

Original Article

## Educating Registered Nurses for Pain Knowledge and Documentation Management: A Randomized Controlled Trial

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### Abstract

**Background:** Registered nurses (RN) play a vital role in patients' postoperative pain management. Therefore, it is important for RNs to have adequate knowledge and documentation skills when it comes to postoperative pain care.

**Objectives:** To develop and test a brief educational intervention based on Finnish acute postoperative pain nursing practice guidelines. This intervention sought to improve RNs' knowledge of pain management and improve their postoperative documentation skills. We used a randomized controlled trial with a pre-, post-, and retention-tests design.

**Methodology:** The CONSORT guidelines have been used to describe the methods. The participants were randomized and divided into intervention (26) and control (24) groups. Thirty-two surgical RNs completed the knowledge test and documentation audit frame in one of Finland's central hospitals.

**Results:** The results indicated statistically non-significant changes in RNs' knowledge of pain management and postoperative documentation skills. In the intervention group, the mean knowledge score increased from pre- to post-intervention; however, the retention test showed no difference between the intervention and control groups. The results indicate that the intervention had no effect on RNs' documentation skills.

**Conclusions:** A brief lecture-based educational intervention therefore appears ineffective in improving RNs' knowledge of pain management and documentation skills.

**Key Words:** Post-Operative Pain, Nurse Education, Knowledge, Documentation, Randomized Controlled Trials

### Introduction

Pain assessment, management, and documentation are crucial parts of registered nurses' (RN) professional competence (van Dijk, 2017). Finnish nursing guideline (2013) highlights seven key points in postoperative pain management, assessment, and documentation: 1) guidance of surgical patients as a part of pain management, 2) identification of patients in pain, 3) pain assessment, 4) implementation of pharmaceutical pain treatment, 5) use of non-pharmacological pain relief methods, 6)

monitoring of patients' status during the pain treatment, 7) documentation of pain management.

The Finnish Society of Anesthesiologists and the Finnish Association for the Study of Pain (2012) also have published national guidelines to acute postoperative pain and pain management documentation as follows: 1) RNs assess pain severity with a validated pain scale, 2) RNs report the pain relief method used, and 3) RNs reassess and documents patients' responses to pain management and possible side effects (The

Finnish Society of Anesthesiologists and the Finnish Association for the Study of Pain 2012).

The International Association for the study of Pain (IASP) launched in 2020, calling the year the Global Year for the Prevention of Pain. In 2020, theme focuses on disseminating pain prevention strategies to researchers, clinicians, and patients. In addition, IASP vision is global pain relief and better patient outcomes (IASP, 2020.) Focusing on the latter, this study concentrated on nursing pain education and prevention of chronic post-surgical pain.

## Background

Although postoperative pain management in acute care settings has been an area of concern for several decades (Schreiber et al., 2014), the extant research suggests that more than half of patients who undergo surgical procedures report inadequate postoperative pain relief (Chou et al., 2016). Consequently, which can predispose patients to chronic pain and disability (Manworren et al., 2018). Moreover, postoperative pain management documentation often fails to meet acceptable quality standard criteria (Erden et al., 2017; Heikkilä et al., 2016), threatening continuity of care and communication across care providers (Erden et al., 2017; Heikkilä et al., 2016). In general, RNs' – who play a vital role in postoperative pain assessment, management (Francis & Fitzpatrick, 2013), and documentation (Heikkilä et al., 2016) –lack basic knowledge about pain management, such as individualized treatment and appropriate pain assessment (Schreiber et al., 2014). In addition, content related to pain management is underrepresented in Finland's nursing curricula (Vaajoki & Haatainen, 2014) and in other countries (Mackintosh-Franklin, 2017; Watt-Watson et al., 2017). Studies into quality of pain management vary in focus as well, including research into identification, assessment, quality and documentation (IASP Curriculum Outline on Pain for Nursing 2018.)

Nursing education related to pain management affects RNs' attitudes (Abdalahim et al., 2011; McNamara et al., 2012), improves their pain knowledge (Abdalahim et al., 2011, van Dijk et al., 2017; McNamara et al., 2012), and enhances pain assessment (Purser et al., 2014). However, research considers the short-term effects of educational interventions or programs while overlooking long-term effects. For example, a four-hour acute pain education for nurses was

effective, when controlled immediately after the pain education program (McNamara et al., 2012). In another study, RNs who received additional pain education had more knowledge and positive beliefs about pain management than nurses without additional pain education (van Dijk et al., 2017). However, there was no monitoring to see if this effect lasted beyond the short term. A systematic review (Drake & Williams, 2017) of acute pain management nursing interventions outcomes and teaching methods in hospital settings used various didactic and interactive teaching methods, including role-plays, lectures, feedback and interactive teaching. The main outcomes included patients' self-reports of pain, nurses' pain assessment, patients' satisfaction with pain management, nurses' documentation of pain assessment, and nurses' provision of pain treatment. (Drake & Williams, 2017.)

**Research questions and hypothesis:** The objective of the present study was to develop and test a brief educational intervention for postoperative pain management and documentation. We chose a classroom lecture as the educational method, because this choice enabled us to utilize the results of this study as a starting point for developing and testing other methods.

As such, we proposed the following hypothesis: The brief educational intervention will increase RNs' knowledge of postoperative pain management and the quality of their postoperative pain care documentation. We formulated this hypothesis as follows:

$H_0: \mu_c = \mu_i$  and  $H_1: \mu_c < \mu_i$ , where  $\mu_c$  is the average change in RNs' pain knowledge or documentation quality in the control group and  $\mu_i$  is the average change in RNs' pain knowledge or documentation quality in the intervention group. The threshold for statistical significance ( $p$ ) is  $<0.05$ .

Alternatively, the hypothesis could be formulated as follows:  $H_0: d \leq 0.2$  and  $H_1: d > 0.2$ , where  $d$  is  $\frac{\mu_i - \mu_c}{\sigma_{\mu_i \mu_c}}$  (Cohen 1988). In  $d$ ,  $\mu_i$  is the average change in RNs' knowledge or documentation quality in the intervention group,  $\mu_c$  is the average change in RNs' knowledge or documentation quality in the control group, and  $\sigma$  is the combined standard deviation.

## Methodology

**Design:** In order to assess brief postoperative nursing educational intervention, this randomized

controlled trial (RCT) included pre-, post- and retention tests. The CONSORT guidelines (2010) for reporting randomized controlled trials have been used to describe the methods (See Supplementary File 1) and the CONSORT flow diagram (2010) have been used to describe the summary of the study design (Fig. 1).

### **Data collection**

**Participants:** Participants were recruited from a central hospital in Finland. A total of 50 RNs excluding persons being responsible for their units' pain education were approached and invited to the study (Fig. 1). All RNs were randomly assigned to intervention and control groups the day before the beginning of the intervention. 18 RNs declined to participation due to lack of interest. We tested the intervention with the nursing staff of three different specialized surgical wards in one Finnish central hospital. Table 1 presents the baseline characteristics of the participants.

**Knowledge test:** To test RNs' postoperative pain management knowledge, this study employed the Acute Postoperative Pain Knowledge Test, an unstructured questionnaire with one semi-structured query. The test was based on updated acute postoperative pain nursing practice guidelines (Kinnunen et al., 2014; Nursing care of short-term pain in adult patients after a surgical procedure, 2013; The Finnish Society of Anesthesiologists and the Finnish Association for the Study of Pain 2012). Before the study, we evaluated the validity of the knowledge test using the Delphi technique (Keenan et al., 2001). The Delphi panel consisted of nurse specialists in pain care from one university hospital in Finland (acute pain service nurses n=2, clinical nurse specialists n=4 and clinical nurse teachers n=3).

The test included background questions gathering information on gender, age, experience in nursing and surgical nursing, current responsibilities in pain management, and previous pain education undertaken in the current workplace. The knowledge test consisted of open questions illustrated in Table 2. On the seven-item questionnaire, the minimum score for a single question was 0, and the maximum score was 3. The knowledge test total scores ranged from 0 to 21 points. Higher score indicated stronger knowledge of postoperative pain assessment, management, and documentation.

**Postoperative pain documentation quality audit frame:** For the current study, we modified previously pre-tested (Grommi, 2015) the Postoperative Pain Quality Documentation Audit Frame ©. We developed the structured analysis frame using a set of important guidelines (NRF, 2012: Recommendations for the Management of Acute Postoperative Pain and Documentation for Pain Management and Short-Term Nursing for Adult Patients with Pain Following a Surgical Procedure 2013; Kinnunen et al., 2014). Incorporating these items the modified postoperative pain documentation audit frame included 37 structured criteria about postoperative pain documentation quality. We also elicited nurses' identification codes, shifts and pharmacological pain relief method. We asked for the nurses' identification codes in order to compare the individual RN's documentation in different phases: before (pre), immediately after the (post), and three months after the intervention (retention).

The scale was as follows 0=no, 1=yes and 2=not evaluable. The "not evaluable" option was used when documentation was unclear, or when a patient did not receive special pain therapy. Every yes answer (=1) scored 1 point, and maximum scores depended on the used or unused pharmacological pain relief method as well as the patient's ability to communicate. Maximum scores consisted of the following: without opioid - 21 points, with opioid - 25 points, patient controlled analgesia - 29 points, epidural analgesia 35 points. A one-point increase to maximum points was assigned if the patient could not communicate. Because the maximum possible score varied, we transformed the Postoperative Pain Quality Documentation Audit Frame scores to a 0-100 scale in order to enable comparisons across all audited RNs.

**Intervention and procedure:** We planned the educational intervention in February 2017 with the aim of improving RNs' postoperative pain assessment, management, and documentation. The intervention lecture followed the Finnish nursing guidelines (The Finnish Society of Anesthesiologists and the Finnish Association for the Study of Pain 2012; Nursing Care of Short-Term Pain in Adult Patients after a Surgical Procedure, 2013; Kinnunen et al., 2014)) included a PowerPoint show with 21 slides. The lecture time was about 45 minutes.

In this study, RN's worked in three selected surgical wards. Before the study, we coordinated with the units' nursing managers in order to bring the RNs to the training space. The RNs' shifts were planned to begin and end earlier or later. Only the research team and nurse managers knew the exact date of the intervention. On the previous day, the researcher (first author) allocated the RNs to groups (surgical ward 1, surgical ward 2, surgical ward 3 and vice staff personnel); then those four groups again were randomly placed into two groups (intervention and control groups). The participants were unaware of the allocation until the intervention.

We implemented the study on a single day in April 2017 between 12am and 16pm. On that day, all of the nursing staff who working on the morning or evening shifts constituted the study population (N=50). On the intervention day, the evening shift RNs came to the training space at 12am. All participants filled took the Acute Postoperative Pain Knowledge Test©. Once all participants responded to the test, the researcher called out the names of individuals who were to leave the classroom and conducted the tests with the remaining nurses. The RNs who leave the classroom became members of the control group, and those who remained in the classroom belonged to the intervention group. Only the intervention group RNs participated in the education intervention. The intervention lecture started immediately after the control group left the room. After the lecture, the intervention group again took the Acute Postoperative Pain Knowledge Test©. After intervention group took the test again, they went to their units to be relieved by the morning shift. Morning shift RNs came to the classroom at approximately 14pm. The previous protocol was repeated in exactly the same manner. However, after the protocol, all morning-shifts RNs finished their workdays. This design aimed to control the potential impact of interaction between the intervention and control groups. Three months after intervention, the researcher directly conducted the retention test in work units, personally asking RNs to take the same test again. Tests were taken under the supervision of the researcher. A documentation audit was conducted retrospectively in spring and summer 2018. The researcher audited each RN's documentation from three different patient records three times at the baseline, post and retention stages.

**Statistical analysis:** We used the linear mixed model with a random subject effect to analyze the effects of group (education vs. no education), time (pre-intervention vs. post-intervention vs. 3-month retention), a group by time interaction, and the length of experience in surgical nursing on knowledge of nursing documentation and documentation of postoperative pain. As the length of experience in surgical nursing correlated with age (Pearson's  $r = 0.767$ ,  $p < 0.001$ ) and the length of experience in nursing ( $r = 0.898$ ,  $p < 0.001$ ), we tried to avoid overadjustment and did not include the latter ones in the models. Moreover, we calculated effect sizes using Cohen's  $d$  (Cohen, 1988), to describe alterations in RNs' pain knowledge and postoperative documentation skills across preintervention, post-intervention, and 3-month retention audits. IBM SPSS Statistics 23 served as the statistical software.

**Ethical considerations:** The study was carried out in full compliance with the Helsinki Declaration. The study was approved by the target organization. The voluntaries were informed about the purpose of the study and voluntary participation, and their written informed consent was taken.

## Results

**Knowledge test:** On the average, pre-intervention knowledge of postoperative pain management score was 11 in the intervention group and 12 in the control group. There were no post-intervention measurements for the control group, and the mean post-intervention score was 12.5 for the intervention group. Finally, the retention test averaged 12 in the intervention group and 12.5 in the control group. The maximum score for both the pre- and post-test was 21 points. Figure 2 presents the following information: item-specific knowledge test scores; the intervention group's scores on the pre-intervention, post-intervention and 3-month retention; and the control group's scores on the pre-intervention and 3-month retention.

The linear mixed model indicated no statistically significant effects on knowledge for the study group and the length of experience in surgical nursing. More specifically, the interaction between the group and time was statistically non-significant ( $p = 0.478$ ), indicating that the change in knowledge over time did not differ between the groups (Fig. 3). Time per se affected the knowledge score ( $p = 0.011$ ); the score increased



with time in both groups. The Cohen's  $d$  effect size was large, 0.86, for the knowledge difference between the pre- and post-intervention tests. This finding indicates that the training affected the RNs' knowledge. However, the effect size for the knowledge difference between the pre- and retention tests in the intervention group, was only 0.48, which means that the long-term effect of the intervention was low. The control group's level of knowledge increased from the pre- to the retention test with an effect size of 0.28. This finding suggests that the long-term effect of the intervention was even lower than implied by the intervention group's results.

**Documentation audit:** The mean pre-intervention Postoperative Pain Quality Documentation Audit Frame score was 31 in the intervention group and 20 in the control group. On average, post-intervention scores were 30 in the intervention group and 34 in the control group. Retention test scores averaged 33 in the intervention group and 25 in the control group.

The linear mixed method model indicated no statistically significant effects on documentation of postoperative pain for the study group, time, or for the length of experience in surgical nursing. Nonetheless, the group by time interaction was statistically significant ( $p = 0.040$ ), mainly because of surprisingly high post-intervention scores in the control group (Fig. 3). In the intervention group, there was no improvement on the documentation scores between pre- and post-measurements. Cohen's  $d$  indicated a minor improvement from pre- to retention measurements ( $d = 0.18$ ). Interestingly, in the control group, documentation scores increased considerably from the pre- to post- ( $d = 0.86$ ) and retention tests ( $d = 0.42$ ).

## Discussion

The results indicate non-significant changes in nurses' knowledge and their documentation quality for postoperative pain management. This brief lecture-based educational intervention was ineffective in changing nurses' knowledge; changes to documentation effectiveness were even lower. These results contradict previous studies with more positive results (Abdalahim et al., 2011; van Dijk et al., 2017). The intervention group demonstrated greater short-term knowledge than the control group, but in the long-term, there was no significant difference between the intervention and the control groups. This finding suggests that the long-term effect of

the intervention was even lower than implied by the intervention group's results. Previous research also shows that the acute pain educational intervention are most effective immediately after the pain education program (McNamara et al., 2012). The use of multiple educational methods might improve the efficacy of nursing pain care and documentation (Abdalahim et al., 2011); for example, pain management experts could spend time working with nurses to improve pain management for patients (Schreiber et al., 2014). This study considered RNs' knowledge and documentation, but observation, for example, might have better highlighted RNs' postoperative pain management activities.

The results of this study showed that the control group obtained better scores on the knowledge test after the intervention in the retention phase. In addition, the control group had greater knowledge skills than the intervention group at pre-intervention. Thus, the intervention group failed to obtain the control group's level of knowledge even at the retention test, which could reflect the small amount of demographic data.

Documentation audit results were unexpected with the control group's scores behaving as one would expect from the intervention group. Furthermore, the knowledge test and documentation audit results were contradictory; the control group had more knowledge, but their pain care documentation was substandard. These results indicate a limited transfer of knowledge to the practice of documentation, further highlighting that knowledge training is ineffective in improving postoperative pain documentation practices. Nurses that had low scores on the knowledge test implemented documentation better than those with an average score. In addition, having a higher score on the knowledge test failed to predict how well a person documented pain management. These results seem to illuminate the inadequacy of focusing only on nurses' knowledge and skills in postoperative pain interventions (Drake & Williams, 2017). Importantly, further investigation still is needed into optimal postoperative pain management and assessment as well as documentation barriers. These barriers could include nurses' day-to-day working conditions, emotional impacts and professional contexts (Drake & Williams, 2017). Furthermore, different kinds of learning styles must be taken into account when designing

educational interventions (Mangold et al., 2018). The development of monitoring systems to systematically evaluate pain management practices is necessary. In addition,

comprehensive and congruent auditing tools to evaluate pain management would allow for benchmarking both at the organizational and national levels.

**TABLE 1**  
**Baseline characteristics of the two groups of participating RNs (N=32, 100%)**

	<b>Intervention group</b>	<b>Control group</b>
<b>Gender</b>	<b>n=16, 50%</b>	<b>n=16, 50%</b>
Female	16 (100%)	15 (94%)
Male	0 (0%)	1 (6%)
<b>Age</b>		
Median	40 years	36 years
Min	22 years	24 years
Max	58 years	58 years
Range	36 years	34 years
Mean	41 years	39 years
<b>Working experience</b>		
Median	123 months	80 months
Min	5 months	2 months
Max	448 months	416 months
Range	443 months	414 months
Mean	178 months	156 months
<b>Surgical working experience</b>		
Median	76 months	73 months
Min	1 month	2 months
Max	442 months	396 months
Range	441 months	394 months
<b>Pain education in the current workplace</b>		
Yes	2 (12%)	1 (6%)
No	14 (88%)	15 (94%)

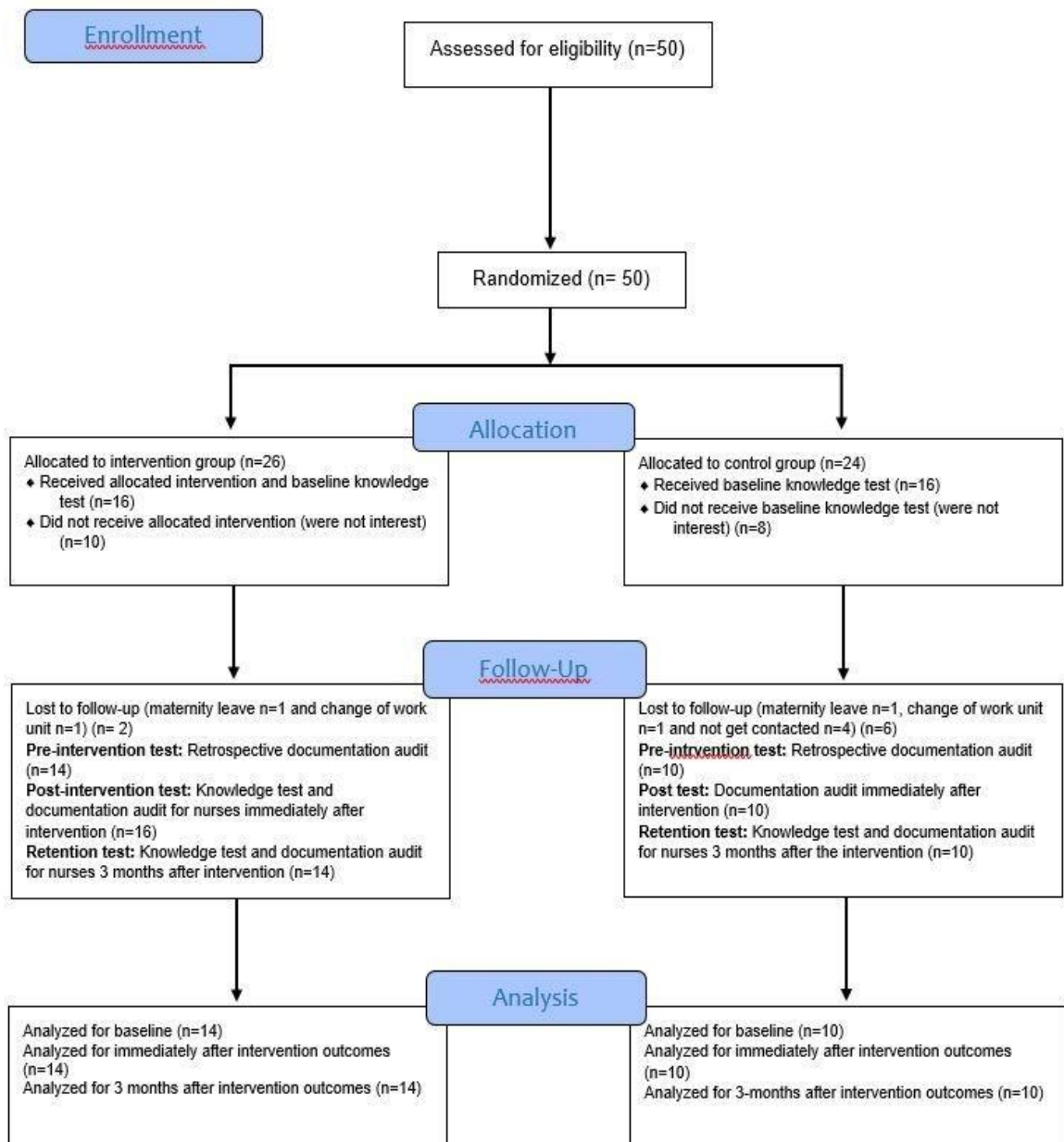
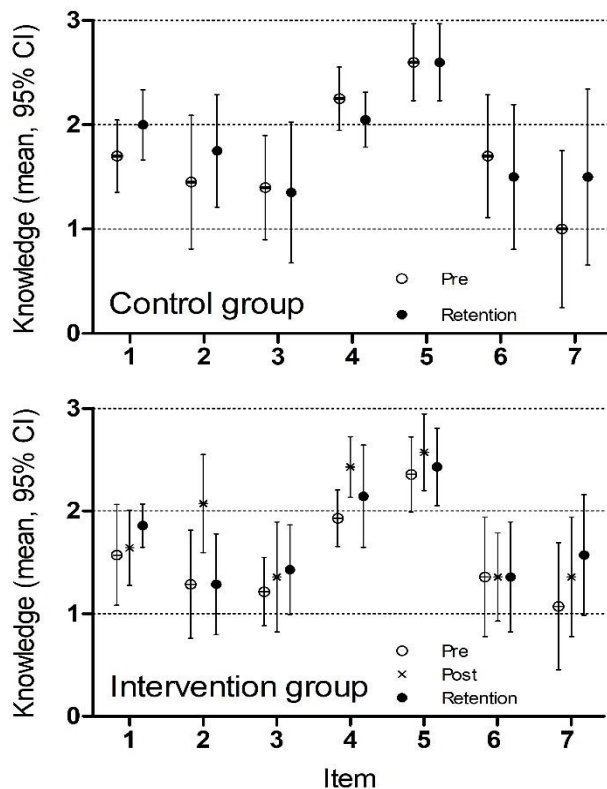


FIGURE 1. CONSORT 2010 flow diagram of RCT

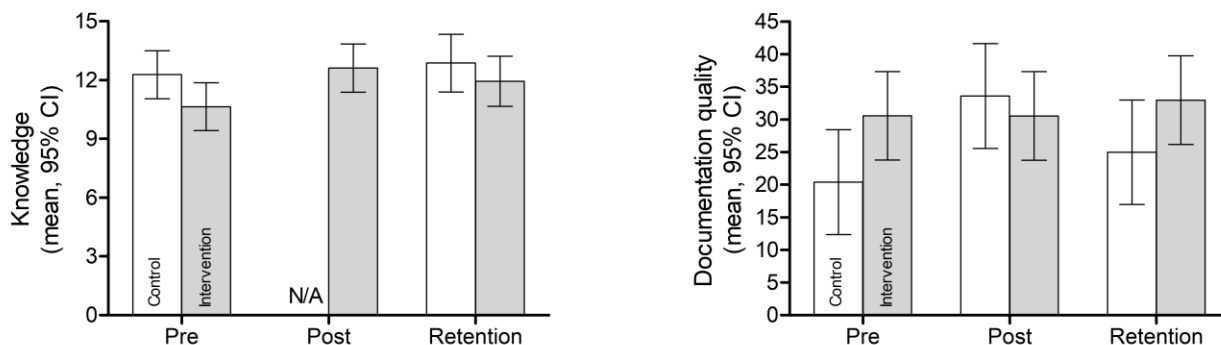
**TABLE 2.**  
**The knowledge tests open questions**

1. Why pain management education is important to a surgical patient?
2. What factors influence the patient's experience of post-operative pain?
3. How to assess a patient's post-operative pain?
4. What kind of non-pharmacological pain relief methods can be use in a postoperative pain management?
5. What issues should be follow during epidural and spinal analgesia, when the mixture included opioid?
6. What issues about pain care should be documented in the patient records at least once during the shift?
7. Three-part patient case (ABC)



**Figure 2.** Mean item-specific knowledge test scores in the control and intervention groups before the intervention (pre), immediately after the intervention (post), and three months after the intervention (retention).





**Figure 3.** Mean  $\pm$  95% CI knowledge test and documentation audit scores in the control (n = 10) and intervention groups (n = 14) before the intervention (pre), immediately after the intervention (post), and three months after the intervention (retention). Scores are adjusted to the length of experience in surgical nursing of 11 years.

Educational interventions should recognize RNs' background knowledge and experience on the topic, thus valuing time and human resources. Furthermore, the implementation of postoperative pain management guidelines should be regular, continuous and visible. It is important for RNs to receive feedback on their pain management activities, so that evidence-based practices can be developed.

Drake & Williams (2017) review highlights that improving nursing pain management requires more than knowledge acquisition. In addition, it shows that the barriers to optimal pain management require further investigation. Future pain nursing research could be enriched by using behavioral change theory for interventions. These interventions should include behavior change components like professional identity, emotions, and intrinsic motivation. (Drake & Williams, 2017.)

Another consideration is the interprofessional nature of pain management education. Effective pain management delivery can be complex, requiring collaborative team approaches that exceed interprofessional expertise. It is important to recognize interprofessional collaboration as a core skill for health care professionals, and recent research recommends an educational shift toward interprofessional learning and collaboration development. (Gordon et al., 2018.)

Within this context, it is important to raise awareness about different learning styles and how they correlate with gender, satisfaction, and years of experience. Learning styles include sensing, intuitive, visual, verbal, active, reflective, sequential, and global forms. Understanding an organization's nursing staff and their learning styles can inform intervention planning, implementation, and evaluation (Mangold et al., 2018.)

This study was a brief lecture-based face-to-face educational intervention and possibly simulation-based educational intervention method because of immediate feedback. As Aura's (2017) results indicate that simulation-based education learning is transferable to clinical practice; in addition, it is suitable for iv pharmacotherapy learning in continuing education. As such, future educational interventions to RNs about postoperative pain management should consider various methods (Aura, 2017; Drake & Williams, 2017) learning styles (Mangold et al., 2018), behavioral aspects like professional identity (Drake & Williams, 2017), and interprofessional learning and collaboration (Gordon et al., 2018).

### Conclusions

Replication of this study with a larger sample is recommended. Our main purpose in this study was to test the effects of study design and a traditional lecture. This study showed impacts on

nurses' short-term knowledge about postoperative pain, but the long-term effects were limited. The nursing documentation audit failed to indicate effective postoperative pain documentation.

Various interventions are needed in order to ensure improvements in all sections of postoperative pain nursing care. Pain care documentation interventions should include both knowledge transferal and the practical exercises. Nurses should demonstrate how knowledge applies to practice and give examples of what postoperative care information means in practice. The challenge remains of finding the most effective method for increasing knowledge and documentation skills regarding postoperative pain management.

**Informed consent:** The voluntaries were informed with the purpose of the study, information on voluntary participation and study withdrawal, and their written informed consent was taken. Show informed consent and provide assurances that participants' rights are protected.

**Acknowledgements:** This research received a grant from Suomen verisuonihoitajayhdistys ry (The Finnish Vascular Nursing Society) and grant for the study registration from UEF/Department of Nursing Science.

**Acknowledgements:** We would like to thank you the Finnish Vascular Nursing Society.

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