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Patient-controlled oral analgesia at acute abdominal pain: A before-and-after intervention study of pain management during hospital stay

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ABSTRACT

Aim: To investigate the patient experience of pain management, when patient-controlled oral analgesia was compared with standard care for patients admitted to hospital with acute abdominal pain. The primary outcome measures were pain intensity and patient perception of care.
Background: Pain management of patients admitted to hospital with acute abdominal pain can be insufficient. Patient involvement in health care has been seen to have benefits for patients.
Methods: A before-and-after intervention study was conducted in an emergency department observation unit and a surgical department. Data were collected from a questionnaire (APS-POQ-R-D) with the six subscales: pain severity, perception of care, interference with activity, interference with emotions, side effects and patient-related barriers.
Results: A total of 156 patients were included. During admission the median score (0–10 scale) for the pain intensity and patient perception of care subscale was 4 ($p = 0.96$) and 8 ($p = 0.92$), respectively, in both the control and intervention group. On the activity subscale, the median scores were 6 and 5 ($p = 0.17$); on the emotion subscale, the scores were 5 and 4 ($p = 0.31$); and on the side effect subscale, the scores were 3 and 4 ($p = 0.18$) in the control and intervention group, respectively. Overall, the score was 5–8 at one item about being allowed to participate in decisions about pain treatment as much as wanted.
Conclusion: Patient-controlled oral analgesia did not improve patient experience of pain management for patients admitted to hospital with acute abdominal pain.

1. Introduction

Acute abdominal pain is one of the most common reasons to visit the emergency department (ED) representing 5–10% of ED visits (Bhuiya, Pitts, & McCaig, 2010; Cervellin et al., 2016; de Burlet, Lam, Larsen, & Dennett, 2017; Falch et al., 2014; Hastings & Powers, 2011; Kamin, Nowicki, Courtney, & Powers, 2003; Pitts, Niska, Xu, & Burt, 2008) and 17–61% of the patients are transferred to a surgical ward (Bhuiya et al., 2010; Cervellin et al., 2016; de Burlet et al., 2017). Pain management in acute abdomen is an important issue, however, it has been reported to be insufficient in the ED (Muntlin, Carlsson, Safwenberg, & Gunningberg, 2011; Schultz, Mogensen, Pedersen, & Qvist, 2013; Schultz, Qvist, Mogensen, & Pedersen, 2013; Schultz, Qvist, Pedersen, & Mogensen, 2017) and in the surgical ward after surgery (Schultz, Qvist, et al., 2013; Singh, Saikia, & Lahakar, 2016; Sommer et al., 2008). Sufficient pain management is important for the patient experience (Schultz, Qvist, et al., 2013; Schultz, Qvist, Mogensen, & Pedersen, 2014b) and because acute severe pain can result

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in neural alterations and therefore chronic pain (Brennan, Carr, & Cousins, 2007). One study showed that 30–55% of patients undergoing abdominal surgery experienced moderate to severe pain on post-operative day one (Falch et al., 2014; Sommer et al., 2008). One review reported that 75% of postoperative patients in general experienced moderate/extreme pain during the immediate time after surgery, with 74% still experiencing these levels of pain at discharge. These findings have been unchanged during two decades despite heightened awareness and clinical improvement in pain management strategies (Gan, Habib, Miller, White, & Apfelbaum, 2014).

Patient-controlled analgesia (PCA) has been investigated as a pain management strategy since the 1960s (McNicol, Ferguson, & Hudcova, 2015). 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 et al., 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 side effects of pruritus and nausea (McNicol et al., 2015).

Patient-controlled oral analgesic (PCOA) is an alternative to IV-PCA. 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 paracetamol or no medication after vaginal and caesarean delivery, and 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 the studies 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 the patient experience of pain relief in patients with acute abdominal pain.

The aim of this study was to investigate the patient experience of pain management, when PCOA was compared with standard care for patients admitted to hospital with acute abdominal pain with or without subsequent surgery. The primary outcome measures were pain intensity and patient perception of care. The secondary outcome measures were pain interference with activity, emotions and side effects, and patient-related barriers to pain management.

2. Methods

2.1. Design

A before-and-after intervention study was performed to test the hypotheses that patient-controlled oral analgesic (PCOA) improves the patient experience of pain management when compared with nurse-administered oral analgesic.

2.2. Setting

This study was performed in an ED observation unit 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. In the Region of Southern Denmark, nearly all nontrauma emergency patients are seen before hospitalization by a general practitioner and are admitted as indicated to the ED before being transferred to an ED observation unit or hospital ward. In all the units, the rooms for patients were one, two or four bedded.

The university hospital is situated at two locations (Odense and Svendborg) in the Region of Southern Denmark. In Odense, patients with acute abdominal pain and an expected hospital stay of < 72 h were transferred to an ED observation unit for patients with gastrointestinal diseases. Patients with an expected hospital stay of > 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 > 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 admitted during December 2014–October 2016 were approached on days where the nurse researcher or nurses from the project team were available for the study. The project nurses did not perform care for approached patients. Inclusion criteria were patients with acute abdominal pain, admitted to the ED from the primary health-care service, discharged from the ED observation unit or the surgical department, at least 18 years of age, able to speak Danish, with a hospital stay longer than 8 h and having an expected compliance to the study intervention. Evaluation of compliance to perform PCOA was based on an assessment of the patients' cognitive, physical and psychological abilities. Assessment of the patients was performed in collaboration between the research nurse/project nurse and the nurse in charge of the patients' care according to a non-validated guideline. Exclusion criteria were all end-of-life patients and patients with chronic pancreatitis, cancer and inflammatory bowel disease and those with a stay in the intensive care unit. Patients with formation of a stoma were also excluded, as we prioritized their attention towards training in stoma care.

Data were obtained by the use of the Revised American Pain Society Patient Outcome Questionnaire (APS-POQ-R), which is reliable and validated (Gordon et al., 2010) and can be used freely (American Pain Society, 2010). The APS-POQ-R includes 23 items and five subscales of pain severity (pain), perception of care (satisfaction), pain interference with function (activity), pain interference with emotions (emotion) and side effects of treatment (safety), as well as three items on the use of nonpharmacological pain treatment methods (Gordon et al., 2010). For the pain severity subscale, the patients had to rate their pain on the 11-point Numeric Ranking Scale (NRS) for pain (Hjermstad et al., 2011) (0 = no pain to 10 = the worst imaginable pain) for the first two items concerning “least pain” and “worst pain.” The last item is about frequency of severe pain, where 0% is “never in severe pain” and 100% is “always in severe pain.” On the patient perception of care (satisfaction) subscale, the patients had to rate their answers on an 11-point scale: one item measures the extent of pain relief (0% = no relief to 100% = complete relief), one concerns the usefulness of information about pain treatment options (0 = not at all helpful, 10 = extremely helpful), one is about patients being allowed to participate in decisions about pain treatment as much as they wanted (0 = not at all, 10 = very much so), and one is about patients' satisfaction with the results of the pain treatment (0 = extremely dissatisfied, 10 = extremely satisfied). Another item concerns information about pain treatment options (yes/no), another concerns the use of nonpharmacological methods to relieve pain (yes/no) and one is about how often a nurse or doctor encouraged the patient to use nonpharmacological methods (never/sometimes/often). Items at the activity, emotion and safety subscales are measured on an 11-point scale: interference with function (activity) (0 = does not interfere, 10 = completely interferes), affective experiences (emotion; 0 = not at all, 10 = extremely) and side effects (safety; 0 = none to 10 = severe).

For this study, the APS-POQ-R was translated into Danish (APS-

POQ-R-D) according to international guidelines (Beaton, Bombardier, Guillemin, & Ferraz, 2000; Guillemin, Bombardier, & Beaton, 1993). Furthermore, the APS-POQ-R-D was slightly modified by changing the reference period and by adding items. The APS-POQ-R uses a 24-hour time frame, which we modified to a 4-hour time frame for the time of hospital arrival and represented the time patients stayed in the ED. A second time frame was created for the rest of the hospital stay, representing the time patients stayed in the surgical ward or the ED observation unit and the time frame for the study intervention. The modification also included addition of a sixth subscale with six items on patient-related barriers, as a qualitative study of patients with acute abdominal pain revealed those as barriers for pain management (Schultz, Mogensen, et al., 2013). Finally, the two following items were added to the patient perception of care (satisfaction) subscale, as we wanted to investigate the effect of PCOA on patient experience upon discharge, an issue that has been reported as important for patients with acute abdominal pain (Schultz, Qvist, Mogensen, & Pedersen, 2014a): "Did you receive information about when to seek medical advice after discharge?" and, "If yes, how useful was the information about when to seek medical advice?" Overall, the APS-POQ-R-D included 39 items and the six subscales. Translation and validation of the questionnaire have been described elsewhere (Schultz, Skraep, et al., 2018).

The patients completed the questionnaire with both time-frames at discharge and returned it to the nurses on duty in a sealed envelope. Demographic data, length of hospital stay, discharge diagnosis, and any readmissions within 30 days were collected from the medical file.

2.4. 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 the NRS-scores. 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.

2.5. 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 (Vargas-Schaffer, 2010) and the study intervention. The study intervention was pilot-tested and staff were trained during clinical practice.

2.6. Intervention (the PCOA group)

Patients in the PCOA group were included from January–October 2016, 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 using 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 nurses delivered to the patients a pillbox containing all prescribed oral medications, along with a printout from the medical file of the prescribed medications, for self-administration over a 24-hour period. The nurses delivered the maximum doses of all prescribed PRN medicine for a 24-hour period to the patients in pill bags, and they reviewed the printout from the medical file and the medication with the patients to ensure that they understood the indications, effect and side effects, and administration of the medication as prescribed. The nurses refilled the pillbox and the pill bags with the PRN medicine daily. During each shift, the nurse in charge of the patient talked to the patient about the patients' use of PRN medicine and documented it in the medical file. The pillbox and pill bags were kept in the patients' bedside table. Any medicine by injection was given by the nurses.

2.7. Statistical analysis

The number of patients to be included was based on a power calculation on the results from a previous study concerning patient satisfaction (Jawaid, Masood, & Ayubi, 2009), as patient satisfaction is part of the term "patient perception of care" which was a primary outcome measures for our study. The previous study (Jawaid et al., 2009) showed patient satisfaction of pain management to be 40% and increase in patient satisfaction to 65% in the intervention group was considered as clinically relevant. To achieve a significance level of ≤ 0.05 and a power of 80%, a total of 70 participants in each group was required. An expected 20% dropout was considered.

Data from the questionnaire were doubly entered into a database in REDCap (version 7.0.11 - © 2017 Vanderbilt University, Tennessee, USA) along with data for demographics, surgical procedures, length of hospital stay, discharge diagnosis and readmissions within 30 days.

All data were transferred to STATA (Version 15.0; StataCorp, Texas, USA). The items were analyzed individually and the subscales were analyzed by summing up the data of each item within the subscale and number of items within the subscale was used as denominator. Items using a 0–100 scale were converted to a 0–10 scale to match the other items.

We used nonparametric methods for the unadjusted analyses, as the subscales themselves were not normally distributed, but when adjusting we achieved acceptable normal distribution for the residuals in the linear regression models. We evaluated the normal distribution of variables and residuals by a normal quantile-quantile plot. Continuous data were reported as medians and interquartile ranges (IQRs), and categorical data as counts and percentages. A Kruskal–Wallis test was used to compare continuous variables, while categorical variables were compared by chi-square test or Fisher's exact test if counts were below 5. Multiple linear regression was used to investigate differences in the subscales between the control and intervention group when adjusted for gender, discharge diagnosis and surgery. A p-value of < 0.05 was considered significant.

2.8. Ethical considerations

At discharge, patients were invited to take part in the study at a time convenient to them. They were given time to consider the invitation, and some took advantage of this opportunity. Patients received oral and written information about the study. They were informed that they could withdraw from the study at any time without consequences for their care and treatment, and that their statements would be anonymized. The patients gave written consent. The Danish Data Protection Agency (ID: 2008-58-0035) and the Regional Scientific Ethical Committees for Southern Denmark (ID: S-20140160) approved the study.

3. Results

In total, 234 patients were approached: 159 over six months in the control group and 75 over ten months in the PCOA group. The lower number and longer time period for inclusion of patients in the PCOA group compared with the control group were due to some resistance to the study intervention among the nurses in the units. In the control group, 25 patients (16%) declined, 17 patients (11%) dropped out and two were excluded as they did not fulfill inclusion criteria. In the PCOA group, 20 patients (27%) declined, 6 patients (8%) dropped out, 4 were transferred to another unit (5%), 3 did not perform PCOA before discharge (4%) and 1 did not fulfill inclusion criteria. In total, 156 patients were included in the statistical analysis: 115 in the control group and 41 in the PCOA group.

Table 1
Patient characteristics in the two groups.

	Control group n = 115		PCOA group n = 41		*p*-Value[a]
	n	%	n	%	
Gender					
Male	57	50	25	61	0.28
Cohabitation					0.45
Alone	17	15	9	22	
Children	4	3	0	0	
Children and adult	28	24	13	32	
Adult	64	56	19	46	
Unknown	2	2	0	0	
Level of education					0.68
Elementary/high school	31	27	13	32	
Vocational	37	32	12	29	
Short further education	9	8	4	10	
Medium further education	18	16	6	15	
Long further education	9	8	5	12	
Other/unknown	11	10	1	2	
Occupation					0.48
Trade or office	21	18	6	15	
Industrial or handicraft	9	8	7	17	
Social/healthcare/teaching	19	17	6	15	
Retirement	39	34	11	27	
Student	12	10	7	17	
Other	15	13	4	10	
Diagnosis at discharge					0.05
Appendicitis	16	14	6	15	
Perforated appendix	24	21	8	20	
Ileus	11	10	0	0	
Gallstones/cholecystitis	22	19	13	32	
Diverticulitis	12	10	1	2	
Acute pancreatitis	13	11	8	20	
Other	9	8	5	12	
Nonspecific abdominal pain	8	7	0	0	
Surgery	84	73	24	59	0.11
Type of surgery					0.40
Diagnostic laparoscopy	69	82	21	88	
Open surgery	11	13	1	4	
Readmission after surgery[b]	4	5	2	8	

PCOA = patient-controlled oral analgesia.
[a] Fisher's exact test.
[b] Patients discharged after surgery and readmitted within a week with acute abdominal pain.

The median age was 55 years (IQR: 39–66) and 49 years (IQR: 35–62) in the control and PCOA groups, respectively ($p = 0.40$). The median length of hospital stay was 76.7 h (IQR: 46–114) in the control group, and 79.6 h (IQR: 49–115) in the PCOA group ($p = 0.81$). The median time to surgery was 8.9 h (IQR: 5.8–20.4) and 9.2 h (IQR: 4.8–12) in the control and PCOA groups, respectively ($p = 0.44$).

There were no significant differences regarding patient characteristics between the two groups on the variables measured, but there tended to be a significant difference in the discharge diagnosis ($p = 0.05$) and number of patients who underwent surgery ($p = 0.11$) (Table 1). The rates of readmission were 13% and 17% in the control and PCOA groups, respectively ($p = 0.60$).

The results from the analysis of continuous data from the AP-POQ-R-D are shown in Table 2. There was no significant difference between the two groups for the pain severity subscale, but patients in the PCOA group tended to have lower NRS pain scores for “worst pain” compared to the control group.

For the perception of care subscale (satisfaction), there was no significant difference between the two groups (Table 2). Information about pain treatment options at hospital arrival was reported by 61% of patients in the control group and by 63% in the PCOA group ($p = 0.82$), while information performed during admission was reported by 69% of patients in the control group and by 78% in the PCOA group ($p = 0.26$). Information about situations in which to contact medical services after discharge was reported by 80% of patients in the control group and by 85% in the PCOA group ($p = 0.54$).

Adjustment for differences between the two groups regarding the pain, satisfaction, activity, emotion and safety subscales are shown in Table 3.

Nonpharmacological pain treatment interventions were reported used by 46% of patients in the control group and by 36% in the PCOA group ($p = 0.28$). It was reported that a health professional encouraged the use of nonpharmacological interventions for pain relief in 24% and 29% of patients in the control and PCOA group ($p = 0.70$), respectively. The encouragement was “often” in 5% of the situations in both groups, “sometimes” for 18% and 24% and “never” for 76% and 71% of patients in the control group and PCOA groups, respectively ($p = 0.70$). The type of nonpharmacological interventions for pain relief is shown in Table 4.

4. Discussion

The study revealed two major findings: firstly, there was no significant difference between the two groups regarding pain intensity and perception of care; secondly, patients in both groups did not participate in pain management decisions as much as they wanted.

The findings showing no difference in the patients' experience of pain intensity and perception of care between the two groups might reflect that PCOA does not improve pain management for patients admitted to hospital with acute abdominal pain. Other studies on PCOA for elective patients admitted within the obstetric and orthopedic specialties have shown similar findings with unchanged pain scores and patient satisfaction (Bonnal et al., 2016; East et al., 2007; Kastanias et al., 2010); only one study reported increased patient satisfaction (Bonnal et al., 2016). These results differ from studies with IV-PCA, where a significant decrease in pain scores on postoperative day one and an increase in patient satisfaction have been reported (Birnbaum et al., 2012; McNicol et al., 2015). The differences in pain scores might reflect that our study did not focus exclusively on postoperative patients and the fact that our questionnaire did not focus on a 24-hour time frame after surgery. Another explanation of the differences could be lack of information about the pain management options, as only 61–78% of the patients reported to remember information about pain management options. Consequently, the patients might have accepted pain, as they could have assumed that they received the most optimal pain treatment. A third explanation of the differences could be lack of instructions on how to use the PRN analgesics in PCOA. With IV-PCA, the instructions are simple, as the patients only have to press a button. In addition, the use of the analgesia pump is fairly safe, as it has been programmed to limit the amount and number of PRN analgesia infusions. When using the PCOA strategy, patients might have to choose between paracetamol, NSAIDs and opioids and at different doses, which requires more thorough guidance of the patients by the health-care professionals. Therefore, the patients might have been reluctant to use analgesics due to uncertainty and thus not obtain a decrease in pain intensity, an increase in patient satisfaction or positive perception of care.

Our study and previous studies on PCOA (Bonnal et al., 2016; East et al., 2007; Kastanias et al., 2010) concern only patients with acute pain. Our study excluded patients with known chronic pain as the pain management strategy might be more complex; however, these patients might benefit more from PCOA, as one study reported that patients with chronic pain were familiar with different types and doses of analgesics and the effect they had on them (Schultz, Lundby, Filipsen, Rasmussen, & Pottegard, 2018). In addition, one study reported that younger patients and patients who administered medication for a chronic disease at home tended to have a more positive attitude towards self-administration of medication during hospitalization compared to other patients (Vanwesemael, Boussery, Van Den Bemt, & Dilles, 2018). The patients who benefit the most from self-administration of analgesics or

Table 2
Results of continuous data from the APS-POQ-R-D.

Subscales and items	Control group n = 115			PCOA group n = 41			
	n	Median	IQR	n	Median	IQR	*p*-Value
Hospital arrival (the first 4 h)							
Pain severity (pain) – summarized (0–10)	113	7	5–8	40	7	5–8	0.82
Least pain	114	6	3–8	41	5	3–7	0.67
Worst pain	115	9	7–10	41	8	7–9	0.08
How often were you in severe pain?	114	7	4–8	40	7	4–9	0.94
Perception of care (satisfaction) – summarized (0–10)	64	7	6–8	24	7	5–8	0.64
How much pain relief have you received?	113	6	3–8	39	5	3–8	0.87
How helpful was the information about pain management options?	66	7	5–9	26	8	5–9	0.38
Were you allowed to participate in decisions about pain treatment as much as you wanted?	110	6	0–9	39	5	1–8	0.60
How satisfied are you with the results of your pain treatment?	110	8	5–10	40	8	7–9	0.94
Hospital admission (the rest of the hospital stay) (0–10)							
Pain severity (pain) – summarized	112	4	3–5	40	4	3–6	0.96
Least pain	115	2	1–4	41	2	1–3	0.87
Worst pain	114	7	5–9	41	7	5–8	0.52
How often were you in severe pain?	113	3	1–5	40	3	1–6	0.87
Perception of care (satisfaction) – summarized (0–10)	57	8	7–9	26	8	7–9	0.92
How much pain relief have you received?	115	8	5–9	39	8	6–9	0.67
How helpful was the information about pain management options?	76	8	6–9	32	8	5–9	0.98
Were you allowed to participate in decisions about pain treatment as much as you wanted?	112	7	3–9	40	8	5–10	0.54
How satisfied are you with the results of your pain treatment?	113	9	7–10	41	8	7–9	0.28
How helpful was information about when to seek medical service after discharge?	83	9	7–10	32	9	8–10	0.66
Interference with functions (activities) – summarized (0–10)	109	6	4–8	41	5	4–7	0.17
Pain interfered with activities in bed	111	7	5–8	41	5	3–8	0.14
Pain interfered with activities out of bed	111	6	4–8	41	5	3–7	0.16
Pain interfered with falling asleep	110	5	3–8	41	5	3–7	0.40
Pain interfered with staying asleep	110	6	2–8	41	5	3–7	0.56
Interference with emotions (emotions) – summarized (0–10)	110	5	2–7	41	4	2–6	0.31
How much the pain caused you to feel anxious	111	5	2–8	41	4	2–7	0.40
How much the pain caused you to feel depressed	111	5	2–7	41	4	2–6	0.69
How much the pain caused you to feel frightened	111	3	1–7	41	3	1–6	0.61
How much the pain caused you to feel helpless	110	5	2–8	41	3	1–6	0.08
Side effects (safety) – summarized (0–10)	106	3	2–5	41	4	2–6	0.18
Severity of nausea	109	4	1–8	41	6	1–8	0.21
Severity of drowsiness	110	6	2–8	41	6	2–8	0.69
Severity of itching	107	0	0–0	41	0	0–2	0.48
Severity of dizziness	108	2	0–5	41	2	0–6	0.47
Barriers to pain management – summarized (0–6)	100	3	2–4	38	3	2–4	0.71
Pain medicine can effectively control pain	110	5	4–5	41	4	4–5	0.16
Pain medicine is very addictive	101	3	1–4	40	3	1–4	0.98
If I talk about pain, nurses and doctors will think that I am a complainer	110	0	0–2	40	0	0–2	0.83
It is easier to put up with pain than with the side effects that come from pain medicine	105	1	0–3	41	1	0–3	0.61
It is better to remain at rest than to take painkillers for mobilization	109	1	0–3	41	1	0–3	0.69
Pain medicine can keep you from knowing what is going on in your body	108	3	2–5	39	3	3–5	0.59

PCOA = patient-controlled oral analgesia.
IQR = inter quartile range.

Table 3
Multiple linear regression of five subscales during hospital admission.

	Pain		Satisfaction		Activity		Emotion		Safety	
	CE	*p*-Value	CE	*p*-Value	CE	*p*-Value	CE	*p*-Value	CE	*p*-Value
PCOA	0.07	0.85	0.21	0.59	−0,36	0.46	−0.30	0.58	0.66	0.11
Gender										
Female	0.36	0.32	−0.09	0.81	0.01	1.00	0.53	0.28	1.30	**0.001**
Discharge diagnosis										
Appendicitis										
Perforated appendicitis	−0.26	0.66	−0.67	0.29	−0.37	0.59	−0.16	0.84	−0.38	0.53
Ileus	−0.14	0.86	0.46	0.50	−0.05	0.95	1.55	0.17	−0.30	0.72
Gallstones/cholecystitis	0.33	0.56	−0.59	0.26	0.10	0.89	0.09	0.91	0.25	0.68
Diverticulitis	1.70	**0.04**	−1.11	0.17	1.20	0.21	0.54	0.63	0.16	0.85
Acute pancreatitis	0.78	0.29	−1.09	0.12	0.36	0.69	1.55	0.13	1.10	0.16
Nonspecific abdominal pain	0.29	0.74	−1.45	0.37	0.53	0.60	1.43	0.23	0.50	0.57
Others	0.77	0.30	−0.059	0.40	−0.40	0.63	0.64	0.53	0.21	0.78
Surgery	0.61	0.20	−0.41	0.41	0.77	0.17	0.77	0.024	0.88	0.08

CE = coefficient.
PCOA = patient-controlled oral analgesics.
Bold: A significant difference between the control and PCOA group.

Table 4
The type of nonpharmacological pain treatment interventions.

	Control group n = 115		PCOA group n = 41		*p*-Value[a]
	n	%	n	%	
Cold pack	39	26	2	40	0.48
Deep breathing	33	29	8	19	0.18
Distraction (TV, reading etc.)	35	27	6	24	0.78
Heat	37	26	4	29	0.84
Imagery or visualization	38	26	3	38	0.46
Massage	40	26	1	33	0.78
Meditation	40	27	1	17	0.59
Listen to music	39	27	2	17	0.43
Prayer	40	26	1	20	0.75
Relaxation	39	29	2	9	0.04
Walking	33	26	8	26	0.94
Other	41	26	0	0	0.55

PCOA = patient-controlled oral analgesia.
[a] Fisher's exact test.

any medicine need to be identified more clearly in terms of the situation of the patient and the category of pain.

The second major finding was that patients in both groups were not allowed to participate in pain management decisions as much as they wanted. The desire was higher at hospital arrival where the patients were in more severe pain than during admission. This might reflect that the patients wanted influence on waiting time to analgesics after hospital arrival, which has been reported to 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) and experienced as being too long for patients in pain (Schultz, Qvist, et al., 2013). It could also reflect a desire for influence on the route of administration of the analgesics for example a wish for injections with a faster effect compared with oral analgesics. A qualitative study would explore how patients want to participate in pain management decisions.

An explanation for patients not being allowed to participate as much as they wanted could be due to resistance from the health-care professionals to share decisions and responsibility on pain management strategies. This was to some extent revealed during recruitment of patients to the PCOA group, where the health-care professionals expressed resistance to the study intervention. They were skeptical about the ability of the patients to perform PCOA. Other studies have reported similar findings with nurses being restrictive (Madsen, Qvist, Moller, & Schultz, 2018; McTier, Botti, & Duke, 2014; McTier, Botti, & Duke, 2015; Schultz, Maagaard, Hamid, & Qvist, 2018) or skeptical (Riemondy, Gonzalez, Gosik, Ricords, & Schirm, 2016) about using PCOA, because of a negative attitude towards patients' ability to perform PCOA responsibly (Sawhney & Maeda, 2013). The skepticism from the nurses could reflect a tendency of underestimating the patients' intensity of pain, when compared with self-reported pain, as reported in several studies (Duigan & Dunn, 2008; Ene, Nordberg, Bergh, Johansson, & Sjostrom, 2008; Idvall & Brudin, 2005; Solomon, 2001). One study of postoperative patients reported that analgesics were provided on the basis of the nurses' pain scores (Ene et al., 2008), while another reported that discrepancy between the patient's perception of pain and the nurses' perception was one of the strongest predictors of insufficient pain management (Curtiss, 2001).

However, the skepticism of PCOA might also reflect a limited knowledge about the analgesics. Studies have reported that the nurses experienced not to be qualified to guide the patients in administration of medication without receiving further training (Grantham, McMillan, Dunn, Gassner, & Woodcock, 2006) and only guided the patients in administration of the medication if they knew the effect and side-effect of the medication (Schultz, Maagaard, et al., 2018). Finally, the resistance towards PCOA could also concern lack of knowledge and practice on how to share decisions on pain management strategies with the patients or how to involve patients in care and treatment. Thus, the majority of the patients were "never" encouraged to use non-pharmacological interventions for pain relief that includes patient involvement.

4.1. Strengths and limitations

The strength of this study is that the intervention was blinded to the health professionals during the inclusion of patients in the control group. The results from the control period were thus more likely to reflect the common standard practice in the units. A randomized controlled trial would not have been possible without a high risk of bias in the PCOA group, as the patients stayed in multi-bedded rooms.

The study is limited by its small sample size and retrospective nature with potential memory bias of the patients. The small sample size may have resulted in an underpowered study which might explain the lack of effect of PCOA. Despite no significant difference in the background data, there might have been differences between the groups that we did not measure. Because of the resistance from the health-care professionals to perform the study intervention, patients included in the PCOA group might have had a more straightforward treatment during their hospital stay. The assessment of the patients cognitive, physical and psychological ability to perform PCOA might also been have been affected by the individual nurses' attitude towards PCOA. The inclusion was stopped after ten months because of the risk of bias among the staff and changes in procedures in the surgical wards and the ED/ED observation unit.

5. Conclusion

This study showed that patient-controlled oral analgesia did not improve the patient experience of pain management for patients admitted to hospital with acute abdominal pain. Our study showed that the patients did not participate as much as they wanted in decisions about pain management.

6. Implications for practice

The results in our study are based on a relatively small sample, consequently, a larger study is required two gain a more solid evidence for the effect of PCOA. In addition, the time, context and type of pain experienced by the patients need to be clarified to achieve a positive effect of PCOA, for example, is it more suitable for patients with chronic pain than patients with acute pain? A validated tool to score patients eligible for PCOA might be a solution and might make the PCOA more accessible for the nurses, as it might reduce their doubt about the patients' ability to perform PCOA if they were unexperienced within the subject.

To improve the nurses' attitude towards PCOA, the nurses' knowledge of the effect and side-effect of the analgesics must be improved to give the nurses confidence in guiding patients in administration of the medication. Teaching and training of the nurses could be an option, as well as an interdisciplinary collaboration between nurses, physicians and pharmacists in guiding the patients. Another approach to improve the nurses' attitude towards PCOA is to increase the nurses' knowledge and practice on how to perform a patient-centered care with shared decision making, especially as the request for patient involvement from patients are increasing.

Conflict of interest

The authors have no conflict of interest to declare.

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