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Effectiveness of Alternative Nursing Care Methods for Preventing Postoperative Nausea and Vomiting (PONV)

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<p>Postoperative nausea and vomiting (PONV) is very common: 20-30 % of patients suffer from it. PONV can be and is treated with affective antiemetics, but alternative methods are also affective based on studies. Treating PONV is important, because if untreated, it can delay healing.</p> <p>The purpose of this thesis was to describe the effectiveness of alternative nursing care methods for prevention of PONV. The aim was to produce an easily accessible source of information for students and in the field of nursing care alternative methods for preventing PONV. The main research questions for this thesis were: What are the alternative nursing methods preventing PONV and how well do alternative nursing care methods work to prevent post-operative nausea and vomiting following general anaesthesia?</p> <p>Descriptive literature review was used as a research method in this study, and it was carried out by collecting nine (9) research articles regarding the topic by using CINAHL, PubMed and ProQuest databases. The material was then systematically reviewed, analysed by using inductive content analysis and gathered together.</p> <p>The results lead to the conclusions that alternative nursing care methods as a preventive measure for PONV should be more researched and taken into use more widely, since different studies show that the alternative methods are effective. By increasing more participants, researching globally and adding wider scale of procedures (duration, more invasive) could give even more detailed and confirming information. Results of this study could be utilised by educating acu-qualified nurses who could share their knowledge in the field and use their expertise for the benefit of patients.</p>	
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<p>Postoperatiivinen pahoinvointi ja oksentelu on erittäin yleistä: 20–30 % potilaista kärsii siitä. Oireita voidaan helpottaa pahoinvointilääkkeillä, mutta vaihtoehtoiset hoitomenetelmät ovat tutkimusten mukaan myös erittäin tehokkaita. Postoperatiivisen pahoinvoinnin hoitaminen on tärkeää, koska hoitamattomana se voi hidastaa paranemista.</p> <p>Tämän opinnäytetyön tarkoituksena oli kuvata toimenpiteen jälkeisen pahoinvoinnin ja oksentelun vaihtoehtoisten hoitomenetelmien tehokkuutta. Tavoitteena oli luoda helposti tavoitettavaa tietoa terveydenhuoltoalan opiskelijoille sekä työpaikoille. Opinnäytetyön tutkimuskysymykset olivat: mitkä ovat toimenpiteen jälkeisen pahoinvoinnin ja oksentelun vaihtoehtoiset hoitomenetelmät ja kuinka hyvin ne toimivat yleisanestesian jälkeisen pahoinvoinnin ja oksentelu ehkäisyssä?</p> <p>Tutkimusmenetelmänä käytettiin kuvailevaa kirjallisuuskatsausta, jossa kerättiin aiheeseen sopiva useampi (9) tutkimusartikkeli CINAHL, PubMed ja ProQuest tietokannoista. Aineisto käytiin systemaattisesti läpi ja tulokset analysoitiin induktiivista sisällönanalyysiä hyödyntäen, jonka jälkeen ne koottiin yhteen.</p> <p>Tulokset yhdeksän eri tutkimuksen perusteella johtivat päätelmiin, joissa vaihtoehtoiset hoitomenetelmät postoperatiivisen pahoinvoinnin ja oksentelun ennaltaehkäisyssä tulisi olla laajemman tutkimuksen ja käytön piirissä, koska eri tutkimukset osoittavat menetelmien tehokkuuden. Koska kuitenkin otos oli suhteellisen pieni ja kohdistui vain tiettyihin toimenpiteisiin, tulisi tutkimusta jatkossa laajentaa osallistujien määrää lisäämällä, globaalisti sekä koskemaan eri mittaisia ja erityyppisiä, kuten invasiivisempiä, toimenpiteitä. Tämän opinnäytetyön tuloksia voisi hyödyntää kouluttamalla akuhoitoihin pätevöityviä sairaanhoitajia, jotka voisivat sekä jakaa osaamistaan että käyttää taitojaan potilaiden hyväksi. Tuloksia voitaisiin myös käyttää sairaanhoitajien opetuksessa ja uusien aiheeseen liittyvien tutkimuksien lisäämisessä.</p>	
Avainsanat	postoperatiivinen pahoinvointi ja oksentelu, ennaltaehkäisy, hoitotyön vaihtoehtoiset menetelmät

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1 Introduction

General anaesthesia (GA) is a medically induced state of controlled unconsciousness: a mixture of sleep, painlessness and muscle paralysis that causes the patient to be in a deep unconscious state (NHS 2021). Postoperative nausea and vomiting (PONV) related to general anaesthesia is a simple but complex problem. It is influenced by numerous factors such as the patient, procedure, anaesthesia and the release of 5-hydroxytryptamine (5-HT) in a series of neuronal events involving both the central nervous and gastrointestinal tract. (NIH 2016.)

PONV is important to take into consideration because 20-30% of the patients undergoing surgery experience it (Kiviluoma et al. 2021: 916). This is because during anaesthesia the human body goes through unnatural stress. Postoperative nausea and vomiting are physiological symptoms. Nausea is an uncomfortable subjective feeling, whereas vomiting is stomach content coming out from the mouth. PONV increases the risk of the recovery process by slowing down an unpleasant experience for a patient. (Terveyskylä 2021.) It also causes financial damage, both to a patient and to society with prolonged sick leave. Vomiting and nausea can cause dehydration, fluid balance disorder, bleeding, the formation of a haemorrhage, loose stitches, oesophageal rupture and aspiration. (Kiviluoma et al. 2021: 916.)

There are five known risk factors which increases the risk of suffering PONV; female gender; age over 50; previous postoperative nausea; non-smoking; migraine tendency and being prone to motion sickness. Also, long duration of anaesthesia, type of surgery (e.g., gynaecological, abdomen, plastic, head and neck) and opioid analgesia adds to the probability of PONV. When preventing PONV predisposing factors must be considered; prevention and medication are planned carefully. (Kiviluoma et al. 2021: 917, Heikkinen et al. 2013: 209.)

On a wide international study of over 4000 patients, it was discovered ondansetron 4 mg, dexametzone 4 mg and droperidol 1,25 mg prevent 26% of the risk of PONV. When using propofol instead of vaporizable anaesthetics, the risk decreases by 19% and when avoiding nitric oxide, it decreases by 12% (Kiviluoma et al. 2021: 924). Finding methods to minimise PONV was the goal of this study. Multiple studies show that alternative methods such as acupuncture are helpful prior to the operation. (Kiviluoma et al. 2021: 925.)

2 Background

2.1 General Anaesthesia

General anaesthesia (GA) is described as above mentioned and it is executed with anaesthetic gases, intravenous anaesthetics, analgesics (e.g., propofol, sevoflurane, thiopental, midazolam, ketamine and dexmedetomidine) and muscle relaxants (e.g., alcurone and rocuronium). This causes medicinal relaxation. (Kiviluoma et al. 2021: 106, 129.) GA requires certain criteria to be fulfilled to be used. The decision (indication and contraindications) is made by anaesthesiologist together with the patient beforehand. A patient's general health status must be at a level that can tolerate deep sedation. Age, physical condition, illnesses (cardiovascular, diabetes), medication, bodyweight (obesity comorbidity), infections and living habits (tobacco, alcohol, and other substances) are therefore precisely checked over. (Current Care Guidelines 2014.)

2.2 Postoperative Nausea and Vomiting (PONV)

There is a difference between nausea and vomiting: where nausea is a subjective feeling of discomfort and does not always lead to vomiting, whereas vomiting is an objective patient experience involving the expulsion of the gastric contents through the mouth. Both are essential preventive defence processes throughout evolution (NIH 2021). When talking about PONV, the surgery itself with medication (vaporisable anaesthetics and opioids) increases the body's defence mechanisms by stimulating vomiting centre in the brain. Females, smokers, those with previous experience of PONV or motion sickness, and postoperative opioids, all enhance the risk of PONV. Also, age and anxiety contribute to the outcome. (Finnanest 2021.) The literature already shows that using ondansetron during and after anaesthetic-used procedures prevents PONV. It is also known that the healthier the patient, the easier the recovery is. (Kiviluoma et al. 2021: 106, 129, 920.)

2.3 Preventive Nursing Methods

Nurses have limited ways to help patients pre- and postoperative non-pharmacological ways, but those options can decrease postoperative nausea. These methods include, for example, listening: the patient feels heard and respected about fears, previous experiences and other exposure factors. Nurses can boost a patient's self-confidence, decrease fear, and give relevant, accurate information about what is going to happen in the operating theatre. (Arweström et al. 2010.)

Apfel-scoring was created by cross-validating two separate materials from which these five (5) factors was recognised: female gender, smoking, sensitivity to nausea, age over 50 and opioid use after surgery contributes PONV and slows down recovery. (Olkola et al. 2021: 919.) Table 1 describes risk factors and medication correlation.

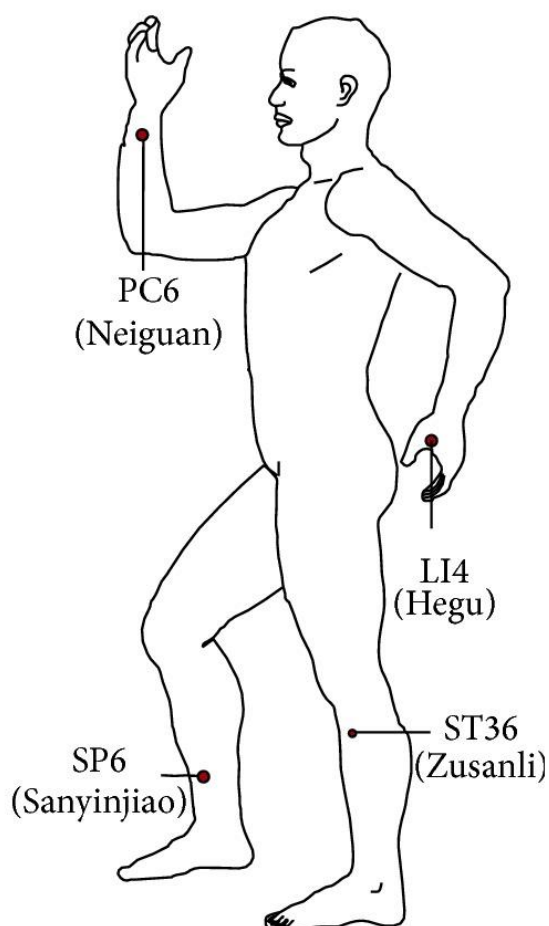
Table 1. Postoperative nausea and vomiting risk assessment and preventive medication strategy accordingly (Kolodzie & Apfel 2009; 22: 532-8.)

No risk factors (10%)	One (1) risk factor (20 %)	Two (2) risk factors (40 %)	Three (3) risk factors (60 %)	Four (4) risk factors (80 %)
No preventive medication	Dexamethasone 4 mg	Dexamethasone 4 mg + propofol anaesthesia or dopamine receptor blocker	Dexamethasone 4 mg + propofol anaesthesia or dopamine receptor blocker or 5-HT3-blocker	Dexamethasone 4 mg + propofol anaesthesia or dopamine receptor blocker, 5-HT3-blocker, or NK1-blocker

Acupuncture and acupressure by stimulating P6-acupoint (Neiguan-point or Pericardium 6) has been stated as effective nausea medication. However, because the stimulation is difficult to implement, it is not widely in use. Ginger and abundant hydration might also help, but they lack research. (Kiviluoma et al. 2021: 925.) P6 is in the wrist, between the tendons, two fingers width away from the crease of the wrist and palm.



Picture 1. P6 acupoint. (Lopu jo!, 2022.)



Picture 2. Location of Hegu (L14), Zusanli (ST36), and Sanyinjiao (SP6) and Neiguan (PC6) acupoints. (NHL 2015.)

The relief of pain via acupuncture has been found to cause the release of neurotransmitters at the cellular level into the bloodstream. It is still unknown why P6 is particularly efficient. (Lopu jo! 2022; Aorn.org.2020.) Whilst it has similar effects as traditional antiemetics such as metoclopramide, cyclizine, prochlorperazine, droperidol, ondansetron and dexamethasone. Acupressure can be done by anyone, while for acupuncture a licensed acupuncturist is required. (Aorn.org. 2020.)

Auricular acupuncture (picture 3. below, thin needles inserted to outer ear), aromatherapy including lavender, ginger, spearmint, peppermint oil and alcohol swab sniff can also make a difference when suffering from PONV. Results are based on relaxation, to ease headaches, to settle the stomach to restore its natural function and to relieve nausea. (Aorn.org. 2020.) As well as the above, hypnosis, relaxation imagery, music therapy, aromatherapy have been used for the past two centuries (NIH 2015).



Picture 3. Auricular acupuncture (Perinton Family Acupuncture.)

3 Purpose, Aim and Research questions

The purpose of this thesis was to describe the effectiveness of alternative nursing care methods for prevention of PONV. The aim was to produce an easily accessible source of information for students and in the field of nursing care alternative methods for preventing PONV.

The main research questions for this thesis were: what the alternative nursing methods are preventing PONV and how well alternative nursing care methods work to prevent PONV following general anaesthesia.

4 Methodology

This thesis is a descriptive literature review, which can be defined as such; it gives an overview of the many publications and studies mentioned and information on their research methodologies and findings. (Aveyard 2014.)

Literature review progresses by formatting the research question, seeking material, selecting it, constructing the description and examine of the results. In actuality, a literature review is a critical, succinct analysis of earlier studies and literature associated with the research issue, followed by a synthesis informed by the researcher's own objectives based on that. (NIH 2017.)

The advantages of descriptive literature review are throughout, information synthetisation and conclusions about the topic. Literature reviews also create new information through careful evaluation and critical summarisation. Also, it answers the research question. (Howandwhat 2022.)

The disadvantages on the other hand are that they are time consuming, and they lack of relevant and necessary amount of research due to lack of interest for the topic or different cultures, such as in this thesis. (Howandwhat 2022.)

4.1 Data Search

The data was collected by using three different databases: CINAHL and PubMed and ProQuest, to find research articles on this topic since these databases had the most search results after preliminary searches. Studies published from 2012 to 2022 were included in the data searches, this was used as a limitation in the database search (Table 2).

Table 2. Inclusion and exclusion criteria

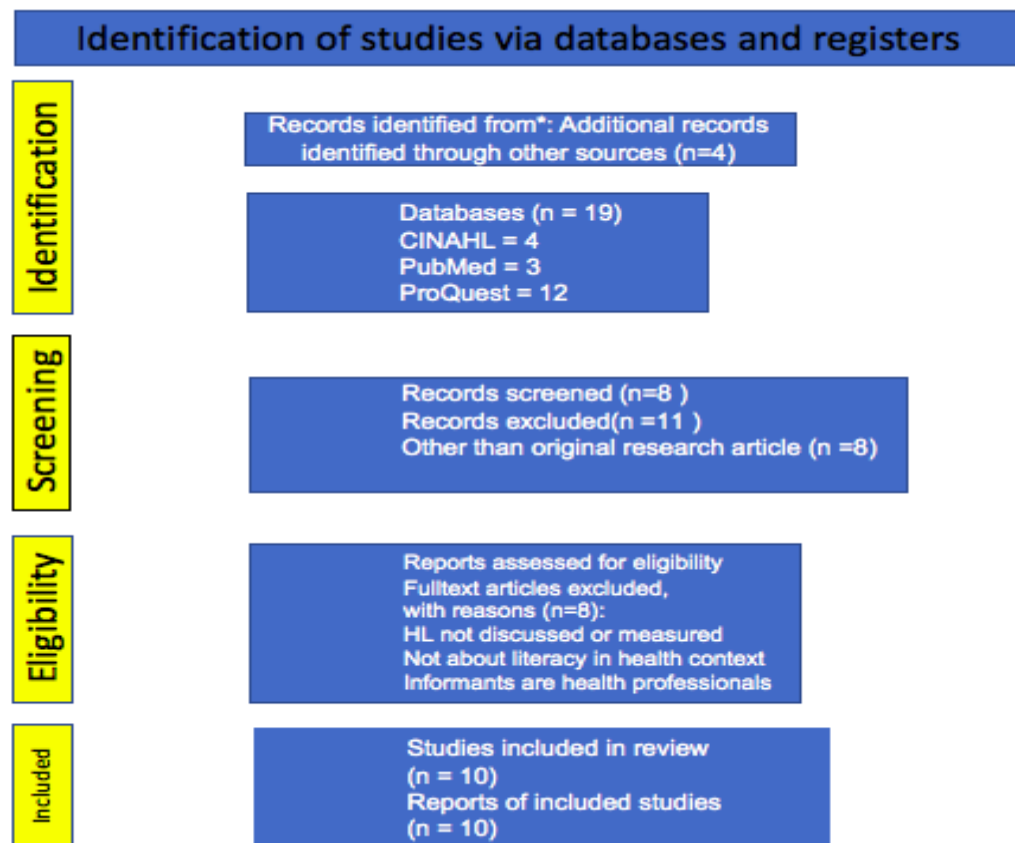
Inclusion criteria	Exclusion criteria
Surgery patients in general anaesthesia; methods and interventions prevent postoperative nausea and vomiting	sedation, local anaesthesia, cancer, chemotherapy, children
The content of the research answers the research questions	The content of the research does not answer the research questions
Peer reviewed research articles	Pro gradu, thesis, dissertation, literature review
Publication in English or in Finnish	Other language than Finnish or English

The Boolean approach was applied in order to specify the search. One can focus, broaden, or express the study by utilising the Boolean technique where words and phrases were mixed with the Boolean operators AND, OR, NOT, quote marks ("), and brackets (). (Aliyu 2017: 216–222.) Search terms (General anaesthesia) AND (drug*) AND (postoperative nausea OR PONV) AND vomiting AND prevent* AND (acupuncture OR aromatherapy) NOT (child* OR sedation OR local anaesthesia OR cancer* OR

chemotherapy) were used in database searches (Appendix 1). These were carefully chosen after preliminary searches.

First, to determine whether the search results met the inclusion criteria, the title of the article was read. The second stage involved reading the abstracts of the articles that had been included based on their titles. These abstracts served as the basis for excluding articles that did not focus on inclusion and exclusion criteria. The remaining articles were carefully examined. Remaining ones that satisfied all inclusion requirements were selected based on the entire content. The process is presented in the Prisma flow diagram (Figure 1).

Figure 1. PRISMA flow diagram



The quality of the selected articles was appraised using critical appraisal programme (CASP). CASP is the process in which the research is examined for its trustworthiness, value and relevance in a particular context. With the use of the critical appraisal skills, one can objectively evaluate the reliability, applicability, and outcomes of published articles. (CASP, 2023.) This thesis went through CASP checklist of 8 questions and three (3) sections A-C. These questions are designed to help thinking logically. Questions were divided in three sections by appraisal tool (Appendix 5).

4.2 Data Analysis

By focusing on the content or contextual meaning of the data being collected, inductive content analysis was used to analyse the data for this thesis. Content analysis (Appendix 2) is only possible after the content is carefully chosen and given a thorough reading. Inductive content analysis is often used amongst nursing students and during nursing studies. Open coding, the creation of general categories, subcategories, and abstraction are all components of inductive analysis. Open coding refers to the process of summarising data using headings that explain the meaning of the original data. Later, a list of these headers is created to create categories. Subcategories of parallel and non-parallel categories are separated into categories. Analysing the correlation and meaning within the topic while looking for key phrases, themes, or subjects within a set of data is essential to data analysis. (Elo & Kyngäs 2008. 107-115.)

Qualitative content analysis method was used in this thesis. Content analysis is a research tool used to determine the presence for example certain concepts. This method is used in human sciences to describe phenomenon and interpret text data. The focus is on describing, understanding and explaining by quantifying and analysing. Content analysis is to categorize data to classify, summarize and tabulate the data. (Columbia 2023.)

In the appendices, there is a table that contains the findings of the data search (Appendix 1.). The above-mentioned databases were searched on using the Boolean approach and the search terms listed in Appendix 1.

5 Results

This descriptive literature review examined altogether 9 (n=9) studies (Appendix 3). The studies included elective and non-elective patients in China (1), USA (4), The UK (1), Macedonia (1), and Australia (2). The aim for all studies except two, was to assess, evaluate and compare the effectiveness of chosen alternative nursing methods. Two studies conducted a survey to acknowledge patients' attitudes and opinions on different alternative nursing methods to prevent PONV. To analyse the data, studies used meta-analyses' and statistical analyses' by using different programs.

As main limitations to these studies, the studies were conducted in small areas with relatively small numbers of participants. These studies were only conducted in very non-versatile number of surgeries. To be exact: laparoscopic cholecystectomy, laparoscopic surgery, craniotomy and strabismus surgery.

Four of the studies in this thesis were randomised controlled trials (RCT) which increases the reliability of the results. Two of the RCT's were about TEAS, one about P6 acupoint stimulation and one about auricular acupressure.

5.1 The effectiveness of alternative nursing care methods

Teas has shown the best effect to prevent PONV, as it was the most researched within the nine studies that were included in this thesis. TEAS reduced PONV, lower rates of dizziness and pruritus, and fewer patients who needed antiemetic rescue (Appendix 5). TEAS has gained widespread acceptance and use throughout the world, and it combines transcutaneous electrical nerve stimulation (TENS) and conventional Chinese acupuncture (Guoheng et al. 2021). In gynecological laparoscopic surgery, preoperative TEAS is a useful tactic for raising the level of recovery, postoperative analgesia, patient satisfaction, and hastening discharge (Chen et al. 2015b).

While the patient is in the PACU for the first 24 hours after surgery, auricular acupressure significantly lessens nausea. Uncertainty exists on whether the intervention reduces nausea directly or as a side effect by lowering the requirement for medication. (Bosco et al. 2017.) As well as intraoperative laser acupuncture stimulation of PC6 and LI4 lowers PONV in patients when combined with an antiemetic drug (Akcaboy et al. 2020).

A study about P6 acupoint stimulation indicates that it is an excellent adjunct to antiemetic drug therapy in the effective prevention of PONV (Li et al. 2013). For the prevention of PONV, the effect of TEAS of P6 combined with dexamethasone is superior to that of dexamethasone alone and comparable to that of tropisetron combined with dexamethasone (Chen et al. 2015a).

Patients are open to the idea of using gum as a possible non-drug treatment for PONV. If clinical trials demonstrate that chewing gum is successful, this therapy approach is likely to be widely adopted. (Darvall et al. 2019.)

6 Discussion

The pharmacological nursing care methods play a big role when it comes to prevention of PONV, there is no changing that, since general anaesthesia is medication caused

state of controlled unconsciousness (NHS 2021). Alternative methods in a use of preventive method saves resources within the hospital and is better and safer for the patient. The purpose of our review was to find out how effective these methods are.

From previous knowledge, in western medicine, the amount of alternative nursing care methods for preventing PONV have been very limited. Western postoperative nursing care is very pharmacological-centered, and the general culture has not been, and to this day, is not very accepting when it comes to alternative methods (herbs, acupuncture, acupressure etc.).

6.1 Main Results

As this thesis was done and final results were found, all the results from selected articles indicate that alternative nursing care methods are effective as a preventive measure for PONV.

As well as the two different surveys conducted in Australia show that, as a PONV prevention strategy, chewing gum is well welcomed by patients (Darvall et al. 2019) and patients have interest in trying acupuncture as a preventive measure for PONV (Trinca et al. 2017). These suggest that the unwillingness of patients is a very unlikely barrier to implement these techniques.

The effectiveness of TEAS (transcutaneous electrical acupoint stimulation) has been studied in three different articles. TEAS has shown effectiveness when used alone (Chen, J. et al. 2020) and when used with of dexamethasone (Chen et al. 2015a). TEAS has also shown effectiveness as a preoperative preventive measure (Chen, Y. et al. 2015). PONV is also decreased by PC6 and LI4 intraoperative laser acupuncture stimulation in combination with an antiemetic medication (Akcaboy et al. 2020). Thus, as a simple assumption, TEAS with PC6 and LI4 intraoperative laser acupuncture stimulation in combination with an antiemetic medication will reduce the incidence of PONV.

Due to its superior ability to prevent PONV in the first six hours following surgery, granisetron is a superior alternative to ondansetron, which is more commonly used as an antiemetic (Bafghi et al. 2019). As a recommendation and in favour of this thesis, more studies and results should be researched about granisetron, especially when used simultaneously with some form of alternative nursing method. (Trinca et al. 2017.)

6.2 Ethical Considerations and Reliability

Turnitin program is used in this thesis to avoid plagiarism. As a gesture of respect towards the original authors of the used references, in-text references are correct and overall referencing is done clearly and correctly. When doing a literature review, which depends on previously created literature, it is extremely important to respect previously done research. (TENK, 2012. p.6.)

Duty to maintain the integrity of the research (The European Code of Conduct for Research Integrity 2017) is considered by both authors of his thesis. Only reliable databases offered by our University of Applied Sciences were used.

Ethical considerations have been considered in this thesis by becoming sufficiently familiar with the subject. Also, ethical consideration includes following the ethical guidelines of good scientific practice (TENK, Hyvä tieteellinen käytäntö 2021). Since reliable articles and sources were used in this literature review, ethical approval has therefore already been considered.

Data searches were made by following guidelines in the utilisation of databases: CINAHL, Medline and ProQuest. Data selection was accurate, precise, considered and eliminated certain results and it left the analysis phase to be relevant and reliable. Therefore, as a challenge, article findings were more limited and quantitatively small. However, due to the reasons mentioned previously, ethical considerations are easier to consider in every step, especially relating to results and methods.

Reliability related factors could be, for example, reliability of the methods used in descriptive literature review: methodical and game rules were followed (planning, search and selection) (Salminen, 2011. P. 7; 16).

6.3 Recommendations

Current situation with alternative nursing methods is that they are not in wide enough use that could be possible. In the western culture it is more common to believe in pharmacological curing methods. Culture differences and people's prejudices are the main obstacles for these methods to be taken into use more globally. With more professionals using alternative nursing care methods to prevent PONV there could be more inspiration to do further research and learn more.

These results could be utilised practically by training acu-competence nurses to both educate others in surgical wards and use acupuncture more often. These findings could also be used for educational purposes in nursing schools, which could also encourage future professionals in doing more research.

To summarise the recommendations from the authors of this thesis, is to widen the research, with more participants and a more global aspect. Using these alternative nursing care methods in more diverse surgeries; shorter, longer, laparoscopic and more invasive. As long it is safe for the patient.

7 Conclusions

To conclude, alternative nursing care methods as a preventive measure for PONV should be more researched and taken into use more widely. Different studies show that the alternative methods are effective (Appendix 4.), especially the use of TEAS has shown its effectiveness. Alternative methods should be used simultaneously with different medicines to prevent and treat PONV.

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Appendix 1. Results of the Database Searches

DATABASE	Search phrase	Lim- iters	Number of hits	Selected based on title	Selected based on abstract	Selected based on whole text
CINAHL	(General anaesthesia) AND (drug*) AND (postoperative nausea OR PONV) AND vomiting AND prevent* AND (acupuncture OR aromatherapy) NOT (child* OR sedation OR local anaesthesia OR cancer* OR chemotherapy)		N= 4	n= 4	n= 4	n= 4
PubMed	(General anaesthesia) AND (drug*) AND (postoperative nausea OR PONV) AND vomiting AND prevent* AND (alternative method*) NOT (child* OR sedation OR local anaesthesia OR cancer* OR chemotherapy)		n= 3	n= 2	n= 2	n = 1

ProQuest	(General anaesthesia) AND drug* AND (postoperative nausea OR PONV) AND vomiting AND prevent* AND (acupuncture OR aromatherapy) NOT (child* OR sedation OR local anaesthesia OR cancer* OR chemotherapy)		n= 12	n= 4	n=4	n= 4
Total			N= 19	N= 10	N= 10	N= 9

"Are the results of the study valid?"	Section A
1. Was there a clear statement of the aims of the research?	YES
2. Is a qualitative methodology appropriate?	YES
3. Was the research design appropriate to address the aims of the research?	YES
4. Was the data collected in a way that addressed the research issue?	YES
"What are the results?"	Section B
1. Have ethical issues been taken into consideration?	YES
2. Was the data analysis sufficiently rigorous?	YES
3. Is there a clear statement of findings?	YES
"Will the results help locally?"	Section C

1. How valuable is the research?	YES
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Appendix 3. Description of the Selected Articles

Study	Aim	Sample	Research design/methods/analysis	Major findings	Limitations
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Chen, J. et al. 2020 China	To assess the effectiveness of TEAS (transcutaneous electrical acupoint stimulation) on prevention of PONV after general anesthesia	The 14 studies involved 1653 participants, 835 participants received TEAS in experimental group, while 818 participants received sham TEAS in control group	Meta-analysis, statistical analyses by using Review Manager version 5.3, the chi-square test, I^2 statistic, a Mantel-Haenszel randomized effect model	The current findings suggested that, as compared to controlled intervention, the use of TEAS resulted in significantly reduced rates of PONV, fewer patients who required antiemetic rescue, and lower rates of dizziness and pruritus.	Small number of trials conducted only in China and USA
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Akca-boy et al. 2020 USA	To evaluate the effectiveness of intraoperative laser acupuncture stimulation of Pericardium 6 (PC6) and Large Intestine 4 (LI4) acupoints combined with anti-emetic drug prophylaxis on PONV	A total of 88 patients, scheduled for laparoscopic cholecystectomy, were assigned into 2 groups	Statistical analysis was performed by SPSS 24.0 program, Numerical data were analyzed with independent samples <i>t</i> test and categorical data with Chi-square, Fisher's exact tests	There was no significant difference between groups in age, sex distribution, and ASA status. When paired with an anti-emetic medication, intraoperative laser acupuncture stimulation of PC6 and LI4 reduces PONV in patients undergoing laparoscopic cholecystectomy	
Chen, Y-H. et al. 2015 UK	Comparing the effects of combinations of electrical acupoint stimulation or tropisetron with dexamethasone with the effects of dexamethasone alone, for inhibition of	Randomized 157 patients undergoing elective gynaecological laparoscopic surgery under GA into three groups: acupoint stimulation+dexamethasone (n=53), tro-	Normality was tested by the Kolmogorov–Smirnov analysis. Kruskal–Wallis test. Fisher's exact test was used to assess categorical outcomes among groups.	Comparable to tropisetron combined with dexamethasone for the prevention of PONV in gynaecological patients undergoing laparoscopic surgery, the effect of TEAS of P6 in combination with dexamethasone is superior to dexamethasone alone	a potential placebo effect may contribute to the greater antiemetic efficacy in the acustimulation group due to those patients receiving the

	PONV in gynaecological patients undergoing laparoscopic surgery	piisetron+dexamethasone (n=53), and dexamethasone alone (n=51).			active P6 stimulation were more likely to detect a tingling sensation. A general limitation to a single type of short-duration surgery.
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Li et al. 2013 USA	1. To evaluate the efficacy of pericardium 6 (P6; also known as Neiguan) acupoint stimulation versus placebo, and routine antiemetic for preventing PONV after craniotomy, and 2. to compare the efficacy of invasive acupuncture with non-invasive transcutaneous electrical nerve stimulation (TENS) on P6.	A total of 300 Chinese patients undergoing craniotomy	A single-center, prospective, double-blind, five-arm, parallel-group, randomized controlled trial. All data analyzed by a blinded statistician at a separate location, The intention-to-treat principal, Chi-square test, Kruskal-Wallis- test, Nemenyi test and Scheffé's method	In order to effectively prevent PONV in patients undergoing craniotomies, P6 acupoint stimulation is a useful addition to conventional antiemetic medication therapy. Traditional acupuncture works better than TENS	Recruiting patients with no experience of any kind of acupuncture
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Bafghi et al. 2019 Macedonia	To compare the effects of both ondansetron and granisetron on the reduction of PONV after strabismus surgery	120 patients who referred to the operating room of the hospital for strabismus surgery and randomly divided into three groups: A (Ondansetron), B (Granisetron) and C (Placebo). Study population consisted of 76 male patients (63.3%) and 44 (36.7%) females.	Statistical analysis through SPSS, data were analysed by Chi-square, ANOVA and TUKEY tests, Kolmogorov-Smirnov test	Granisetron is a better option to Ondansetron for preventing PONV since it is more effective at preventing PONV during the first six hours following surgery	
Bosco et al. 2017 USA	To investigate the effect of acupressure in patients with a history of PONV and motion sickness.	A total of 150 patients using a computer-generated randomization schedule to one of three groups: auricular acupressure point intervention group (N =	Using univariate analysis, ANOVA, and multiple comparisons	In the 24 hours following surgery, auricular acupressure greatly reduces nausea while the patient is in the PACU. It is unclear if the intervention reduces nausea as a direct result or as a side effect by reducing the need for drugs	Need further research on the effect of acupressure on patients undergoing other

		50), sham point group (N = 47), and placebo group (N = 53)			types and longer surgery
Dar-vall et al. 2019 Aus-tralia	To conduct a survey of postoperative surgical patients' attitudes regarding PONV and its treatment. asking patients if they had had post-operative nausea or vomiting and if they would be willing to try any non-drug remedies in general and chewing gum in particular.	100 patients completed the survey; Median (IQR) age was 50 (33–64) years; 49 (49%) were female and 51 (51%) were male	Survey approved by Ethics Committee, Chi-square test	Chewing gum as a possible non-drug treatment for PONV is well welcomed by patients. If chewing gum is shown to be effective in clinical studies, widespread adoption of this therapy method is probable	Survey was confined to a single, metropolitan hospital, and may not be generalisable to other healthcare settings

Trinca et al. 2017 Australia	To conduct a survey in a large Western teaching hospital that did not offer acupuncture to find out what patients knew and thought about the practice as a management option for PONV	161 participants, many of them had a European background (88.8%) and were over 40 years old (87.6%).	Over a 4-week period, a self-completed, anonymous questionnaire survey, Descriptive analysis (number and %) was used to present the survey data,	Australian patients showed a great deal of interest in acupuncture for PONV, indicating that patient desire is not likely to be a significant obstacle to the use of this method. This is positive and offers devoted backing for acupuncture's possible inclusion in a hospital setting for urgent care	Future studies should ideally include patients across a wider age range and with more diverse backgrounds and more world-wide
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Chen Y et al. 2015 USA	to evaluate the effects of transcutaneous electric acupuncture stimulation (TEAS) on the quality of recovery (QoR) and postoperative analgesia after gynaecological laparoscopic surgery	71 participants, aged 18 to 60 years, who underwent general anaesthesia for elective gynaecological laparoscopic surgery	Single-center, prospective, randomized, double-blind, placebo-controlled trial, Statistical analysis was performed using SPSS version 18.0, Kolmogorov-Smirnov test, Mann-Whitney test,	For gynaecological laparoscopic surgery, preoperative TEAS is a successful intervention for enhancing the standard of recovery, postoperative analgesia, patient satisfaction, and hastening discharge. To determine the best TEAS timing, frequency, and intensity use, more research is necessary	Cultural differences between countries may limit the questionnaires' generalizability, a single center study in a strictly defined patient population. This may potentially limit external validity of the findings
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Appendix 4. **The Effectiveness of Alternative Nursing Care Methods**

	Procedure	reduced number of patients needing antiemetic rescue	reduced incidents of PONV	reduced incidents of dizziness
TEAS (Chen, J. et al. 2020) China		x	x	x
Intraoperative laser acupuncture (Akcaboy et al. 2020) USA	laparoscopic cholecystectomy		x with antiemetics	
Combination of electrical acupoint stimulation with and without dexamethasone (Chen, Y-H. et al. 2015) UK	gynaecological patients undergoing laparoscopic surgery		X with dexamethasone	

Appendices

2 (2)

Pericardium P6 acupoint stimulation (Li et al. 2013) USA	craniotomy	x	x	
comparing ondansetron and granisetron (Bafghi et al. 2019) Macedonia	Strabismus (vision disorder) procedure		X with granisetron	
Auricular acupressure among patients with history of PONV (Bosco et al. 2017) USA	General anaesthesia	x	x	
TEAS (Chen Y et al. 2015) USA	gynecological laparoscopic surgery		x	x