Applied Nursing Research 40 (2018) 110–115

Contents lists available at ScienceDirect

Applied Nursing Research

journal homepage: www.elsevier.com/locate/apnr

Original article

Patient-controlled oral analgesia for acute abdominal pain: A before-and-after intervention study on pain intensity and use of analgesics

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ARTICLE INFO

Keywords:
Acute pain
Pain management
Patient-centered care
Patient involvement
Self-administered medication

ABSTRACT

Aim: To compare the use of patient-controlled oral analgesia with nurse-controlled analgesia for patients admitted to hospital with acute abdominal pain. The primary outcome measure was pain intensity. The secondary outcome measures were the use of analgesics and antiemetics.

Background: Inadequate pain management of patients with acute abdominal pain can occur during hospital admission. Unrelieved acute pain can result in chronic pain, stroke, bleeding and myocardial ischemia.

Methods: A before-and-after intervention study was conducted in an emergency department and a surgical department with three subunits. Data were collected from medical charts and analyzed using chi-squared and Kruskal–Wallis tests.

Results: A total of 170 patients were included. The median pain intensity score, using the numeric ranking scale, was 2.5 and 2 on Day 2 ($p = 0.10$), 2 and 2 on Day 3 ($p = 0,40$), 2.5 and 0 on Day 4 ($p = 0.10$), 2 and 0 on Day 5 ($p = 0.045$) in the control and intervention group, respectively. The percentage of patients receiving analgesics was 93 and 86 on Day 2 ($p = 0.20$), 91 and 75 on Day 3 ($p = 0.02$), 89 and 67 on Day 4 ($p = 0.009$) and 80 and 63 on Day 5 ($p = 0.39$). The use of antiemetics was similar in the two groups.

Conclusion: Patient-controlled oral analgesia significantly reduced the numerical ranking pain scale score on Day 5 and the consumption of analgesics on Days 3 and 4 after hospital admission. Patient-controlled oral analgesia is feasible as pain management for patients, but only with minor impact on experienced pain intensity and use of analgesics.

1. Background

Acute abdominal pain is one of the most common reasons for visiting the emergency department (ED) (Falch et al., 2014; Hastings & Powers, 2011). Several studies have reported insufficient pain management in the ED (Marinsek et al., 2007; Muntlin, Carlsson, Safwenberg, & Gunningberg, 2011; Schultz, Mogensen, Pedersen, & Qvist, 2013; Schultz, Qvist, Mogensen, & Pedersen, 2013; Schultz, Qvist, Pedersen, & Mogensen, 2017; Waldo, 2012) and in the surgical ward (Schultz, Qvist, et al., 2013; Schultz, Mogensen, et al., 2013; Schultz et al., 2017; Singh, Saikia, & Lahakar, 2016; Sommer et al., 2008). Inadequate pain management can result in neural alterations leading to chronic pain (Brennan, Carr, & Cousins, 2007; Falch et al., 2014). Furthermore, unrelieved pain after surgery can lead to complications including myocardial ischemia, stroke and bleeding (Brennan et al., 2007).

Pre-diagnostic restriction of analgesics to patients with acute abdominal pain is regularly reported (Falch et al., 2014) and time to analgesics after hospital arrival may vary from 37 to 206 min (Marinsek et al., 2007; Mills, Shofer, Chen, Hollander, & Pines, 2009; Muntlin et al., 2011; Schultz et al., 2017; Schultz, Mogensen, et al., 2013; Waldo, 2012). However, studies have shown that early administration of analgesics does not influence the result of clinical evaluation, diagnostic conclusion or treatment (Ciarrocchi & Amicucci, 2013; Manterola, Vial, Moraga, & Astudillo, 2011; Oguzturk et al., 2012). To provide early administration of analgesics in the ED, studies of nurse-initiated pain management have been conducted. One study reported that use of a nurse-initiated non-opioid analgesic protocol reduced time to administration of analgesics from 98 to 28 min after hospital arrival, but did not achieve adequate analgesic effect (Finn et al., 2012),

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https://doi.org/10.1016/j.apnr.2018.01.007
Received 18 September 2017; Received in revised form 10 January 2018; Accepted 19 January 2018

defined as a reduction in pain score of ≥2 to a level < 4 (Jao, Taylor, Taylor, Khan, & Chae, 2011). Another study reported that use of a nurse-initiated intravenous opioid analgesic protocol reduced time to analgesics from 108 to 60 min and a reduction of pain scores of "weak pain" from 4.1 to 3.7 (Muntlin et al., 2011).

Since the 1960s, patient-controlled analgesia (PCA) has been investigated as a pain management strategy. With PCA the patients provide pain management by self-administration of intravenous opioids using devices designed for this purpose. The idea is to give the patient the power to control their pain (McNicol, Ferguson, & Hudcova, 2015). One study reported that the use of intravenous patient-controlled analgesia (IV-PCA) in the ED decreased pain scores and increased patient satisfaction compared with non-PCA regimes (Birnbaum et al., 2012). A Cochrane review reported that use of IV-PCA for postoperative pain decreased pain scores, and increased patient satisfaction and opioid consumption on postoperative day one, but with a higher incidence of pruritus and nausea (McNicol et al., 2015). Another study reported that 30–55% of patients undergoing abdominal surgery experienced moderate to severe pain on postoperative day one (Sommer et al., 2008).

An alternative to IV-PCA is patient-controlled oral analgesia (PCOA). One study of postpartum pain relief reported unchanged pain scores and patient satisfaction when the PCOA group was compared with the standard of nurse-administered analgesics. In the PCOA group, the patients used either no medication or paracetamol only after vaginal delivery and after caesarean the use of opioids was unchanged when compared with standard care (East, Dube, & Perreault, 2007). One study in women undergoing elective caesarean section showed that the PCOA group had unchanged pain scores, and an increased patient satisfaction and use of opioids when compared with women receiving parenteral analgesia (Bonnal et al., 2016). Studies of pain management in cases of knee arthroplasty have shown no difference in pain score, patient satisfaction, opioid consumption or side effects when PCOA was compared with usual care (Kastanias, Gowans, Tumber, Snaith, & Robinson, 2010), but showed less pain interference with general activity, mood, physical therapy, sleep, and appetite, when as-needed (Pro re nata = PRN) analgesics were patient-controlled (Lambert & Cata, 2014). To our knowledge, no study has investigated how PCOA affects pain relief in patients with acute abdominal pain.

The aim of this study was to investigate the use of PCOA on pain management compared with standard procedure for patients admitted to hospital with acute abdominal pain with or without subsequent surgery. The primary outcome measure was pain intensity. The secondary outcome measures were the use of analgesics and antiemetics.

2. Materials and methods

2.1. Design

A 'before-and-after' intervention study was performed to test the hypotheses that PCOA reduces pain intensity when the administration of oral analgesics is controlled by the patient.

2.2. Setting

The study was performed in an ED and a surgical department with three subunits in a University Hospital in Southern Denmark with a background population for primary referral of approximately 430,000 inhabitants.

The hospital is situated at two locations (Odense and Svendborg). In Odense, patients with acute abdominal pain and an expected hospital stay of < 72 h were transferred to an Emergency Department Observation Unit for patients with gastrointestinal diseases. Patients with an expected hospital stay of more than 72 h were transferred to one of the subunits at the surgical department.

In Svendborg, patients with acute abdominal pain and an expected hospital stay of more than 24 h were transferred to a surgical unit. During busy hours in the ED, the patients could be admitted directly from primary health care to the surgical unit.

2.3. Data collection

Patients were included during December 2014–October 2016 on days where nurses from the project team were on duty. Inclusion criteria were patients with acute abdominal pain, admitted to the ED from the primary health-care service, discharged from the Emergency Department Observation Unit or the surgical department, a minimum of 18 years of age, Danish-speaking, with a hospital stay longer than eight hours and having an expected compliance to the study intervention. Compliance to perform PCAO were based on an assessment of the patients' cognitive function and how affected they were by the acute situation. Exclusion criteria were all end-of-life patients, patients with known pancreatitis, cancer and inflammatory bowel disease. The formation of a stoma or a stay in the intensive care unit were also exclusion criteria.

Data were obtained from the medical files and included: demographic data, Numeric Ranking Scale (NRS) scores, type and amount of analgesics and antiemetics and any readmissions within 30 days. Data for NRS-scores, analgesics and antiemetics were collected from hospital arrival to discharge, or over a stay of a maximum of five days.

2.3.1. Standard care (control group)

Patients in the control group were included during December 2014–May 2015. As standard care, the nurses performed pain assessment by use of an 11-point verbal numerical rating scale (NRS). The NRS pain score reflected the patient's experience of pain from 0 to 10, with 0 as no pain and 10 as the worst imaginable pain (Hjermstad et al., 2011). In addition, the nurses dispensed and administered any medicine at the time as prescribed by the physician. PRN analgesics were given upon patient request or at the recommendation of physicians and nurses. Health professionals and patients were not aware of the planned study intervention.

2.3.2. Teaching and training

Before the study intervention with PCOA was performed, teaching and training of the intervention took place during August–December 2015. The nurses and physicians participated in sessions regarding the principles of pain management according to NRS-scores (Hjermstad et al., 2011), the WHO 3-step analgesic ladder (Greene & Harris, 2008; Vargas-Schaffer, 2010) and the study intervention. During the time period, the study intervention was pilot-tested and staff were trained during clinical practice.

2.3.3. Intervention (the PCOA group)

Patients in the PCOA group were included during January–October 2016 at 12 to 24 h after hospitalization or when convenient, according to the situation of the patient. In the PCOA group the nurses performed pain assessment by use of the NRS as in the control group. PCOA was defined as self-administration of oral analgesics from a pillbox or a pill bag dispensed by a nurse. The pillbox containing prescribed oral medications for a 24-hour period was delivered to the patient for self-administration. The maximum doses of prescribed PRN medicine for a 24-hour period were delivered to the patient in pill bags. The nurses refilled the pillbox and the pill bags with PRN medicine daily. Any medicine by injection was given by nurses.

2.4. Statistical analysis

The number of patients to be included was based on a power calculation on the results from a previous study (Jawaid, Masood, & Ayubi, 2009) that showed a patient satisfaction of pain management at 40%. An increase in patient satisfaction to 65% in the intervention group was considered as clinically relevant. To achieve a significance level of