Original Article

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Nurses' Perspectives Toward Use of Intravenous Patient-Controlled Analgesia for the Management of Pain After Surgery: Content Analysis of Open-Ended Survey Questions

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Abstract:

Objective: To explore the perspectives of registered nurses on intravenous patient-controlled analgesia (IV-PCA) treatment for patients after surgery.

Material and Methods: Data were collected from 270 registered nurses working in a university hospital in southern Thailand. The text data were interpreted using qualitative content analysis.

Results: Three themes emerged regarding nurses' perceived barriers and facilitators to the use of IV-PCA treatment after surgery. Additionally, five main themes arose from the data pertaining to nurses' roles and responsibilities. The development and enhancement of nurses' knowledge and skills related to IV-PCA treatment included the following: the basic principles of IV-PCA treatment, proper patient selection, patient education, standardized and appropriate IV-PCA prescriptions, administration of opioid analgesics and management of side effects, setup of the PCA pump, preparation and change of the PCA syringe, safe nursing management of patients undergoing IV-PCA treatment, assessment and handling of opioid-induced over-sedation and respiratory depression, administration of naloxone, as well as IV-PCA documentation and the analysis and interpretation of that documentation.

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Conclusion: To enhance the safety and effectiveness of IV-PCA treatment, nurses should undergo thorough education and a training program.

Keywords: nurses' perspectives, patient-controlled analgesia, pain after surgery

Introduction

Major advances in pain treatment and innovative pain management techniques have been developed to provide optimal postoperative pain control, enhancing patient recovery after surgery. The intravenous patient-controlled analgesia (IV-PCA) modality has been the cornerstone of treating acute postoperative pain since 1971[1-3]. The degree of pain relief achieved, along with the number of side effects or adverse events experienced, is recognized as an indicator of the effectiveness and success of IV-PCA treatment[3-5]. Administration of IV-PCA involves a multidisciplinary team approach, including the patient, family, or both. Previous studies that examined the benefits and safety of IV-PCA revealed inconclusive results[3-5].

The efficacy and safety of IV-PCA treatment vary and depend on several factors[6]. Nurses play a vital role in ensuring and maintaining the safe and effective use of IV-PCA treatment. Nurses who provide care for patients receiving IV-PCA after surgery should have adequate knowledge, practice, and an appropriate attitude regarding this treatment[7-9]. Previous studies revealed limited knowledge and a negative attitude toward PCA among nurses[1,10,11]. Similarly, a study conducted to determine the capability of Thai registered nurses towards IV-PCA treatment revealed a very low level of competence[12]. Although IV-PCA treatment has become the most common standard modality for post-surgical pain management[2,13,14], lower usage and popularity of this modality are noticed in the current context of pain management in Thai hospitals. In recent years, postoperative IV-PCA has gained interest among Thai patients.

Although PCA has been available to patients after surgery for decades, there is limited evidence about nurses' perspectives on the use of IV-PCA post-surgery, indicating a lack of knowledge and a negative attitude toward IV-PCA[1,15]. To our knowledge, no prior research has explored nurses' viewpoints on the use of IV-PCA after surgery in the context of Thai hospitals.

The successful implementation of PCA treatment on a global scale needs to be modified for effective use in individual contexts. It may be possible to enhance optimal postoperative pain management for Thai surgical patients undergoing surgery by utilizing IV-PCA treatment that aligns with and meets the demands of nursing practice in Thai hospitals. Plans must be long-term and consider that adequate knowledge, skills, and a supportive environment are essential for achieving sustainability in clinical practice. The implementation of IV-PCA for surgical patients in Thai hospitals needs to be reinterpreted or reorganized to fit the nursing care context in Thailand. Therefore, this qualitative study was conducted to gain a richer and deeper data set in order to seek a holistic and nuanced understanding of the factors associated with the use of IV-PCA treatment and the roles and responsibilities of nurses regarding this treatment.

Material and Methods

This study employed qualitative content analysis to explore registered nurses' perspectives regarding the use of IV-PCA after surgery. This approach examined and interpreted the content of a raw text data set provided by the participants. The key themes were identified through the

systematic categorization of written materials generated from the questions of an open-ended questionnaire to answer the research question and gain a more holistic and clear understanding of the issue[1,15,16].

Invitation emails containing information about the study, along with an attachment of the participant information sheet, were sent to eligible participants. Registered nurses who expressed a willingness to participate in the study were enrolled. The researchers clearly informed the registered nurses about the study details and discussed participants' involvement, providing each participant with an information sheet. Questionnaires accompanied by a cover letter were distributed to the nurse participants. They were asked to complete the questionnaire, and the researchers communicated the timeframe for completing it as well as the method for returning the questionnaire.

Three open-ended questions were used: (1) What do you see as facilitators and barriers to using IV-PCA for managing acute postoperative pain? (2) In your view, what should be the roles and responsibilities of nurses regarding the use of IV-PCA for managing acute postoperative pain? (3) What knowledge, skills, or capabilities do you wish to enhance to ensure safe and efficient care for patients receiving IV-PCA after surgery? The demographic characteristics of the nurse participants were also collected: age, gender, educational level, work unit, clinical experience in various areas, experience in caring for patients undergoing surgery, experience caring for patients receiving IV-PCA after surgery, and participation in training or professional conferences related to IV-PCA treatment.

Data collection took place from January 5 to March 31, 2023. A total of 372 full-time registered nurses providing direct patient care for individuals receiving IV-PCA treatment after surgery at a university hospital in southern Thailand were eligible and invited to participate in this study. The exclusion criteria included: (1) currently working only in nursing administration roles; (2) currently in pain management nurse positions or involved in an acute pain service; and (3) holding a position that requires direct supervision.

The unit coordinators distributed the questionnaires, along with a cover letter and informed consent form, to the nurses. Three hundred-eight questionnaires were returned by the participants; however, 38 incomplete questionnaires were excluded. The remaining 270 questionnaires were included in the final qualitative content analysis.

Permission to approach the nurse participants and collect data was granted by the directors of the surgical department and the director of nursing services, including the head nurses and staff nurses of each targeted unit. The participant information sheet, in accordance with Human Research Ethics Unit standards and policies, was sent to all participants. Each participant provided individual written consent after willingly and freely choosing to participate in this study. The names and identities of the participants were kept confidential, using pseudonyms during data collection, analysis, and publication.

Descriptive statistics were employed to analyze the demographic data. The qualitative data underwent systematic content analysis. First, the raw texts from the open-ended questions were read independently and discussed by three researchers to gain an overall impression. Next, systematic coding was performed by the same three researchers to identify similarities and differences within the data set, aiming to identify and quantify key words and themes. Meanings were interpreted to draw conclusions and generate results. The primary findings were shared with the research team to ensure the credibility of the analysis[15,16]. Transparency and consistency were preserved throughout the content analysis. Data were categorized without reliance on preconceived theories, biases, or any discrimination by the researchers[17-19].

Results

The participants consisted of 259 female and 11 male registered nurses, with an average age of 35.11 years (standard deviation=9.72). The majority had completed a bachelor's degree in nursing. More than half had been working as registered nurses and providing care for patients after surgery for more than 9 years. Most had experience caring for patients receiving IV-PCA after surgery, and more than half reported having received IV-PCA knowledge.

1. Barriers and facilitators to the use of IV-PCA

Three themes emerged from the data concerning barriers and facilitators to the use of IV-PCA treatment for acute postoperative pain. These themes included patient-related factors, resource-and-equipment-related factors, and medical and nursing staff-related factors. Participants identified patients' knowledge and understanding as significant factors influencing the use of IV-PCA treatment, which encompassed learning capability and cognitive function; age; level of consciousness, orientation, and postoperative confusion; physical fitness; concurrent disorders or comorbidities; and the postoperative stability of patients. Furthermore, education for patients on utilizing the IV-PCA and fear of side effects and complications were highlighted as key barriers and facilitators in the adoption of IV-PCA treatment. The following comments illustrate this theme.

"Knowledge and understanding of patients towards how to properly use PCA are vital for safe and effective use of PCA after surgery. Optimal pain relief is achieved in cases that have the capability to press the PCA button after surgery. Quite often, patients had no idea how to use PCA, which resulted from an inadequate understanding of PCA, or they did not know they would receive PCA after surgery. Patients might be reluctant to use or overuse PCA for adequate pain management and reluctant due to the increased risk of developing adverse effects from PCA. Sometimes, family members pressed the PCA button for patients". (Participant 124)

The nurse participants reported resource and equipment factors as barriers and facilitators to using PCA after surgery. Equipment-related factors included the following: the useability or user-friendliness of complicated electronic PCA devices; problems related to using electronic PCA devices; the complexity and differences in the process related to setting up, programming, and administering IV-PCA; patient confusion between the PCA demand button and the nurse call bell; and the patient's inability to confirm the bolus dose delivery after pressing the PCA button.

"Giving opioids via PCA infusion pump involves too many different steps and details of its use. Each PCA infusion pump product has unique details for the use of the pump. Complex PCA infusion pumps lead to increased time consumption and the risk of errors. Patients, particularly elderly patients, confuse the PCA demand button with the nurse call bell or other devices. Also, repeated pressing of the PCA demand button occurs because patients do not know whether they received the pain medication or not". (Participant 205)

Resource-related factors included educational materials and an e-learning module for nurses and patients on the use of PCA, nursing practice guidelines for the use and management of PCA, sufficient nurse staffing and a high nurse-patient ratio, adequate pain management specialists, and the establishment and activation of an acute pain service (APS).

"Administration of IV-PCA after surgery is not part of our routine nursing practice. Standard PCA information given to patients before surgery is very important. Pamphlet or material to educate patients on PCA use is highly needed for patient education and preparation. Educational materials/tools and a clinical practice guideline for nurses on the use of PCA are also required. An e-learning module or online continuing education course regarding PCA should be provided for the nurses". (Participant 2)

The following sub-themes regarding medical and nursing staff factors emerged from the data: knowledge and

experience that medical and nursing staff have about IV-PCA treatment; communication and collaboration between physicians and nurses; the hierarchical structure of the healthcare profession; mutual respect among staff members of interprofessional teams; respect for autonomous decision making; and culture and communication in Thai nursing as an example in the following comments written by the nurse participants:

"Medical doctors should work collaboratively and mutually in making clinical decisions with nurses regarding PCA treatment. Assessment and selection of patients to use PCA after surgery, including discontinuation of PCA, should be done together between the medical doctors or anesthetists and nurses. The clinical decision to stop using PCA, as well as suggestions made by nurses, should be accepted. Consensus is yet to be reached on the use of PCA for individual patients". (Participant 79)

2. Roles and responsibilities of nurses

Five themes emerged from most nurse participants regarding their roles and responsibilities in using IV-PCA for acute postoperative pain: proper patient selection; preoperative patient education on PCA use; verification and translation of the PCA prescription; PCA administration; and adequate PCA monitoring and documentation. Most nurse participants regarded patient selection for IV-PCA after surgery as a role and responsibility of nurses, conducted in cooperation and collaboration with anesthetists and surgeons.

"Selection of eligible patients to use PCA after surgery must be done before surgery. PCA patient selection should be properly done by anesthetists, surgeons, and nurses. Moreover, reassessment of a patient's suitability for PCA should also be done immediately after surgery and particularly when a patient's condition has changed. Also, anesthetists and surgeons should respect and accept the decisions nurses make on the appropriateness of patients for the use of IV-PCA." (Participant 70)

Every nurse participant perceived patient education as their main role and responsibility regarding IV-PCA treatment. Several nurse participants also expressed the obstacles they faced regarding this issue that resulted from unplanned IV-PCA use after surgery:

"Without giving patient education, proper PCA use after surgery is impossible. Although anesthetists have this responsibility, nurses play a vital role and responsibility in PCA education for patients before surgery and as required". (Participant 109)

"Nurses did not know which patients would receive PCA after surgery, we did not provide education for patients before surgery. Patients use PCA improperly after surgery. It is inappropriate and ineffective to give PCA education for patients immediately after surgery". (Participant 244)

Every nurse participant recognized the need for verification and translation of IV-PCA prescriptions. According to the nurses, an IV-PCA prescription is complex and distinct from a traditional intravenous opioid prescription for the following reasons:

"It is the legal role and responsibility of nurses to carry out medical doctor's orders. However, in the case of an IV-PCA prescription, it consists of specific parameters such as bolus dose, lockout interval, hour limits, and background infusion. The same PCA prescription is ordered for almost all patients but may not fit everyone. However, the nurses do not have adequate knowledge to verify or make discussions on this matter. This procedure requires specific knowledge and training". (Participant 89)

Every nurse participant practiced PCA monitoring and documented the patient's clinical condition in the PCA chart according to the physician's orders and the unit protocol. The PCA chart was checked daily and audited by the anesthetists. They also mentioned facing challenges in documenting processes related to data from the PCA infusion pump. The participants further noted the insufficient interpretation and use of the recorded data to

inform or adjust the pain management plan. Additionally, they suggested developing a comprehensive and structured continuing education and training program about IV-PCA before caring for patients.

"Monitoring and recording the clinical conditions of PCA patients were conducted according to the medical doctor's order using the PCA chart. The data included the number of demands made by the patient as required, number of successful demands, amount of opioid infused, pain scores at rest and during activity, sedation scores, respiratory rate, and nausea and vomiting." (Participant 31)

Discussion

This study offers a novel understanding of nurses' perspectives on the use of IV-PCA for acute postoperative pain within the context of Thai nursing. The results revealed that all nurse participants considered patients, resources and equipment, and medical and nursing staff as factors inextricably linked to the safe and effective use of IV-PCA. As previously mentioned, the major patient barriers identified by the nurse participants were the inappropriate use of PCA, resulting from inadequate PCA understanding, post-surgery conditions, and advanced age. The findings were consistent with prior studies noting the importance of these factors on the safety and efficacy of PCA treatment[3,20]. Educating patients on the use of the PCA device is necessary before surgery or at the commencement of PCA[21,22]. Teaching patients about PCA devices immediately after surgery can hinder their learning process[23,24]. Accordingly, contraindications for using PCA include patient refusal, impaired mental status, physical or mental inability to press the handset, and a lack of understanding or capacity to make decisions to press the PCA button. The nurse participants' views regarding barriers related to patient conditions after surgery align with current evidence[6,10,12].

In this study, most nurse participants viewed elderly postoperative patients as a greater barrier to learning the use of IV-PCA treatment after surgery compared to adult patients. Consistent with previous studies, hospitalized adults of advanced age were recognized as a factor that increased the risk of developing adverse events in PCA due to age-related pharmacokinetic or pharmacodynamic changes and decreased renal function. Older patients with cognitive impairments and learning difficulties may struggle to follow PCA instructions, which can lead to improper PCA use. For this reason, administering PCA to older adult patients requires special caution[18,21,22]. Hence, the patient factor is one of the cornerstones that can either enhance or hinder the safe and effective use of PCA.

Study participants reported that the variety and complexity of electronic PCA devices are equipment-related factors influencing PCA safety and efficacy. The study findings are consistent with prior literature that identified device design flaws as significant obstacles to the safe and effective use of PCA[16,22,25]. Consequently, the same manufacturer of the PCA pump device is recommended for hospitals. Nurses and patients using PCA pumps must be knowledgeable about specific PCA pumps and protocols[7,10,11]. Adequate pain specialist staff and APS management were viewed by nurse participants in this study as facilitators of PCA. This viewpoint underscores the importance of an APS with a well-trained, capable multidisciplinary staff to enhance the safe and effective use of IV-PCA treatment, which has become a minimum requirement for pain control[5,26,27].

The ability to make accurate clinical decisions and implement appropriate nursing interventions is a crucial aspect of nursing practice and influences the quality of patient care. Effective clinical decision-making should rely on evidence-based practice. Therefore, the current use of IV-PCA does not align with the best practices that may be inherent in the application of evidence-based practice within the Thai nursing context[28].

All nurse participants generally agreed that inadequate knowledge and experience related to PCA

among nurses were staff-related factors impacting the safe and effective use of IV-PCA. Well-trained staff nurses are essential for administering PCA to manage pain[1,16,23]. Untrained and incompetent medical and nursing personnel represent significant contraindications to the use of PCA treatment[26,27,29]. Notably, the perceived roles and responsibilities of nurses regarding intravenous PCA are outlined in the current literature[30,31]. Nurses engaged in the administration and management of IV-PCA are crucial to ensuring its safe and effective application. This underscores the commitment and intentions of Thai nurse participants in this study to deliver comprehensive care for patients receiving IV-PCA post-surgery.

The study participants indicated that coordination and collaboration between nurses and medical doctors are crucial factors influencing the safe and effective use of IV-PCA. These findings support the fundamental principle of PCA treatment, which involves a multidisciplinary team along with patients[30-32]. The decision-making constraints and the limited autonomy among the nurses revealed in this study further underscore the existing hierarchy and workplace dynamics between nurses and medical doctors in this context[33]. It is widely acknowledged that PCA education for all healthcare professionals and patients is vital and establishes a foundation for the safe and effective use of IV-PCA. A shortage of qualified staff nurses, an unsafe nursing environment, and insufficient patient understanding are significant barriers to the effective use of IV-PCA[30-33].

Conclusion

This study offers a thorough understanding of the factors influencing the use of IV-PCA and the roles and responsibilities of nurses regarding IV-PCA. Furthermore, it highlights the need for improvements in PCA knowledge and skills from the perspective of nurse participants, which would facilitate the development of an IV-PCA capability approach to enhance the safe and effective use of IV-PCA. Implementing PCA treatment in a healthcare organization should consider not only the nature of the evidence but also the viewpoints of nurses, healthcare staff, and the context in which the evidence is to be applied. Successful implementation of IV-PCA treatment on a global scale must be adapted for effective use within the Thai hospital context. It is feasible to improve postoperative pain relief using IV-PCA for Thai surgical patients undergoing surgery; however, the implementation of this treatment must align with the healthcare context in Thailand.

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Conflict of interest

There are no potential conflicts of interest to declare.

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