hodges et al., 2014; Pellegrini et al., 2009; Sites et., 2014; Winston et al., 2003), one of them used a 0-100 scale with “0” being none and “100” being the worst possible nausea (Anderson & Gross; 2004). Another one used 4-point scale with “0” being none, “1” being some, “2” being a lot and “3” being severe in assessment (Hunt et al., 2013).

Studies by Sites and colleagues (2014) reported a high attrition rate of 40%. The contributing factors included inadequate manpower to provide intervention, nurses’ unfamiliarity with the study protocols causing deviation. Therefore, adequate manpower,
sufficient communication and full briefing are needed when using aromatherapy in clinical practice.

Aromatherapy could significantly reduce PONV for patients in PACU (Anderson & Gross; 2004; Hodges et al., 2014; Hunt et al., 2013; Winston et al., 2003). Also aromatherapy showed a faster effect to reduce PONV score as comparing with standard treatment of antiemetic (Hunt et al, 2013; Pellegrini et al; 2009). Surprisingly, aromatherapy could contribute to a faster effect than antiemetics (Cotton et al, 2007; Winston et al; 2003). However, the effect on length of stay is inconclusive (Cotton et al, 2007; Winston et al; 2003). Aromatherapy attributed to a significant high patient satisfaction rate above 85% (Anderson & Gross, 2004; Pellegrini et al., 2009). In a study, 90% of patient reported that they would like to try aromatherapy in the future.

As the provision of aromatherapy for relieving PONV was supported among all seven studies, the use of aromatherapy should be initiated in PACU without delay.

2.5 Complication

Some people have suggested that essential oils may have potential side effects such as mucus membrane irritation, dermatitis and allergy (Lane et al, 2012), but no complication was reported from any of the seven selected studies.

2.6 Conclusion

Seven RCTs with high quality of evidence was retrieved in the systematic review. Based on the evidence, aromatherapy is a safe and fast intervention for decreasing PONV score and use of antiemetic, and increasing patient satisfaction. Therefore, aromatherapy should be recommended for those adult patients undergoing elective surgery with general anesthesia for relieving PONV in PACU.
CHAPTER 3 TRANSLATION AND APPLICATION

3.1 Implementation potential

In the previous chapters, the adverse effects of PONV on postoperative adult patients have been discussed. Evidence from the literature confirms the possibilities of using aromatherapy for reducing the incidence and severity of PONV, thus reducing the need for antiemetics. Before translating this evidenced-based innovation into clinical practice, its implementation potential should be assessed. Five aspects, including target setting, target audience, transferability, feasibility and cost-benefit analysis of the intervention will be discussed in evaluating this.

3.1.1 Target Setting

The target setting is an operating theatre with five operating rooms in a sub-acute public hospital in Hong Kong. The various specialties of surgery include breast surgery, colorectal surgery, endocrine surgery, hepatobiliary surgery, vascular surgery and urology. There are two recovery rooms in the operating theatre on separate floors, having a total of 6 recovery bays for postoperative monitoring.

3.1.2 Target Audience

The characteristics of target patients must be aged 18 years old or above in either sex undergoing elective surgery with either general anesthesia or IV sedation. The patients must be transferred to PACU for monitoring after operation. Patients undergoing nasal surgery, pregnant, allergy to alcohol or receiving pre-anesthesia prophylactic aromatherapy therapy will be excluded.
3.1.3 Transferability

In order to assess whether the findings are transferable into real clinical practice, the previously mentioned seven studies were examined to see if they could be reproduced in the current target setting.

The selected seven studies had been conducted in the recovery area of the operating theatre where the environmental setting is similar to our target setting. All the participants were adult surgical patients aged 18 years old or above, undergoing elective surgery with general anesthesia or IV sedation. The operations performed included laparoscopic, breast surgery, thyroid surgery, otolaryngology surgery, head and neck surgery, urological and gynaecological surgery, very similar to the target setting.

Both the target hospital and the proposed innovations share similar core values of providing patient-centered service to the community. The target hospital included mission of delivery efficiency and cost-effectiveness service to the sociality (Hong Kong West Cluster, 2014). Perioperative nursing involves the distinct mission of ensuring patient safety, promoting patient comfort and providing quality care (Boyle, 2005; Hospital Authority, 2012). Therefore, the purpose of the innovation reconciled with the prevailing philosophy of providing safe, cost-effective and quality care to patients.

The target hospital’s operating capacity allows it to manage on average 10 cases under general anesthesia and intravenous sedation in every working day. From the case record in 2014, there are approximates of 1900 elective cases under general anesthesia or intravenous sedation yearly in the target setting (Appendix 10). By statically summary from the patient registry in the recovery room of the target setting, there were approximately 30% of patient complaints PONV after surgery (Appendix 11). The revealed data from the selected papers suggested that aromatherapy is effective in relieving PONV. Thus, the innovation would
benefit a sufficiently large number of patients undergoing surgery with general anesthesia or IV sedation in the target setting.

The proposed innovation will be divided into four phases in implementation: preparation, a pilot program, implementation and evaluation. During the preparation phase, a core committee will be formed to organize the whole program. Since perioperative nurses needs to interact with other healthcare team in proving care, representatives from the perioperative nursing discipline, the anesthesia and surgical departments will be invited to join the core committee, so that professionals from different disciplines can collaborate with each other and gain consensus in the action plan. The whole implementation plan will last for one year (Appendix 19). Detail information will be discussed in Chapter 6.

3.1.4 Feasibility

The proposed innovation involves evidence-based practice that requires intricate decision making and diligent synthesis of the best available evidence. In order to maintain the service quality at a high level, nursing staff must endeavor to keep up-to-date with the latest scientific knowledge and information. The hospital, its administrators and managers will surely support the proposed innovation if it is supported by a significantly high level of evidence, since the healthcare leaders has a role to stimulate and guide staff in evidence-based practice activities (Shivnan, 2011).

All health care professionals as well as perioperative nurses will have the autonomy to carry out the innovation. Meanwhile, the proposer and the core committee have the freedom to terminate the implementation if it is considered undesirable or ineffective. The hospital has created a constructive climate in terms of implementing research-grounded innovation, for example, the evidence-based practice (EBP) guideline of surgical time-out procedure to prevent wrong site surgery in 2012, the adoption of EBP of preoperative warming for prevent
postoperative hypothermia in 2013 and the EBP of using chlorhexidine gluconate for reducing surgical site infection in 2013.

In fact, introduction of a new innovation may interfere with the usual practice of post-anaesthetic care and cause distractions from other aspect of monitoring, since the nurses need to provide additional treatment for patients with PONV. It may increase their workload and paperwork during PONV assessment, so nurses may be reluctant to accept the innovation and prefer to follow the beaten path of managing PONV solely with pharmacology approach. Besides, they may have doubts about the effect of the innovation and have predetermined perceptions that antiemetics are the only way to provide optimal care.

Therefore, in considering the using capability of the innovation, it is very important to begin the dissemination process with a clear explanation and adequate training to the nursing staff. The nurses will get to know that aromatherapy is a fast and a simple alternative therapy for relieving PONV which has been adopted by nurses in many countries (American Society of PeriAnesthesia Nurses, 2008). Through detailed explanation, nurses can come to understand how the proposed innovation will give benefit to patients and enhance patient better care, so that their acceptance of it will be encouraged. Moreover, the presentation of credible and positive scientific evidence will be equally persuasive.

Nursing innovation in clinical practice usually involve human relationship with other healthcare professionals (Price, 2006). Anaesthetists and surgeons may query the effectiveness of non-pharmacological treatment and worry about whether the innovation will delay usage of standard antiemetics, thus increasing the complication of PONV. Ploeg et al. (2007) suggested that the most common factors for facilitating nursing guideline included, local leaders, staff training, strong organization support and multidisciplinary collaboration. Therefore, a multidisciplinary core committee will be set up where leaders from different
parties including the nurses, surgeons and anesthetists are free to express their concern from their professional perspectives. By making good use of best evidence in the discussion and decision making process, different concerns could be addressed. Hence, consensus on the evidence-based guideline could be achieved.

In current practice, anaesthetists will usually turn first to pharmacological treatment (intravenous metoclopramide or ondansetron). Nurses usually assist patients in an indirect manner by encouraging deep breathing and positioning changes. Anaesthetists may feel their role is being undermined. Conversely nurses may feel that they do not have enough confidence to implement the innovation in the face of accepted standard practice. In fact, anaesthetists will need to give rescue antiemetics if required, should aromatherapy be found ineffective in persistent PONV. Besides, participation from the anaesthetists can increase acceptance and confidence of the nursing staff.

Aromatherapy is a simple treatment which can be easily integrated into daily postoperative care. According to the selected evidence, it is suggested to delivery aromatherapy by means of taking three deep breathe in each treatment dose and the maximum dose is 3 times(Cotton et al., 2007; Pellegrini et al., 2009). Aromatherapy can produce quick effect in 5 minutes time (Cotton et al, 2007; Anderson & Gross, 2004; Hunt et al; 2013; Pellegrini et al; 2009; Site eta la, 2014; Winston et al; 2003). Therefore, the whole procedure of assessment and intervention, involving deep inhalation of the chosen aroma, should take only 15 minutes to implement and assessment in each 5 minutes time (Appendices 8 & 9).

Three hours of training in a service workshop will be provided by the innovation proposer nurse to all nurses (40 nurses) in the target theatre. They will learn the skills of applying aromatherapy and will have the chance to participate in a practical workshop where
they can also ask questions. The workshop will provide two Continuing Nursing Education (CNE) points and an attendance certificate to the trainee to increase their motivation of participation. A plastic badge marked “Aromatherapy Provider” and a training digital versatile disc (DVD) will training materials will be given to all participants, so as to guarantee the innovation is delivered by a qualified person.

Inadequate staffing is a major contributing factor to the attrition rate in the selected studies. In the target setting, there are six nurses in the recovery room for providing postoperative care. The innovation will require one more nurse in the PACU. The additional manpower will be achieved by reallocation, not by new recruitment, so no extra cost in salary is needed. The APN in the core committee will be responsible for arrange staff reallocation.

For equipment preparation, the 70% IPA pad is already available in the target setting. In the target hospital, there are approximately 10 patients undergoing general anesthesia or IV sedation every day, with each needing three inhalations of three treatment doses, and then an additional 90 pieces of 70% IPA prep pad are required for the adoption of innovation. If the innovation takes about six month for implementation, then about 4275 extra IPA pads will be needed. From the record of 1900 cases yearly in the target setting, 950 standard assessment forms and information sheet are needed to be available for approximately 950 patients in six months. For nursing staff training, all 40 nurses in the theatre will be trained, since all nurse will have chance to be assigned as a recovery room nurse in daily practice. 40 badges marked “Aromatherapy Provider” and DVDs with training material are need to be prepared also.

3.1.5 Cost-benefit analysis of the innovation

Risk of implementation of the proposed innovation
Although, Lane et al. (2012) mentioned potential side effects of essential oil, no complication was reported from any of the seven selected studies in clinical trial. The selected trials have proved the safety of using aromatherapy; no adverse effects have been found. Therefore, the potential risk of the proposed innovation is minimal.

**Potential benefit of the proposed innovation**

Aromatherapy provides potential benefit to the postoperative patient by reducing the severity of PONV. It is a complementary therapy that works by using scents to stimulate the olfactory system, and it is an intervention that has not been introduced in Hong Kong so far. For health care professionals, the proposed EBP guideline by nursing staff will increase autonomy and job satisfaction from nurses. Also, collaboration between different professional disciplines will increase team spirit in the operating department. The hospital will benefit from a reduction in the cost of providing PONV care, as providing aromatherapy is much cheaper than using antiemetics.

**Material cost of implementation of the proposed innovation**

The material cost of introducing the proposed innovation includes set-up cost and operation cost. For the set-up cost of forming a core committee, the total cost is $9,100 as extra working hours are required for nurses, anaesthetists and surgeons to attend the meeting (Appendix 13). The training expenses are $2,143 for buying material and providing three extra training hours for nursing staff (Appendix 12). In terms of operational cost, the total expense is $334,528, including both material cost and the cost of providing salary-based care (Appendix14). Therefore, the total cost for the implementing the innovation is $345,771(Appendix 15).
Non-material cost of implementation of the proposed innovation

Working pressure on nursing staff may be increased because they need to manage PONV directly by giving treatment according to the new protocols. Besides, morale may be affected due to the changes from the old practice. Therefore, support from the whole department and the core committee is essential. Open minded communication between core committee and staff will facilitate the implementation process, so the innovation can be sustained in the future.

Material cost of not implementing the proposed innovation

When looking at the material cost of implementing the innovation, there may be an illusion that the innovation may require a significant cost, but actually the cost is only calculated for the short run. When compare with the current practice of using antiemetic, the costs of using a single dose of ondansetron and metoclopramide are $24.88 and $2.35, but one IPA cost only $0.03 (Queen Mary Hospital, 2011). Also extra manpower may become unnecessary after the nurses adapt to the new protocol. Therefore, in the long run, the innovation may significantly reduce hospital expense.
CHAPTER 4: EVIDENCE-BASED PRACTICE GUIDELINE

Based on the evidence from systematic review, a guideline for using aromatherapy for relieving PONV in PACU for adult patients is developed.

4.1 Title

Evidence-based guideline for using aromatherapy for relieving PONV in PACU for adult patients

4.2 Objectives

1. To promote comfort by relieving PONV for postoperative adult patients.

2. To provide an evidence-based guideline of best practice on using aromatherapy in treatment PONV in PACU for adult surgical patients under general or IV sedation anesthesia.

3. To guide nurses in providing high quality care based on the best available evidence in managing PONV in PACU.

4. To ensure the aromatherapy is provided in a consistent and standardized manner.

4.3 Target group

The target groups of the innovation are

1) Patients undergoing elective surgeries with general anesthesia or IV sedation

2) Adult patients aged 18 or above
4.4 Rating scheme for the strength of the evidence

The level of evidence is classified from 1++ to 4 and the grade of recommendation is ranked as A, B, C and D according to the SIGN classification (Appendix 1)

4.5 Recommendations

Recommendations are proposed in three different aspects including assessment, intervention and evaluation.

4.5.1 Assessment 1.0

Recommendation 1.1

*Before using aromatherapy, the target patients should be screened for contraindications such as history of alcoholism, allergy to alcohol, pregnancy status, persistent nausea and vomiting with before operation, upper respiratory tract infection, and inability to breathe through nose, taking disulfiram, cefoperazone or flagyl.*

Available evidence:

- Assessment should be done to exclude heavy drinker, pregnant women and patients requires emergency surgeries or taking disulfiram or flagyl. (Sites, et al, 2014)(1+)

- Aromatherapy should not be given to patients with upper respiratory infection, allergy to IPA, using psychoactive medication, inability to breathe through nose, pregnancy, and taking disulfiram, cefoperazone or flagyl. (Pellegrini et al., 2009)(1+)

- Aromatherapy is not suitable for patients with upper respiratory tract infection, impaired ability to inhale through the nose, history to IPA, pregnant, on breast feeding, or taking disulfiram, cefoperazone or flagyl. (Cotton et al., 2007)(1+)
- Patients who are not suitable for aromatherapy included having history to IPA, inability to breathe with nose, pregnant, taking disulfiram, and persistent nausea for 24 hours, and history of alcoholism. (Winston et al., 2003)(1+)

Recommendation 1.2

The target patients should be aged 18 or above and undergoing elective surgery with general anesthesia or IV sedation

Grade of recommendation: A

Available evidence:

- The eligible patients were aged 18 or above, male or female, ASA class I or II, who were scheduled for elective surgery with general anesthesia with intubation. (Sites, et al., 2014)(1+)

- Aromatherapy was used for adult surgical patients with scheduled operation. (Hodge et al., 2014)(1+)

- Patients should be aged 18 years or older, able to consent cognitively, and scheduled for surgery with nitrous oxide or volatile gas anesthesia. (Hunt et al., 2013)(1+)

- The target patients of using aromatherapy were women with ASA I, II and III, ages 18 to 65 years, and undergoing elective surgery with general anesthesia. (Cotton et al., 2007)(1+)

- Eligible user of aromatherapy should be aged over 18 years old and scheduled for surgery with general anesthesia or IV sedation. (Anderson & Gross, 2004)(1+)
Aromatherapy should be provided for female patients with ASA status I or II, older than 18 years old and undergoing elective surgery with general anesthesia. (Winston et al., 2003)(1+)

4.5.2 Intervention 2.0

<table>
<thead>
<tr>
<th>Recommendation 2.1</th>
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<tbody>
<tr>
<td><strong>Provide information and obtain consents from patient prior to the application of using aromatherapy</strong></td>
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<tr>
<td><strong>Grade of recommendation</strong>: A</td>
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Available evidence:

- Before using aromatherapy day surgery nurses should obtain written inform consent and assess the risk factor of the target patients (Sites et al., 2014)(1+)
- Targeted patients should be recruited at Pre-admission Surgical Centre with written consent. (Hodge et al., 2014)
- Written consent was obtained before using aromatherapy. (Hunt et al., 2013)(1+)
- Informed consent was obtained and demographic data was collected after patient fulfilled the inclusion criteria of using aromatherapy. (Pellegrini et al., 2009).(1+)
- A baseline nausea scores was recorded after informed written consent from patients. (Cotton et al., 2007)(1+)
- Informed consent was obtained at the PACU holding area before aromatherapy. (Winston et al., 2003)(1+)
Recommendation 2.2

*Using aromatherapy with a commercial available 70%IPA pad, folds into half and place at 0.5 inches from patients nares. Educate the patient to take 3 deep inhalation of the vapour with maximum dose of 3.*

Available evidence:

- The target patients should be educated to take out the 70% commercial available IPA pad from the packing, then fold it in half and place it at about 0.5 inches from the nares. (Pellegrini et al., 2009)(1+)

- The nurse in PACU folded a 70% commercial available IPA pad at about 0.5 inches from patient’s nares and instructing patients to take 3 deep inhalation with up to total of 3 administrations. (Cotton et al., 2007) (1+)

- The aromatherapy was given by instructing patients to take 3 slow deep breathe with aroma pad under the nose. (Anderson & Gross, 2004)(1+)

- A standard 70% IPA pad was used by folding in half and place it under patient’s nose. Then instructed the patient to take 3 deep breathe through nose. (Winston et al., 2003)(1+).

Recommendation 2.3

*Rescue antiemetic is required in case that aromatherapy is insufficient to relieve PONV*

*Grade of recommendation: A*
Available evidence:

- If PONV were not relieved after 10mins from initial symptom, rescue antiemetic should be offered. (Sites et al., 2014) (1+)

- At the end of 5mins after the first treatment or aromatherapy, if nausea persists, rescues antiemetic should be prescribed by physician. (Hodge et al., 2014) (1+)

- For patients with persisted PONV after 3 treatment of aromatherapy, antiemetic with promethazine or metoclopramide should be prescribed. (Pellegrini et al., 2009) (1+)

- If patient’s PONV was refractory to IPA aromatherapy, rescue medication with ondansetron should be given. (Cotton et al., 2007) (1+)

- After 3 doses of IPA treatment, if patients PONV were not reduced, anaesthetists should prescribe ondansetron, metoclopramide or promethazine as rescue treatment. (Winston et al., 2003) (1+)

4.5.3 Evaluation 3.0

Recommendation 3.1

*Evaluation the severity of PONV by using standard verbal numeric scale from 0-10, with “0” being none and “10” being the worst*

*Grade of recommendation: A*

Available evidence:

- A 0 to 10 descriptive ordinal scale with 0 being none and 10 being the worst imaginable symptom was used for assessing PONV (Sites et al., 2014) (1+)
- A 10-Point Likert-type scale with 0 being none and 10 being worst possible was used for rating PONV scores for postoperative patients. (Hodge et al., 2014)(1+)

- The severity of nausea was evaluated by using the 0 to 10 verbal numeric rating scales with 0 being “no nausea” and 10 being “the worst imaginable nausea”. (Pellegrini et al., 2009)(1+)

- The nausea scores was assessed by using a 0 to 10 Verbal Numeric Rating Scales (VNRS) with 0 indicated “no nausea” and 10 indicated “the worst imaginable nausea”. (Cotton et al., 2007)(1+)

- A “0” to “10” verbal numeric rating scale with 0 being “no nausea” and 10 being “the worst imaginable nausea” was used for assessing the level of nausea.(Winston et al., 2003)(1+)

Available evidence:

- The assessment of severity of PONV was performed at initial complaint, at 5 minutes after the first treatment and second treatment. (Sites et al., 2014)(1+)

- The subjects were asked to rated their PONV scores at initial complaint and 5 minutes after treatment. (Hunt et al., 2013)(1+)
The PONV scores were obtained and documentation at initial complaint, every 5 minutes following aromatherapy for the first 30 minutes and every 15 minutes until discharge. (Pellegrini et al., 2009)(1+)

VNRS scores were obtained on initial complaint, every 5 minutes after aromatherapy treatment for 30 minutes, and every 15 minutes until discharge. (Cotton et al., 2007) (1+)

The severity of PONV was assessed by using VNRS at initial complaint, in every 5 minutes until symptom relieved and then in every 15 minutes thereafter until discharge. The VNRS scores was found significantly decreased at 5-, 10- and 15-minute after using aromatherapy with IPA (P=0.002, P=0.015 and P=0.036 respectively) (Winston et al., 2003)(1+)
CHAPTER 5-IMPLEMENTATION PLAN

In the previous chapter, the potential for using aromatherapy in relieving postoperative nausea and vomiting (PONV) in adult surgical patients in post-anesthesia care unit was addressed. Transferability, feasibility and cost-benefit analysis were considered. Several recommendations were suggested based on rated scientific evidence. The next crucial steps are to close the research evidence and actual practice gap with a working plan for guideline dissemination and implementation, pilot testing and evaluation.

5.1 Dissemination plan

The method used for presentation of the new guidelines to the target audience is very important. It not only increases awareness of the project, but also promotes understanding and acceptance (Miller & Kearney, 2004). Mateo & Kirchhoff (2009) suggested that it can also influence the speed and extent of the dissemination process. Identification of the target stakeholders and how to communicate with them will be the next subject.

5.1.1 Identifying the stakeholder

A successful adoption of a new evidence-based innovation requires a shift of thinking and a new collaboration pattern. Potential stakeholders are those who would be affected by the proposed change (Sanares & Heliker, 2006). Therefore, interconnectedness and open communication among the stakeholders can ensure common ownership and accountability during the whole implementation process. The potential stakeholders involved three levels of involvement: they are administrative, managerial and operational levels.
**The administrative level**

Leadership support from administrative level is key facilitator for successful evidence-based practice implementation (Ploeg et al., 2007). Therefore, approval should be obtained from the target hospital’s General Manager in Nursing (GMN) (Appendix 16) as she is the guidelines and policies advisor. The GMN is responsible for keeping the hospital up to date on any changes of evidence-based practice, she is also responsible for training, development, funding and resource allocation, and hence essential in facilitating guideline implementation. Therefore, without support from the General Manager in Nursing, the implementation will be impossible.

**The managerial level**

The Chiefs of Service (COS) of the Surgical and Anaesthetic Departments, Department Operation Manager (DOM), Ward Manager (WM) and Advanced Practicing Nurses (APN) are key stakeholders in the proposed innovation (Appendices 16 & 17). Leadership’s supports can influence staff in attitudes and beliefs on a new innovation, as they are role model, resources person and liaison person (Ploeg et al., 2007). Once they are on board, their influence, guidance and support increases the level of acceptance from other professional disciplines.

Like all clinical guideline implementation, the major challenge for the project leader is to look for resources (Feder et al., 2000). The most important concern is the time and opportunity cost of staff so managerial decisions here are crucial (Miller & Kearney, 2004). Here the ward manager and Advanced Practicing Nurses can help to liaise with the anesthesiology department by discussing with the anesthesiology. The Advanced Practicing Nurses can rearrange roster scheduling to encourage staff to attend training for the new innovations. Management will also evaluate pilot testing and standards of care.
The Operational level

Nursing staff in the post-anesthetic care are responsible for implementing the new protocols (Appendix 18). A positive staff attitude helps greatly here in terms of morale and motivation, especially if results are positive (Ploeg et al., 2007). However, the innovation may increase workload, hence the need of effective communication on the scientific evidence (Mateo & Kirchhoff, 2009).

5.1.2 The process of communicating the plan

As the new innovation involves collaboration between different professional disciplines, a strategic communication plan is required. Management will be the first party to be approached, followed by the administrative level, the other professional disciplines and the frontline nursing staff.

Management level

The ward manager in the operating theatre is the first target for liaison. As leader of nursing in operating theatre, he/she is responsible for monitoring all the nursing activities in the unit. A formal meeting aim at seeking approval with the ward manager will be arranged. A comprehensive written proposal will be prepared focusing on why to change, what to change and how to change.

The incidence rate of PONV in the department will be discussed. The innovation of aromatherapy will be introduced with clear goals and objectives. Feasibility, transferability and cost-benefits will be explained.

After approval, the Ward Manager will arrange a PowerPoint presentation and send the written proposal to all APN in operating theatre, detailing implementation protocols. The aims, objectives, significance and possible outcomes will be explained, emphasizing any
current insufficiencies in managing postoperative nausea and vomiting, and focusing on positive outcomes from trial experience in clinical practice. The budget plan and implementation protocol will be discussed. Feedback from all Advanced Practicing Nurses will be used for proposal refinement.

After consensus has been achieved, the ward manager will arrange a presentation to the surgical Chief of Service in the monthly surgical/anaesthetic department meeting. The need for the innovations will be explained, focusing on advantages and possible benefits, cost and possible problems. Feedback from the leaders will be considered carefully. Each party’s explicit and clear role will be represented clearly. Any safety concerns can be addressed here.

**Administration level**

After communication with the managerial level, the next step will be seeking approval from the administrative level. The General Manager in Nursing is the policy maker and gatekeeper of the hospital, responsible for ensuring that all services provided in the organization are consistent with the hospital mission statement. Liaison here will achieve final approval of innovation implementation. The Department Operation Manager will help to communicate with the General Manager in Nursing through email for getting final approval for the innovation implementation. Any innovation that enhances quality of health care to the community is of potential benefit and will augment the mission statement of the target hospital.

**Other professional disciplines**

Surgeons and anesthetists may view the implementation from different perspectives, concerned about such matters as patient safety and recovery. Their Chief of Service will disseminate details about the benefits, proposed guideline and protocols via team meeting.
mass email, video compact disc and monthly newsletters. Information will cover current practice in treating PONV, the mechanism of aromatherapy, details of the proposed guideline and the implementation schedule. One surgeon and anesthetist will be nominated by their COS to join the innovation core committee. They are welcome to express concern and provide opinion on behalf of their discipline.

**Frontline nursing staff**

Nurses will be informed of the new innovations in the biweekly operating theatre nursing meeting. As nurses in the post-anesthetic care unit are the end users of the new approach, their feedbacks will also be welcome. Three in-service training sessions will be provided by the proposer, an APN and two senior nurses in the core committee.

**5.1.3 Initiating the change**

Changes will be initiated from the top down approach with support from managerial and administrative staff. Involvement of the leaders will enable positive attitudes toward the change (Ploeg et al., 2007). Evaluation of any deficiencies in current treatment of PONV is balanced against the advantages of the new protocols.

The incidence of PONV in the target setting is around 30%, when comparing it with global data, it is about 15-76% (Winston et al., 2003; Pellegrini et al., 2009). Therefore, the incidence rate represents a considerable concern in the target setting. Postoperative nausea and vomiting is unpleasant and also entails risk of postoperative complications like pulmonary aspiration, dehydration and wound dehiscence (Apfel et al., 2004; Mamaril et al., 2006; Tinsley & Barone, 2013). Although usage of antiemetics is effective in managing the problem, it is associated with potential side effects such as increased myocardial electrical instability, hypotension, fatigue and dry mouth. (Pellegrini et al., 2009). In reviewing
alterative therapy for relieving PONV, aromatherapy has already been recommended by perianesthesia nurses in America as a safe and effective treatment (American Society of PeriAnesthesia Nurses, 2008), a fact that should be widely broadcast.

As teamwork and inter-professional collaboration is a critical facilitator for successful EBP guideline implementation (Ploeg et al., 2007). A core committee with different professional disciplines will be formed to initiate the implementation of aromatherapy in relieving PONV. A surgeon and an anesthetist will be nominated as representatives by their Chief of Service. An Advance Practicing Nurses and two senior nurses from the post-anesthetic care unit will be invited to join. Including the project proposer (a registered nurse), there will be altogether six members in the committee with three different professional backgrounds.

The proposer will act as coordinator and project leader. A trusting and supportive atmosphere is vital for launching the new innovation. All professional disciplines should reach a mutual understanding of the process before starting the program, and cooperate with each other during the whole implementation process. Three formal meetings will be held before guideline implementation. The first meeting will be a general introduction, guideline explanation and implementation schedule. The second meeting will involve practical details, and recommendations on implementation and training. The proposed training schedule and resource preparation will be discussed in the third meeting.

In the training plan for nursing staff, three small group education sessions will be organized by the core committee in the operating theatre. Literature states that small group education session is a key facilitator for guideline implementation, since learning is encouraged by social interaction with peer (Ploeg et al., 2007). It also provides flexibility for the managerial level in staff allocation, as only twelve nurses will be trained in each session.
The project proposer will be responsible for demonstrating the skills and techniques involved. All participants are required to give a return demonstration to the trainer at the end of the education session. The Advanced Practicing Nurses and the two senior nurses will be responsible for supervising the return demonstration session. Each session will last for three hours. Trainees are welcome to raise their concerns during training and will be presented with badges and certificates from the department as “Trained Aromatherapy Providers”. Soft and hard copies of training material will be provided for reference.

Indeed, involvement of the anesthesiology department is crucial since patients will still require rescue antiemetics should aromatherapy prove ineffective.

5.1.4 Guiding the change

The explicit aim of the proposed guidelines is to provide high quality care to enhance postoperative patient recovery. Clarity in assigning appropriate and meaningful roles will ensure effective collaboration (Medves et al., 2010). A clear and systematic guideline will help to assist in practitioner decision making in a consistent way.

A feasible implementation plan and schedule should be developed to guide the progress of change. Managerial approval, administrative approval and forming core committee will take about 6 weeks, since the department meetings are held on a monthly basis. Another 2 weeks is required for staff training. The pilot study will last for one month. According to hospital record, monthly admission rate of surgical adult patient with general anesthesia or IV sedation is around 160 cases. When the incidence rate of PONV of the target setting is 30%, then 40 nurses in the theatre will have at least one chance to use the aromatherapy in order to truly reflect the feasibility of the guideline. Two months will be used on troubleshooting, guideline evaluation and refinement. After alteration in the trial design, the refined guideline will come to actual implementation for six months, so as to make sure that there is enough
time for the staff to adapt the new guideline. Finally, one month will be used for
implementation evaluation.

In order to guide the change, nurses in the core committee will be trained to use
aromatherapy by the guideline innovator. By using the way of train-the trainer, the supervisor
can facilitate the training process by develop a role model. They also can help in
troubleshooting as they are all senior staff with copious clinical experience.

5.1.5 Sustaining the change process

Time, resource constraints, heavy workload due to manpower shortage and high patient
to staff ratios may compromise guideline implementation (Ploeg et al., 2007). Continuous
evaluation of time, money and manpower is required. Feedback collected by the core
committee on patient outcome and nursing compliance will encourage greater resource
allocation by management. Standards of care can thus be ensured and possible deficiencies
identified.

Details of successful implementation can be shared with other local hospitals through
publication and presentation. Project leaders from other operating theatre will be invited to
view the innovations at first hand. The successful implementation stories will be shared to
other local hospital and operating theatre nurse advisory group through publication,
presentation and clinical visit.

5.2 Pilot study Plan

Before actual implementation, a small scale pilot test will be conducted to see whether
the guideline is workable in actual clinical practice. As we are breaking new ground, the pilot
study should hopefully detect any technical and logistical problems, so as to avoid
unexpected difficulties. The proposal guidelines will be modified accordingly.
5.2.1 The Objectives of the pilot study are:

1) To determine the feasibility of the new guideline.
2) To identify possible difficulties in implementation.
3) To gather factual information to increase confidence at administrative level.
4) To foster any necessary improvements and modifications.

5.2.2 Pilot design, time frame, target sample

The pilot project will be subject to quantitative study design. Patients will be recruited by means of random sampling during pre-anesthetic consultation. Inclusion criteria are: adult patients (age 18 years or above), in either sex undergoing elective surgery with general anesthesia or IV sedation. Pregnancy, nasal obstruction, pre-emptive aromatherapy and allergy to alcohol predicate exclusion from the study.

The pilot study will be carried out over the course of a month in the post-anesthetic care unit from 1st November 2015 to 30th November 2015. Nurses involved will be responsible for monitoring, providing care and documenting the effect throughout the whole process. The severity of nausea and vomiting will be documented before and after the use of aromatherapy. Time to symptom relief and use of rescue antiemetic will also be documented.

5.2.3 Ethical considerations

A clinical research ethical review will be requested from the Cluster Research Ethic Committee/ Institutional Review Board prior to the pilot study. The aim of the ethical approval is to protect the rights, safety and well-being of patients recruited for the study. Adult patients undergoing surgery with either general anesthesia or IV sedation will be fully briefed on the basics of aromatherapy and any possible complications thereof. Written consent will be required as recommended from the selected evidence. The patients have the
right to withdraw from the study at any time. Also, anaesthetists will be standing by for prescribing rescue antiemetic if aromatherapy is ineffective. Any information collected will remain confidential and keeping the a locker in the operating theater.

5.2.4 Outcome measure

During the study, all demographic data will be recorded. The severity of PONV will be assessed by use of the Verbal Numeric Rating Scale, as used in literatures by Pellegrini et al. (2009); Cotton et al. (2007); and Winston et al. (2003). This is a descriptive ordinal scale where “0” represents “no nausea” and “10” represents “worst imaginable nausea”. The times of inhalation dose and any usage of rescue antiemetic will be recorded. Also, the effectiveness of the intervention assessed. The primary outcome of the study is to measure the change in the severity of PONV after using aromatherapy. Withdrawals from the study will be enumerated and documented according to reason in the remark column in the self-designed postoperative nausea and vomiting assessment form (Appendix 22).

5.2.5 Patient satisfaction and nursing compliance

Patients will be required to complete a self-designed, open ended questionnaire on subjective level of satisfaction at the time of discharge from the ward (Appendix 20). The 5-point Liker Scale (1= totally dislike, 2=dislike, 3=neutral, 4=agree, 5=totally agree) will be used.

Regarding nursing compliance, another self-designed questionnaire will be used for finding staff compliance on the innovation (Appendix 21). Questions related to workload, time, resources, difficulties and satisfaction will be included. Comments and problems raised by the nurses will be analyzed by the core committee for guideline revision.
Regarding financial concerns, material and non-material costs will be clearly documented. Material cost covers price of the alcohol prep, guideline documentation and DVDs. Also, work time and use of antiemetic will be documented by the proposer in every month.

5.2.6 Evaluation

Collected data will be analyzed by the core committee. Information about demographics data, current incidence of PONV, and change in severity of PONV before and after aromatherapy, usage of rescue antiemetic and financial details will be comprised in a written report. Recommendations for improvement will also be included. The report will be presented at the monthly department meeting for consideration of full-scale implementation.
CHAPTER 6: EVALUATION PLAN

After actual implementation for 6 months, an evaluation process is needed to examine whether the goals and objectives are being met. An evaluation plan can help to provide effective service and enable subsequent decision-making regarding guideline implementation (Mateo & Kirchhoff, 2009). The outcome measures form the evaluation will help to further refine in the implementation plan, so continue improvement is achieved.

6.1 Identification of outcomes

The evaluation plan will be outcomes and process specific. Three aspects will be considered: patients, staff and organization.

6.1.1 Patient outcomes

Evaluation of outcomes helps in establishing the clinical effectiveness of the new guidelines. The primary goal of the innovation is to reduce the severity of PONV. The secondary outcome is to assess any reduction in usage of rescue antiemetic. Severity of PONV will be assessed 5 minutes after each dose of aromatherapy. Maximum dosage of aromatherapy is 3 inhalations. The times of inhalation used for each patient will also be recorded (Appendix 22). The information recorded by nurses is objective data of the study, while subjective data will be reported by the patient satisfaction evaluation questionnaire. All the comment will be taking into consideration by the core committee for guideline refinement.

6.1.2 Staff outcomes

Nursing staff opinions are directly related to the guideline implementation, as negative reaction can contribute to discontinuation of new initiatives (Mateo & Kirchhoff, 2009). Staff gratification is closely related to patient satisfaction, as nurses interact and empathize with the
patient during each intervention. Survey on staff compliance will be conducted to seeking valuable feedback from innovation end user.

### 6.1.3 Organization outcomes

Mateo & Kirchhoff (2009) suggested the effectiveness of a guideline implementation in corporate sense is to provide better service and reducing cost of production. The patient outcome, patient satisfaction and material cost summary can help to evaluate the organization outcome. This information can be used as persuasive data to fight for resource for actual implementation.

### 6.2 Nature of Participants and sample size

Eligible patients are adults scheduled for elective operations under general anesthesia or IV sedation. The sample size is calculated by using the one sample t-test of an online statistical program. The primary outcome examines the severity of PONV (Lenth, 2011). In the literature, standard deviation is set to 3.26 (Hodge et al., 2014). The statistical significance to change is 1. By setting the alpha value of significance level at 0.05 and power at 80%, the calculated sample is 85 patients. In summary from patient record book, the setting provides approximately 1900 cases utilizing general anesthesia and IV sedation in the target setting yearly (Appendix 10). Estimated monthly cases are about 160. Therefore, one month suffices for sample recruitment.

### 6.3 Measurement

The evaluation plan will take place in August 2016. Data collection will be carried out as previously described. The staff and patients outcome will be measured by using questionnaire after evaluation. In the long run, the core proposer will continuous to perform regular evaluation by distributing questionnaire to both the patients and staff. The cost effectiveness
will be measured by recorded the actual material and non-material cost of the pilot study in every month. A seasonal financial report will be generated by the proposer and present in department meeting.

6.4 Data analysis

All the collected data will be analysis by using the SPSS vision 19 after pilot study. The analysis process will be carried out at September 2016. Demographic data and surgical information will be summarized by using descriptive statistics. In order to determine if the change in severity of postoperative nausea and vomiting and antiemetic consumption, two-tailed paired t-test is used for determine if the severity and consumption is reduced.

Qualitative data like recommendation from patients and staff will be read and summery in a written report for providing constructive recommendation. Feedback from staff will reflect their willingness and obstacles to change of the current practice on managing PONV. All expenses will be summarized by the proposer with a balance table in every month.

6.5 Basis for determine effective use of aromatherapy

Firstly, according to Anderson and Gross (2004), the severity is measured by using visual analogue scale (0-10). The change in scale before and after aromatherapy is used to reflect the effectiveness of the innovation. In the literature, use of aromatherapy can reduce severity of PONV by 56% at 5 minutes. If 50% reduction in severity at 5 minute after treatment is achieved, the project will be considered successful.

Secondly, Winston et al. (2004) suggested that severity of PONV averages 8 out of 10 before aromatherapy. A mean score of severity less than 7 will be considered as effective intervention.
Lastly, evidence showed that aromatherapy can reduce usage of rescue antiemetics by 50% (Anderson and Gross, 2004). If this target is achieved, the innovation will be regarded as effective.
CHAPTER 7 CONCLUSION

In summary, the translational research sought to determine whether the available evidence could enough to support the use of aromatherapy as an evidence-based countermeasure PONV in real clinical setting. The research shows that high level of evidence is available to support the use of aromatherapy as an effective treatment option for relieving PONV in PACU setting.

Bases on the evidence, valuable recommendations on defining target patients, choosing type of flavour, selecting mode of delivery and developing means of assessment are summarized for developing an evidence-based guideline for clinical practice. It is believed that aromatherapy therapy in IPA flavour is a fast, safe, effective and simple treatment to reduce severity of PONV in postoperative patients; hence it should be implemented into clinical practice right away.

A comprehensive plan is developed before actual implementation of the innovation of aromatherapy. The feasibility, transferability and cost-benefit analysis are assessed with positive result. In order to facilitate an effective a timely implementation of innovation, the communication plan address the barriers and facilitator related to difference parties, organizational context and it is tailored to different group of stakeholders. To initiate change in real practice, a pilot study plan and an evaluation is developed for guiding and evaluating the progress of implementation.

Aromatherapy is a readily available, cost-effective and safe treatment for patient with PONV in PACU. As knowledge is already available from around the world, it is time to get it translated into real clinical setting. The use of the evidence-based guideline on aromatherapy in PACU setting is beneficial to patients, nurses, organization and the whole health care
system. The new innovation will be implementation as a treatment option for postoperative patients and it is worth to implement.
References


Hospital Authority. (2012). *Guidelines for specialty nursing services - Perioperative care*. (pp, 1-94.) Hospital Authority


strategies for health care teams and team-based practice. *Journal of Evidence-Based Healthcare, 8*:79-89.


Appendix 1. Summary of electronic database search and result

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<td>1) Aromatherapy</td>
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<td>2) Isopropyl alcohol</td>
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<tr>
<td>3) Peppermint</td>
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<td>4) Alternative method</td>
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<td>5) Post operative nausea</td>
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<td>13) Limited search to randomized control trial</td>
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<tr>
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Appendix 2. PRISMA chart of search

Appendix 3. Level of evidence assessment by using SIGN

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1++</td>
<td>High quality meta-analyses, systematic reviews of RCTs or, RCTs with a very low risk of bias</td>
</tr>
<tr>
<td>1+</td>
<td>Well conducted meta-analysis, systematic reviews, or RCTs with a low risk of bias</td>
</tr>
<tr>
<td>1-</td>
<td>Meta-analyses, systematic reviews, or RCTs with a high risk of bias</td>
</tr>
<tr>
<td>2++</td>
<td>High quality systematic reviews of case control or cohort studies; High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that relationship is causal</td>
</tr>
<tr>
<td>2+</td>
<td>Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal</td>
</tr>
<tr>
<td>2-</td>
<td>Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal</td>
</tr>
<tr>
<td>3</td>
<td>Non-analytic studies, e.g. case report, case series</td>
</tr>
<tr>
<td>4</td>
<td>Expert opinion</td>
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(Scottish Intercollegiate Guideline Network, 2008)

**GRADES OF RECOMMENDATION**

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<th>Grade</th>
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<tbody>
<tr>
<td>A</td>
<td>A least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population; or A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results</td>
</tr>
<tr>
<td>B</td>
<td>A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1++ or 1+</td>
</tr>
<tr>
<td>C</td>
<td>A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results, or Extrapolated evidence from studies rated as 2++</td>
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<tr>
<td>D</td>
<td>Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2+</td>
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**Methodology Checklist 2: Controlled Trials**

**Study identification** *(Include author, title, year of publication, journal title, pages)*

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<tr>
<th>Guideline topic:</th>
<th>Key Question No:</th>
<th>Reviewer:</th>
</tr>
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Before completing this checklist, consider:

1. Is the paper a randomized controlled trial or a controlled clinical trial? If in doubt, check the study design algorithm available from SIGN and make sure you have the correct checklist. If it is a controlled clinical trial questions 1.2, 1.3, and 1.4 are not relevant, and the study cannot be rated higher than 1+

2. Is the paper relevant to key question? Analyze using PICO (Patient or Population Intervention Comparison Outcome). IF NO REJECT (give reason below). IF YES complete the checklist.

**Reason for rejection:** 1. Paper not relevant to key question □  2. Other reason □ (please specify):

**Section 1: Internal validity**

*In a well conducted RCT study...*  

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<th>Can’t say</th>
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<td>The study addresses an appropriate and clearly focused question</td>
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<td>□</td>
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<tr>
<td>1.2</td>
<td>The assignment of subjects to treatment groups is randomised.</td>
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<td>□</td>
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<td>1.3</td>
<td>An adequate concealment method is used.</td>
<td>□</td>
<td>□</td>
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<td>1.4</td>
<td>Subjects and investigators are kept ‘blind’ about treatment allocation.</td>
<td>□</td>
<td>□</td>
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<td>1.5</td>
<td>The treatment and control groups are similar at the start of the trial.</td>
<td>□</td>
<td>□</td>
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<td>1.6</td>
<td>The only difference between groups is the treatment under investigation.</td>
<td>□</td>
<td>□</td>
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<td>1.7</td>
<td>All relevant outcomes are measured in a standard, valid and reliable way.</td>
<td>□</td>
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<td>1.8</td>
<td>What percentage of the individuals or clusters recruited into each</td>
<td>□</td>
<td>□</td>
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<tr>
<td>1.9</td>
<td>All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).</td>
<td>Yes ☐ No ☐ Can’t say ☐ Does not apply ☐</td>
<td></td>
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<tr>
<td>1.10</td>
<td>Where the study is carried out at more than one site, results are comparable for all sites.</td>
<td>Yes ☐ No ☐ Can’t say ☐ Does not apply ☐</td>
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</table>

**SECTION 2: OVERALL ASSESSMENT OF THE STUDY**

| 2.1 | How well was the study done to minimise bias? |
|     | High quality (++): ☐ |
|     | Acceptable (+): ☐ |
|     | Unacceptable – reject 0: ☐ |

| 2.2 | Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention? |

| 2.3 | Are the results of this study directly applicable to the patient group targeted by this guideline? |

| 2.4 | Notes. Summarise the authors’ conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question and mention any areas of uncertainty raised above. |
### Appendix 5. Quality Assessment by using Scottish Intercollegiate Guideline Network methodology checklist 2, Version 2.0, 2012 - Section I internal Validity

<table>
<thead>
<tr>
<th>Study identification</th>
<th>1.1 The study addresses an appropriate and clearly focused question.</th>
<th>1.2 The assignment of subjects to treatment groups is randomized.</th>
<th>1.3 An adequate concealment method is used.</th>
<th>1.4 Subjects and investigators are kept blind’ about treatment allocation.</th>
<th>1.5 The treatment and control groups are similar at the start of the trial.</th>
<th>1.6. The only difference between groups is the treatment under investigation</th>
<th>1.7 All relevant outcomes are measured in a standard, valid and reliable way.</th>
<th>1.8. What percentage of the individuals or clusters recruited into each treatment is of the study dropped out before the study was completed?</th>
<th>1.9 All subjects are analyzed in the groups to which they were randomly allocated intention to treatment analysis)</th>
<th>1.0 Where the study is carried out at more than one site, result is comparable for all sites.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Sites et al., 2014</td>
<td>Yes Remarks: N=196 P: Post GA patients I: Aromatherapy C: Controlled breathing O: 1. severity of nausea and vomiting 2. use of antiemetic</td>
<td>Yes Remarks: 2 groups Gp1: aromatherapy (peppermint) Gp2: control Controlled breathing The grouping is generated by a computerized random number table</td>
<td>Can’t Say Remarks: No mentioned</td>
<td>Yes Remarks: Patient Single blinded</td>
<td>Yes Remarks: Inclusive and exclusive criteria are stated clearly. P value was mentioned in demographic data analysis.</td>
<td>Yes Remarks: Same protocol was used.</td>
<td>Yes Remarks: A standard tool was used for comparison. 0-10 descriptive ordinal scale (DOS) was used. 0:none 10: the worst</td>
<td>40% Percentage Reason of high attrition rate: 1. Lack of certified registered nurse to follow the protocol. 2. Deviation from study protocol. 3. ASA score unfit 4. Admission needed 5. Self withdrawal</td>
<td>Yes Does not apply</td>
<td></td>
</tr>
<tr>
<td>2 Hodge et al., 2014</td>
<td>YES Remarks: N=339 P: post GA patients I: Aromatherapy C: breathing with unscented inhaler(placebo) O:1. satisfaction with the treatment 2. severity of nausea and vomiting</td>
<td>YES Remarks: 2 groups Gp1: aromatherapy by aromatic inhaler (lavender, peppermint, ginger and spearmint oils) Gp2: placebo (unscented inhaler) The grouping is generated by a computerized random number table</td>
<td>Can’t Say Remarks: Not mentioned</td>
<td>Can’t Say Remarks: Not mentioned</td>
<td>Yes Remarks: Inclusive and exclusive criteria are stated clearly.</td>
<td>Yes Remarks: Same protocol was used.</td>
<td>Yes Remarks: A standard tool was used for comparison. 10-Point Likert-type scales were used 0:none 10: the worst</td>
<td>8% Reason: 1. Nurse didn’t missed to identify the subject before giving antiemetic medication. 2. Nurse haven’t trained for study protocol 3. Inadequate time to use the inhaler</td>
<td>Yes Yes Remarks: Carry out at both PACU and at home</td>
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<td></td>
<td>Hunt, et al., 2013</td>
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<td>Yes</td>
<td>Remarks: N=1190</td>
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<td>P: post GA</td>
<td>patients</td>
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<td></td>
<td>I: Aromatherapy</td>
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<td>C: saline(placebo)</td>
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<td></td>
<td>O: severity of</td>
<td>nausea and</td>
<td>vomiting</td>
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<td></td>
<td>Yes</td>
<td>Remarks: 4 groups</td>
<td>gp1: aromatherapy(ginger)</td>
<td>gp2: aromatherapy(peppermint spirit)</td>
<td>gp3: aromatherapy(isopropyl alcohol)</td>
<td>gp4: placebo(saline)</td>
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<td></td>
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<td>Remarks: The grouping is generated by a computerized listing for random assignments by another party</td>
<td>“Assumption College”, which is not involved in the study</td>
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<td></td>
<td>No</td>
<td>Remarks: Both staff and patient couldn’t be blinded because the aroma has specificity odors</td>
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<td>Remarks: Same protocol was followed</td>
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<td>Pellegrini et</td>
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<td>al., 2009.</td>
<td>Yes</td>
<td>Remarks: N=96</td>
<td>P: post GA</td>
<td>patients</td>
<td>I: Aromatherapy</td>
<td>C: antiemetic medications</td>
<td>O: 1: median dose of promethazine required</td>
<td>2: time to reduce half of nausea score</td>
<td>3: Patient satisfaction</td>
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<td></td>
<td>Yes</td>
<td>Remarks: 2 groups</td>
<td>Gp1: Aromatherapy(isopropyl alcohol)</td>
<td>Gp2: control(intravenous promethazine 12-25mg)</td>
<td>The grouping is done by “using a computer-generated random numbers process into a control or an experimental group”</td>
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<td>Remarks: A standard tool was used for comparison. 4-point scale (VDS) was used</td>
<td>0: none</td>
<td>1: some</td>
<td>2: a lot</td>
<td>3: severe</td>
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<td>2: a lot</td>
<td>3: severe</td>
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<td>Yes</td>
<td>Remarks: A standard tools were used for comparison. 4-point scale (VDS) was used</td>
<td>0: none</td>
<td>1: some</td>
<td>2: a lot</td>
<td>3: severe</td>
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<td></td>
<td>Cotton et al., 2007</td>
<td>Yes</td>
<td>Remarks: N=100 patients P: post GA I: Aromatherapy C: antiemetic medications O: 1. time to reduce half of nausea score 2. nausea score after 1st treatment 3. nausea score after 2nd treatment 4. require for rescue antiemetic</td>
<td>Yes</td>
<td>Remarks: 2 groups Gp1: Aromatherapy (isopropyl alcohol) Gp2: control (intravenous ondansetron 4 mg) The grouping is done by “using a computer-generated random numbers program.” Block randomization was done by researcher who is not participate in collection (Hines, 2012)</td>
<td>Can’t Say</td>
<td>Remarks: Not mentioned</td>
<td>Yes</td>
<td>Remarks: Inclusive and exclusive criteria are stated clearly. P value was mentioned in demographic data analysis.</td>
<td>Yes</td>
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<td>6</td>
<td>Anderson &amp; Gross, 2004</td>
<td>Yes</td>
<td>Remarks: N=33 patients P: post GA &amp; IV sedation patients I: Aromatherapy C: saline(placebo) O: 1. severity of PONV at initial 2. severity of PONV 2mins after treatment 3. Severity of PONV 5mins after treatment 4. Patient satisfaction</td>
<td>Yes</td>
<td>Remarks: 3 groups Gp1: Aromatherapy (isopropyl alcohol) Gp2: Aromatherapy (peppermint) Gp3: Placebo (saline) “a random number generator determined the contents of each serially number bag. The data is “analyzed by investigator unaware of the treatment allocation”</td>
<td>Yes</td>
<td>Remarks: The random number was prepared by individual who is not involved in the study. The data is “analyzed by investigator unaware of the treatment allocation”</td>
<td>Yes</td>
<td>Remarks: Inclusive and exclusive criteria are stated clearly. P value was mentioned in demographic data analysis.</td>
<td>Yes</td>
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<td>Winston et al., 2003</td>
<td>Yes</td>
<td>Remarks: N=100 P: post GA patients I: Aromatherapy C: antiemetic medications O: 1. severity of PONV at initial 2. severity of PONV 5mins after treatment 3. Severity of PONV 10mins after treatment 4. Severity of PONV 15mins after treatment 5. Time of reduction of PONV in half percent 6.Length of stay in PACU</td>
<td>Yes</td>
<td>Remarks: 2 groups Gp1: Aromatherapy (isopropyl alcohol) Gp2: control (intravenous ondansetron 4 mg) The grouping is generated by a computerized random number table in block (Hines, 2012)</td>
<td>No</td>
<td>Remark: No blinding is allowed in this study</td>
<td>Yes</td>
<td>Remarks: Inclusive and exclusive criteria are stated clearly.</td>
<td>Yes</td>
</tr>
<tr>
<td>Study identification</td>
<td>2.1 How well was the study done to minimize bias?</td>
<td>2.2 Taking into account clinical considerations, your evaluations of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?</td>
<td>2.3. Are the results of this study directly applicable to the patient group targeted by this guideline?</td>
<td>2.4. Summaries the author’s conclusion. Add any comments on your own assessment of the study, and the extent to which it answers your question and mention any areas of uncertainty raised above. This is a very important part of the evaluation and will feature in the evidence table.</td>
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<tr>
<td>1 Sites et al., 2014</td>
<td>I+ Yes, involved statistical power of study.</td>
<td>Yes</td>
<td>Yes</td>
<td>The study recommended controlled breathing with or without aromatherapy (with peppermint oil) could also be an effective alternative treatment to relief PONV. This study compared using aromatherapy with control (standard treatment: controlled breathing. Although, the finding was statistically insignificant, effect showed that aromatherapy and controlled breathing could reduce PONV by 57.7 to 62.5%. A little risk of selection bias may occur since blinding method is unclear. Some attrition bias is due to acceptable reason such as lack of manpower to provide intervention, unfamiliar with the study protocol by nurses and unplanned admission etc. Further study should include better promotion and adequate manpower to enhance and implement the study protocol.</td>
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<tr>
<td>2 Hodge et al., 2014</td>
<td>I+ Yes, involved statistical power of study.</td>
<td>Yes</td>
<td>Yes</td>
<td>This study compared aromatherapy with placebo and findings shows that aromatherapy (blend of essential oil: lavender, peppermint, ginger, spearmint oil) a statistically effective to relief PONV, and it had a higher perceived effectiveness. The risk of selection bias may be present because the concealment and blinding method were unclear. The possible attrition bias low because only 8% subjects were dropped out with detail report.</td>
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<tr>
<td>3 Hunt, et al., 2013</td>
<td>I+ Yes, involved statistical power of study.</td>
<td>Yes</td>
<td>Yes</td>
<td>The author compared the effect of aromatherapy (1. Ginger, 2. blend of essential oil, isopropyl alcohol) with saline placebo. The results supported the use of aromatherapy to relief PONV. The finding showed that aromatherapy with</td>
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blend flavor is superior then ginger and alcohol. Also, using aromatherapy to alleviate PONV could greatly reduce use of antiemetics. There included low risk in selection bias because randomization was conducted individual party (Assumption College) by using computerized listing. Also, the risk of attrition bias is very low since the dropout rate is only 3.28%. Little risk of performance bias may be occurring since the study arms contain special odors.

<table>
<thead>
<tr>
<th></th>
<th>Author(s)</th>
<th>Study Type</th>
<th>Inclusion of Statistical Power of Study</th>
<th>Risk of Selection Bias</th>
<th>Risk of Attrition Bias</th>
<th>Risk of Performance Bias</th>
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<td>4</td>
<td>Pellegrini et al., 2009</td>
<td>1+</td>
<td>Yes, involved statistical power of study.</td>
<td>Yes</td>
<td>Low</td>
<td>Low</td>
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<td>5</td>
<td>Cotton et al., 2007</td>
<td>1+</td>
<td>Yes, involved statistical power of study.</td>
<td>Yes</td>
<td>Low</td>
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<td>6</td>
<td>Anderson &amp; Gross, 2004</td>
<td>1+</td>
<td>Yes, involved statistical power of study.</td>
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</table>
blinded in grouping, and analyzed by the investigators who are not aware about the treatment allocation. The study shows low risk in performance bias and attrition bias. Conclusions must be cautious in respect of small scale of study.

<table>
<thead>
<tr>
<th></th>
<th>Winston et al., 2003</th>
<th>1+</th>
<th>Yes, involved statistical power of study.</th>
<th>Yes</th>
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Comparison was made between the effect of aromatherapy (IPA) and control (standard treatment: antiemetic). Findings supported the use of aromatherapy to relief PONV, and it could produce a faster effect than medication. Thus, use of aromatherapy may reduce length of stay in PACU. There included low risk in selection bias because randomization was completed by using computer generated randomization in block. Also, the risk of attrition bias is very low since the dropout rate is zero. Risk of performance bias may be occurring since blinding was not done in this study.
### Appendix 7. Table of evidence

<table>
<thead>
<tr>
<th>Citation</th>
<th>Study Design</th>
<th>Evidence Level</th>
<th>Subject Characteristics</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Outcomes measures/ Length of follow up</th>
<th>Effect Size</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sites et al., 2014</td>
<td>RCT</td>
<td>1+</td>
<td><em>196 patients in PACU&lt;br&gt;</em> aged 18 years or above&lt;br&gt;* male or female&lt;br&gt;*ASA I or II&lt;br&gt;*Undergoing elective surgery with general anesthesia&gt;60mins&lt;br&gt;*Mean age: &lt;br&gt;Group1: 47.9 ± 15.6 years&lt;br&gt;Group2: 47.4 ± 15.7 years</td>
<td>Group 1: aromatherapy, (n=93)&lt;br&gt;(3 deep inhalation of a soaked cotton with peppermint spirits)&lt;br&gt;Group 2: Controlled breathing without aromatherapy, n =103</td>
<td>(1) Incidence of PONV&lt;br&gt;Group 1&lt;br&gt;(28%: 26/93 subjects)&lt;br&gt;Group 2&lt;br&gt;(15.5% 16/103 subjects)&lt;br&gt;*Female gender with PONV(P=0.024)&lt;br&gt;(2) Intervention efficacy: use of rescue antiemetic&lt;br&gt;Group 1&lt;br&gt;(57.7%, 15/26 subjects)&lt;br&gt;Group 2&lt;br&gt;(62.5%, 10/16 subjects)&lt;br&gt;(χ²=.09; P=.76) insig.&lt;br&gt;(3) Intervention Effectiveness: Severity of PONV&lt;br&gt;Group 1&lt;br&gt;(31.8%)&lt;br&gt;Group 2&lt;br&gt;(40%)&lt;br&gt;(χ²=.26; P=.61) insig.</td>
<td>Incidence of PONV&lt;br&gt;(1) Incidence of PONV&lt;br&gt;(2) Intervention efficacy: use of rescue antiemetic&lt;br&gt;(3) Intervention Effectiveness: Severity of PONV</td>
<td>The overall incidence rate Of PONV is 21.4%, female shows a statistically significant rate of PONV.&lt;br&gt;The antiemetic requirement is slightly higher in control group but no statistically significant different&lt;br&gt;The effectiveness of controlled breathing alone is slightly higher than that in aromatherapy group, but also not statistically significant different.</td>
<td></td>
</tr>
<tr>
<td>Citation</td>
<td>Study Design</td>
<td>Evidence Level</td>
<td>Subject Characteristics</td>
<td>Intervention</td>
<td>Comparison</td>
<td>Outcomes measures/ Length of follow up</td>
<td>Effect Size</td>
<td>Interpretation</td>
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</tr>
<tr>
<td>Hodge et al., 2014</td>
<td>RCT</td>
<td>1+</td>
<td>*339 patients in PACU</td>
<td>Group 1: aromatherapy, (n=54/121)</td>
<td>Group 2: breathing with unscented inhaler (placebo, n =40/121)</td>
<td>(1) Incidence of PONV</td>
<td>(1) Incidence of PONV is 35.7% (n=121 subjects)</td>
<td>No significant different in level of satisfaction in two group</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>* aged 18 years or above</td>
<td>(QueseEase aromatic Inhaler with mixture of peppermint, ginger, lavender and spearmint oil)</td>
<td></td>
<td>(2) Level of satisfaction using 10-point Likert-type Scale (0-10) at the point of nausea and 3mins after PONV</td>
<td>(2) Mean difference in level of Satisfaction Group 1: 6.8 Group 2: 7.1 (insig.)</td>
<td>Both intervention group and control group show effective in reducing PONV score</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>* male or female</td>
<td>(3 deep inhalation of an aromatic inhaler)</td>
<td></td>
<td>(4) Severity of PONV</td>
<td>(3) Mean score in Severity of PONV at initial and follow up Group 1: 5.4 4 Group 2: 5.5 4 P&lt;0.01</td>
<td>Aromatherapy group had a higher perceived effectiveness then the placebo group.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>*Undergoing elective surgery with general anesthesia</td>
<td></td>
<td></td>
<td>Length of follow up: 3mins after treatment</td>
<td>(4) Perceived effectiveness Group 1: 5.72±3.26 Group 2: 2.72±3.12 P&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Citation</td>
<td>Study Design</td>
<td>Evidence Level</td>
<td>Subject Characteristics</td>
<td>Intervention</td>
<td>Comparison</td>
<td>Outcomes measures/ Length of follow up</td>
<td>Effect Size</td>
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</tr>
<tr>
<td>Hunt et al, 2013</td>
<td>RCT</td>
<td>1+</td>
<td>*1,190 patients in PACU *aged 18 years or above *male or female *Undergoing elective surgery with general anesthesia &gt;60 minutes</td>
<td>Group 1: aromatherapy (ginger, n=76) Group 2: aromatherapy (blend of ginger, spearmint, peppermint &amp; cardamom, n=74) Group 3: aromatherapy (isopropyl alcohol, n=78) (3 deep inhalation of a soaked gauze pad with different aroma oil)</td>
<td>Group 4: breathing without saline (Placebo, n =40/121)</td>
<td>(1) Incidence of PONV (2) Change in PONV score using 4-point Scale (VDS) (3) Patient’s response of improvement in nausea severity (4) Required for antiemetic Length of follow up: 5mins after the onset of PONV</td>
<td>(1) Incidence of PONV is 26.3% (n=301 subjects) (2) Change in PONV score Gp1 &gt; Gp4: 1.86, p=0.002 Gp2 &gt; Gp4: 2.7, p&lt;0.001 Gp3 &gt; Gp4: 1.22, p=insig. Gp1 &gt; Gp3: 1.58, p=0.017 Gp2 &gt; Gp3: 2.13, p&lt;0.001 Gp2 &gt; Gp1: 1.38, p=0.07 (3) Patient’s response of improvement in nausea severity Gp1 vs Gp4: 27.4, p=0.002 Gp2 vs Gp4: 42.7, p&lt;0.001 Gp3 vs Gp4: 11.6, p=insig. Gp1 vs Gp3: 15.8, p=0.05 Gp2 vs Gp 3: 31.2, p&lt;0.001 Gp2 vs Gp1: 15.3, p=0.03 (4) Required for antiemetic: Gp1 vs Gp4: -25.6, p=0.002 Gp2 vs Gp4: -40.3, p&lt;0.001 Gp3 vs Gp4: -9, p=insig. Gp1 vs Gp3: -16.5, p=0.03 Gp2 vs Gp 3: -31.3, p=0.001 Gp2 vs Gp1: -14.7, p=insig.</td>
<td>Use aromatherapy in blend or ginger essential oil contribute to a significant change in PONV score when compare with saline placebo and alcohol group. The result is insignificant to show the effect of aromatherapy with alcohol. Patient reports greater improvement in nausea in blend or ginger group, blend is superior then alcohol and ginger, while ginger is superior then alcohol. The number of antiemetic medication required was significantly reduced blend or ginger essential oil group.</td>
</tr>
<tr>
<td>Citation</td>
<td>Study Design</td>
<td>Evidence Level</td>
<td>Subject Characteristics</td>
<td>Intervention</td>
<td>Comparison</td>
<td>Outcomes measures/Length of follow up</td>
<td>Effect Size</td>
<td>Interpretation</td>
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<tr>
<td>Pellegrini et al., 2009</td>
<td>RCT</td>
<td>1+</td>
<td>*96 patients in PACU</td>
<td>Group 1: aromatherapy (IPA, n=42) 3 deep inhalation in every 15mins (max. 3 times) (commercially IPA pad)</td>
<td>Group 2: prescription antiemetic, n=43 promethazine 12.5 to 25mg IV in every 30mins (max. dose 50mg) Or Maxolon 10mg IV in every 15mins (max. dose: 30mg)</td>
<td>(1) Incidence of PONV in PACU (2) Median dose of promethazine required per group (3) Initial severity of PONV by using verbal numeric rating scale (VNRS) (4) Time (in mins) to reduce half in VNRS (5) Patient satisfaction</td>
<td>(1) Incidence of PONV is 60-76% (n=58 subjects) (2) The median dose of promethazine required per group in PACU Group 1: 0 Group 2: 12.5mg P=0.02 (3) Initial severity: insign. difference (4) Time (in mins) to reduce half in VNRS Gp1 &lt; Gp2 7mins &lt; 20mins, p=0.045 (5) Patient satisfaction No difference (insign)</td>
<td>Use aromatherapy with IPA can significantly reduce use of antiemetics Aromatherapy contributed to a significantly faster effect to reduce PONV than antiemetic.</td>
</tr>
</tbody>
</table>

*96 patients in PACU
* aged 18 years or above
* women only
* Undergoing elective surgery with general anesthesia >60 minutes
* Mean age: Group 1: 33.98 ± 10.9 years
  Group 2: 37.09 ± 11.0 years

Length of follow up: Every 5 mins in the first 30 minutes after PONV and every 15 minutes for 75 mins more
<table>
<thead>
<tr>
<th>Citation</th>
<th>Study Design</th>
<th>Evidence Level</th>
<th>Subject Characteristics</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Outcomes measures/ Length of follow up</th>
<th>Effect Size</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton et al., 2007</td>
<td>RCT</td>
<td>1+</td>
<td>*100 patients in PACU  * aged 18 -65 years old  * female only  *ASA I-III  *Undergoing elective laparoscopic surgery with general anesthesia &gt;60 minutes  *Mean age: Group1: 30.47 ± 5.7 years</td>
<td>Group 1: aromatherapy (IPA, n=42)  3 deep inhalation in every 5mins (max. 3 times) (commercially alcohol pad)</td>
<td>Group 2: prescript antiemetic, n=43  Ondansetron 4 mg IV in every 15mins (max. dose 8 mg)</td>
<td>(1) Incidence of PONV in PACU  (2) Time (in mins) to reduce half in verbal numeric rating scale (VNRS) after 1st treatment  (3) Time (in mins) to reduce half in verbal numeric rating scale (VNRS) after 2nd treatment  (4) Require for rescue antiemetic medication  (5) Patient satisfaction</td>
<td>(1) Incidence of PONV in PACU is 15%-21% (n=13subjects)  (2) After 1st treatment: Group 1: 15.00-10.6mins Group 2: 33.88 ±23.2mins (p=0.001)  (3) After 2nd treatment: Group 1: 15.00-5.25mins Group 2: 26.25 ±7.5mins (p=0.013)  (4) Require for antiemetic Group No difference (insign)  (5) Patient satisfaction No difference (insign)</td>
<td>Aromatherapy with IPA contributed to a significantly faster effect to reduce PONV than antiemetic.</td>
</tr>
<tr>
<td>Citation</td>
<td>Study Design</td>
<td>Evidence Level</td>
<td>Subject Characteristics</td>
<td>Intervention</td>
<td>Comparison</td>
<td>Outcomes measures/ Length of follow up</td>
<td>Effect Size</td>
<td>Interpretation</td>
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</table>
| Anderson & Gross, 2004 | RCT | 1+ | *33 patients in PACU  
* aged 18 years old or above  
* male or female only  
* Undergoing elective surgery with general anesthesia (85% subjects)  
* Undergoing elective surgery with moderate or deep IV sedation (15% subjects)  
* Mean age: Group 1: 49 ± 3 years Group 2: 42 ± 6 years Group 3: 44 ± 5 years | Group 1: aromatherapy (IPA, n=11)  
Group 2: aromatherapy (Peppermint oil, n=10)  
3 deep inhalation in every 5mins (max. 3 times) With scented gauze | Group 3: Placebo n (Saline, n=12) | (1) Incidence of PONV in PACU  
Incidence of PONV in PACU is 15%-21% (n=13 subjects)  
(2) Initial severity of PONV by using 0-100-mm visual analogue scale (VAS)  
Initial severity of PONV 60.6±4.3 mm (insign)  
(3) Severity of PONV score 2 mins after treatment  
Group 1 or Group 2 43.1±4.9 mm (p=0.005) Group 3  
(4) Severity of PONV score 5 mins after treatment  
(5) Patient satisfaction toward treatment  
Length of follow up: 5 mins after first symptom of PONV | (1) Incidence of PONV in PACU  
Incidence of PONV in PACU is 15%-21% (n=13 subjects)  
(2) Initial severity of PONV 60.6±4.3 mm (insign)  
(3) 2 mins after treatment: Group 1 or Group 2 43.1±4.9 mm (p=0.005) Group 3  
(4) 5 mins after treatment: Group 1 or Group 2 28.0±4.6 (p=0.00001)  
(5) Overall satisfaction 86.9±4.1 mm  
93% would like to try on aromatherapy in the future operation (r²=0.17, p=0.028) | Aromatherapy with IPA or peppermint oil shows contributed to a significantly effect to reduce PONV  
The effectiveness of aromatherapy increase patient satisfaction and acceptance of the treatment. |
<table>
<thead>
<tr>
<th>Citation</th>
<th>Study Design</th>
<th>Evidene Level</th>
<th>Subject Characteristics</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Outcomes measures/ Length of follow up</th>
<th>Effect Size</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winston et al., 2003</td>
<td>RCT</td>
<td>1+</td>
<td>*100 patients in PACU</td>
<td>Group 1: aromatherapy (IPA, n=29)</td>
<td>Group 2: Control Ondansetron 4 mg IV in every 15mins (max. dose 8 mg)</td>
<td>(1) Incidence of PONV in PACU</td>
<td>(1) Incidence of PONV in PACU is 41% (n=41subjects)</td>
<td>Aromatherapy with IPA shows contributed to a significantly effect to reduce PONV</td>
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<td>* aged 18 years old or above</td>
<td>3 deep inhalation in every 5mins (max. 2 times)</td>
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<td>(2) Initial severity of PONV by using 0-10 verbal numeric rating scale(NRS)</td>
<td>(2) Initial severity of PONV No difference (insign)</td>
<td>Aromatherapy with IPA contributed to a significantly faster effect to reduce PONV than antiemetic.</td>
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<td>* female only</td>
<td>(commercially alcohol pad)</td>
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<td>(3) Severity of PONV score 5mins after treatment</td>
<td>(3) 5mins after treatment: Group 1 &lt; Group 2 (3&lt;6, p=0.002)</td>
<td>Aromatherapy may decrease length of stay in PACU.</td>
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<tr>
<td></td>
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<td>*ASA I-II</td>
<td></td>
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<td>(4) Severity of PONV score 10mins after treatment</td>
<td>(4) 10mins after treatment: Group 1 &lt; Group 2 (3&lt;5, p=0.015)</td>
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<td>*Undergoing elective laparoscopic surgery with general anesthesia</td>
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<td></td>
<td>(5) Severity of PONV score 15mins after treatment</td>
<td>(5) 15mins after treatment: Group 1 &lt; Group 2 (2&lt;5, p=0.036)</td>
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<td>(6) Time (in mins) to reduce half in nausea score</td>
<td>(6) Time (in mins) to reduce half in nausea score</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Group 1 &lt; Group 2 (6.3mins&lt;27.7mins, p=0.22)</td>
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<td></td>
<td>(7) Length of stay in PACU</td>
<td>(7) Length of stay in PACU Group 1&lt; Group 2 (58.4±26.5&lt;60.3±24.8= insign.)</td>
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</table>
Appendix 8. Comparison between studies on mode of giving aromatherapy and method of delivery aromatherapy

<table>
<thead>
<tr>
<th>Studies</th>
<th>Type of aroma (Intervention group)</th>
<th>Mode of delivery</th>
<th>Method of delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sites et al., 2014</td>
<td>Peppermint</td>
<td>13-dram vial with a cotton braid impregnated with 500 microliters of peppermint spirit.</td>
<td>3 inhalation with Inhale through the nose and exhale through the mouth to count of 3 Maximum dose: 2 , Interval: 5 minutes</td>
</tr>
<tr>
<td>Hodge et al., 2014</td>
<td>Blend (lavender, peppermint, ginger, spearmint)</td>
<td>Commercial inhaler</td>
<td>Few inhale through the nose Maximum dose:1</td>
</tr>
</tbody>
</table>
| Hunt et al., 2013 | 1. ginger  
2. Blend (ginger, peppermint spirit, spearmint, cardamom)  
3. isopropyl alcohol                                                                 | A 5cc while bottle with a 2-inch x 2-inch impermeable, backed gauze pad with certain aroma                                                                                                                                 | 3 inhalation with Inhale through the nose and exhale through the mouth to count of 3 Maximum dose: 1                                                                                     |
| Pellegrini et al., 2009 | isopropyl alcohol                                                                                | A commercial available 70% IPA pad, fold into half, place at 0.5inch from nares                                                                                                                                 | 3 inhalation at 3 times Maximum dose: 3 , Interval: every 15 minutes                                                                                                                            |
| Cotton et al., 2007 | isopropyl alcohol                                                                                | A commercial available 70% IPA pad, fold into half, place at 0.5inch from nares                                                                                                                                 | 3 inhalation at 3 times Maximum dose: 3 , Interval: 15 minutes                                                                                                                              |
| Anderson & Gross, 2004 | 1. isopropyl alcohol  
2. peppermint                                                                 | 1. A 2” x 2” gauze pad with 1 ml 70% isopropyl alcohol  
2. A 2” X 2” gauze pad with 2ml saline and 0.2 ml peppermint oil | 3 inhalation at 1 times Maximum dose: 1                                                                                                                                                           |
| Winston et al., 2003 | isopropyl alcohol                                                                               | A commercial available 70% IPA pad, fold into half, place at 0.5inch from nares                                                                                                                                 | 3 inhalation at 2 times Maximum dose: 2                                                                                                                                                      |
Appendix 9. Comparison between studies on assessment intervention and the regime of using rescue antiemetic.

<table>
<thead>
<tr>
<th>Studies</th>
<th>Assessment time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sites et al., 2014</td>
<td>At 5, 10 minutes Then followed by rescue antiemetic if needed. (Type of antiemetic: not mentioned)</td>
</tr>
<tr>
<td>Hodge et al., 2014</td>
<td>At 3 minutes</td>
</tr>
<tr>
<td>Hunt et al., 2013</td>
<td>At 5 minutes Then followed by rescue antiemetic if nausea score is rated at 1-3. (Type of antiemetic: not mentioned)</td>
</tr>
<tr>
<td>Pellegrini et al., 2009</td>
<td>At 15 minutes, then, at 30 minutes Rescue antiemetic if needed: Promethazine 12.5 to 25mg IV every 30 minutes, max. 50mg, Metoclopramide 10mg IV every 15 minutes, max. 30mg.</td>
</tr>
<tr>
<td>Cotton et al., 2007</td>
<td>At 5 minutes follow treatment for 30 minutes Then, at 15 minutes thereafter until discharge</td>
</tr>
<tr>
<td>Anderson &amp; Gross, 2004</td>
<td>At 2 minutes follow treatment for 30 minutes Rescue antiemetic if needed: (droperidol, ondansetron, metoclopramide by anaesthesiologists) At 5 minutes after antiemetic administration</td>
</tr>
<tr>
<td>Winston et al., 2003</td>
<td>At 5 minutes interval until nausea resolved, then 15 minutes until discharge Rescue antiemetic if needed: (4mg ondansetron IV in every 15 minutes, max. 2 does. )</td>
</tr>
</tbody>
</table>
Appendix 10. Summary of the adult surgical cases with general anesthesia and IV sedation in the target hospital from the 21st January, 2015 to the 31st of March, 2015

<table>
<thead>
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<th>Number of adult cases under</th>
<th>Month</th>
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<tr>
<td></td>
<td>January</td>
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<tr>
<td>General Anesthesia</td>
<td>135</td>
</tr>
<tr>
<td>IV Sedation</td>
<td>8</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Number of adult cases complaint nausea and vomiting</th>
<th>Month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>January</td>
</tr>
<tr>
<td>General Anesthesia</td>
<td>40</td>
</tr>
<tr>
<td>IV Sedation</td>
<td>2</td>
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</tbody>
</table>
Appendix 1. Estimated training cost of using aromatherapy.

<table>
<thead>
<tr>
<th>Material cost</th>
<th>Calculation</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 100 pieces 70% IPA pad*</td>
<td>1. $0.03 x 100</td>
<td>$3</td>
</tr>
<tr>
<td>2. 50 pieces of assessment form</td>
<td>2. $1 x 40</td>
<td>$40</td>
</tr>
<tr>
<td>3. 40 plastic badges</td>
<td>3. $10 x 40</td>
<td>$400</td>
</tr>
<tr>
<td>4. 40 DVD</td>
<td>4. $2 x 40</td>
<td>$80</td>
</tr>
<tr>
<td>5. 50 pieces of lecture notes</td>
<td>5. $3 x 40</td>
<td>$120</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material cost in working hours</th>
<th>Calculation</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 3 extra hours for providing training by APN</td>
<td>1. $400(salary in hourly base) x 3</td>
<td>$1200</td>
</tr>
<tr>
<td>2. 3 extra hour for attending training by nurses</td>
<td>2. $200(salary in hourly base) x 3</td>
<td>$600</td>
</tr>
</tbody>
</table>

**Total**                                           |                                                                  | $2143   |

*The cost of one piece of 30mm x 65mm 70% isopropyl alcohol pad swab disinfection use disposable is $0.03 (Queen Mary Hospital, 2015)*
Appendix 13. Estimated cost of forming the core committee

<table>
<thead>
<tr>
<th>Material cost</th>
<th>Calculation</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 100 pieces of printed documents</td>
<td>1. $1 x 100</td>
<td>1. $100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material cost in working hours</th>
<th>Calculation</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 3 extra hours for attending meeting by APN</td>
<td>1. $400(salary in hourly base) x 3</td>
<td>1. $1200</td>
</tr>
<tr>
<td>2. 3 extra hours for attending meeting by 2 nurses</td>
<td>2. $200(salary in hourly base) x 3</td>
<td>2. $600</td>
</tr>
<tr>
<td>3. 3 extra hours for attending meeting by anaesthetists</td>
<td>3. $1200(salary in hourly base) x 3</td>
<td>3. $3600</td>
</tr>
<tr>
<td>4. 3 extra hours for attending meeting by surgeons</td>
<td>4. $200(salary in hourly base) x 3</td>
<td>4. 3600</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$9100</td>
</tr>
</tbody>
</table>
Appendix 14. Estimated operational cost of using aromatherapy for PONV patients

<table>
<thead>
<tr>
<th>Material cost</th>
<th>Calculation</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 3600 pieces 70% IPA pad</td>
<td>1. $0.03 x 4275</td>
<td>$128.25</td>
</tr>
<tr>
<td>2. 950 pieces of assessment form</td>
<td>2. $1 x 950</td>
<td>$950</td>
</tr>
<tr>
<td>3. 950 pieces of information sheet</td>
<td>3. $1 x 950</td>
<td>$950</td>
</tr>
<tr>
<td>Non-Material cost in working hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Cost of providing treatment by 7 nurses in recovery</td>
<td>1. $200(salary in hourly base) x 0.25 x 7 x 950</td>
<td>$332,500</td>
</tr>
<tr>
<td>(1 nurses in each recovery bay + 1 extra nurse in PACU, total 7 nurses)</td>
<td>(Formula: salary of nurse in hourly bases x time for proving single treatment for each patient (0.25) hours x number of nurses required (7) x estimates number of case in 6 month (1900/12X6))</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$334,528.25</td>
</tr>
</tbody>
</table>
## Appendix 15. Total cost of using aromatherapy for PONV patients

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Committee set up cost</td>
<td>$2143</td>
</tr>
<tr>
<td>2. Training cost</td>
<td>$9100</td>
</tr>
<tr>
<td>3. Operational cost</td>
<td>$334,528</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$345,771</strong></td>
</tr>
</tbody>
</table>
Appendix 16. The Hospital Management Structure of the Target Hospital

Figure 1 Hospital Management structure of the target hospital

Hospital Chief Executive

Hospital Operations Management
- General Manager (Nursing)
  - General Manager (Administrative Service)
  - Chief of service (MEDI)
    - Department Operation Manager (MEDI)
    - Chief of service (SRG)
      - Department Operation Manager (SRG)
      - Chief of service (SR6) (ENT)
      - Chief of service (SR6) (ANAES)
  - Chief of service (SR6)
    - Senior Nursing Officer (Central Nursing Department)
    - Department Operation Manager (Medical)
    - Department Operation Manager (Surgical)
    - Advanced Practicing Nurse (Infection control)
    - Ward Manager (Outpatient Clinic)

Clinical Service

Nursing & Patient Services
- General Manager (N)
  - Department Manager (Pharmacy)
  - Department Manager (Physiotherapy)
  - Social Worker Officer
  - Senior Occupational Therapist
  - Dietitian Department (In-charge)
  - Clinical psychology (In-charge)
  - Speech Therapy (In-charge)

Allied Health & Pharmacy Services

Cluster Service
- On-site Support
- Consultant (Radiologists)
- Associate Consultant (Hematologists)
- Associate Consultant (Clinical Biologists)
- Department Manager (Prosthetic-Orthotists)
- Department Manager (Podiatrists)
- Finance Manager
- Human Resources
- Information
Appendix 17. The Organization Chart of Operating Theatre of the Target Hospital

Figure 2. Organization Chart of Operating Theatre of the Target Hospital

Chief of Service (Anesthetics)

Ward Manager

Advanced practicing Nurse A (Day Surgery & Sterilization)
- Safety Offer in Day Surgery
- Training and Development
- Duty roster and leave plan allocation
- Quality and Standard Monitoring
- Coordinator
- Policy implementation and Audit program
- SSP planning
- Sterilization Unit in-charge
- Procurement of Day surgery equipment

Advanced practicing Nurse B (Day Surgery & Endoscopy)
- Safety Offer in Day Surgery
- Consumable management
- Training and Development
- Quality and Standard Monitoring
- Coordinator
- Policy implementation and Audit program
- SSP planning
- Day Surgery & Endoscopy Unit in-charge

Advanced practicing Nurse C (Main Operating Theater & Anesthetic Nursing)
- Safety Offer Consumable management
- Training and Development
- Duty allocation in main theatre
- Quality and Standard Monitoring (Surgical team)
- Coordinator for surgical team
- Policy implementation and Audit program
- Recovery room management

Advanced practicing Nurse D (Main Operating Theater & Anesthetic Nursing)
- Research and Audit
- Training
- Anesthetic Nursing
- Monitoring and Coordination
- Supervised and training for Operating Theater Assistant
- Inventory keeping
- Procurement of anesthetic equipment & Consumables
Appendix 18. Evidence-based protocol of using aromatherapy for relieving postoperative nausea and vomiting

**Recruit subject**
- Include:
  1. Adult (age 18 or above)
  2. Female or male
  3. Undergoing elective surgery
  4. Under general anesthesia or Deep intravenous sedation
- Exclude:
  1. Pregnant
  2. Allergy to alcohol
  3. Received prophylactics aromatherapy
  4. Unable to breathe with nose

**Preoperative education**
1. Deliver information of aromatherapy
2. Getting consent from patients

**Operation**

**Post operation in Post-anesthetic care unit**
1. Identify subjects by verifying the consent form
2. Assess of sign of post-operative nausea and vomiting
3. Complete the postoperative nausea and vomiting assessment form

**Operating Theatre**
- If patient complain nausea, record the time & severity
- Provide 1st inhalation of aromatherapy, record the time
- Reassess the severity of nausea after 5 minutes
- If nausea again, provide 2nd inhalation of aromatherapy & record
- Reassess the severity of nausea after 5 minutes
- If nausea again, provide 3rd inhalation of aromatherapy & record
- Reassess the severity of nausea after 5 minutes

**If patient still complain nausea or vomiting, inform anesthetists for assessment or administer antiemetic**
Appendix 19. Implementation Timeline

<table>
<thead>
<tr>
<th>Task</th>
<th>Week</th>
<th>Month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8</td>
<td>3 4 5 6 7 8</td>
</tr>
<tr>
<td>Month/Year</td>
<td>9/15</td>
<td>10/15</td>
</tr>
<tr>
<td>PREPARATION</td>
<td>Communication with Stakeholders</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td>- Ward manager</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Advance Practicing Nurse</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Department Operation Manager</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Chief of Service</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- General Manager in Nursing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Nursing staff</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Core Committee Meeting</td>
<td>✓ ✓</td>
</tr>
<tr>
<td></td>
<td>Staff Training and Guideline promotion</td>
<td></td>
</tr>
<tr>
<td>PILOT</td>
<td>Pilot Testing</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Pilot Test Evaluation</td>
<td>✓ ✓</td>
</tr>
<tr>
<td>IMPLEMENTATION</td>
<td>✓ ✓ ✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>EVALUATION</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Self Design Patient Satisfaction Evaluation Questionnaire**

Evaluation of using aromatherapy in relieving postoperative nausea and vomiting

We would like to collect your valuable opinion on using aromatherapy for relief postoperative nausea and vomiting. It would be grateful if you would spend a few minutes to complete the following questions. Comment collected will be used for service improvement. Please rate the questions with 5-Point Liker Scale (1—totally disagree, 2—disagree, 3—neutral, 4—agree, 5—totally agree)

<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Aromatherapy useful to relieve my feeling of postoperative nausea and vomiting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Aromatherapy does not cause any discomfort to me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I am satisfy with the aromatherapy provided</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I would like to use aromatherapy again in the future operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I will recommend aromatherapy to other patients who need operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Recommendation**

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Appendix 21. Self-designed nursing compliance evaluation questionnaire

<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. It is easy to use aromatherapy in post-anesthesia care unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. It is worth continuing the use of aromatherapy in post-anesthesia care unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Provide aromatherapy does not increase my workload.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. The training provided on using aromatherapy is useful.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. The guideline is concise and easy to follow</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. The use of aromatherapy increases my job satisfaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. The use of aromatherapy improves my working autonomy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. The aromatherapy increase my sense of achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I am willing to provide aromatherapy to postoperative patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. I will recommend aromatherapy to other nurses working in post-anesthetic care unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Recommendation
Appendix 22. Self-designed Postoperative Nausea and Vomiting Assessment Form

<table>
<thead>
<tr>
<th>Evidence-based Guideline on Using Aromatherapy</th>
<th>Postoperative Nausea and Vomiting Assessment Form</th>
<th>(Patient Barcode Label)</th>
</tr>
</thead>
</table>

**Part I. Demographic data**
1. Gender                                            Male/Female
2. Age                                               
3. Date of operation                                 

**Part II. Surgical Information**
1. Preoperative Diagnosis                             
2. Duration of operation                              hour(s) mins
3. Type of anesthesia                                 

**Part III. Postoperative Nausea and Vomiting Record**
*If patient complaint NAUSEA, the severity of nausea and vomiting is rated using Verbal Numeric Rating Scale as “0” no nausea and “10” the worst imaginable nausea.
*Aromatherapy should be given by using a 70%IPA pad, folds into half and place at 0.5 inches from patients nares. Educate the patient to take 3 deep inhalation of the vapour. The maximum doses of aromatherapy are 3 times.*
*Reassess the severity of nausea and vomiting at 5 minutes after each dose of aromatherapy.*

<table>
<thead>
<tr>
<th>Time of complain nausea</th>
<th>Severity (0-10)</th>
<th>Time of giving aromatherapy</th>
<th>Severity (0-10) at 5 minutes after aromatherapy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Tick ✅ the appropriate box in below*

*Document reason in remark column if patient withdraw of treatment*

- ☐ Vomit without nausea
- ☐ Withdraw of treatment

**Remark:**

__________________________________________________________________________

__________________________________________________________________________

**Part IV. Usage of antiemetic**
If patients still complain nausea or vomiting, inform anesthetist for assessment and administer antiemetic.

<table>
<thead>
<tr>
<th>Time of complain vomiting</th>
<th>Anesthetist informed</th>
<th>Antiemetic administered and dosage given</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dr.</td>
<td></td>
</tr>
</tbody>
</table>