Abstract of dissertation entitled

**Effectiveness of oral ginger to reduce postoperative nausea and vomiting in adult patients undergoing elective surgery**

Submitted by

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Nausea and vomiting are the most common distressing symptoms after surgical operation. These complications are frequently affecting patients who required surgery and anesthesia. Treatment of nausea and vomiting using antiemetic drugs could help relieve the symptoms but would also result in unwanted adverse effects. 50% of patients were observed to have postoperative nausea and vomiting (PONV) in the target setting, which is a surgical ward of an acute public hospital in Hong Kong. Preoperative use of oral ginger, which has been reported as an effective antiemetic agent without undesirable effects, to reduce PONV was suggested in the literature since the 1990s. Taking oral ginger powder-containing capsule one hour before induction of anesthesia might help reduce PONV in patients undergoing elective surgery. However, the innovation has not been
applied to clinical areas. No evidenced-based guideline was developed in the
target setting. In 2006, a meta-analysis of clinical trials was conducted to evaluate
the efficacy of oral ginger to reduce PONV. Subsequently, no published systematic
review of studies evaluating the effectiveness of ginger to reduce nausea and
vomiting particularly for surgical patients was available. In recent years, new
evidence has been found in the literature, which urges for an updated review.
Thus, this dissertation aims to review the up-to-date evidence systematically to
confirm the effective of oral ginger to reduce PONV and translate the best
evidence from the literature to the real clinical setting by assessing the
implementation potential, developing an evidence-based guideline and devising a
pilot study and evaluation plan.

A systematic literature search was performed in four electronic databases, which
involve PubMed, Medline, CINAHL and Cochrane Library. Five randomized
controlled trials which assessed the effectiveness of oral ginger for reducing
PONV in subjects undergoing elective surgery, were critically appraised by the
Scottish Intercollegiate Guidelines Network (SIGN) methodology checklist. The
findings of the evaluated studies, which were graded as high quality, consistently
indicated that prophylactic use of oral ginger significantly reduced PONV compared to placebo and ginger is a safe antiemetic agent.

The study subjects of the identified studies and the target audience share similar characteristics and would only take 12 months to be implemented and evaluated. Thus PONV is deemed to be transferable to target setting. Moreover, the innovation does not require new skills, facilities or evaluation tools, and hence it would be feasible with the administrative support from the target hospital if staff consensus could be obtained. The setup and annual running costs were estimated to be HKD 19,182 and HKD 48,888.

A twelve-month program would be conducted by a communication team which facilitates the implementation of the innovation by developing an evidence-based guideline, communicating with stakeholders, promoting the innovation, conducting a pilot study and evaluation plan. The team would spend three months on the communication process until ethical approval granted. After a two-month promotion period to obtain staff consensus, patient outcomes, staff outcomes, and cost-benefit balance would be monitored and evaluated in the pilot study and evaluation study which last for two months and four months respectively. The
primary outcome of the evaluation study is the postoperative nausea severity of patients who underwent surgery, which measured by VAS. The effectiveness of the innovation depends on the basis of the reduction of patient’s nausea severity, staff satisfaction, and cost-benefit ratio. Finally, the evaluation results would be reviewed and recommendations would be made to the target hospital whether the preoperative use of oral ginger should be implemented on a permanent basis.
Effectiveness of oral ginger to reduce postoperative nausea and vomiting in adult patients undergoing elective surgery

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A dissertation submitted in partial fulfillment of the requirements for

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Declaration

I declare that this dissertation thereof represents my own work, except where the due acknowledgement 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 ..............................................

NG WING YEE
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Chapter 1: Introduction

1.1 Background

Postoperative nausea and vomiting (PONV) may occur up to 24 hours after surgery. It is regarded as the most common problems associated with surgical procedures and anesthesia. According to the guideline published by Gan et al. (2014), the incidence of vomiting was 30% and that of nausea was 50% in patients underwent surgery. The incidence rate could be as high as 80% in a group of high-risk patients. The risk factors of PONV include female sex, history of PONV or motion sickness, Non-smoking status, use of volatile anesthetics, postoperative opioid, general versus regional anesthesia, type of surgery and duration of anesthesia (Golembiewski et al., 2005; Gan et al., 2014). Golembiewski et al. (2005) stated that nausea and vomiting are two separate entities and defined that “Nausea is a subjective unpleasant sensation in which the patient is aware of the urge to vomit but does not necessarily do so. Vomiting is an objective physical motion characterized by contraction of the abdominal muscles, a descent of the diaphragm, and an opening of the gastric cardia, resulting in the expulsion of stomach contents from the mouth.” Uncontrolled PONV may cause prolonged recovery, increased medical costs, and poor patients’ satisfaction (Golembiewski et al., 2005; Chaiyakunapruk et al., 2006; Palatty et al., 2013; Montazeri et al.,
Currently, antiemetic drugs are the standard treatment to relieve PONV. In spite of the effectiveness of these drugs, they may lead to undesirable side effects (Palatty et al., 2013; Mandal et al., 2014). Nowadays several complementary therapies are advocated to be effective in controlling nausea and vomiting. Taking oral ginger is one of the suggested non-pharmacologic therapies against nausea and vomiting induced by surgery, pregnancy, chemotherapy and motion sickness. In order to further investigate the effectiveness of oral ginger in preventing PONV and determine whether it is a feasible intervention for patients in a target clinical setting, a systematic review of published clinical studies would be conducted. Subsequently, an evaluation of the implementation potential, an introduction of an evidence-based practice guideline and construction of an implementation plan would also be included in this study.
1.2 Affirming the Need

Nowadays, the number of patients required surgical procedures rises from 341,000 in 2003 to 444,342 in 2013 in hospitals managed by Hospital Authority in Hong Kong. The target setting is a surgical ward in an acute public hospital in Hong Kong. The number of scheduled elective surgical procedure in the target setting is also increasing. More and more patients might suffer from PONV, a common unpleasant surgical complication, because of the growing need for surgery. There is no published data regarding PONV in the target setting. 50% of patients were observed to have PONV by nurses in the target setting. PONV could be a simple annoying sensation but sometimes it might lead to the life-threatening situation. Repeated vomiting can cause electrolyte imbalance, dehydration and aspiration pneumonia. Traction on sutures, wound dehiscence, esophageal tears and gastric herniation could result from persistence retching (Golembiewski et al., 2005; Chaiyakunapruk et al., 2006; Montazeri et al., 2013; Mandal et al., 2014). Besides, it is observed in the target setting that patients with nausea sensation usually have a poor appetite and refuse diet. The outcomes of PONV delay patients’ recovery. Hence, higher health care costs would be required due to increased length of hospital stay (Golembiewski et al., 2005; Chaiyakunapruk
et al., 2006; Montazeri et al., 2013; Mandal et al., 2014; Gan et al., 2014).

The current treatment in the setting for patients with PONV is the antiemetic drug such as metoclopramide, which is a dopamine receptor antagonist and would be given orally or intravenously. 5-HT3 receptor antagonists, such as Ondansetron which are considered to have fewer side effects but with a higher cost, are prescribed if patients cannot tolerate the side effects of metoclopramide. Prophylactic antiemetic drugs have been seldom prescribed preoperatively. Undoubtedly, the current pharmacological treatment for PONV is effective to reduce nausea and vomiting. However, in the clinical setting, patients often refuse antiemetic drug even if they have PONV symptoms, owing to the undesirable side effects of these drugs, which include drowsiness, dizziness, dry mouth, headache and abdominal cramps. The avoidance of antiemetic drugs by patients makes the problem of PONV unsolved. Other harmful side effects that patients might not be aware of are cardiovascular complications, postural hypotension, akathisia, elevated liver enzymes, and agranulocytosis (Palatty et al., 2013; Montazeri et al., 2013; Mandal et al., 2014). In view of the growing surgical procedures in hospitals, nausea and vomiting being the most common complication after surgery and general anesthesia (GA) and the fact that current standard pharmacological
treatment have side effects, there should be more study to investigate the effect of complementary and alternative therapies against PONV, which are considered to be safe.

Ginger (Zingiber officinale) is a plant that has been used as traditional medicine since ancient time and is now considered as a food on the FDA’s “generally regarded as safe” list (Montazeri et al., 2013). Ginger is suggested to be effective in controlling nausea and vomiting due to its anti-5HT3 (serotonin receptor subtype), anti-neurokinin-1, antihistaminic and prokinetic effects without undesirable adverse effects, which helps accelerate gastric emptying and stimulate peristalsis (Palatty et al., 2013; Montazeri et al., 2013; Giacosa et al., 2015). A meta-analysis conducted by Chaiyakunapruk et al. in 2006 found that a fixed dose of at least 1 gram of ginger to be taken orally one hour before induction of anesthesia is more effective to control PONV than placebo. Nevertheless, this intervention has not been implemented into the clinical setting. There is no structured guideline or protocol regarding the use of oral ginger as PONV prophylaxis. These days, many preoperative preparations are initiated by nurses. Preoperative workup such as medication use for bowel preparation and chlorhexidine bath for skin preparation could be
prescribed by nurses per protocol. Therefore, prescription and administration of oral ginger as preoperative workup could be done by nurses if there is a structured and clear protocol.

There are many studies with different level of evidence concerning the efficacy of using ginger as an antiemetic agent in different target groups. Besides the meta-analysis evaluating the effectiveness of ginger to reduce PONV by Chaiyakunapruk et al. in 2006, afterwards, no published systematic review of randomized controlled trials (RCT) evaluating the effectiveness of ginger to reduce nausea and vomiting particularly for surgical patients was found in the literature, even though there were a few more RCTs published after the meta-analysis in 2006. Thus, a systematic review is needed to evaluate the efficacy of oral ginger in reducing PONV.

1.3 Objectives and Significance

1.3.1 Research question

Does prophylactic oral ginger reduce PONV in adult patients undergoing elective surgical procedures?
1.3.2 PICO

*Population:* adult patients undergoing elective surgical procedures

*Intervention:* preoperative administration of oral ginger as prophylaxis

*Comparison:* standard treatment/ placebo

*Outcome:* reduction of PONV

1.3.3 Objectives

The purpose of this dissertation is to review the current literature regarding the effectiveness of ginger on PONV reduction in surgical patients and to incorporate the best evidence of ginger as PONV prophylaxis into usage in the target setting for the amelioration of service quality. The objectives of this study are listed below:

i. To review and appraise the published studies investigating the effectiveness of oral ginger to reduce PONV in adult patients undergoing elective surgical procedures.

ii. To evaluate the implementation potential of using ginger as PONV prophylaxis.

iii. To construct an evidence-based protocol of using ginger as PONV prophylaxis.
iv. To devise implementation and evaluation plan of using ginger as PONV prophylaxis.

1.3.4 Significance

Gan et al. (2014) recommended that an inexpensive antiemetic agent should be used as PONV prophylaxis even if the PONV risk is low. It is proven that use of ginger is an effective means for reducing PONV. It is safe and free of unwanted adverse effects. Reduction of PONV allows good recovery of postoperative patients. Use of ginger might improve patients’ satisfaction and prevent patients from the harmful side effects of antiemetic drugs by reducing the use of the drugs. Prescribing oral ginger as a part of the preoperative preparation under protocol is a nurse-led intervention, which allows autonomy of practice and professionalization in nursing practice. An improved PONV situation may reduce the health care costs by shortened length of hospital stay, minimized costs for treating complications and decreased health care providers’ workload.
Chapter 2: Critical Appraisal

2.1 Search and Appraisal Strategies

A systematic literature search was performed in four databases, which involve PubMed, Medline, Cumulative Index to Nursing and Allied Health Literature (CINAHL) and Cochrane Library, through the electronic resources provided by the University of Hong Kong Library. The following words or terms were used in the keywords search: 1) ginger, 2) postoperative nausea vomiting, 3) PONV, 4) nausea, 5) vomiting, 6) Surgery, 7) surgical and 8) postoperative. Keywords 2-5 and keywords 6-8 were combined using “or” function in order to capture all relevant studies. The result was then combined with keyword 1 using “and” function. There were no time and language restrictions. Reference lists of retrieved eligible studies and relevant reviews were also reviewed for additional publications. After the identification of records through database searching, the titles and abstracts of the identified records were examined to look for any duplication and the relevance. Duplicated and less relevant articles were excluded. Full texts of the remaining articles were reviewed. Eligible studies retrieved must meet the inclusion criteria. The searching strategy was summarized using a flow diagram shown in Appendix A.
The methodology checklist for randomized controlled trial developed by Scottish Intercollegiate Guidelines Network (SIGN) was adopted as the appraisal tool in this study. The checklist consists of two sections. The first section examines the internal validity and the second section asks for the overall assessment of the studies.

### 2.1.1 Inclusion criteria

The studies must be randomized controlled trials, published in English or Chinese, with full text available, examined the antiemetic effect of ginger in preventing PONV, have adult patients undergoing surgery as the target group and measure nausea or vomiting as an outcome. The dose of ginger administered in the study intervention must be 1 gram or above because this is the recommended effective dose suggested in previous studies (Ernst & Pittler, 2000; Chaiyakunapruk et al., 2006; Giacosa et al., 2015).

### 2.1.2 Exclusion criteria

Studies with target group undergoing surgery under spinal anesthesia (SA) only would be excluded as SA is not the risk factor of PONV and the severity of nausea in patients having surgery under SA might not be detectable easily.
2.2 Results

2.2.1 Search results

The literature search identified 28 potential studies. After screening of titles and abstracts, 18 articles were excluded due to non-RCTs, non-English studies, full text not available, unmatched target group or non-oral form of ginger used as the intervention. Full texts of the remaining 10 studies were reviewed. Studies by Eberhart et al., 2003; Tavlan et al., 2006 and Nale et al., 2007 were excluded because the dosage of ginger in the intervention group was less than 1 gram. The study by Kalava et al., 2013 was also excluded because all subjects had surgery under SA. The remaining 6 articles were included in this systematic review. The search results were summarized using a flow diagram shown in Appendix A.

2.2.2 Summary of sampled studies

The data from sampled studies were extracted and recorded using a Table of Evidence shown in Appendix B. All six identified articles were randomized placebo-controlled clinical trials from 1990 to 2014. The studies were conducted in India, Iran, Thailand and Great Britain. Participants in 2 of the studies were males or females undergoing a wide range of surgical procedures. Those of the
other 4 studies were all females undergoing gynecological surgery and 3 of them only recruited subjects undergoing laparoscopic surgery. Apart from that, other patient characteristics were similar. Sample size ranged from 60 to 160. All studies used ginger powder containing capsules and administered one hour before the induction of anesthesia. Outcomes measured were the severity of nausea, episodes of vomiting in a different point of time postoperatively. The severity of nausea was measured using Visual Analog Scale (VAS). Some studies also measure the frequency of antiemetic drug use postoperatively. Effect sizes were summarized in the table of evidence.

2.2.3 Appraisal results

The selected RCTs were generally well conducted except the study conducted by Visalyaputra et al., 1998. SIGN grading system (Appendix C) was adopted to evaluate the level of evidence of the selected studies. The study by Montazeri et al. (2013) obtained 1++ level, which means the quality of the RCTs was high and the risk of bias was low. Four of them obtained 1+ level, which means the RCTs were well conducted with low risk of bias (Bone et al., 1990; Phillips et al., 1993; Apariman et al., 2006; Mandal et al., 2014).
The study conducted by Visalyaputra et al., 1998 was rejected after critical appraisal because the focus question of the study was not clear. The sample size was small and some subjects were not assessed. The study design was fairly complicated with four arms. Data and statistical analysis of the study were poorly conducted. The overall level of evidence of the study was low. It might not be suitable to select the study into this systematic review. The detail of the appraisal was listed in the SIGN checklist shown in Appendix F.

All 5 remaining studies addressed the same appropriate and clear focus question (Bone et al., 1990; Phillips et al., 1993; Apariman et al., 2006; Montazeri et al., 2013; Mandal et al., 2014). The patient problem, intervention, comparison and outcomes were clearly stated. Subjects were randomized in these 5 studies but 2 of them (Bone et al., 1990; Phillips et al., 1993) did not mention the randomization method. One of the studies (Mandal et al., 2014) used computer random number list and two of them (Apariman et al., 2006; Montazeri et al., 2013) used the 4 sized blocks. Only one of the studies mentioned the use of concealment method (Montazeri et al., 2013). Participants of all 5 studies were blinded. The placebo capsules used in all studies looked similar to the ginger containing capsules. Blinding of assessors was mentioned in 3 studies (Phillips et al., 1993; Apariman
et al., 2006; Montazeri et al., 2013). Subjects in intervention and control group looked similar at the start of the trials in all 5 studies. All of them provided subjects’ demographic data and other primary variables. 2 studies provided with all p value >0.05 (Montazeri et al., 2013; Mandal et al., 2014). 3 mentioned that there is no significant difference when comparing subjects’ demographic data and other primary variables (Bone et al., 1990; Phillips et al., 1993; Apariman et al., 2006). All subjects in the same group were equally treated in all studies. The potential confounding factor was minimized. The outcomes of all 5 studies were clearly stated and measured by valid and reliable tools, which was VAS. The dropout rate of the four studies was 0%. 2.4% of subjects in the control group of the study by Montazeri et al. (2013) were excluded and intention to treat (ITT) analysis was applied in the study. The detailed appraisal checklists are attached in Appendices D-I.

2.3 Summary and Synthesis

2.3.1 Summary

2.3.1.1 Study design

All five studies are RCTS. The two studies done in the 1990s were three-arm studies which ginger group, metoclopramide group and control group (Bone et al.,
Those studies aimed to compare the prophylactic antiemetic effect of ginger and metoclopramide. The other three studies were two-arm studies with ginger group and control group. Subjects in the intervention group of Apariman et al. (2006) and Montazeri et al. (2013)’s studies received only ginger, which is the treatment being studied while those in both the intervention group and control group of Mandal et al. (2014)’s study received ondansetron. The aim of Mandal et al. (2014)’s study was to test the efficacy of ginger added to ondansetron for preventing PONV, which was slightly different from other studies. Mandal et al. (2014) also mentioned that it might be unethical to withhold any prophylaxis in the control group for PONV to obtain a strict control group.

2.3.1.2 Subject characteristics

Subjects in Montazeri et al. (2013) and Mandal et al. (2014)’s studies were males or females undergoing a wide range of surgical procedures. Those of the other three studies were all females undergoing gynecological surgery and 3 of them only recruited subjects undergoing laparoscopic surgery (Bone et al., 1990; Phillips et al., 1993; Apariman et al., 2006). Other characteristics such as age, weight, anesthesia or surgical time and American Society of Anesthesiologists
Classification (ASA class) were similar. The mean age was 30-40 years old. The mean weight was ranged from 50 to 70 kg. Anesthesia or surgical time was within 0.5 to 2 hours. Subjects were mainly classified as ASA class I or II. The majority of subjects in all studies had surgical procedures under GA. Subjects who were pregnant, lactating mothers, alcoholism, had motion sickness, known allergy or contraindication to ginger and used opioids or antiemetic drug 24 hours before surgery were commonly excluded. Montazeri et al. (2013) also excluded subjects with afflictions of cancer, hepatitis and digestion system blockage, platelet count below 100 thousand, long-term use of corticosteroids and having drugs causing vomiting. Mandal et al. (2014) excluded subjects with the hepatic, renal or cardiopulmonary abnormality, diabetes and significant gastrointestinal disorders.

2.3.1.3 Intervention and controls

Ginger powder containing capsules were administered one hour before the induction of anesthesia as a treatment to prevent PONV in all five selected studies. The dosage of ginger used in the studies was 1g (Bone et al., 1990; Montazeri et al., 2013; Mandal et al., 2014), 1.5g (Apariman et al., 2006) or 2g (Phillips et al., 1993). A same number of placebo capsules was given to the patient in the control group in five studies and the placebo capsules were also administered one hour
before the induction of anesthesia. The placebo capsules contain 0.5g lactulose
(Bone et al., 1990), 1g lactose (Phillips et al., 1993) or 2g chickpea powder
(Montazeri et al., 2013). Ingredients of placebo capsules in the studies by
Apariman et al. (2006) and Mandal et al. (2014) were not specified.

2.3.1.4 Outcomes

Severity of nausea (Apariman et al., 2006; Montazeri et al., 2013; Mandal et al.,
2014) and incidence of nausea (Bone et al., 1990; Phillips et al., 1993; Montazeri
et al., 2013; Mandal et al., 2014) or vomiting (Bone et al., 1990; Apariman et al.,
2006; Mandal et al., 2014) are the primary outcomes measured in the studies. The
parameters were measured at different time points from 0 to 24 hours
postoperatively. Some studies provided antiemetic drugs to subjects with PONV
and the frequency of using or proportion of patients required these rescue
antiemetic drugs was measured (Bone et al., 1990; Phillips et al., 1993; Mandal et
al., 2014). Apariman et al. (2006) also measured the nausea severity in subjects
received postoperative pethidine. No side effect caused by ginger was reported in
all studies.
2.3.1.5 Effectiveness

All three studies measuring the severity of nausea found that the mean VAS score was significantly lower in the treatment group at different time point after surgery. Montazeri et al. (2013) found a significant effect of ginger on nausea severity only at the 2nd hour after surgery. Apariman et al. (2006) and Mandal et al. (2014) found significant effects of ginger on nausea severity at 2nd, 6th and 4th 6th hour respectively. Montazeri et al. (2013) did not obtain a significant difference in the incidence of nausea among intervention and control groups while Bone et al. (1990) and Phillips et al. (1993) found significant results on this. Apariman et al. (2006) failed to find a significant difference in the incidence of vomiting among intervention and control groups while Bone et al. (1990) obtained a significant result on this. Bone et al. (1990) and Phillips et al. (1993) concluded that ginger had comparable antiemetic effect with metoclopramide since they found no significant difference in the parameters between the ginger and metoclopramide groups. The three studies measuring the use of rescue antiemetic drugs found that the demand of rescue antiemetic drugs was significantly higher in the control group (Bone et al., 1990; Phillips et al., 1993; Mandal et al., 2014). Apariman et al. (2006) claimed that antiemetic effect of ginger on postoperative opioid use was also significant.
2.3.2 Synthesis

The RCTs included in this systematic review had clearly stated research questions, hypotheses and study designs. Apart from randomization, all of the studies applied blinding of subjects to avoid bias. The quality of the selected studies is acceptable and the results of the studies could be considered as reliable. The results of the evaluated studies consistently showed that prophylactic use of oral ginger significantly reduced PONV compared to placebo and ginger is a safe antiemetic agent without undesirable adverse effects. That the prophylactic antiemetic effect of ginger was comparable to that of metoclopramide was also proved in some of the studies. In early studies, ginger as an antiemetic agent was advocated in a group of gynaecological patients requiring surgery. Recent studies made use of ginger in a wider range of general surgical patients. The gynaecological surgeries in the studies were mainly abdominal surgeries and the laparoscopies were usually abdominal laparoscopies. In our surgical unit, a large proportion of patients requires elective abdominal surgery. Nowadays, more and more surgical procedures in the target setting could be carried out under laparoscopy. Otherwise, the demographic characteristics of patients in the setting are fairly similar to those of the subjects in the studies. The subject populations in the selected studies might represent the group of patients undergoing elective surgery in the local setting. Therefore, the intervention might be transferable to the target setting.
In view of the significant results found in the selected studies, preoperative use of oral ginger has a beneficial effect in reducing PONV for adult patients undergoing elective surgery. Administration of oral ginger capsule should be adopted as routine preoperative management in surgical wards for adult patients undergoing elective surgery.
Chapter 3: Implementation Potential and Clinical Guideline

3.1 Implementation Potential

3.1.1 Target setting

The target setting is a surgical department consisting of four surgical wards in an acute hospital managed by the Hospital Authority in Hong Kong. The four surgical wards provide pre- and postoperative care to patients who require colorectal, hepatobiliary, breast, head and neck, upper gastrointestinal, vascular and urological surgery.

3.1.2 Target audience

Adult patients who require elective surgery and are admitted to the surgical wards for pre- and postoperative care are targeted to receive the proposed intervention. The target patients must be aged 18 or above.

3.1.3 Transferability

Five selected studies reviewed in the previous chapter were assessed to see whether the novel intervention is transferable to the target clinical setting. The
selected studies were conducted in surgical units or day center of the operating
theatre, where pre- and postoperative interventions were provided. Similarly, the
target setting also delivered pre- and postoperative care to patients. The study
subjects and the target audience share similar characteristics. Study subjects were
aged 18 or above who underwent elective surgical procedures. The types of
surgery were breast surgery, surgical or gynecological laparoscopy, sinus surgery,
skin grafting, head and neck surgery, urological surgery, abdominal surgery,
orthopedic surgery and ear, nose, throat (ENT) surgery. The characteristics of the
setting and the participants were comparable in both the studies and the target
setting. Thus, it is suitable to carry out the proposed innovation in the target
setting.

Providing oral ginger to adult patients who require elective surgery has its
philosophy of care to minimize patient distress and enhance recovery. The mission of
the target surgical department is to provide quality surgical service to the community,
to uphold the highest standard of care and to deliver the best contemporary surgical
care to our patients (Department of Surgery, United Christian Hospital). The proposed
innovation and the target setting share common core value to deliver quality surgical
care to patients.
In the practice setting, the average number of patient who admitted for elective surgery under GA is 140 per month. There is a sufficiently large number of patients who could benefit from the proposed innovation. According to the reviewed studies, oral ginger was given an hour prior to anesthesia induction, which would not take too long to implement. The effect of the intervention was assessed till 24 hours after the surgery. The proposed innovation would not take too long to implement and evaluate. Hence, the innovation would be transferable to the target setting.

3.1.4 Feasibility

Administration of oral ginger one hour prior to induction of anesthesia would be regarded as one of the preoperative nursing interventions. These days, nurses have been allowed to decide whether a patient needs a specific preoperative intervention and then provide the intervention to the patient according to protocols. Chlorhexidine bathing, shaving, and application of compressive stockings are the examples of nurse-led preoperative interventions. Therefore, it is possible for nurses to have freedom in adopting the innovation in the target setting. The evidence-based guideline developed in this chapter would guide front-line nurses to implement the innovation in the target setting. Nurses could decide whether a patient is suitable to receive oral ginger according to the guideline. If
there is any undesirable effect caused, nurses have the freedom to terminate the use of such innovation.

The interference of current nursing staff functions caused by the implementation of preoperative oral ginger might increase nurses’ workload. Nurses might need to spend additional hours to attend the information briefing session and study the evidence-based guideline. Providing preoperative assessment for identifying eligible patients, administration of oral ginger before operation and monitoring postoperative nausea level are the extra obligations brought from the new guideline for nurses, which might perhaps increase nurses’ workload. Moreover, current staff functions of pharmacy staff might also be interfered. Specifically, pharmacy staff are responsible for purchasing the oral ginger, providing proper storage of the ginger and managing the stock in wards. Although the literature has stipulated that ginger is safe, medical support by doctors is required if there is any undesirable effect. Thus, doctors might need to provide assessments to patients with undesirable effect after taking oral ginger. Currently, PONV has been treated with medication prescribed by doctors. Nursing innovation may interfere the curing role of doctors. Nurse-led intervention might perhaps lead to doctors’ unwillingness to relinquish certain aspects of their role. Oral ginger would be
given as capsule format, which might be considered as a kind of medication that require doctors’ prescription. Nurse-led administration of oral ginger capsule might need further discussion and cooperation with doctors. Doctors might need to spend additional hours to study more about the effect of ginger, attend meetings with nurses and participate in the revision of the guideline in order to minimize the friction between doctors and nurses. As a result, doctors’ current staff functions might also be interfered.

Nursing Service Department (NSD) of the target hospital laughed a platform called MODERNnet (M- Mobile, O- Online Real-time Dialogue, D- Internet Discussion Forum, E- Evidence-based Practice, R- Research, and N- Nursing) to encourage evidence-based practice sharing and research utilization. Nurses are encouraged to propose evidence-based projects and the approved projects would be carried out and monitored by a committee formed by nursing managers and evidence-based practice coordinators. Administrative support of the nursing innovation would be given by the NSD of the target hospital.

Preoperative administration of oral ginger is a nurse-led intervention to reduce PONV. The innovation minimizes patients’ distress and enhance good recovery.
after surgery with an acceptable increase in nurses’ workload. Development of evidence-based nursing intervention allows the nursing practice towards professionalization. Nurse-led service could raise job satisfaction, provide opportunities for professional development and also allow autonomy of practice (Hegney, 2013). Implementation of the innovation not only may benefit the patients but also the nursing profession. Hence, there is a satisfactory degree of consensus among nurses in the target surgical unit and among the administrators in the NSD.

New nursing skills are not required in the implementation of the innovation. The effect of the innovation would be evaluate using visual analog scale (VAS), which is a common evaluation tool used by nurses. Briefing sessions to nurses might be needed to clarify the clinical guideline of ginger usage and assessment of nausea severity. Implementation of the innovation do not require new skills, facilities or evaluation tools, as a result, the innovation would be feasible under the administrative support from the NSD if staff consensus could be obtained.
3.1.5 Cost-Benefit Ratio

_Risk of implementation of the proposed innovation_

Ding et al. (2013) reported that continuous use of ginger for pregnancy-induced nausea might interfere the clotting profile of patients taking antiplatelet or anticoagulant, otherwise, the use of ginger was generally considered to be safe. Moreover, there was no reported undesirable effect resulted from the use of ginger for PONV in all the selected studies.

_Potential benefit of the proposed innovation_

Ginger is a complementary therapy which was reported to have potential benefit in reducing PONV. Patients’ physical and psychological distress would be minimized by reducing nausea and vomiting after the surgery. Reduced PONV would prevent patients from having a poor appetite and hence they could resume adequate diet earlier to achieve a good recovery. Rapid recovery from surgery helps reduce hospital length of stay and save medical costs.

The proposed innovation is a nurses-led service, which allows autonomy of practice for nurses. Preoperative use of oral ginger also reduces the postoperative use of antiemetic drugs, which means nurses would spend less nursing time on
administration of intravenous medications. Nursing procedures such as insertion
of a nasogastric tube for vomit patients would also be reduced. Therefore, nurses’
workload could be lessened.

Apart from the cost saved from the reduced use of the antiemetic drug, the
innovation also helps the organization to save costs by shortening the hospital
length of stay and reducing the readmission rate, which regards to the
complications caused by PONV or use of antiemetic drugs.

Costs of implementation of the proposed innovation

The costs of implementing the proposed innovation comprise the set-up costs and
maintaining costs. Set up costs includes documents for introducing the
preoperative use of ginger, ginger powder capsules and assessment forms used in
pilot study. Nursing hours for the formation of project committee, information
sections for ward nurses and administration and assessment in the pilot study are
also counted in the setup costs. The estimated material and non-material setup
costs are HKD 19,182 in total. The estimated number of patients eligible for the
use of preoperative ginger are 1,680 per year. Hence, the maintaining costs were
calculated based on the estimated figure. The estimated maintaining costs include
ginger capsules, assessment forms and nursing hours. The estimated total maintaining costs of the innovation are HKD 48,888 per year. Details of cost calculation are listed in Appendix J.

**Costs saved from implementing the proposed innovation**

Three out of the five selected studies suggested that the demand of rescue antiemetic drugs was significantly lower in subjects who receive preoperative ginger (Bone et al., 1990; Phillips et al., 1993; Mandal et al., 2014). As a result, preoperative use of ginger would save the costs of antiemetic drugs. The estimated cost saved from reduced use of antiemetic drugs and shortened hospital length of stay is HKD 2,567,880 per year. Details of cost calculation are listed in Appendix J. The annual costs saved is impressive compared to the maintaining costs spent per year, which means that higher quality of care could be provided with a considerable amount of cost saved.

**3.2 Evidence-Based Practice Guideline**

According to the evidence retrieved from the systematic review in chapter one, an evidence-based practice guideline of using oral ginger to reduce PONV in adult patients undergoing elective surgery was generated and attached in the Appendix
K. Nurses may refer to the guideline when they provide preoperative use of oral ginger to adult patients who need elective surgery.
Chapter 4: Implementation Plan

4.1 Communication Plan

4.1.1 Identification of stakeholders

Stakeholders are people who can affect or be affected by the proposed innovation.

The Chief of Service (COS) and the Department Operating Manager (DOM) are stakeholders as they will make the final decision and give approval for implementation of the innovation. Their support might affect staff attitude towards the new policy. Ward Managers (WM) and Advanced Practice Nurses (APN) are experienced in implementing new guidelines. They help monitor the implementation process and provide supervision to front-line staff. As the guideline users, all nurses are important stakeholders because they are not only the service providers but also the data collectors. Thus, their efforts would highly affect the result of the study. Pharmacy staff are also regarded as stakeholders as the new policy might bring extra workload to them. They are responsible for ensuring the availability of ginger powder which is important as required by the new guideline. Doctors are also stakeholders who need to provide support when there is unexpected adverse effect and give advice throughout the implementation process. Therefore, a good communication plan can facilitate the collaboration among different parties involved during the implementation process.
4.1.2 Communication process

First of all, informal discussion about using oral ginger to reduce PONV would be encouraged among nurses working in the surgical unit of the targeted hospital. The purpose of the informal discussion is to raise the problem of PONV, introduce the new evidence-based practice, collect opinions about the innovation and gather a group of nurses who are interested in the proposed project. After a two-week discussion period, a group of four surgical nurses including two APNs are formed. The group will hold several meetings to discuss the significance of the problem and how the proposed innovation help, identify barriers during the implementation process, calculate the cost-benefit ratio, review the opinions collected, revise the evidence-based guideline and prepare a formal presentation of the innovation.

WMs would be invited to a meeting and a presentation about the innovation would be conducted by the group. The significance of the PONV problem, the effectiveness of the proposed evidence-based practice, the feasibility of applying the innovation in the department and the cost-benefit ratio would be included in the presentation. Expert opinions from WMs are encouraged and gathered.

Revised guideline and a proposal would be presented to the DOM in the scheduled department meeting. Gaining the consensus and advice from WMs and the DOM, the group will send a written proposal to and make an appointment with the COS
to deliver a presentation. The guideline will be continuously modified until the approval granted by the COS. A communication team will be formed by the four nurses afterwards. One of the APNs would act as the team leader.

The communication team would promote the innovation and overcome the barriers step by step. To begin with, communication with front-line nurses is extremely important as they are the target users of the evidence-based guideline. The guideline will be printed and circulated among the front-line nurses for a period of two weeks. Information sessions would then be held to present the details of the intervention, clarify unclear content, collect opinions from nurses and mention how nurses would benefit from the innovation. The new intervention might slightly increase nurses’ workload during the preoperative period. However, nursing time for management of PONV would be saved in the postoperative period. Besides the information sessions, nurses are welcomed to give their advice and ask the team questions whenever they want. Secondly, the team will call a meeting with the in-charge people of the pharmacy. The proposed innovation would be briefly introduced, storage issue and the logistic issue to stock the ginger powder capsules would be discussed. Furthermore, as mentioned in Chapter 3, medical support is essential to deal with any unexpected adverse effect. Hence, the
participation of doctors cannot be eliminated. A surgeon and an anesthetist would be invited to join the team as advisors to revise the guideline throughout the process of development. These advisors would also ensure the communication between the team, surgeons and anesthetists. All surgeons and anesthetists will receive an e-mail about the details of the innovation and how doctors would benefit from the innovation. These days, doctors and nurses work together in a complimentary approach. More and more interventions, which previously required doctors’ prescription, were shifted to protocol-driven nurse-led interventions. These nurse-led interventions would help reduce doctors’ workload. In addition, doctors’ workload would also be reduced if postoperative complications were minimized.

During the communication process, it might be challenging to gain consensus from different parties. Importantly, feedback should be allowed and the guideline should be revised continuously to address different concerns during the process. It is essential to provide enough time to all involved parties to give comments and raise their concerns. Therefore, proper time management for the communication process is important. There will be a 2-week informal discussion period before the formation of the group. The group will spend about a month to review the
literature and prepare for the written proposal and oral presentation. After the preparation, the group will introduce the proposal and conduct presentations to related people mentioned above. The group will revise the guideline and form a formal communication team after approval granted. Information sessions for nurses will then be conducted and discussion with pharmacy in-charge people will also be conducted at the same period. Afterwards, there will be a 2-week period for comment collection. Later, the team will spend time on revising the guideline before the pilot study. The expected total time taken for the communication process would be five months. Appendix L. shows the timeline of the communication process.

4.2 Pilot Study Plan

4.2.1 Objectives

The objectives of the pilot study are:

• To explore the feasibility of implementing the innovation;

• To identify unexpected issues;

• To allow opportunities for staff to familiarize with the new guideline;

• To check the availability of resources;

• To collect feedback for modification of the new guideline.
4.2.2 Subjects

Subjects are patients who aged 18 or above and admitted for elective surgery under GA with the surgical time less than 120 minutes. Subjects will be excluded if they are in conditions, such as pregnancy, lactating women, alcoholism, known allergy or contraindication to ginger, platelet count below 100 thousand, long-term use of corticosteroids, hepatic, renal or cardiopulmonary abnormality, diabetes and significant gastrointestinal disorders.

4.2.3 Measurements

Nausea severity will be measured using visual analogue scale (VAS) (from 0= “no nausea” to 10= “worst possible nausea”) at the 6th hour after the surgery. The nausea severity score will be recorded on vital signs chart by ward nurses. Episodes of vomiting and antiemetic drug use will also be counted by ward nurses. The proportion of subjects with vomiting episode and the proportion of subjects requiring antiemetic drug use will then be calculated. Staff interviews will be conducted by the team after the pilot study. Staff comments will be recorded.

4.2.4 Procedures

The pilot study will be conducted in one of the surgical wards in the target hospital. There is a two-week preparation period for staff briefing and purchase of
ginger powder capsules. Duration of the study would be one month with a sample size of 90 participants. All patients admitted for elective surgery will be assessed by nurses and eligible patients will be selected according to the guideline. Oral ginger will be given to the selected patients before the surgery and their postoperative nausea severity will be recorded. Appendix L. shows the timeline of the pilot study.

4.2.5 Evaluation

The team will then spend a week for staff interviews to identify unexpected problems, collect comments and review the storage and logistic issues. Finally, the team will conduct meetings to revise the guideline and make appropriate amendment.

4.3 Evaluation Plan

4.3.1 Objectives

This evaluation aims to measure the effectiveness of oral ginger in reducing PONV in patients undergo elective surgery, evaluating the staff satisfaction towards the guideline, analyzing the cost-benefit balance and determining whether the innovation is sustainable.
4.3.2 Design

This evaluation is a single-arm study with all subjects receiving the same intervention. The hypothesis of this study is that there is a lower incidence or reduction of PONV in patients undergo elective surgery under the care of the new guideline. The main outcome is the postoperative nausea severity measured by VAS (from 0= “no nausea” to 10= “worst possible nausea”) at the 6th hour after the surgery. The objective of this evaluation is to determine if the nausea score is reduced. In the target setting, the observed mean nausea score in patients receiving usual care for nausea at the 6th hour after the surgery was 4. The study was designed to compare the nausea score difference between patients under the care of the new guideline and those under current routine care.

4.3.3 Nature and Number of Clients

Clients are aged 18 or above and admitted for elective surgery under GA with the surgical time less than 120 minutes. Clients will be excluded if they are in conditions, such as pregnancy, lactating women, alcoholism, known allergy or contraindication to ginger, platelet count below 100 thousand, long-term use of corticosteroids, hepatic, renal or cardiopulmonary abnormality, diabetes and significant gastrointestinal disorders.
In order to obtain an appropriate sample size, one sample t-test would be used. According to the selected studies in Chapter 1 and clinical considerations, the smallest meaningful difference would be 0.5. The level of significance and the power would be taken as 5% and 80% respectively. Hence, 289 subjects are needed in this evaluation study. The potential attrition rate is negligible because it only takes a few hours from the time of intervention delivered to the time of assessment. As a result, the total sample size will be 300.

**4.3.4 Outcomes & Measurements**

The primary outcome of this evaluation is the postoperative nausea severity of patients who underwent surgery, which measured by VAS (from 0= “no nausea” to 10= “worst possible nausea”) at the 6th hour after the surgery. In addition to the primary outcome, the proportion of subjects with vomiting episode and the proportion of subjects requiring antiemetic drug use due to PONV would also be examined. The nausea severity score will be recorded on vital signs chart by ward nurses. Episodes of vomiting and antiemetic drug use will also be counted by the nurses. These outcomes would reflect the effectiveness of the innovation in reducing PONV. The data will be collected by front-line nurses and then analyzed by the team. Moreover, staff satisfaction towards the new guideline would also be
evaluated. The guideline users will be interviewed to assess their satisfaction about the innovation. Nurses are encouraged to comment whether the innovation helps reduce nursing time spent on PONV management. Staff satisfaction is one of the important indicators to determine whether the guideline is successful or not. Additionally, cost-benefit balance is an essential element to decide whether the innovation is sustainable. The actual cost spent for the innovation will be recorded and evaluated. The team will also review the cost saved from PONV management by comparing the number of antiemetic drug use before and after implementation of the new guideline. Hospital length of stay would also be compared between patients under the usual care and those under the care of the new guideline. The team will calculate the balance between the cost spent on maintaining the new guideline and the cost saved from the reduced antiemetic drug use and decreased the length of stay.

4.3.5 Procedures

The evaluation study would be conducted in 4 surgical wards of the target hospital. There is a two-week preparation period for staff briefing and purchase of ginger powder capsules. Duration of the study would be one month with a sample size of 300 participants. All patients admitted for elective surgery will be assessed
by nurses and eligible patients will be selected according to the guideline. Oral
ginger will be administered to the selected patients one hour before induction of
anesthesia and their postoperative nausea severity will be documented by ward
nurses. The expected length of the evaluation study would be one month. A
timetable for the evaluation study is shown in Appendix L.

4.3.6 Data Analysis
The data will be analyzed statistically by using SPSS version 23. The nausea score
difference, the proportion difference of subjects with vomiting episode and
requiring antiemetic drug between patients under the care of the new guideline
and those under current routine care, would be analyzed by one-sample t-test. A P
value <0.05 was considered as significant. In addition, data collected in staff
interviews would also be discussed at the committee meeting to evaluate staff
satisfaction. The cost-benefit balance would be analyzed by calculating the cost
saved or spent in the evaluation study.

4.4 Basis for Implementation
The communication team will review the study results and recommendation will
be made to managers for the continuation of the new policy according to its
effectiveness. The innovation will be considered as effective and fully implemented if the following basis fulfilled. Oral ginger would be regarded as effective to reduce PONV by reducing the nausea score at the 6th hour after the surgery. Accordingly, as mentioned in the reviewed articles, the innovation would be considered to be effective if the mean nausea score decreases by at least 1 (25%). The minimization of antiemetic drug use might result in a saved cost and a decrease in health care providers’ workload. Thus, the guideline would be regarded as successful if the proportion of subjects requiring antiemetic drug decreases by 15%.

The new evidence-based clinical guideline will be fully implemented if the results of the evaluation study meet the basis. Finally, the APN, leader of the team, will review the results and make recommendations to the NSD whether the preoperative use of oral ginger should be implemented on a permanent basis. Henceforward, patients who need elective surgery could benefit from oral ginger in reducing PONV. It would be delighted to have a success of translating the best evidence from the literature to the real clinical setting.
Appendices

Appendix A.

**PRISMA 2009 Flow Diagram**

Records identified through database searching (n = 38)

Additional records identified through other sources (n = 2)

Records after duplicates removed (n = 28)

Records screened (n = 28) → Records excluded (n = 18)

Full-text articles assessed for eligibility (n = 10) → Full-text articles excluded, with reasons (n = 4)

Studies included in critical appraisal (n = 6) → Full-text article rejected after critical appraisal (n = 1)

Studies included in systematic review (n = 5)

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## Appendix B.
### Table of Evidence

<table>
<thead>
<tr>
<th>Bibliographic citation</th>
<th>Study type (Level of evidence)</th>
<th>Patient characteristics</th>
<th>Intervention(s)</th>
<th>Dosage</th>
<th>Comparison</th>
<th>Outcome measures</th>
<th>Effect size (Intervention- Control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandel et al., 2014</td>
<td>Randomized, controlled trial (1+)</td>
<td>· Patient undergoing ambulatory surgical procedures (fibro-adenoma breast, surgical laparoscopy, gynaecological laparoscopy, sinus surgery, skin grafting, thyroid surgery, squint, orchitectomy, incisional hernia) · Under GA · ASA class I or II · Male or female · Anesthesia time (mins): 29-106 · Age (year): 20-50 · Weight (Kg): 60-80</td>
<td>Group 1: single dose IV Ondansetron (4 mg) and two oral capsules of 0.5g ginger one hour before surgery with sips of water (n=50)</td>
<td>1g ginger powder (0.5g x 2)</td>
<td>Group 2: single dose IV Ondansetron (4 mg) and two oral capsules of placebo one hour before surgery with sips of water (n=50)</td>
<td>1) No. of patients experienced episodes of PONV at 0.5, 1, 2, 4, 6, 12, 18hr (0-10) 2) Post-operative mean VAS scoring (PONV severity) at 4, 6hr (0-10) 3) Rescue antiemetic (Metoclopramide) use frequency</td>
<td>0.5 hr: -1 (p=0.314) 1 hr: -7 (p=0.006) 2 hr: -8 (p=0.003) 4 hr: -11 (p=0.0004) 6 hr: -10 (p=0.0008) 12 hr: -5 (p=0.022) 18 hr: -7 (p=0.779)</td>
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<tr>
<td>Montazeri et al., 2013</td>
<td>Randomized, controlled trial (1++)</td>
<td>· Patient undergoing genitourinary system, orthopedic, ENT and abdominal surgery · Male or female · Anesthesia time (mins): 20-100 · Mean age (year): 18-60</td>
<td>Group 1: Taking ginger containing capsules orally with 30ml water 1 hour before surgery (n=81)</td>
<td>1g ginger powder (0.25g x 4 capsule)</td>
<td>Group 2: Taking placebo capsule (containing Chickpea powder) orally with 30ml water 1 hr before surgery (n=79)</td>
<td>1) Average nausea score (0-10) 2) Average numbers of nausea</td>
<td>Postoperative, 1) 2hr: -0.6 (p=0.043) 4hr: -0.3 (p=0.405) 6hr: -0.3 (p=0.395) 2) 2hr: -0.27 (p=0.053) 4hr: -0.15 (p=0.383) 6hr: -0.21 (p=0.259)</td>
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<tr>
<td>Apariman et al., 2006</td>
<td>Randomized controlled trial (1+)</td>
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<td>Surgical time (mins): 55-300</td>
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<td>Group 1: Taking ginger containing capsules orally with 30ml water 1 hour before surgery (n=30)</td>
<td>1.5g ginger powder (0.5 g x 3 capsules)</td>
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<td>Group 2: Taking placebo capsules orally with 30ml water 1 hr before surgery (n=30)</td>
<td>1) Severity of nausea (Median VAS) (0-10)</td>
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<td>2) Vomiting episode (proportion of subjects)</td>
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<td>3) Nausea severity in subjects received postoperative pethidine (Median VAS)</td>
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<td>Group 2: oral placebo capsules taken 1 hr before induction+ 1.25mg droperidol IV injection given during induction period (n=29)</td>
<td>2g ginger root (0.5mg x 2 capsules taking preoperatively and 0.5mg x 2 capsules taking postoperatively)</td>
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<td>Group 3: oral ginger root capsules taken 1 hr before induction+ IV placebo injection given during induction period (n=27)</td>
<td>Group 1: oral placebo capsules taken 1 hr before induction+ 1.25mg IV placebo injection given during induction period (n=28)</td>
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<td>Group 4: oral ginger root capsules taken 1 hr before induction+ 1.25mg droperidol IV injection given during induction period (n=27)</td>
<td>1) Incidence of nausea 1) Group2-control: -0.12 Group3-control: -0.1 Group4-control: -0.01 (p=0.61)</td>
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<td>2) Incidence of vomiting 2) Group2-control: -0.22 Group3-control: -0.1 Group4-control: -0.1 (p=0.29)</td>
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<td>Phillips et al., 1993</td>
<td>Randomized, controlled trial (1+)</td>
<td>Patients undergoing gynaecological laparoscopic surgery - Female - ASA class I, II or III - Under GA - Mean age (Years): 33 - Mean surgical time(mins): 25 - Mean Weight (Kg): 66</td>
<td>Group 1: take oral capsule containing 10mg metoclopramide 1 h before induction of anesthesia. (n=40) - Group 2: take oral capsule containing 2g ginger root 1 h before induction of anesthesia. (n=40) - Group 3: take oral placebo capsule containing 2g lactose 1 h before induction of anesthesia. (n=40)</td>
<td>1) Incidence of nausea - -0.2 (ginger-control) (p=0.006) -0.05 (ginger-metoclopramide) (p=0.34) 2) Proportion of subjects require antiemetic use after surgery - -23% (ginger-control) (p&lt;0.05) -17% (metoclopramide-control) (p&lt;0.05)</td>
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<td>Randomized, controlled trial (1+)</td>
<td>Patients undergoing gynaecological surgery - Female - ASA class I or II - Under GA - Age 16-65 - Mean surgical time(mins): 55 - Mean Weight (Kg): 62</td>
<td>Group 1: oral ginger root capsules taken at premedication time+ IV placebo injection given during induction period (n=20) - Group 2: oral placebo capsules taken at premedication time+ IV placebo (sterile water) injection given during induction period (n=20) - Group 3: oral placebo (lactulose) capsules taken at premedication time+ IV placebo (sterile water) injection given during induction period (n=20)</td>
<td>1) Proportion of subjects with incidence of nausea - -23% (ginger-control) (p&lt;0.05) -21% (metoclopramide-control) (p&lt;0.05) 2) Proportion of subjects episodes of vomiting - -25% (ginger-control) -20% (metoclopramide-control) (p value N/A) 3) Administration of metoclopramide after surgery - -6 (ginger -control) (p&lt;0.05) -1 (metoclopramide -control) (p&lt;0.05)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix C.

SIGN GRADING SYSTEM 1999 – 2012

LEVELS OF EVIDENCE

1++ High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1+ Well-conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias
1- Meta-analyses, systematic reviews, or RCTs with a high risk of bias
2++ High quality systematic reviews of case control or cohort or studies
   High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
2+ Well-conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2- Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3 Non-analytic studies, e.g. case reports, case series
4 Expert opinion
# Methodology Checklist 2: Controlled Trials

**SIGN**

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


**Guideline topic:** How does oral ginger reduce postoperative nausea and vomiting in adult patients undergoing elective surgeries?  

**Key Question No:** 1  

**Reviewer:** Ng Wing Yee

### Before completing this checklist, consider:

1. Is the paper a **randomised 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? Analyse 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...**

<table>
<thead>
<tr>
<th></th>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.1</strong></td>
<td>The study addresses an appropriate and clearly focused question</td>
</tr>
<tr>
<td><strong>1.2</strong></td>
<td>The assignment of subjects to treatment groups is randomised. Method is not specified</td>
</tr>
<tr>
<td><strong>1.3</strong></td>
<td>An adequate concealment method is used.</td>
</tr>
<tr>
<td><strong>1.4</strong></td>
<td>Subjects and investigators are kept ‘blind’ about treatment allocation. Blinding of investigator not mentioned.</td>
</tr>
<tr>
<td><strong>1.5</strong></td>
<td>The treatment and control groups are similar at the start of the trial.</td>
</tr>
<tr>
<td>1.6</td>
<td>The only difference between groups is the treatment under investigation.</td>
</tr>
<tr>
<td>1.7</td>
<td>All relevant outcomes are measured in a standard, valid and reliable way.</td>
</tr>
<tr>
<td>1.8</td>
<td>What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?</td>
</tr>
<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>
</tr>
<tr>
<td>1.10</td>
<td>Where the study is carried out at more than one site, results are comparable for all sites.</td>
</tr>
</tbody>
</table>

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

| 2.1 | How well was the study done to minimise bias? *Code as follows:* | 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? | It is a 3-arm study comparing the effect of ginger, metoclopramide and placebo on preventing PONV. The sample size are small with only 60 subjects, 20 in each group. The quality of the study is still acceptable. The lower incidence of nausea, vomiting episodes and postoperative use of metoclopramide would be due to the study interventions. |
| 2.3 | Are the results of this study directly applicable to the patient group targeted by this guideline? | Might be. Subjects in the study are all female undergoing gynaecological laparoscopic surgery. The results might be transferable to the targeted patient group. |
| 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. | 49 |
Preoperative ginger administration is more effective than placebo. The effect of ginger and metoclopramide are shown comparable. Ginger might be a good antiemetic with comparable therapeutic effect and less side effects.
### Methodology Checklist 2: Controlled Trials

**Guideline topic:** How does oral ginger reduce postoperative nausea and vomiting in adult patients undergoing elective surgeries?

<table>
<thead>
<tr>
<th>Key Question No: 1</th>
<th>Reviewer: Ng Wing Yee</th>
</tr>
</thead>
</table>
| Study identification  
(Include author, title, year of publication, journal title, pages) | |

**Before** completing this checklist, consider:

1. **Is the paper a randomised 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?** Analyse 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…*  

<table>
<thead>
<tr>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes ✓ No □ Can't say □</td>
</tr>
</tbody>
</table>

<p>| 1.1 The study addresses an appropriate and clearly focused question. | Yes ✓ No □ Can't say □ |
| 1.2 The assignment of subjects to treatment groups is randomised. Method is not specified | Yes □ No □ Can't say ✓ |
| 1.3 An adequate concealment method is used. | Yes □ No ✓ Can't say □ |
| 1.4 Subjects and investigators are kept ‘blind’ about treatment allocation. Nursing staff had no knowledge of which treatment each patient had received. | Yes ✓ No □ Can't say □ |</p>
<table>
<thead>
<tr>
<th>Section</th>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Can't say</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>The treatment and control groups are similar at the start of the trial.</td>
<td>✅</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>1.6</td>
<td>The only difference between groups is the treatment under investigation.</td>
<td>✅</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>1.7</td>
<td>All relevant outcomes are measured in a standard, valid and reliable way.</td>
<td>✅</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>1.8</td>
<td>What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?</td>
<td>0% in intervention group</td>
<td>0% in controlled group</td>
<td></td>
<td></td>
</tr>
<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>☐</td>
<td>☐</td>
<td>☒</td>
<td>Does not apply</td>
</tr>
<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>☐</td>
<td>☐</td>
<td>☒</td>
<td>Does not apply</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Section</th>
<th>Question</th>
<th>Evaluation</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>How well was the study done to minimise bias?</td>
<td>High quality (++)</td>
<td>It is a 3-arm study comparing the effect of ginger, metoclopramide and placebo on preventing PONV. The quality of the study is acceptable. The lower incidence of nausea would be due to the study interventions.</td>
</tr>
<tr>
<td>2.2</td>
<td>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?</td>
<td>It is a 3-arm study comparing the effect of ginger, metoclopramide and placebo on preventing PONV. The quality of the study is acceptable. The lower incidence of nausea would be due to the study interventions.</td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>Are the results of this study directly applicable to the patient group targeted by this guideline?</td>
<td>Might be. Subjects in the study are all female undergoing gynaecological laparoscopic surgery. The results might be transferable to the targeted patient group.</td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td>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.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Preoperative ginger administration is more effective than placebo. Proportion of subjects require antiemetic use after surgery was significantly reduced in ginger group but not in metoclopramide group. The effect of ginger and metoclopramide are shown comparable. Ginger might be a good antiemetic with comparable therapeutic effect and less side effects.
### SIGN Methodology Checklist 2: Controlled Trials

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

**Guideline topic:** Effectiveness of oral ginger to reduce postoperative nausea and vomiting in adult patients undergoing elective surgical procedures

**Key Question No:** 1

**Reviewer:** Ng Wing Yee

**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...**

<table>
<thead>
<tr>
<th></th>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>The study addresses an appropriate and clearly focused question. Yes □ No □ Can't say ✓</td>
</tr>
<tr>
<td>1.2</td>
<td>The assignment of subjects to treatment groups is randomised. Randomization was mentioned, but the method was not specified. Yes □ No □ Can't say ✓</td>
</tr>
<tr>
<td>1.3</td>
<td>An adequate concealment method is used. Not mentioned. Yes □ No ✓ Can't say □</td>
</tr>
<tr>
<td>1.4</td>
<td>Subjects and investigators are kept 'blind' about treatment allocation. Yes ✓ No □ Can't say □</td>
</tr>
</tbody>
</table>
### 1.5 The treatment and control groups are similar at the start of the trial.
P values not mentioned. No significant difference was mentioned by author.

<table>
<thead>
<tr>
<th>Yes ☑</th>
<th>No ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can’t say ☐</td>
<td></td>
</tr>
</tbody>
</table>

### 1.6 The only difference between groups is the treatment under investigation.

<table>
<thead>
<tr>
<th>Yes ☑</th>
<th>No ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can’t say ☐</td>
<td></td>
</tr>
</tbody>
</table>

### 1.7 All relevant outcomes are measured in a standard, valid and reliable way.

<table>
<thead>
<tr>
<th>Yes ☑</th>
<th>No ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can’t say ☐</td>
<td></td>
</tr>
</tbody>
</table>

### 1.8 What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?

<table>
<thead>
<tr>
<th>10% in (ginger) group</th>
</tr>
</thead>
<tbody>
<tr>
<td>10% in (ginger+ droperidol) group</td>
</tr>
<tr>
<td>3.3% in (droperidol) group</td>
</tr>
<tr>
<td>6.7% in controlled group</td>
</tr>
</tbody>
</table>

### 1.9 All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).

<table>
<thead>
<tr>
<th>Yes ☐</th>
<th>No ☑</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can’t say ☐</td>
<td>Does not apply ☑</td>
</tr>
</tbody>
</table>

There was no assessment for subjects withdrew from the study.
Data analysis of those subjects was not mentioned.

### 1.10 Where the study is carried out at more than one site, results are comparable for all sites.

<table>
<thead>
<tr>
<th>Yes ☐</th>
<th>No ☑</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can’t say ☐</td>
<td>Does not apply ☑</td>
</tr>
</tbody>
</table>

### SECTION 2: OVERALL ASSESSMENT OF THE STUDY

#### 2.1 How well was the study done to minimise bias?

*Code as follows:*

- 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?

Significant result was not obtained in the study.

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

Might be. Subjects in the study are all female undergoing gynaecological laparoscopic surgery. The
results might be transferable to the targeted patient group.

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.

The author suggested that significant reduction of PONV incidence was not found in the study.

Sample size was small with a proportion of subjects not studied due to difficult or multiple intubation and prolonged recovery. No analysis was done among these subjects. The study design was fairly complicated with four arms. The aim of the study was not clear. If the aim of the study is to investigate the effectiveness of ginger in preventing PONV, the design should be simple, which means to have only ginger group and the placebo group. If the aim is to test whether prophylactic antiemetic agent is effective to prevent PONV, the design would be comparing prophylactic group and control group (without prophylactic). Data analysis of the study was poorly conducted. The severity of nausea was measured by a four-point scale, which is ordinal. However, in the analysis, the author just took it as yes or no (No= no sensation of nausea, Yes= mild, moderate and severe nausea). Ginger might not significantly prevent nausea but might improve the severity. How ginger improve the nausea severity cannot be analyzed using such analytic method. There are many arms in this study. Multiple regression was used in this study showing no significant difference between groups. There might be significant difference if using simple regression analysis.
Appendix G.

Methodology Checklist 2: Controlled Trials

SIGN

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


Guideline topic: Effectiveness of oral ginger to reduce postoperative nausea and vomiting in adult patients undergoing elective surgical procedures

Key Question No: 1

Reviewer: Ng Wing Yee

**Before** completing this checklist, consider:

1. Is the paper a **randomised 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? Analyse 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…*  

<table>
<thead>
<tr>
<th></th>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>The study addresses an appropriate and clearly focused question.</td>
</tr>
<tr>
<td>1.2</td>
<td>The assignment of subjects to treatment groups is randomised.</td>
</tr>
<tr>
<td></td>
<td>Blocks of four.</td>
</tr>
<tr>
<td>1.3</td>
<td>An adequate concealment method is used.</td>
</tr>
</tbody>
</table>
1.4 Subjects and investigators are kept 'blind' about treatment allocation. 
Subjects were blinded, but others did not mention

1.5 The treatment and control groups are similar at the start of the trial. 
P value not mentioned

1.6 The only difference between groups is the treatment under investigation.

1.7 All relevant outcomes are measured in a standard, valid and reliable way.

1.8 What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?
0% in intervention group
0% in controlled group

1.9 All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).

1.10 Where the study is carried out at more than one site, results are comparable for all sites.

SECTION 2: OVERALL ASSESSMENT OF THE STUDY

2.1 How well was the study done to minimise bias? 
*Code as follows:*  
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?
Yes. Severity of nausea in intervention group was significantly lower at postoperative 6 hour. Antiemetic effect of ginger on postoperative opioid use was significant.

2.3 Are the results of this study directly applicable to the patient group targeted by this guideline?
Might be. Subjects in the study are all female undergoing gynaecological laparoscopic surgery. The results might be transferable to the targeted patient group.
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.

| The author suggested that the effectiveness of ginger to prevent nausea was significant. However, it is only borderline significant for ginger in preventing vomiting. Surprisingly, antiemetic effect of ginger on postoperative opioid use was significant. |
Methodology Checklist 2: Controlled Trials

**SIGN**

<table>
<thead>
<tr>
<th>Study identification</th>
<th>(Include author, title, year of publication, journal title, pages)</th>
</tr>
</thead>
</table>

Guideline topic: How does oral ginger reduce postoperative nausea and vomiting in adult patients undergoing elective surgeries?

**Key Question No:** 1

**Reviewer:** Ng Wing Yee

**Before** completing this checklist, consider:

1. Is the paper a **randomised 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? Analyse 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

<table>
<thead>
<tr>
<th>In a well conducted RCT study…</th>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 The study addresses an appropriate and clearly focused question.</td>
<td>Yes ☑ No ☐ Can’t say ☐</td>
</tr>
<tr>
<td>1.2 The assignment of subjects to treatment groups is randomised. 4 sized blocks</td>
<td>Yes ☑ No ☐ Can’t say ☐</td>
</tr>
<tr>
<td>1.3 An adequate concealment method is used.</td>
<td>Yes ☑ No ☐ Can’t say ☐</td>
</tr>
<tr>
<td>1.4 Subjects and investigators are kept ‘blind’ about treatment allocation. Researcher was not aware of the treatment regime.</td>
<td>Yes ☑ No ☐ Can’t say ☐</td>
</tr>
</tbody>
</table>
### 1.5 The treatment and control groups are similar at the start of the trial.  
Yes ☑  No □  
Can't say □

### 1.6 The only difference between groups is the treatment under investigation.  
Yes ☑  No □  
Can't say □

### 1.7 All relevant outcomes are measured in a standard, valid and reliable way.  
Yes ☑  No □  
Can't say □

### 1.8 What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?  
- 0% in intervention group
- 2.4% in controlled group

### 1.9 All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).  
Yes ☑  No □  
Can't say □  Does not apply □

### 1.10 Where the study is carried out at more than one site, results are comparable for all sites.  
Yes □  No □  
Can't say □  Does not apply ✓

### SECTION 2: OVERALL ASSESSMENT OF THE STUDY

#### 2.1 How well was the study done to minimise bias?  
*Code as follows:*
- 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?  
Ginger might be effective to reduce PONV because the average nausea score is significantly lower in the intervention group at postoperative 2 hr.

#### 2.3 Are the results of this study directly applicable to the patient group targeted by this guideline?  
Yes. Patient group in the guideline would undergo abdominal surgery, which is similar to the subjects in this study.

#### 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.
The authors concluded that ginger was effective in preventing nausea 2 hours after surgery. They also observed that subjects in the placebo group had a higher incidence and score of nausea and more antiemetic drug use after surgery. No side effects were observed in the dose of ginger used in the study. This study is a good quality study with power =90%. Although it only showed statically significant result of reducing nausea score 2 hours after surgery in the intervention group, ginger might be helpful in reducing PONV with no side effects.
Appendix I.

Methodology Checklist 2: Controlled Trials

SIGN

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

Guideline topic: How does oral ginger reduce postoperative nausea and vomiting in adult patients undergoing elective surgeries?

Key Question No: 1
Reviewer: Ng Wing Yee

Before completing this checklist, consider:

1. Is the paper a randomised 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? Analyse 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…

Does this study do it?

| 1.1 | The study addresses an appropriate and clearly focused question. | Yes ☑ | No ☐ |
| 1.2 | The assignment of subjects to treatment groups is randomised. | Yes ☑ | No ☐ |
| | Computer random number list | Can't say ☐ |
| 1.3 | An adequate concealment method is used. | Yes ☐ | No ☑ |
| | Can't say ☐ |
| 1.4 | Subjects and investigators are kept ‘blind’ about treatment allocation. | Yes ☑ | No ☐ |
| | Blinding of investigator not mentioned. | Can't say ☐ |
| 1.5 | The treatment and control groups are similar at the start of the trial. | Yes ☑ No □ Can't say □ |
| 1.6 | The only difference between groups is the treatment under investigation. | Yes ☑ No □ Can't say □ |
| 1.7 | All relevant outcomes are measured in a standard, valid and reliable way. | Yes ☑ No □ Can't say □ |
| 1.8 | What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed? | 0% in intervention group 0% in controlled group |
| 1.9 | All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis). | Yes ☐ No □ Can't say □ Does not apply ☑ |
| 1.10 | Where the study is carried out at more than one site, results are comparable for all sites. | Yes ☐ No □ Can't say □ Does not apply ☑ |

### SECTION 2: OVERALL ASSESSMENT OF THE STUDY

| 2.1 | How well was the study done to minimise bias? *Code as follows:* | 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? | As the only difference between groups is the ginger intervention, we might say that the effect is due to the intervention. The dose of IV ondansetron are the same in both group. However it might be a confounding factor, which affects the result. The author suggested that it is unethical to withhold any PONV prophylaxis, so a strict control group cannot be included in the study. |
| 2.3 | Are the results of this study directly applicable to the patient group targeted by this guideline? | Yes. Patient group in the guideline would undergo surgical laparoscopy, thyroid surgery, orchiectomy and incisional hernia, which is similar to the subjects in this study. |
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.

1g ginger as preoperative prophylaxis of PONV is effective to reduce episodes of PONV, nausea severity and use of rescue antiemetic. Although IV ondansetron as prophylaxis might be a confounding factor, it could still be concluded that ginger is an effective therapeutic option to prevent PONV.
Appendix J.

Estimated costs of implementing preoperative use of ginger

<table>
<thead>
<tr>
<th>Items</th>
<th>Unit prize &amp; amount</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setup costs (material)</td>
<td></td>
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<tr>
<td>Documents (for information session of implementation of the innovation)</td>
<td>HKD 1x 200</td>
<td>HKD 200</td>
</tr>
<tr>
<td>Ginger powder capsules (for pilot study)</td>
<td>HKD 2 x 20 cases</td>
<td>HKD 40</td>
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<tr>
<td>Assessment form (for pilot study)</td>
<td>HKD 0.1 x 20 cases</td>
<td>HKD 2</td>
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<tr>
<td>Setup costs (non-material)</td>
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<tr>
<td>Nursing hours (for committee meetings)</td>
<td>HKD 400/hr x 1hr x 4 meetings</td>
<td>HKD 1,600</td>
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<tr>
<td>Committee formed by 2 advanced practice nurses (APN) and 4 registered nurses (RN)</td>
<td>HKD 250/hr x 1hr x 4 meetings</td>
<td>HKD 1,000</td>
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<tr>
<td>Information session for ward nurses (16 APNs and 100 RNs in the department)</td>
<td>HKD 400/hr x 0.5hr x 16</td>
<td>HKD 3,200</td>
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<tr>
<td>Nursing hours for administration of ginger and PONV assessment (for pilot study)</td>
<td>HKD 270/hr x 0.1 hr x 20 hrs</td>
<td>HKD 540</td>
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<td><strong>Total costs total:</strong> HKD 19,182</td>
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Maintaining costs (material)

<table>
<thead>
<tr>
<th>Items</th>
<th>Unit prize &amp; amount</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ginger powder capsules</td>
<td>HKD 2 x 1680 cases/year</td>
<td>HKD 3,360/year</td>
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<tr>
<td>Assessment form</td>
<td>HKD 0.1 x 1680 cases/year</td>
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Maintaining costs (non-material)

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<td>Nursing hours for administration of ginger and PONV assessment</td>
<td>HKD 270/hr x 0.1 hr x 1680 cases/year</td>
<td>HKD 45,360/year</td>
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<td></td>
<td><strong>Maintaining costs total:</strong> HKD 48,888/year</td>
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</table>

Estimated costs saved after implementation of preoperative use of ginger

<table>
<thead>
<tr>
<th>Items</th>
<th>Unit prize &amp; amount</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intravenous (IV) metoclopramide (assume 50% of patients experience PONV and require IV metoclopramide)</td>
<td>HKD 30/day x 840 cases/year</td>
<td>HKD 25,200/year</td>
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<tr>
<td>Nursing hours for administration of IV metoclopramide</td>
<td>HKD 270/hr x 0.1 hr x 840 cases/year</td>
<td>HKD 22,680/year</td>
</tr>
<tr>
<td>Hospital length of stay (assume 50% of patients experience PONV and require 1 day extra hospital stay)</td>
<td>HKD 3000/day x 840 cases/year</td>
<td>HKD 2,520,000/year</td>
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<tr>
<td></td>
<td><strong>Total costs saved:</strong> HKD 2,567,880/year</td>
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</table>

66
Evidence-based practice guideline

Title

Evidence-based practice guideline of preoperative use of oral ginger to reduce postoperative nausea and vomiting (PONV) in adult patients undergoing elective surgery

Background

Nausea and vomiting are the most common distressing symptoms after surgery. Patients who need surgery and anesthesia are susceptible to those symptoms. The postoperative incidence of vomiting is 30% and that of nausea is 50% in patients (Gan et al., 2014). Current treatment for PONV using antiemetic drugs could undoubtedly relieve PONV symptoms but those drugs could induce undesirable effects. In recent decades, ginger has been reported as an effective and safe antiemetic agent for adult patients to reduce PONV. A systematic review of good quality randomized controlled trials (RCT) was conducted to assess the effectiveness of oral ginger to reduce PONV. The review found that preoperative use of oral ginger significantly reduced PONV compared to placebo. Nowadays, the use of ginger to reduce PONV is not common in clinical areas. Therefore, a guideline is constructed to guide nurses in applying this innovation in a clinical setting.
Objectives

i. To enhance health service quality based on the best available evidence

ii. To develop an evidence-based guideline which guide nurses in providing prophylactic ginger use and PONV assessment

iii. To standardize the procedures of prophylactic ginger use and PONV assessment

Target group

Adult (aged 18 or above) patients who are admitted for elective surgery under general anesthesia (GA) are targeted to have the intervention.

Recommendations

Scottish Intercollegiate Guidelines Network (SIGN) grading system (Appendix C) was adopted to evaluate the level of evidence of the reviewed studies and the grade of recommendations.

Recommendation 1.0

Screening of patients’ history should be performed to select eligible candidates to receive prophylactic oral ginger.

Grade of recommendation: A

Evidence:

• All subjects were assessed and ineligible candidates who matched the exclusion
criteria were excluded (Bone et al., 1990[1+]; Phillips et al., 1993[1+]; Apariman et al., 2006[1+]; Montazeri et al., 2013[1++]; Mandal et al., 2014[1+]).

- Subjects were excluded if they were in conditions, such as pregnancy, lactating women, alcoholism, known allergy or contraindication to ginger, platelet count below 100 thousand, long-term use of corticosteroids, hepatic, renal or cardiopulmonary abnormality, diabetes and significant gastrointestinal disorders (Bone et al., 1990[1+]; Phillips et al., 1993[1+]; Apariman et al., 2006[1+]; Montazeri et al., 2013[1++]; Mandal et al., 2014[1+]).

- Continuous use of ginger for pregnancy-induced nausea might interfere the clotting profile of patients taking antiplatelet or anticoagulant (Ding et al., 2013[1+]).

Recommendation 2.0

*Preoperative oral ginger should be given to patients who have surgery under general anesthesia (GA).*

Grade of recommendation: A

Evidence:

Subjects in four selected studies had surgery under GA. Preoperative use of oral ginger in other types of anesthesia has not been generally tested (Bone et al., 1990[1+]; Phillips et al., 1993[1+]; Apariman et al., 2006[1+]; Mandal et al., 2014[1+]).
2014[1+]).

**Recommendation 3.0**

*Patients who receive operation with planned surgical time more than 120 minutes should be excluded.*

Grade of recommendation: A

Evidence:

- Surgical types of the subjects were mainly abdominal laparoscopy or ambulatory surgical procedures with mean surgical time 60 minutes (Bone et al., 1990[1+]; Phillips et al., 1993[1+]; Apariman et al., 2006[1+]; Montazeri et al., 2013[1++]; Mandal et al., 2014[1+]).

- Surgical time generally ranged from 25 to 120 minutes in the reviewed studies. A limited number of subjects with the surgical time longer than 120 minutes were studied (Bone et al., 1990[1+]; Phillips et al., 1993[1+]; Montazeri et al., 2013[1++]; Mandal et al., 2014[1+]).

**Recommendation 4.0**

*Prophylactic oral ginger should be given with sips of water one hour before induction of anesthesia.*

Grade of recommendation: A
Evidence:

- Subjects in all five reviewed studies swallowed oral ginger powder with sips of water one hour before induction of anesthesia (Bone et al., 1990[1+]; Phillips et al., 1993[1+]; Apariman et al., 2006[1+]; Montazeri et al., 2013[1++]; Mandal et al., 2014[1+]).

**Recommendation 5.0**

*Prophylactic oral ginger should be given in a form of powder-containing capsules.*

Grade of recommendation: A

Evidence:

- Subjects were provided with oral ginger powder in form of capsule for easier swallowing (Bone et al., 1990[1+]; Phillips et al., 1993[1+]; Apariman et al., 2006[1+]; Montazeri et al., 2013[1++]; Mandal et al., 2014[1+]).

**Recommendation 6.0**

*The dosage of ginger given preoperatively to reduce PONV should be 1 gram.*

Grade of recommendation: A

Evidence:

- The dosage of ginger used in the studies was 1 gram (Bone et al., 1990[1+];
Montazeri et al., 2013[1++]; Mandal et al., 2014[1+]).

- The recommended daily dose of ginger for pregnancy-induced nausea and vomiting is 1 gram. The daily maximum dose of ginger is 4 gram in pregnant women (Ding et al., 2013[1+]).

Recommendation 7.0

Assessment of nausea severity using visual analog scale (VAS) at 2nd, 4th, 6th hour after the surgery is recommended.

Grade of recommendation: A

Evidence:

- The severity of nausea was assessed using VAS at 2nd, 4th, 6th hour after the surgery (Apariman et al., 2006[1+]; Montazeri et al., 2013[1++]; Mandal et al., 2014[1+]).

Recommendation 8.0

The use of the antiemetic drug should be considered in patients with intolerable nausea and vomiting after the surgery.

Grade of recommendation: A

Evidence:

- Rescue antiemetic drugs were given postoperatively to patients with intolerable
nausea and vomiting after the surgery (Bone et al., 1990[1+]; Phillips et al., 1993[1+]; Mandal et al., 2014[1+]).
## Appendix L.

### Timetable for the Implementation Plan

<table>
<thead>
<tr>
<th>Months of Study</th>
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<tbody>
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References


