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A Literature Review Study on the Effectiveness of Pre-operative Education for Post-operative Pain Management

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Abstract

Context: Post-operative pain (POP) is one of the essential consequences of various surgeries in surgical patients, and various pharmacological and non-pharmacological methods should reduce it. Due to the side effects of medicinal methods, the use of non-medicinal methods has attracted the attention of nurses and health care workers nowadays. Considering this issue, the main goal of this study was to evaluate pre-operative education (POE) on the reduction of POP in surgical patients.

Evidence Acquisition: This narrative review evaluated previous research from 1990 to 2024. Accordingly, 184 studies were obtained in the first search stage through advanced search in national and international databases, including Web of Science, Islamic World Science Citation Center (ISC), Scopus, PubMed, Magiran, and Google Scholar, Iran-Doc. Then, considering the inclusion and exclusion criteria, 22 studies were considered for the present review study.

Results: Based on the present review, most evaluated studies (approximately 64%) showed that POE positively and significantly affects POP. Previous studies have reported that various parameters play a role in the impact of POE on POP, including the type of surgery, the length of follow-up, the continuity of care, the method of providing training, the quality of the intervention, the patient's awareness of the pain measurement method, with or without the educator's interaction and empathy during education, and the presence or absence of patient anxiety during training.

Conclusions: Considering the positive and significant effect of POE on POP, nurses and caregivers of patients who are candidates for surgery should use the appropriate educational content and educational methods to reduce POP in patients according to the type of surgery and other influencing variables. However, before that, the nurses themselves should get enough information about the different methods of POE so that they can convey the educational content to the patients with proper quality and efficiency.

Keywords: Surgery, Pre-operative, Education, Post-operative, Pain Management, Surgical Candidate Patients

1. Context

From the distant past, pain has been a part of human experiences that can be protective, stimulating, or destructive and can also make people aware of the existence of an apparent or hidden injury in the human body (1). Pain is a complex combination of physiological, psychological, social, and cultural variables, and each person's sensitivity to it differs (2).

Pain after surgery is still one of the clinical challenges for nurses and the patient's family (3). Improper management of pain after surgery may cause anxiety, insomnia, increased stress, and limited mobility (3, 4). In addition, inadequate pain treatment increases postoperative complications and requires more extended hospitalization (5). The lack of control of acute pain after surgery is associated with many other complications, including increased disease severity, physical dysfunction, reduced quality of life, reduced recovery process, long-term use of narcotic drugs during and after hospitalization, and increased costs (6, 7). Narcotic drugs have many side effects in controlling pain after surgery. For example, morphine has negative effects on the internal regulation of the release of endorphins in the body's natural response to pain (3, 8). In addition, post-operative pain (POP) relief without the

use of narcotic drugs reduces nausea and vomiting, reduces the incidence of surgical site dislocation, and facilitates and increases mobility (8, 9).

In addition, early postoperative pain appears to cause persistent pain that may persist for several months after surgery in a significant proportion of patients. Analgesic measures are necessary to prevent the development of acute and chronic pain after surgery and to reduce the occurrence and intensity of pain during and immediately after surgery (3, 5, 6). Pain management is one of the most significant clinical challenges of nursing during the postoperative care period (6). Although the studies show improvements in the current situation, some researchers still indicate insufficient pain management after surgery (10).

Efforts to increase patients' awareness of pain and analgesic options may increase the likelihood of achieving optimal pain control after surgery (11, 12). Patients should be comfortable enough to participate in recovery and continue self-care immediately in the postoperative period with the shortening of hospital stays and the increase of same-day surgery (13). Pre-operative education (POE) is a means to prepare patients for their role in pain planning and the postoperative recovery period (14). Pre-operative education can include information about the importance of pain control, treatment goals, the amount of pain experienced by the patient, and the importance of pain reporting (15, 16).

Pain management options include pharmacological and non-pharmacological methods that should be taught (17). This study evaluated the impact of POE on POP by reviewing previous studies, which were presented as a narrative review.

2. Evidence Acquisition

The current study was a narrative review type, and through the evaluation of the previous study, the research results were collected and became the basis of the present study. For this purpose, relevant studies from 1990 - 2024 were extracted through advanced search in national and international databases, including Web of Science, Islamic World Science Citation Center (ISC), Scopus, PubMed, Magiran, and Google Scholar Iran-Doc. Different keywords were used to search the databases mentioned above, the most important and relevant of which are "operation," "pre-operative," "education," "postoperative," "pain," "perioperative," and "recovery.""surgery," "elective surgery," "pain experience," "preoperative information," "undergoing surgery," "self-efficacy," "self-care," patient," "pain relievers," and "pain relief." Various criteria were used to exclude some searched studies from gathering results for the present review. Unpublished studies and studies published in non-authoritative journals and public Internet databases were not considered. Considering the primary purpose of the present study, only research was selected that focused on POP and pain caused by the disease itself, and before surgery, was not considered. In the first stage of the search, 184 studies were selected, and after applying the inclusion and exclusion criteria, 22 studies were considered for the present review.

3. Results

Past research has shown that post-surgery pain is still a severe problem for surgical patients. The available evidence on POE over POP shows various results. Based on the findings, approximately 64% of previous studies reported that POE has a positive and significant effect on POP, and the remaining 36% showed opposite results (Table 1).

A review by Heydari et al. was conducted on the effect of POE on POP. The results showed that out of thirteen evaluated studies, seven reported positive effects, and six reported no significant impact of POE on POP (14). In another study by Chaudhary and Shankar, the effect of POE on post-operative outcomes was investigated, and educational intervention by the researcher in the pre-operative period through personal counseling was provided to the study group. The findings showed that patients who receive structured, individual, and detailed POE and counseling can better deal with POP in the immediate postoperative period (11).

Cooke et al. showed that preoperative self-efficacy training for routine care for patients undergoing joint replacement surgery to reduce postoperative pain and anxiety also had no significant effect on patient satisfaction (17). Pereira et al. found that the empathetic patient-centered approach positively affects psychological and clinical outcomes in outpatient surgery candidates and significantly reduces POP (18)—the effect of patient education programs on headaches caused by spinal anesthesia. Aberomand et al. evaluated that educational programs significantly reduce headaches (19). In addition, another study on the effectiveness of providing oral or written preoperative information to female patient candidates for oncology surgery by Angioli et al. was conducted, and the findings showed a positive and significant impact of the information provided in reducing POP (20).

In addition, Porras-González et al., which was about the effectiveness of the nursing method in pain management after major outpatient surgery, showed

Table 1. The Summary of Previous Studies Results About the Effect of Pre-operative Education on Post-operative Pain

Authors; (Year)	Study Type	Total Sample Size (Person)	Surgery Type	Positive and Significant Effect of POE on POP?
Chaudhary and Shankar (2016) (11)	Prospective case-control study	302	Lab cholecystectomy, hernia surgery and anorectal surgery	Yes
Heydari et al. (2019) (14)	Systematic review study	4160	Various surgery	7 studies (Yes) 6 studies (No)
Cooke et al. (2016) (17)	Pilot randomized controlled trial study	91	Joint replacement surgery	Yes
Pereira et al. (2016) (18)	Prospective case-control study	104	General ambulatory surgery	Yes
Aberomand et al. (2016) (19)	Empirical study	120	General, orthopedic and urology surgeries	Yes
Angioli et al. (2014) (20)	Randomized study	190	Gynecologic oncology surgery	Yes
Porras-González et al. (2015) (21)	Quasi-experimental study	380	Ambulatory surgery	Yes
Chen et al. (2014) (22)	Quasi-experimental study	92	TKA	Yes
Sugai et al. (2013) (23)	Quasi-experimental study	135	Outpatient surgery	Yes
Schmidt et al. (2015) (24)	Randomized controlled trial study	652	Oncologic surgery	Yes
Berge et al. (2004) (25)	Randomized controlled trial study	40	THR	Yes
Abd-Elghany et al. (2019) (26)	Quasi-experimental study	60	TKA	Yes
Kearney et al. (2011) (27)	Quasi-experimental study	150	Joint replacement surgery	Yes
Bakhshandeh et al. (2014) (28)	Quasi-experimental study	72	Coronary artery bypass graft	Yes
Mohammadi et al. (2017) (29)	Quasi-experimental study	130	Percutaneous nephrolithotomy (PCNL)	Yes
Amirmohseni et al. (2016) (30)	Quasi-experimental study	64	Knee arthroplasty surgery	Yes
Louw et al. (2014) (31)	Randomized controlled trial study	67	Lumbar radiculopathy	No
Biau et al. (2015) (32)	Randomized controlled trial study	209	THR	No
van Dijk et al. (2015) (33)	Quasi-randomized controlled trial	377	Various surgery	No
Kesanen et al. (2017) (34)	Randomized clinical trial	100	Spinal stenosis surgery	No
Rapp et al. (2021) (35)	Retrospective matched case control study	229	Spinal surgery	No
Moharrami et al. (2021) (36)	Systematic review and meta-analysis	Not reported	Lower limb joint replacement surgery	1 study (Yes) 4 studies (No)

Abbreviations: THA, total hip arthroplasty; TKA, total knee arthroplasty.

that pre-surgery counseling by nurses caused a significant reduction in POP (21). The effect of POE intervention with face-to-face cognitive-behavioral training on pain and rehabilitation performance of patients who underwent total knee replacement (TKA) by Chen et al. was studied, and the findings showed a significant decrease in POP (22). In Sugai et al., the effectiveness of oral (interactive) and written training by the surgeon was evaluated for elective outpatient surgery patients, and the results of this research also showed that the above-mentioned interventional training method has a significant effect on reducing POP (23). In addition, Schmidt et al. reported that providing an educational booklet one day before surgery for candidates for various surgeries reduces the meaning of POP in patients (24). A randomized controlled trial by Berge et al. selected 40 patients who were candidates for total hip replacement (THR) and were divided into two intervention and control groups. Then, a short psychological pain management rehabilitation program was conducted for the intervention group, and no educational intervention was implemented for the control group. The results showed that patients who learned pain management experienced less pain intensity, discomfort, and sleep disturbance than the control group (25).

Abd-Elghany et al. conducted a study on the efficacy of implementing a pre-operative health education program on postoperative outcomes of patients undergoing total knee arthroplasty. The mentioned

study showed significant improvement in the level of general awareness, self-reported actions, and the overall outcome score of knee injury and osteoarthritis in the intervention group compared to the control group after the training (26). In Kearney et al., the effects of POE on patient outcomes after joint replacement surgery were evaluated in 150 operated patients. The findings of the mentioned study showed that patients who participated in the POE class reported that they were more ready for surgery and were better able to control their POP (27). Based on the findings of Bakhshandeh et al. on patients undergoing coronary artery bypass graft surgery (28) and Mohammadi et al. regarding patients undergoing percutaneous nephrolithotomy (29), POE significantly reduces POP in surgical patients. In another study by Amirmohseni et al., a combined training program including face-to-face training, presentation of booklets, and presentation of an educational video one day before surgery was implemented for 32 people (intervention group) of knee arthroplasty surgery candidate patients but the control group (32 people) received routine care. The results showed that the intervention group reported significantly less dry POP than the control group most of the time (30).

Contrary to the research mentioned above, the findings of some other studies have shown that POE does not significantly affect POP. Lowe et al. also presented educational content verbally and face-to-face by a physiotherapist before surgery for patients with lumbar radiculopathy, the results of which showed that this educational method had no significant effect on POP (31). In Biau et al., the nurse taught the pain reliever pump and the care method related to the surgery by the physiotherapist twelve weeks before the surgery for patients who are candidates for THR. The findings showed that the aforementioned educational methods did not significantly affect POP for the studied patients (32). van Dijk et al. (2015) reported that providing an educational video about pain assessment, painkillers, and pain management for 1 - 30 minutes before surgery for surgical candidates did not significantly reduce POP (33). Similarly, in Kesanen et al., POE was provided through a telephone conversation for 21 minutes to patients with vertebral canal stenosis who were candidates for surgery; the non-significant effect on the reduction of POE was reported as the main finding of this study (34). In a retrospective matched case-control study conducted by Rapp et al., 229 candidates for spinal surgery were considered and divided into intervention (113 people) and control (116 people) groups. The intervention group patients participated in educational programs before the operation, but this did not happen to the control group. The results showed that POE for spine surgery candidates does not necessarily lead to improved pain management, shorter length of stay, or greater patient satisfaction (35). Moharrami et al., in a systematic review and meta-analysis study about POE for pain relief after lower limb joint replacement surgery, showed that training before total hip arthroplasty (THA) and total knee arthroplasty (TKA) cannot significantly reduce POP (36).

Most past studies have indicated that POE, as a complex intervention, can reduce POP. The reason for this complexity can be somehow related to the philosophy and nature of education. From the results of this evidence, many factors can be influential in the effectiveness of POE on POP, which include the type of surgery, length of follow-up period, continuity of care, method of providing education, quality of intervention, patient awareness of pain measurement method, Interactive training is accompanied by empathy, and anxiety reduction. Many factors are involved in the teaching and learning process's structure and effectiveness. Using scientific approaches to education according to patients' needs can effectively transfer knowledge and concepts and provide the ultimate goal of increasing knowledge, learning, and changing behavior. Structured and comprehensive educational programs with appropriate educational content will increase patients' awareness and enable them to participate more in self-care, increase self-efficacy, improve pain management, and reduce postoperative complications. The role of the educator, who may be a skilled, trained nurse, becomes more prominent. The importance of the art of communication, interaction, and empathy with patients in the process of education by care providers and providing feedback to patients plays a significant role in meaningful learning and control of patients' pain and anxiety.

4. Conclusions

Based on the results, almost two-thirds of previous studies reported that POE positively and significantly reduces POP. Meanwhile, the findings of one-third of the other evaluated studies showed that POE cannot have a significant impact on POP control. The effectiveness or non-effectiveness of POE on POP depends on various parameters, including the type of surgery, length of follow-up time, continuity of care, method of providing training, quality of intervention, patient awareness of pain measurement method, interactive training with empathy, and reducing anxiety. Due to the positive and significant impact of POE on POP in most studies, nurses and caregivers of patients who are candidates for surgery, according to the type of surgery, are suggested

to use appropriate educational content and educational methods to reduce POP in patients. However, before that, the nurses themselves must get enough information about the different techniques of POE so that they can convey the educational content provided to the patients with proper quality and efficiency.

Footnotes

Authors' Contribution: Z. A.: Presenting the idea, designing the study; F. M.: Writing and revision of the manuscript.

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References

1. Ferrell BA. Pain management. *Clin Geriatr Med*. 2000;**16**(4):853-74. [PubMed ID: 10984760]. https://doi.org/10.1016/s0749-0690(05)70048-3.
2. Eccleston C. Role of psychology in pain management. *Br J Anaesth*. 2001;**87**(1):144-52. [PubMed ID: 11460803]. https://doi.org/10.1093/bja/87.1.144.
3. Hutchison RW. Challenges in acute post-operative pain management. *Am J Health Syst Pharm*. 2007;**64**(6 Suppl 4):S2-5. [PubMed ID: 17353557]. https://doi.org/10.2146/ajhp060679.
4. Rao S M. Acute post operative pain. *PAIN Indian J Anaesth*. 2006;**50**:340-4.
5. Misiolek H, Cettler M, Woron J, Wordliczek J, Dobrogowski J, Mayzner-Zawadzka E. The 2014 guidelines for post-operative pain management. *Anaesthesiol Intensive Ther*. 2014;**46**(4):221-44. [PubMed ID: 25293474]. https://doi.org/10.5603/AIT.2014.0041.
6. Kitson A. Post-operative pain management: a literature review. *J Clin Nurs*. 1994;**3**(1):7-18. [PubMed ID: 8313080]. https://doi.org/10.1111/j.1365-2702.1994.tb00353.x.
7. Reimer-Kent J. Improving post-operative pain management by focusing on prevention. *Nurs BC*. 2004;**36**(4):20-4. [PubMed ID: 15552180].
8. Etches RC. Complications of Acute Pain Management. *Anesthesiol Clin North Am*. 1992;**10**(2):417-33. https://doi.org/10.1016/S0889-8537(21)00475-2.
9. American Geriatrics Society Expert Panel on Postoperative Delirium in Older A. Postoperative delirium in older adults: best practice statement from the American Geriatrics Society. *J Am Coll Surg*. 2015;**220**(2):136-48 e1. [PubMed ID: 25535170]. https://doi.org/10.1016/j.jamcollsurg.2014.10.019.
10. Apfelbaum JL, Chen C, Mehta SS, Gan TJ. Postoperative pain experience: results from a national survey suggest postoperative pain continues to be undermanaged. *Anesth Analg*. 2003;**97**(2):534-40. [PubMed ID: 12873949]. https://doi.org/10.1213/01.ANE.0000068822.10113.9E.
11. Chaudhary I, Shankar M. Study on the effect of pre-operative patient education on post-operative outcomes. *Int J Med Res Health Sci*. 2016;**10**. https://doi.org/10.5281/zenodo.1124575.
12. Garretson S. Benefits of pre-operative information programmes. *Nurs Stand*. 2004;**18**(47):33-7. [PubMed ID: 15357551]. https://doi.org/10.7748/ns2004.08.18.47.33.c3662.
13. Pool MK, Nadrian H, Pasha N. Effects of a self-care education program on quality of life after surgery in patients with esophageal cancer. *Gastroenterol Nurs*. 2012;**35**(5):332-40. [PubMed ID: 23018169]. https://doi.org/10.1097/SGA.0b013e3182605f86.
14. Heydari A, Manzari ZS, Abbaspour H. [Effect of preoperative education on postoperative pain after elective surgery: A systematic review]. *J Hayat*. 2019;**25**(3):220-36. FA.
15. Shuldham C. A review of the impact of pre-operative education on recovery from surgery. *Int J Nurs Stud*. 1999;**36**(2):171-7. [PubMed ID: 10376227]. https://doi.org/10.1016/s0020-7489(99)00010-3.
16. Pyati S, Gan TJ. Perioperative pain management. *CNS Drugs*. 2007;**21**(3):185-211. [PubMed ID: 17338592]. https://doi.org/10.2165/00023210-200721030-00002.
17. Cooke M, Walker R, Aitken LM, Freeman A, Pavey S, Cantrill R. Pre-operative self-efficacy education vs. usual care for patients undergoing joint replacement surgery: a pilot randomised controlled trial. *Scand J Caring Sci*. 2016;**30**(1):74-82. [PubMed ID: 25857374]. https://doi.org/10.1111/scs.12223.
18. Pereira L, Figueiredo-Braga M, Carvalho IP. Preoperative anxiety in ambulatory surgery: The impact of an empathic patient-centered approach on psychological and clinical outcomes. *Patient Educ Couns*. 2016;**99**(5):733-8. [PubMed ID: 26654958]. https://doi.org/10.1016/j.pec.2015.11.016.
19. Aberomand R, Ravari A, Mirzaei T, Savaie M. Effects of Patient Educational Programs on the Headache Caused by Spinal Anesthesia. *Evidence Based Care*. 2016;**5**(4):41-50. https://doi.org/10.22038/ebcj.2015.6292.
20. Angioli R, Plotti F, Capriglione S, Aloisi A, Aloisi ME, Luvero D, et al. The effects of giving patients verbal or written pre-operative information in gynecologic oncology surgery: a randomized study and the medical-legal point of view. *Eur J Obstet Gynecol Reprod Biol*. 2014;**177**:67-71. [PubMed ID: 24793931]. https://doi.org/10.1016/j.ejogrb.2014.03.041.
21. Porras-Gonzalez MH, Baron-Lopez FJ, Garcia-Luque MJ, Morales-Gil IM. Effectiveness of the Nursing Methodology in Pain Management after Major Ambulatory Surgery. *Pain Manag Nurs*. 2015;**16**(4):520-5. [PubMed ID: 25530124]. https://doi.org/10.1016/j.pmn.2014.09.013.
22. Chen SR, Chen CS, Lin PC. The effect of educational intervention on the pain and rehabilitation performance of patients who undergo a total knee replacement. *J Clin Nurs*. 2014;**23**(1-2):279-87. [PubMed ID: 24313941]. https://doi.org/10.1111/jocn.12466.
23. Sugai DY, Deptula PL, Parsa AA, Don Parsa F. The importance of communication in the management of postoperative pain. *Hawaii J Med Public Health*. 2013;**72**(6):180-4. [PubMed ID: 23795326]. [PubMed Central ID: PMC3689499].
24. Schmidt M, Eckardt R, Scholtz K, Neuner B, von Dossow-Hanfstingl V, Sehouli J, et al. Patient Empowerment Improved Perioperative Quality of Care in Cancer Patients Aged >/= 65 Years - A Randomized Controlled Trial. *PLoS One*. 2015;**10**(9). e0137824. [PubMed ID: 26378939]. [PubMed Central ID: PMC4574984]. https://doi.org/10.1371/journal.pone.0137824.
25. Berge DJ, Dolin SJ, Williams AC, Harman R. Pre-operative and post-operative effect of a pain management programme prior to total hip replacement: a randomized controlled trial. *Pain*. 2004;**110**(1-2):33-9. [PubMed ID: 15275749]. https://doi.org/10.1016/j.pain.2004.03.002.

26. Abd-Elghany SM, Hassanein AA, Mohammed H. Efficacy of Implementing Pre-operative Health Education Program on Post-operative Outcomes of Patients Undergoing Total Knee Arthroplasty. *Int J Novel Res Healthcare Nurs*. 2019;**6**(3):239-49.
27. Kearney M, Jennrich MK, Lyons S, Robinson R, Berger B. Effects of preoperative education on patient outcomes after joint replacement surgery. *Orthop Nurs*. 2011;**30**(6):391-6. [PubMed ID: 22124192]. https://doi.org/10.1097/NOR.0b013e31823710ea.
28. Bakhshandeh H, Babaee T, Sadeghi R. The effect of pre-operative education on post-operative pain perception in patient undergoingCoronaryArteryBypass Graft. *Cardiovascular Nurs J*. 2014;**3**(2):40-7. FA.
29. Mohammadi M, Emami SA, Mahmoudi F, Bahrani S. [The Effect of Preoperative Education on Postoperative Pain and Anxiety in Patients Undergoing Percutaneous Nephrolithotomy (PCNL)]. *J Isfahan Med Sch*. 2017;**35**(426):428-33. FA.
30. Amirmohseni L, Shariati A, Baraz S, Latifi SM. [Effectiveness of blended instruction on pain and requirement for analgesic after knee arthroplasty surgery]. *J Clin Nurs Midwifery*. 2016;**5**(3):1-11. FA.
31. Louw A, Diener I, Landers MR, Puentedura EJ. Preoperative pain neuroscience education for lumbar radiculopathy: a multicenter randomized controlled trial with 1-year follow-up. *Spine (Phila Pa 1976)*. 2014;**39**(18):1449-57. [PubMed ID: 24875964]. https://doi.org/10.1097/BRS.0000000000000444.
32. Biau DJ, Porcher R, Roren A, Babinet A, Rosencher N, Chevret S, et al. Neither pre-operative education or a minimally invasive procedure have any influence on the recovery time after total hip replacement. *Int Orthop*. 2015;**39**(8):1475-81. [PubMed ID: 25971655]. https://doi.org/10.1007/s00264-015-2802-y.
33. van Dijk JF, van Wijck AJ, Kappen TH, Peelen LM, Kalkman CJ, Schuurmans MJ. The effect of a preoperative educational film on patients' postoperative pain in relation to their request for opioids. *Pain Manag Nurs*. 2015;**16**(2):137-45. [PubMed ID: 25246325]. https://doi.org/10.1016/j.pmn.2014.05.006.
34. Kesanen J, Leino-Kilpi H, Lund T, Montin L, Puukka P, Valkeapaa K. Increased preoperative knowledge reduces surgery-related anxiety: a randomised clinical trial in 100 spinal stenosis patients. *Eur Spine J*. 2017;**26**(10):2520-8. [PubMed ID: 28138781]. https://doi.org/10.1007/s00586-017-4963-4.
35. Rapp A, Sun M, Weissman H, Perez-Cruet MJ, Fahim DK. Pre-operative patient education does not necessarily reduce length of stay or pain after spinal surgery. *Interdisciplinary Neurosurgery*. 2021;**24**:101044. https://doi.org/10.1016/j.inat.2020.101044.
36. Moharrami MR, Anvari HM, Abedi Gheshlaghi L, Nazari B. Preoperative education for pain relief after the lower limb joint replacement surgery: A systematic review and meta-analysis. *Trauma Monthly*. 2021;**26**(1):52-60.