



# Non-pharmacological pain management in adults after surgery-Literature review

Zhiwei Wang

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Laurea University of Applied Sciences

Non-pharmacological pain management in adults after surgery-  
Literature review

Zhiwei Wang  
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Zhiwei Wang

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#### Abstract

Postoperative pain is one of the most serious and concerned problems in patients undergoing surgery. Effective postoperative pain management can reduce patients' pain, decrease the use of analgesics and complications, increase patient satisfaction. Due to the side effects and the risk of addiction of medications, more and more researchers and guidelines recommend multi-mode management of postoperative pain. Non-pharmacological therapies are methods to manage pain without drugs. They have the characteristics of low cost, safety and easy implementation by nurses, and have been more and more widely recommended and applied.

The thesis is about non-pharmacological pain management in adults after surgery. The theoretical background includes the concept and classification of pain, pain management, concept and methods of non-pharmacological pain management. The purpose is to search for and describe non-pharmacological pain management, to find effective and high-quality evidence to guide surgical nursing clinical practice. The study conducted based on literature review, the data were obtained from Laurea Electronic Library databases and Google Scholar. The selected articles were English articles published from 2012 to 2021 on adult surgical patients. Ten articles in three non-drug methods were included, which were analyzed and summarized using synthesis method separately.

The findings of this thesis show that massage can reduce postoperative pain intensity, it can be part of the multimodal pain management scheme. It is necessary to raise awareness of massage therapy to promote its use. Acupuncture and electroacupuncture can decrease postoperative pain and the consumption of analgesics, electroacupuncture might also reduce analgesics related side effects. They can be used as an adjuvant therapy for postoperative pain management. Virtual reality (VR) can relieve pain after surgery, it may be able to improve patients' satisfaction and shorten the hospital stay. VR is a safe and effective non-drug technology. It can be as an adjunct method for postoperative pain management.

Keywords: non-pharmacological pain management, after surgery, adults

## Table of Contents

1	Introduction .....	5
2	Theoretical framework .....	6
2.1	Pain and postoperative pain.....	6
2.2	Pain management .....	6
2.3	Non-pharmacological pain management .....	7
3	Purpose and aim .....	7
4	Methodology.....	8
4.1	Descriptive literature review.....	8
4.2	Literature search.....	9
4.3	Conducting data gathering and analysis.....	9
5	Results .....	10
5.1	Physical therapy.....	10
5.1.1	Massage .....	10
5.1.2	Acupuncture.....	11
5.2	Psychological therapy .....	12
5.2.1	Virtual Reality (VR) .....	12
6	Discussion and Conclusion.....	13
7	Ethical consideration .....	14
7.1	Reliability and relevance .....	15
	References .....	17
	Tables.....	22

## 1 Introduction

Postoperative pain is one of the most serious and concerned problems in patients undergoing surgery. Study found that 86% of patients experienced postoperative pain, 75% of them had acute moderate to severe postoperative pain (Gan, Habib, Miller, White & Apfelbaum 2014). Postoperative pain can raise patients' blood pressure and heart rate, affect patients' mood, sleeping and quality of life, and then affect postoperative satisfaction and rehabilitation progress. Effective postoperative pain management can promote early mobilization, reduce complications, shorten hospital stay, increase patient satisfaction and reduce nursing care costs. However postoperative pain management remains an issue (Rawal 2016).

Opioids had been considered as an effective agent for postoperative pain management despite some side effects (Rawal 2016). In recent years, researchers have increasingly recognized that opioids have many side effects, including nausea, vomiting, drowsiness, constipation and even intestinal obstruction, morphine can cause respiratory depression, opioid overuse may cause addiction and so on (Gan 2017). Professionals have been developing safer and more effective alternatives to opioids to manage postoperative pain such as multimodal analgesia and non-pharmaceutical methods (Graff & Grosh 2018; Cuomo, Bimonte, Forte, Botti & Cascella 2019).

For a long time in the past, postoperative pain management was mainly charged by the anesthesiologist and surgeon, maybe because the surgical ward nurses did not allow to give the anesthetic in many countries. Whenever patients have pain, the nurse need to inform the anesthesiologist or surgeon, the process of waiting can aggravate patient's pain, then increase the dosage of the drugs. Nurses are easily accessible to patients, nurses spend more time with patients, monitor and assess patient's pain, so nurses in the recovery room and surgical ward play a vital role in the process of postoperative pain management. Researchers also thought that postoperative pain management should be done by a multi-professional team, including nurses (Horn & Kramer 2021).

The advantages of non-pharmacological pain management are that they are relatively low cost and safe, and easier for nurses to implement. Research indicated that non-pharmacologic method could save opioid regardless of surgery (Tick et al. 2018). Study found that nurses with positive attitude could facilitate the practice of non-pharmaceutical pain management approaches (Zelege, Kassaw & Eshetie 2021). Therefore, increasing nurses' knowledge of non-pharmaceutical methods in pain management is essential. Finding effective non-drug pain management methods can enable nurses to better manage postoperative pain, reduce the use of pain medications especially opioids, reduce postoperative complications and the length of

hospital stay, increase patient satisfaction and reduce the health care costs. This thesis is to find effective and high quality postoperative non-drug management evidence to guide nursing clinical practice.

## 2 Theoretical framework

### 2.1 Pain and postoperative pain

The revised International Association for the Study of Pain defines pain as an uncomfortable sensation and emotive experience generally caused by tissue damage (Raja et al. 2020). Pain is a subjective experience that includes not only the perception of pain, but also the emotional experience associated with pain (Sluka 2016). Everyone's sense of pain is not the same, it is affected by social, cultural, physiological and spiritual factors, so everyone's experience of pain is also different. There are many ways to describe pain. Pain can be classified local pain or systemic pain according to the location; acute pain and chronic pain depending on the duration of the pain. Acute pain comes suddenly, severe and has short duration, it is usually caused by injury and local tissue damage. Chronic pain lasts long periods, usually more than 3 months. Chronic pain can range from mild to severe, it is usually persistent and needs to ongoing treatment (Felman 2022). Postoperative pain usually is acute pain due to the surgical trauma. Postoperative pain is a serious unpleasant feeling, emotional and spiritual experience caused by surgical trauma (Gupta et al. 2010). Postoperative pain is the patients' response to surgical wound, all surgical patients experience a certain level postoperative anxiety, fear and pain. Pain is the most common and one of the most distressing experiences of postoperative patients, the extent of these influence may be reduced by proper intervention. Unalleviated postoperative pain can lead to a variety of problems that can affect the patients physically, mentally, financially and socially (King & Fraser 2013). Sometimes poorly managed acute pain can become chronic pain (Tick et al. 2018). Therefore, effective postoperative pain management is extremely important.

### 2.2 Pain management

Pain management is defined as the use of medical and health care approaches to relieve pain (Stöppler 2021). Pain management should involve all relevant medical staff. Effective pain management should consist of pain assessment and pain intervention. Common pain assessment and measurement scales include visual analogue scale (VAS), numerical rating scale (NRS), verbal rating scale (VRS), brief pain inventory (BPI) (Felman 2022; Small & Laycock 2020). The VAS, NRS and VRS are simple pain assessment scales, they are used for patient self-assessment and generally used for post-operative acute pain assessment, while BPI is generally used for chronic pain assessment (Small & Laycock 2020). Pain interventions

include drug and non-drug approaches. Intervention of acute pain often involves medication, including opioids, nonsteroidal anti-inflammatory drugs (NSAIDs) and acetaminophen and so on (Felman 2022). Pain management should relieve pain with minimal side effects and as economical as possible. Non-medication therapies are easy to implement, economical and have few side effects. Some studies considered multimodal therapy to manage postoperative pain aiming to minimize the dose of opioid and related side effects (Rawal 2016). A clinical practice guideline also recommended multimodal analgesia or pharmacologic combined with non-pharmacological methods to treat postoperative pain (Chou et al. 2016)

### 2.3 Non-pharmacological pain management

Non-pharmacological therapies are ways to reduce pain without using medicine, which are cheap and easy to implement. Non-pharmacological pain management include psychological methods such as cognitive behavioral therapy, distraction methods; physical treatment such as massage, heat and cold and so on (Pak, Micalos, Maria & Lord 2015). Distraction techniques like music, aromatherapy and visual simulation are used preoperatively, intraoperatively and postoperatively, and have been very useful for patients with pain and anxiety (Poulsen & Coto 2018; Dimitriou, Mavridou, Manataki & Damigos 2017; Mosso et al. 2019). A clinical practice guideline suggested that transcutaneous electrical nerve stimulation might be used as an adjunct method to postoperative pain management in patients undergoing surgery, but it is not clearly stated that acupuncture, massage can assist other postoperative pain management methods due to lack of data (Chou et al. 2016). Massage and acupuncture are more commonly used non-pharmacological therapies, they are beneficial and have no obvious adverse effects and should be more explored and applied in practice. Currently, non-pharmacological therapies have been increasingly used for pain management because pharmacotherapies often have some side effects and increase the risk of complications. One study showed that non-pharmacological treatments can play an indispensable role in pain management in patients (Pak, Micalos, Maria & Lord 2015).

## 3 Purpose and aim

This thesis is to search for and describe non-pharmacological pain management after surgery in adults using the literature review method. The aim is to utilize the results of literature review of non-pharmacological pain management method in surgical nursing care.

The research questions are:

1. What kind of non-pharmacological pain management therapies are used in postoperative pain in surgical nursing according to studies?

2. Whether non-drug interventions can decrease pain after surgery, reduce the consumption of opioid painkillers and relevant side effects?
3. Is non-pharmaceutical method easier for nurses to implement? What are the barriers for nurses using this method?

#### 4 Methodology

The question about non-pharmacological pain management after surgery is answered with a descriptive literature review. The thesis applies a literature review and uses descriptive methods to analyse and interpret the data. The method was selected because the preliminary searches found that there were already some high-quality literatures on non-pharmacological approaches to postoperative pain management. Synthesizing the results of these literatures, effective evidence can be obtained to guide clinical practice. It is not necessary to collect primary data again.

##### 4.1 Descriptive literature review

Literature review is a kind of academic paper that summarizes related research articles on a certain area in a period of time, it can gather and provide up-to-date information (Jaidka, Khoo & Na 2013; Aveyard 2010). Literature review includes descriptive and systematic literature review, meta-analysis and meta-synthesis. Descriptive literature review collects literatures on a topic area, and then summarizes and synthesizes these literatures, it can help readers get a comprehensive understanding of current knowledge about this topic (Cronin, Ryan & Coughlan 2008). A literature review should can reflect a comprehensive and clear picture of knowledge in a particular area over a period of time, compare different research results, find out the current research gaps, and point out how to advance the progress of this topic gap (Efron & Ravid 2018).

Nowadays, there are more and more available literatures, and it is impossible for everyone to read every article. Therefore, it is very important to review the latest researches on a particular topic, which can help readers understand the latest developments and research trends on a topic (Aveyard 2010). The result of a single study is limited, it does not give readers a full picture of the latest knowledge. This may be due to limited population sample size or study design defects (Aveyard 2010). So, I chose the method of literature review to conduct my topic. Through literature search, I found some new and high-quality literatures on my topic, and learned about the change in the perception and use of non-pharmacological pain management intervention. My knowledge in this field has been broadened. I also found these articles got different results. Through comparing and analyzing these results, I can deeply understand the knowledge of non-drug management of postoperative pain, and get



relatively accurate and reliable evidence. Finally, the latest and reliable evidence can be used to guide postoperative pain management. This literature review also lays a good foundation for further scientific research on this subject in the future.

#### 4.2 Literature search

This thesis is about non-pharmacological pain management after surgery in adults, according to the topic, the search terms were set up: “non-pharmacological pain management” AND “after surgery” AND “adults”. The literature search was conducted in Laurea Electronic Library databases based on the inclusion and exclusion criteria in table 1. Databases included EBSCO (CINAHL, MEDLINE), PROQUEST, ELSEVIER (SCIENCE DIRECT), due to the limited number of articles searched, more searches were made on GOOGLE SCHOLAR.

Inclusion	Exclusion
Adult	Children or the elderly
Postoperative	Preoperative or intraoperative
Pain management after surgery	Chronic pain management
Non-pharmacological methods	Pharmacological methods
Full text	Reviews
Within 10 years	Older than 10 years
Languages: English	Other languages than English
Academic articles and research	Non-academic articles

Table 1: Inclusion and Exclusion Criteria

#### 4.3 Conducting data gathering and analysis

The literatures obtained from Laurea Electronic Library databases and Google Scholar were screened. Systematic review and meta-analysis are considered to be the top-level of evidence, and Randomized Controlled Trials (RCTs) also have high quality, so these two type articles were top priority literatures (Aveyard 2010). Firstly, the inconsistent articles were excluded by browsing the abstract, and then the articles needed were selected by reading the full text. Finally, ten articles with three non-drug pain management methods were selected.

These ten articles included four articles on massage therapy, three articles on acupuncture therapy and three articles on virtual reality.

Data charts were used to construct a clear description of these included articles. These data charts helped to observe and synthesize the studies. Then articles on each therapy were analyzed, compared and summarized using synthesis method and descriptive summary. The included non-pharmacological intervention articles are showed in table 2.

Non-pharmacological pain management methods	
Physical therapy	<ul style="list-style-type: none"> <li>• Massage (four articles)</li> <li>• Acupuncture (three articles)</li> </ul>
Phycological therapy	<ul style="list-style-type: none"> <li>• Virtual reality (three articles)</li> </ul>

Table 2: The included articles

## 5 Results

This literature review explored non-pharmacological pain management approach in adult after surgery. In this section, the results of literature accepted were analysed.

### 5.1 Physical therapy

#### 5.1.1 Massage

Four articles have been chosen about massage. All of the articles are less than five years, two of them are RCT, two of them are systematic review and meta-analysis. Two articles are from Canada, one is from Japan, and one is from Turkey. Details see appendix.

A systematic review with meta-analysis of twelve RCTs (n=462) showed that massage relieved the intensity of immediate postoperative pain and the suffering of patients, and it was safe and easy to implement by nurses (Boitor, Gélinas, Lalonde & Thombs 2017). Another systematic review with meta-analysis of ten RCTs (n=1157) suggested that massage therapy might reduce the pain for a short time, it could be used as one of the many modes of pain management after surgery (Kukimoto, Ooe & Ideguchi 2017). A RCT found that hand massage could help patients pain-free for a long time, relieve pain intensity and corresponding effects

(Boitor, Martorella, Maheu, Laizner & Gelinas 2019). Another RCT suggested that hand massage was effective to patients, it could decrease postoperative pain and anxiety levels, and speed up the recovery patients as a supplement to medication therapy (Demir & Saritas 2020).

Based on these results, massage can reduce postoperative pain and pain intensity, and it can be part of multiple modes of pain management program. Massage is a non-invasive physical therapy, it is suitable for nurses to perform, and it is safe and easy to implement by nurses. Nurses had an essential role in the treatment of massage.

Massage therapy belongs to manual stimulation techniques, which is one of the most popular non-pharmacological alternative therapies. Its positive effects on pain management have been confirmed by some researches, and it is an acceptable and accessible method (Martorella et al. 2014; Demir & Saritas 2020; Kukimoto et al. 2017). Massage is also considered safe. Study showed that massage has rare severe adverse reactions in the management of pain (Yin, Gao, Wu, Litscher & Xu 2014).

Patients undergoing surgery suffer from a variety of disorder in physical, psychological and spiritual aspects. Study found massage could not only reduce postoperative pain but also relieve other suffering such as anxiety (Boitor et al. 2017). Another systematic review showed that massage was beneficial to relieve postoperative pain and anxiety (Boyd et al. 2016). Research suggested that massage therapy could be part of multiple modes of pain management program for patients after surgery and nurses had an indispensable role in the program (Kukimoto et al. 2017). Another study also found that nurse play an essential role in promoting the massage therapy program (Martorella et al. 2014).

Massage is easy to be implemented by nurses. However, nurses face some barriers such as a lack of understanding and acceptance of massage and professional support for them (Trail-Mahan, Mao & Bawel-Brinkley 2013; Martorella et al. 2014). At present, massage is still not used as a nursing routine, it is necessary to raise the awareness of nurses and other healthcare personnel to massage, and vigorously promote its application.

### 5.1.2 Acupuncture

Acupuncture is another very common non-drug treatment technique for pain relief. One of the acupuncture articles I have included is RCT, two of them are systematic review and meta-analysis. RCT found that electroacupuncture reduced pain for the first three days after surgery, decreased the use of painkillers and complications (Chen, Wang, Xu, Ma and Zhou 2016). A systematic review and meta-analysis of eleven RCTs (n=703) suggested that electroacupuncture might relieve pain after surgery and reduce the use of opioid, further research is needed to confirm these (Park et al. 2021). Another systematic review and meta-

analysis of thirteen RCTs (n=682) showed that some type of acupuncture could relieve postoperative pain for twenty-four hours and reduced the amount of opioid consumption (Wu et al. 2016).

All of three articles found that acupuncture or electroacupuncture relieved postoperative pain, reduced the amount of analgesics consumption, RCT also found that acupuncture reduced painkiller related side effects. These results suggest that acupuncture could be a useful method for postoperative pain management, it could be an adjunctive treatment to pain management in patients undergoing surgery.

Acupuncture is a type of medical treatment in which needles are inserted into the body's acupoints and the therapeutic effect is achieved by manipulation (Cheng 2014). Acupuncture relieves pain by stimulating the release of neurotransmitters such as opioid peptides, norepinephrine, serotonin, and adenosine (Mayor 2013 & Chen et al. 2014). Acupuncture also activates the endogenous pain inhibition pathway (Chen et al. 2014).

Acupuncture has been widely used in many types of surgery, such as the operation of the chest and heart, knee arthroplasty, pneumonectomy, hip replacement and so on (Chen et al. 2016; Ma et al. 2011; Yuan et al. 2014; Zhou et al. 2011; Tzeng et al. 2015). These studies found that acupuncture was beneficial in minimizing analgesic needs and postoperative complications. Similar results are found in this literature review, however, in one of the included systematic reviews and meta-analyses, the authors believed that due to the low quality of included RCTs, more rigorous design was needed to confirm the benefits of acupuncture.

Many other systematic reviews with meta-analysis also had proved the reliability of acupuncture in alleviating postoperative pain, lowering the dose of opioids and related side effects (Liu, Tan, Molassiotis, Suen & Shi 2015; Wu et al. 2016; Tedesco et al. 2017). Some systematic reviews indicate that acupuncture is safe if properly performed (Adams et al. 2011; Bergqvist 2013). These findings indicate that acupuncture or electroacupuncture can be used alone or as an adjuvant method in postoperative pain management.

## 5.2 Psychological therapy

Psychological therapy alleviates patients' pain through relaxation, diversion of attention, guidance and education, and it plays a great role in regulating patients' pain. Virtual reality has been shown great effects as a distractive method (Mosso et al. 2019).

### 5.2.1 Virtual Reality (VR)

VR is a computer simulation system in which patients are immersed through active interaction with this three-dimensional virtual world. The mechanism of VR is to make patients perceive

virtual objects through technologies, these technologies include visualization devices, sound feedback and tactile feedback and so on (Wikipedia 2022). It relieves pain by diverting the patient's attention.

A RCT found VR reduced patients' pain after surgery, improved the recovery and discharged from the hospital earlier (Cacau et al. 2013). A RCT found that VR reduced postoperative pain and anxiety significantly, most of patients were very satisfied with VR therapy (Gray et al. 2020). The systematic review and meta-analysis of eight RCTs showed that VR was helpful to relieve the severity of postoperative pain (Ding et al. 2020). These results indicate that VR can relieve postoperative pain, it may be able to improve patients' satisfaction and shorten the hospital stay. VR is a safe and effective non-drug technology. It can be used as a complementary method for postoperative pain management.

My findings showed that VR can alleviate patients' postoperative pain as an adjunct method, which is consistent with my expected goal. VR can capture patients' attention more effectively than traditional methods such as watching TV, music, aromatherapy, because it makes patients to completely immerse themselves in the virtual world through multi-sensory stimulation (Li et al. 2017). These stimuli make the patients to regulate negative emotions after surgery. Study showed that VR could relieve these negative emotions by exposing patients to positive stimuli (Jerdan et al. 2018). Another study also found distraction of attention and positive emotional regulation associate with VR can help ease pain (Sharar et al. 2016).

Research suggested that VR could relieve postoperative pain regardless of the type of surgery, but the effects vary between different types of surgery (Ding et al. 2020). Therefore, the effects of VR on different types and levels of surgery should be explored in the future. Because of the spread of COVID-19, this kind of non-face-to-face approach has additional advantages, it should get more attention and promotion.

## 6 Discussion and Conclusion

Postoperative pain is one of the most worried problems and a significant challenge in the management of surgical patients. Postoperative pain can affect patients' recovery and increase the risk of complications (Lundborg 2015). Therefore, postoperative pain management is undoubtedly one of the most concerned to patients and healthcare staff.

Pharmacological methods remain the main way of postoperative pain management (Li, Huang & Zhong 2016). Drugs usually produce certain side effects and risk of addiction. Non-pharmacological alternative therapies are becoming more widely used and recommended, which can complement pharmacological therapy with lower side effects (Lindquist, Snyder, &

Tracy 2014). Some guidelines recommend multiple modes pain management in order to adequately manage postoperative pain (American Association of Nurse Anesthetists 2016, American Pain Society 2016).

Non-pharmacological methods relieve pain by distraction, relaxing, regulating emotional status and so on. This literature review is to explore different non-pharmacological methods of reducing pain in adults undergoing surgery, to increase knowledge among nurses and apply these methods to clinical practice. Non-drug methods do not use drugs to manage postoperative pain, they are easily accessible to nurses. They can be used alone or as an adjuvant therapy to manage postoperative pain of patients, thus minimizing the use of drugs especially opioids, and reducing adverse reactions and improving patients' sense of well-being and satisfaction.

These articles provide information resources on current non-pharmacological approach to postoperative pain management. The results show that massage can relieve pain and pain intensity of patients undergoing surgery, it can be part of the multimodal pain management program. Massage is easy and suitable for nurses to carry out, it is necessary to raise the awareness of nurses and other healthcare staff to promote the application of massage. The findings show that acupuncture can relieve pain after surgery, and decrease the consumption of analgesics and related side effects. Acupuncture can be used as an adjuvant therapy approach. Virtual reality is a safe and effective distraction technique, which can reduce postoperative pain effectively, might improve patients' satisfaction and shorten the hospital stay. It should be paid more attention and applied as an adjunct method for postoperative pain management.

Due to the limited time and the number of articles retrieved, only three non-pharmacological methods were included, and the type of surgery was not defined, the pain level is different between major and minor surgeries. Further review or rigorously studies are required. But anyway, the findings show that non-pharmacological method can be used as an adjunctive therapy or as part of multimodal pain management regimen.

## 7 Ethical consideration

Ethical considerations are principles that should be considered in research design and practice. Common ethical considerations include voluntary participation, informed consent, anonymity, confidentiality, minimal or no harm (Bhandari 2021). Informed consent means that participants should be fully informed of the research and voluntarily participate in the study with human participation. They have the right to refuse to participate in the research or withdraw from the study at any time without any negative results. Participants who are

incapable of informed consent or minors require informed consent from legal representative or their parents. Precautions must be taken to protect the privacy of participants and to keep their personal information confidential. Before conducting research involving humans, a careful assessment of the expected risks and burdens of the research and the foreseeable benefits must be made. Measures must be taken to minimize or do no harm to participants (The World Medical Association 2018).

This thesis is conducted through literature review. The ethical considerations include honesty, objectivity and minimum or no harm to human. Honesty is to avoid plagiarism and false information. Plagiarism is taking someone else's work as one's own, it includes infringing copyright, ideas, or copying text, etc. without labeling the source (Gasparyan et al. 2017). The data in this thesis were obtained from academic or research journals in Laurea Electronic Library, they are real and reliable. Objectivity is to avoid bias in the phase of data collection and data analysis process. Bias is a systematic error due to an unfair sample, or evaluation process that does not give accurate results (Bias 2022). In this literature review, articles of relatively high quality were selected such as RCT, systematic review and meta-analysis, because the results of such articles are relatively reliable. When analyzing the articles, paid attention to understand and respect the authors' argument. In this thesis, the data are real and reliable, the articles with reliable quality were selected, and the author's arguments were respected in the literature analysis, all of these ensured that the evidence is real and reliable, and the use of such evidence to guide clinical practice can ensure the minimum or no harm to patients.

### 7.1 Reliability and relevance

Reliability and relevance of this thesis are the main consideration. This thesis is a literature review on postoperative pain management. It should be considered whether it is credible and can be applied to clinical practice.

Reliability refers to the consistency of measurement results after repeated observations of the same phenomenon, highly reliability is accurate, consistent and repeatable (Middleton 2021). In this thesis, the articles were collected from library databases, and limited to academic or research journals. In the process of data collection, articles were screened in strict accordance with inclusion and exclusion criteria, and articles of relatively high quality were finally included. Objectivity was maintained in the process of data analysis, and authors' original intention was respected, all of which ensured the quality and accuracy. This thesis is a literature review, the method is very clear, and the key words and literature materials are clearly marked, so the research can be repeated.

Relevance is also known as practicability, refers to the practical significance of research, and research with practical significance increases its value, it can make recommendations or

improve methods for related department or staff (Vinz 2021). This thesis is to find effective non-pharmacological pain management evidence to relieve postoperative pain and reduce the consumption of analgesics. It is relevant to hospital clinical practice. Moreover, all the articles included were RCT or systematic evaluation and meta-analysis of relatively high quality, and the evidence obtained from the analysis of such articles is relatively reliable and more likely to be applied in clinical practice, so it has certain practical significance.



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## Tables

Table 1: Inclusion and Exclusion Criteria .....	9
Table 2: The included articles .....	10