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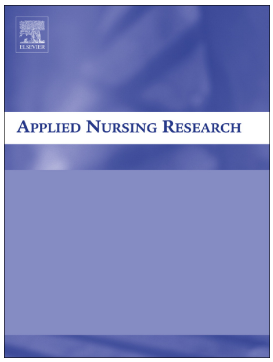
Published in:
Applied Nursing Research

DOI:
10.1016/j.apnr.2018.01.007

Publication date:
2018

Document version:
Accepted manuscript



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PII: S0897-1897(17)30528-1
DOI: https://doi.org/10.1016/j.apnr.2018.01.007
Reference: YAPNR 51037

To appear in: *Applied Nursing Research*

Received date: 18 September 2017
Revised date: 10 January 2018
Accepted date: 19 January 2018

Please cite this article as: Sandra Bruun Madsen, Niels Qvist, Sören Möller, Helen Schultz , Patient-controlled oral analgesia for acute abdominal pain: A before-and-after intervention study on pain intensity and use of analgesics. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Yapnr(2017), https://doi.org/10.1016/j.apnr.2018.01.007

TITLE PAGE

Title:

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

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.

Keywords

acute pain; pain management; patient-centered care; patient involvement; self-administered medication

Background

Acute abdominal pain is one of the most common reasons for visiting the emergency department (ED) (Falch et al., 2014, Hastings and 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, 2013b, Schultz, Qvist, Mogensen, & Pedersen, 2013a, Schultz, Qvist, Pedersen, & Mogensen, 2017, Waldo, 2012) and in the surgical ward (Schultz et al., 2013a, Schultz et al., 2013b, 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 minutes (Marinsek et al., 2007; Mills, Shofer, Chen, Hollander, & Pines,, 2009; Muntlin et al., 2011; Schultz et al., 2013b; Schultz et al., 2017; 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 minutes after hospital arrival, but did not achieve adequate analgesic effect (Finn et al., 2012), 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 minutes 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.

Materials and Methods

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.

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 less than 72 hours were transferred to an Emergency Department Observation Unit for patients with gastrointestinal diseases. Patients with an expected hospital stay of more than 72 hours 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 hours 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.

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.

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.

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.

Intervention (the PCOA group)

Patients in the PCOA group were included during January–October 2016 at 12 to 24 hours 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 was 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.

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 ≤ 0.05 and a power of 80%, a total of 70 participants in each group was required. An expected 20% dropout was included. As we intended to divide the patients into two groups (patients undergoing surgery and patients not undergoing surgery), a total number of 280 patients was desired.

Data for NRS scores, analgesics and antiemetics were entered into an Excel sheet and organized into seven time intervals after hospital arrival: 0–4 hours, 4–12 hours, 12–24 hours, day 2, day 3, day 4 and day 5. For each interval, the highest and lowest NRS pain scores for each patient were registered and the total doses of analgesics and antiemetics were recorded. In a few instances, the dose of analgesic was missing. In these cases, the recommended standard dose for the given analgesic was entered. The summarized data from the Excel sheet were 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 and readmissions.

All data were transferred to STATA (Version 14.0; StataCorp, Texas, USA). The mean of the highest and lowest NRS pain scores for each patient within each time interval was calculated. Continuous data were reported as medians and interquartile ranges (IQRs), and categorical data as absolute numbers and percentages. A Kruskal–Wallis one-way test was used to compare continuous variables, while categorical variables were compared by chi-square test or Fisher's exact test if frequencies were below 5. Multiple linear regression was used to investigate differences in NRS pain score between the control and intervention group in the different time intervals, adjusting for gender, discharge diagnosis and surgery. A p-value <0.05 was considered significant.

Ethical considerations

The participants gave written consent regarding access to their medical charts. The Danish Data Protection Agency (ID: 2008-58-0035) and the Regional Scientific Ethical Committees for Southern Denmark (ID: S-20140160) approved the study.

Results

In total, 234 patients were approached, 159 during six months in the control group and 75 during 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 resistance to the study intervention among the nurses in the units. In the control group, 25 patients declined, three were excluded as two did not fulfill inclusion criteria and one had missing data. In the PCOA group, 20 patients declined and 16 patients were excluded; one did not fulfill inclusion criteria, four were transferred to another unit, five did not perform self-administration of medicine before discharge or within five days of hospitalization and six had missing data. In total, 170 patients were included in the statistical analysis, 131 in the control group and 39 in the PCOA group.

The mean age was 53 years (IQR: 39–66) and 49 years (IQR: 33–66) in the control and PCOA groups, respectively (p=0.47). The median length of hospital stay was 78.3 hours (IQR: 46–115) in the control group, and 75.6 hours (IQR: 48–110) in the PCOA group (p=0.77). The median time to surgery was 9 hours (IQR: 5.8–20.3) and 9.3 hours (IQR: 4.8–12) in the control and PCOA group, respectively (p=0.39).

There were no significant differences with regard to patient characteristics between the two groups, but there tended to be a difference in the discharge diagnosis (p=0.09) and number of patients who underwent surgery (p=0.09)(Table 1). The rate of readmission was 14% and 15% in the control and PCOA group, respectively (p=0.80).

Table 1. Demographics of the patients in the two groups

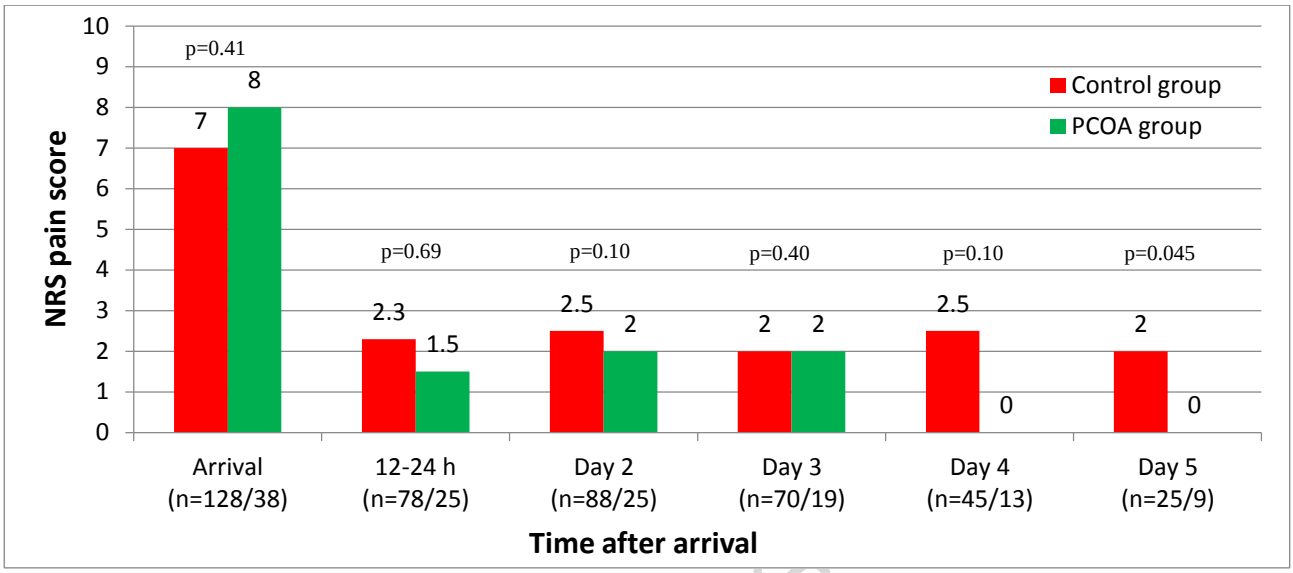
	Control group n=131		PCOA group n=39		
	n	**%**	**n**	**%**	**p-value**
Gender					0.25
Male	67	51	24	62	
Cohabitation					0.26
Alone	22	17	8	21	
Children	5	4	0	0	
Children and adult	31	24	13	33	
Adult	65	50	18	46	
Unknown	8	6	0	0	
Level of education					0.31
Elementary / high school	31	24	13	33	
Vocational	37	28	12	31	
Short further education	10	8	4	10	
Medium further education	23	18	5	13	
Long further education	10	8	4	10	
Other / unknown	20	15	1	3	
Occupation					0.14
Trade or office	21	16	6	15	
Industrial or handicraft	9	7	7	18	
Social, health care, teaching	25	19	4	10	
Retirement	43	33	11	28	
Student	12	9	7	18	
Other	21	16	4	10	
Diagnosis at discharge					0.09
Appendicitis	20	15	5	13	
Perforated appendix	27	20	8	21	
Ileus	13	10	0	0	
Gallstones/cholecystitis	26	20	12	32	
Diverticulitis	13	10	1	3	
Acute pancreatitis	13	10	7	18	
Other	12	9	5	13	
Unknown	8	6	0	0	
Surgery	99	76	24	62	0.09
Type of surgery					0.24
Diagnostic laparoscopy	79	80	21	88	
Open surgery	16	16	1	4	
Readmission after surgery*	4	4	2	8	

PCOA = Patient-controlled oral analgesics
*Patients discharged after surgery and readmitted within a week with acute abdominal pain

NRS scores

At hospital arrival, 98% of the patients in the control group and 97% of the patients in the PCOA group had their pain scored. In the time interval, 12 to 24 hours after hospital arrival, 60% of the patients in the control group and 64% in the PCOA group had their pain scored.

The median NRS score was significantly lower on day 5 after hospital arrival in the PCOA group compared with the control group (p=0.045). The NRS scores tended to be lower on day 2 and day 4 in the PCOA group, compared to the control group; however, the differences were not significant (Figure 1).



NRS = Numerical Ranking Scale
PCOA = Patient-controlled oral analgesics

Figure 1. Median NRS pain scores at admission and during hospital stay.

Adjustment for differences between the two groups in regard to the NRS scores on Day 2, 4 and 5 are shown in Table 2.

Table 2. Multiple linear regression

	NRS pain score Day 2		NRS pain score Day 4		NRS pain score Day 5	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
PCOA	-0.78	0.13	-1.46	0.09	-1.40	0.17
Gender						
Male						
Female	-0.88	0.07	0.21	0.80	-0.32	0.76
Discharge diagnosis						
Appendicitis						
Perforated appendicitis	0.67	0.45	-0.24	0.88	-2.41	0.24
Ileus	2.07	0.06	-0.25	0.89	-2.29	0.10
Gallstones/cholecystitis	0.87	0.32	0.96	0.49	-3.80	0.13
Diverticulitis	1.41	0.22	-0.05	0.98	-2.17	0.42
Acute pancreatitis	1.31	0.22	0.42	0.80	-1.51	0.54
Unknown	-1.41	0.41	-	-	-	-
Others	1.79	0.10	3.46	0.05	-2.30	0.40
Surgery	-0.12	0.85	-0.73	0.47	0.15	0.90

NRS = Numerical Ranking Scale
PCOA = Patient-controlled oral analgesics

Analgesics

The median time to receive analgesics after hospital arrival was 2.38 hours (IQR: 0.68–6.63), and 2.26 hours (IQR: 0.92-4.78) in the control and PCOA group, respectively (p=0.67). In the control group, 65% of the patients received analgesics within the first 4 hours. In the PCOA group, this was 62% (p=0.70). The type of analgesics used during hospitalization is summarized in Table 3. The most used PRN analgesics were paracetamol, ibuprofen and morphine, and the doses handed out did not exceed the

recommendation for daily use of the analgesics. The maximum amount of morphine delivered daily was 60 mg.

Table 3. Number of patients receiving analgesics

	Control group			PCOA group			
	Total n	n	%	Total n	n	%	p-value
Day 1	131			39			
Paracetamol		103	*79*		30	*78*	0.82
NSAID		83	*63*		24	*62*	0.84
Morphine		71	*54*		21	*54*	0.97
Total opioid		91	*69*		27	*69*	0.98
Total analgesia		120	*92*		34	*85*	0.22
Day 2	117			36			
Paracetamol		99	*85*		30	*83*	0.85
NSAID		68	*58*		18	*50*	0.39
Morphine		42	*36*		7	*19*	0.06
Intravenous		21	*18*		1	*3*	0.02
Injection sc/im		18	*15*		0	*0*	0.01
Total opioid		62	*53*		13	*36*	0.08
Total analgesia		109	*93*		32	*86*	0.20
Day 3	98			31			
Paracetamol		85	*87*		23	*74*	0.10
NSAID		46	*47*		14	*45*	0.86
Morphine		36	*37*		7	*23*	0.15
Intravenous		12	*12*		1	*3*	0.15
Injection sc/im		14	*14*		0	*0*	0.03
Total opioid		50	*51*		11	*35*	0.13
Total analgesia		89	*91*		24	*75*	0.02
Day 4	74			23			
Paracetamol		64	*86*		15	*65*	0.02
NSAID		30	*41*		10	*43*	0.80
Morphine		15	*20*		2	*9*	0.20
Intravenous		3	*4*		2	*9*	0.38
Injection sc/im		6	*8*		0	*0*	0.16
Total opioid		31	*42*		7	*30*	0.33
Total analgesia		66	*89*		16	*67*	0.009
Day 5	46			12			
Paracetamol		35	*76*		9	*75*	0.94
NSAID		9	*20*		4	*33*	0.31
Morphine		13	*28*		1	*8*	0.15
Intravenous		2	*4*		1	*8*	0.58
Injection sc/im		5	*11*		1	*8*	0.80
Total opioid		26	*57*		2	*17*	0.01
Total analgesia		37	*80*		9	*63*	0.39

PCOA = Patient-controlled oral analgesics
NSAID=nonsteroidal anti-inflammatory drug
sc/im=subcutaneous/intramuscular

Paracetamol

Within the first 12 hours of hospitalization, 47% and 62% of the patients received paracetamol in the control group and PCOA group, respectively (p=0.10). On day 4, the percentage of patients receiving paracetamol was significantly higher in the control group compared with the PCOA group (p=0.02) (Table 3).

NSAID's

During the first 12 hours after hospital arrival, 38% of the patients in both groups received a nonsteroid anti-inflammatory drug (NSAID)(p=0.97). During the first 12 hours of hospitalization, Diclofenac was

provided to 25% and 28% of the patients and ibuprofen was provided to 16% and 15% of the patients in the control group and PCOA group, respectively (p=0.71) (p=0.92).

From 12 hours to 4 days after hospitalization, 35–47% of patients in both groups received ibuprofen, which was the most used NSAID. There were no significant differences in consumption of any NSAID between the two groups during hospitalization (Table 3).

Opioid and antiemetics

In the control group, 49% of the patients received morphine within the first 12 hours. In the PCOA group this was 44% (p=0.56). Morphine and tramadol were the most used opioids during hospitalization, and patients from the control group consumed higher doses than in the PCOA group, but the differences were not significant (Table 4). No adverse events to the treatment were described in any patient in the two groups.

In both groups, antiemetics were given to 8–11% of the patients on day 1, 2 and 4 and to 19–22% of patients on day 3 of hospitalization. On day 5, 20% of patients in the control group received antiemetics; in the PCOA group this was 9% (p=0.36).

Table 4. Consumption of tramadol and morphine among patients who received the drugs

	Control group			PCOA group			
	N	median	*IQR*	n	median	*IQR*	p-value
Day 1							
Tramadol	20	100	*50–100*	8	50	*50–75*	0.11
Morphine	71	18	*10–33*	21	10	*10–20*	0.18
Day 2							
Tramadol	18	75	*50–100*	4	100	*100–125*	0.16
Morphine	42	15	*10–35*	7	10	*10–30*	0.35
Day 3							
Tramadol	10	75	*50–150*	2	50	*50–50*	0.23
Morphine	36	20	*10–30*	7	10	*10–15*	0.06
Day 4							
Tramadol	7	100	*50–200*	1	50	*50–50*	0.26
Morphine	15	20	*10–30*	2	18	*5–30*	0.54
Day 5							
Tramadol	8	100	*50–125*	1	150	*150–150*	0.31
Morphine	13	10	*10–30*	1	49	*49–49*	0.09

PCOA = Patient-controlled oral analgesics

Discussion

The study revealed three major findings: Firstly, the NRS pain scores tended to be lower in the PCOA group compared to the control group on day 2, 4 and 5 after hospitalization; secondly, fewer analgesics were used on days 2–4 in the PCOA group compared to the control group; thirdly, patients in the PCOA group received significantly less morphine intravenously or as injection on days 2 and 3 compared to the control group.

The tendency of a lower NRS pain score on days 2, 4 and 5 in the PCOA group might reflect that PCOA is a more effective pain management strategy than standard care. It might speak for a confirmation of our hypothesis that when the patients have the power to control pain management it

decreases pain intensity because of psychological reasons, earlier use of analgesics at the onset of pain experience or use of a higher dose of analgesics.

The pattern with a lower pain score in our study is equivalent to studies of IV-PCA (Birnbaum et al., 2012, McNicol et al., 2015); however, neither our study nor other studies on PCOA (Bonnal et al., 2016; East et al., 2007; Kastanias et al., 2010) have shown a significant decrease in pain scores as in the studies with IV-PCA (Birnbaum et al.; 2012, McNicol et al., 2015). An explanation of the differences could be the lack of instructions to the patients 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 have to choose between paracetamol, NSAIDs and opioids and at different doses, which need a more thorough guidance of the patients by the health-care professionals. Furthermore, the patients might be reluctant to use analgesics due to uncertainty and thus accept a higher pain score than patients using IV-PCA.

Another reason for the lower pain scores in the PCOA group compared to the control group in our study could be explained by differences in the background data. When adjusting the pain scores with regard to gender, discharge diagnosis and surgery it did not significantly influence differences on the NRS pain scores in the two groups. However, there might have been differences between the groups that we did not measure. As it was difficult to recruit patients to the PCOA group, due to health-care professionals being skeptical about the ability of the patients to perform PCOA, patients with less pain and a more straightforward treatment during their hospital stay might have been included in the PCOA group. Other studies have shown similar findings with nurses being restrictive (McTier,Botti, & Duke,2014; 2015) 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 second major finding of the study was a lower use of analgesics on days 2–4 in the PCOA group, and this was caused by a lower use of paracetamol and opioids. This means that the use of PCOA resulted in lower pain scores with fewer analgesics, which could represent overtreatment or patients being in a situation with more severe and persistent pain in the control group. One study of postpartum pain management showed similar findings, where patients in the PCOA group used fewer analgesics than patients receiving standard care (East et al., 2007). Other studies of IV-PCA (McNicol et al., 2015) and PCOA (Bonnal et al., 2016) have shown an increase in the use of opioids postoperatively, which is the opposite finding to our study. The difference might be explained by the fact that fewer patients in the PCOA group underwent surgery than in the control group in our study.

Paracetamol was provided to fewer patients in the PCOA group on days 3 and 4 compared with standard care. In our study, the difference might be explained by the fact that fewer patients in the PCOA group underwent surgery than in the control group and that paracetamol was prescribed routinely for management of wound pain. Paracetamol was the most used analgesic in our study, but the use of NSAIDs alone or in combination with paracetamol in treatment of postoperative pain is more

effective than paracetamol alone and is recommended in the WHO analgesic ladder (Gupta & Bah, 2016; Varga, Sabzwari, & Vargova, 2017; Vargas-Schaffer, 2010). However, NSAIDs have a number of serious side effects and are recommended to be used with caution in patients with gastrointestinal, kidney and cardiovascular diseases. In addition, NSAIDs increase the risk of postoperative bleeding and anastomotic leak in colorectal surgery (Gupta & Bah, 2016; Varga et al., 2017).

Our third major finding was that patients using PCOA received significantly less morphine intravenously or as injection on days 2 and 3 compared with patients receiving standard care. This could be explained by the experience of more severe pain or reflect some kind of overtreatment in the control group compared to the PCOA group. Another explanation might be that the patients in the control group waited longer to get PRN analgesics and consequently needed higher doses of opioid and morphine with an immediate effect to manage the pain.

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 retrospective nature of the study is limited by the data recorded in the medical file. The doses of analgesics consumed could be imprecise, because of lack of documentation of how much of the delivered analgesics the patients actually had consumed in the PCOA group.

The small sample size of the PCOA group is a limitation and larger studies are needed. The sample size was smaller than anticipated. According to the power calculation, 41 patients should have been included in the PCOA group. 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/Emergency Department Observation Unit.

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 and use of analgesics.

Implications for practice

Units receiving patients with acute abdominal pain can provide patient-centered care with the implementation of PCOA. This could be of particular interest at a time when patients have increased awareness and requirement of health-care services. The study showed a need to address the

knowledge and attitude of health professionals to patient-centered care and PCOA before implementation. In addition, the roles of the patients and the health professionals should be defined according to the use and documentation of PRN analgesics.

Conflict of interest

No conflict of interest has been declared by the authors.

Acknowledgement

The authors would like to acknowledge funding from the Surgical Department, Odense University Hospital, University of Southern Denmark and Novo Nordisk Foundation.

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Highlights

- When using the patient-controlled oral analgesia strategy, the pain scores of the patients tended to be lower and fewer analgesics were used when compared to the group with nurse-controlled analgesia.

- The pattern with a lower pain score in our study is equivalent to studies of intravenous patient-controlled analgesia; however, neither our study nor other studies on patient-controlled oral analgesia have shown a significant decrease in pain scores as in the studies with intravenous patient-controlled analgesia.

- When using the patient-controlled oral analgesia strategy, patients need a more thorough guidance by the health-care professionals than the use of intravenous patient-controlled analgesia.