The Effect of Patient-Controlled Oral Analgesia for Acute Abdominal Pain after Discharge

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Abstract

Background: During hospitalization, patients who were admitted with acute abdominal pain must be prepared to care for themselves at home after discharge to continue established treatment, promote recovery, and avoid readmission.

Aims: Our aim was to investigate the quality of pain management after discharge, 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. The secondary outcome measures were pain interference with activity, affective experiences, side effects, and use of analgesics.

Design: A questionnaire study measuring the effect of an intervention on patient-controlled oral analgesics.

Settings: An emergency department and a surgical department in Denmark.

Participants: Patients admitted to hospital with acute abdominal pain.

Methods: A pre- and postintervention study was conducted in an emergency department and a surgical department with three subunits. Data were collected using a Danish modified Revised American Pain Society Patient Outcome Questionnaire with five subscales (scale 0-10) completed in weeks 1 and 4 after discharge.

Results: In total, 117 patients were included. The median scores at week 1 and week 4 in the control and intervention groups were, respectively, 2/1 and 1/0 on the pain subscale (p = .11/.16), 3/0 and 3/0 on the activity subscale (p = .19/.80), 1/0 and 0/0 on the emotional subscale (p = .02/.72), 1/0 and 1/0 on the side effect subscale (p = .95/.99), and 8/5 and 7/7 on the patient perception subscale (p = .35/.49). There was no significant difference in the use of analgesics at week 1.

Conclusions: Patient-controlled oral analgesia during the hospital stay did not improve the quality of pain management after discharge.

***Keywords*:** patient-centered care, patient involvement, self-administered medication, Revised American Pain Society Patient Outcome Questionnaire, discharge planning

Background

Acute abdominal pain is one of the most common conditions to present in the emergency department (ED) (Falch et al., 2014; Hastings & Powers, 2011), and the patients' return to home after hospitalization happens "quicker and sicker" (McMurray, Johnson, Wallis, Patterson, & Griffiths, 2007). During hospitalization, the patients must be prepared to care for themselves at home after discharge to continue established treatment, promote recovery, and avoid readmission.

One study from an ED observation unit found that 85% of patients reported they received adequate instructions at discharge (Arendts, MacKenzie, & Lee, 2006), whereas another study revealed that only 67% of patients correctly understood the discharge instructions (Desme et al., 2013). Information about medication at discharge from EDs has been reported to be remembered by 50%-78% of patients (Bulut, Tanrikulu, Dal, & Kapucu, 2013; Gignon, Ammirati, Mercier, & Detave, 2014; Marty, Bogenstatter, Franc, Tschan, & Zimmermann, 2013; Samuels-Kalow, Stack, & Porter, 2012). Home care instructions were remembered by 20%-84% of patients. Fewer than half of the patients reported knowledge of the signs of symptom worsening, and only 45%-56% knew for which symptoms they should return to the ED for evaluation (Engel et al., 2012; Hastings et al., 2011).

Studies from general surgical wards have reported that patients may receive vague self-care advice resulting in difficulties with selfcare after discharge (Frojd, Swenne, Rubertsson, Gunningberg, & Wadensten, 2011; Jangland, Carlsson, Lundgren, & Gunningberg, 2012; McMurray et al., 2007; Williams, 2008; Yiu, Chien, Lui, & Qin, 2011). Inadequate preparation for discharge can result in confusion about medication (Bulut et al., 2013), pain management, and the recovery process (Odom-Forren &Wesmiller, 2017; Schultz, Qvist, Mogensen, & Pedersen, 2014; Sibbern et al., 2017). Studies have found that general surgical patients need specific information on a practical level about pain management, activity, nutrition, and strategies to promote recovery. Patients were less likely to consult a health care service after discharge when sufficient information was received (Pieper et al., 2006; Williams, 2008).

One study of general surgical patients found that patient participation in the management of daily nursing goals resulted in lower pain scores than those with standard care (Lee, Seo, Choi, & Min, 2018). Patient-controlled oral analgesia (PCOA) offers patient involvement in pain management during the patient's hospital stay. A number of studies have investigated the use of PCOA during a patient's hospital stay (Bonnal et al., 2016; East, Dube, & Perreault, 2007; Kastanias, Gowans, Tumber, Snaith, & Robinson, 2010; Lambert & Cata, 2014; Madsen, Qvist, M€oller, & Schultz, 2018), but to the best of our knowledge, no study has investigated its effect

after discharge. Such an investigation could provide data regarding whether having knowledge about the medication and practices PCOA during the hospital stay improved the patient's pain management after discharge.

The aim of this study was to investigate the quality of pain management after discharge when PCOA was compared with standard care for patients admitted to the 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, affective experiences, side effects, and use of analgesics.

Methods

Design

A pre- and postintervention study was performed to investigate the quality of pain management after discharge when the administration of oral analgesics was controlled by the patient during hospital admission.

Setting

This study was performed in an ED observation unit and a surgical department with three subunits at a university hospital in Southern Denmark with a background population for primary referral of approximately 430,000 inhabitants. In all the units, the rooms for patients had one, two, or four beds.

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 less than 72 hours were transferred to an ED 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 in 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 approached between December 2014 and October 2016 on days that nurses from the project team were on duty. Inclusion criteria were acute abdominal pain, admission to the ED from the primary health care service, discharge from the ED observation unit or the surgical

department, a hospital stay longer than 8 hours, and expected compliance with the study intervention. Patients were also required to be Danish speaking and at least 18 years old. Expected compliance to perform PCOA was based on an assessment of the patients' cognitive function and how affected they were by the acute situation. We excluded all end-of-life patients and patients with known pancreatitis, cancer, and inflammatory bowel disease. Furthermore, the formation of a stoma or a stay in the intensive care unit during the hospital stay was also grounds for exclusion.

Data were obtained by use of a modified 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). For this study, the APS-POQ-R was modified and translated into Danish (APS-POQ-R-D) (Schultz et al., 2018a). Data were collected during weeks 1 and 4 after discharge.

The APS-POQ-R-D for week 1 had seven time intervals, one for each day. Each of the first 6 days had 18 items and included the five subscales: pain intensity (pain), perception of care (satisfaction), pain interference with functions (activity), affective experiences (emotional), and side effects (safety), as well as one item on the use of analgesics. The items concerned the previous 24 hours and had to be completed daily. The seventh day included a total of 25 items. Seven of these covered the entire week after discharge: four from the subscale of perception of care (safety), one on the use of nonpharmacologic interventions, one on contact with medical service, and one on return to work. A more thorough description and validation of the questionnaire has been performed elsewhere (Schultz et al., 2018a). The same items and subscales as on the seventh day were answered 4 weeks after discharge concerning the entire fourth week.

Demographic data were collected from the patients before discharge. Length of hospital stay, discharge diagnosis, and readmissions within 30 days were retrieved from the medical file.

Interventions

Standard care (control group)

Patients in the control group were included during December 2014–May 2015. As standard care, the nurses performed pain assessment using an 11-point verbal Numeric Rating Scale (NRS). The NRS pain score reflected the patient's experience of pain from 0-10, 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 prescribed by the physician. As-needed (PRN) analgesics

were given on patient request or on 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 on 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 World Health Organization three-step analgesic ladder (Greene & Harris, 2008; Vargas-Schaffer, 2010), and the study intervention. The study intervention was pilot tested, and staff were trained during clinical practice.

Intervention (PCOA group)

Patients in the PCOA group were included from January-October 2016, 12-24 hours 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 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 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. The pillbox and pill bags were kept in a closed drawer in the patients' unlocked bedside table. Any medicine by injection was given by the nurses.

Statistical Analysis

The number of patients to be included was determined by a sample size calculation based on the results from a previous study (Jawaid, Masood, & Ayubi, 2009) that found patient satisfaction with pain management at 40%. An increase in patient satisfaction to 65% in the intervention group was considered clinically relevant. To achieve a power of 80% with a significance level of 0.05, a total of 70 participants in each group would be required. An expected 20% dropout rate was taken into account, and because we intended to divide the patients into two subgroups (patients undergoing surgery and patients not undergoing surgery), we planned to include a total number of 280 patients.

Data from the questionnaires were double data entered into a database in REDCap (Version 7.0.11; Vanderbilt University, Nashville, TN, USA) along with data for demographic information, surgical procedures, length of hospital stay, and readmissions within 30 days. All data were transferred to STATA (Version 15.0; StataCorp LLC, College Station, TX, USA). The items were analyzed individually for each day in week 1 and week 4. A combined analysis was performed for each item and subscale in week 1. Items using a Likert scale of 0-100 were converted to a 0-10 scale to match the other items.

Continuous variables were reported as medians and interquartile ranges (IQRs), and categorical variables were reported as counts and percentages. A Kruskal-Wallis test was used to compare continuous variables, and categorical variables were compared by chi-square test or Fisher's exact test if counts were <5. Multiple linear regressions were used to investigate differences in the subscales between the control and intervention group when adjusting for gender, discharge diagnosis, and surgery. p Values <.05 were 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. Table 1 shows the flow of inclusion of patients. For those who completed the questionnaire for week 1, the median age was 55 years (IQR: 40-66) and 61 years (IQR: 42-68) in the control and PCOA groups, respectively (p = .24). For the questionnaire for week 4, the values were 57 years (IQR: 42-66) and 56 years (IQR: 40-68), respectively (p = .77). The median length of hospital stay was 76.6 hours (IQR: 46-113) in the control group and 79.6 hours (IQR: 49-110) in the PCOA group (p = .68) for week 1. For week 4, the values were 76.6 hours (IQR: 48-115) and 81.4 hours (IQR: 54-112), respectively (p = .71). The median time to surgery was 8.9 hours (IQR: 5.3-20.6) and 8.7 hours (IQR: 2.2-10.5) in the control and PCOA group, respectively (p = .09) in week 1. For week 4, the values were 8.8 hours (IQR: 5.5-17.6) and 9 hours (IQR: 2.2-10.5), respectively (p = .09).

There were no significant differences between the two groups in regard to patient characteristics; however, there tended to be more patients who underwent surgery in the control group than in the PCOA group in the sample of the questionnaire for week 4 (p = .05). In addition,

there tended to be a difference between the control and PCOA group in regard to discharge diagnoses (p = .10; Table 2).

Table 1

Flow of Inclusion of Patients

Control group	PCOA group
Approached: 159 patients	Approached: 75 patients
Declined: 25 patients (16%)	Declined: 20 patients (27%)
Excluded: Total: 2 patients (1%) Not acute abdominal pain: 2	Excluded: Total: 8 patients (11%) Not acute abdominal pain: 1 Transferred to another unit: 4 Did not perform PCOA: 3
Drop-outs: Week 1: 40 patients (30%) Week 4: 62 patients (50%)	Drop-outs: Week 1: 22 patients (47%) Week 4: 23 patients (49%)
Included for statistical analysis: Week 1: 92 patients Week 4: 70 patients	Included for statistical analysis: Week 1: 25 patients Week 4: 24 patients

PCOA = patient-controlled oral analgesia

Information about pain treatment options during the hospital stay was reported by 60% of patients in the control group and by 74% in the PCOA group (p = .21) at 1 week after discharge. The values at 4 weeks were 70% and 71% (p = .94). Information about when to contact medical service after discharge was reported by 73% of patients in the control group and 88% in the PCOA group at week 1 after discharge (p = .14). At 4 weeks, the values were 74% and 88% (p = .19).

The results from the analysis of the items and subscales from the two questionnaires are shown in Table 3. The results from the emotions subscale indicated that patients in the control group were significantly (p = .02) more affected by emotions at week 1 than patients in the PCOA group. However, when the results were adjusted for gender, diagnosis, and surgery, there only tended to be a difference between the two groups for patients with nonspecific abdominal pain (p = .05). On the pain subscale, there was no significant difference between the control and PCOA groups at week 1 (p = .11) and week 4 (p = .16), and adjustments for gender, diagnosis, and surgery reduced the difference. However, the adjustments revealed a significant effect on the pain subscale for women (p = .01), and patients with a diagnosis of diverticulitis (p = .01), and

of "others" (p = .01) at week 1. Finally, patients in the control group tended to experience more "worst pain" than patients in the PCOA group at week 1 (p = .06). On the activity, side effect, and perception of care subscales no significant differences were found.

Table 2

Demographic Characteristics of the Patients in the Two Questionnaires

	Control group week 1/4 n = 92/70 %	PCOA group week ¼ n = 25/24 %	*p*
Gender			.47/.24
Male	48/44	56/58	
Cohabitation			.33/.35
Alone	13/12	28/25	
Children	4/3	0/0	
Children and adult	25/27	32/54	
Adult	55/59	20/21	
Unknown	2/0	0/0	
Level of education			.41/.91
Elementary/high school	27/24	28/29	
Vocational	31/30	24/25	
Short higher education	7/9	16/8	
Medium higher education	16/17	20/25	
Long higher education	10/11	12/8	
Other/unknown	10/9	0/4	
Occupation			.74/.80
Trade or office	18/23	16/13	
Industrial or handicraft	4/3	12/8	
Social, health care, teaching	17/16	16/17	
Retirement	36/36	40/38	
Student	10/10	8/13	
Other	14/13	8/13	
Diagnosis at discharge			.10/.20
Appendicitis	14/17	8/13	
Perforated appendix	16/19	24/25	
Ileus	9/9	0/0	
Gallstones/cholecystitis	18/19	36/33	
Diverticulitis	12/13	0/0	
Acute pancreatitis	14/12	16/17	
Other	9/7	16/13	
Nonspecific abdominal pain	7/6	0/0	
Surgery	72/79	60/58	.26/**.05**
Type of surgery			.76/.60
Diagnostic laparoscopy	80/80	87/86	
Open surgery	14/16	7/7	
Readmission after surgery*	6/5	7/7	
After discharge			
Readmission	11/13	12/13	.87/.96
Consultation at the GP**	45/48	33/45	.31/.87

PCOA = patient-controlled oral analgesia; GP = general practitioner.
Underline indicate that there was or tended to be a significant difference between the control and the PCOA group.
*Patients discharged after surgery and readmitted within a week with acute abdominal pain.
** Week 1/week 4 after discharge.

Table 3

Results from the Items and Subscales for the Two Questionnaires

Subscales and items	Control group, n = 92/70 (W1/W4)				PCOA group, n = 25/24 (W1/W4)				*p*	
	Median		IQR		Median		IQR			
	Day 1-3	*W1/W4*	Day 1-3	*W1/W4*	Day 1-3	*W1/W4*	Day 1-3	*W1/W4*	Day 1-3	*W1/W4*
Pain (scale 0-10)*	3/3/2	*2/1*	2-5/2-4/1-3	*1-3//0-2*	2/2/1	*1/0*	1-5/1-4/1-3	*0-2/0-1*	.67/.51/.37	*.11/.16*
Least pain (NRS)	2/1/1	*1/0*	1-3/1-3/0-2	*0-2/0-1*	2/1/1	*0/0*	0-3/0-2/0-2	*0-1/0-0*	.70/.61/.53	*.21/.48*
Worst pain (NRS)	5/4/3	*3/1*	3-7/2-7/2-6	*2-5/0-4*	4/4/3	*2/0*	3-6/1-5/1-4	*1-3/0-2*	.66/.33/.24	*.06/.09*
Severe pain (%)	15/10/10	*9/0*	0-40/0-30/0-30	*0-20/0-10*	10/20/10	*6/0*	0-55/0-40/0-30	*0-10/0-10*	.96/.75/.96	*.60/.51*
Activities (scale 0-10)*	5/4/3	*3/0*	3-6/2-5/2-5	*2-4/0-2*	4/4/3	*3/0*	3-6/1-5/1-4	*1-3/0-1*	.50/.47/.27	*.19/.80*
Activities in bed	4/3/2	*2/0*	2-6/1-6/1-4	*1-4/0-1*	2/2/1	*1/0*	0-6/0-5/0-4	*0-3/0-0*	.20/.12/.23	*.04/.12*
Activities out of bed	4/3/2	*2/0*	2-5/1-5/1-4	*1-3/0-1*	2/1/1	*1/0*	0-5/0-6/0-3	*1-2/0-0*	.10/.31/.07	*.03/.31*
Falling asleep	3/2/2	*2/0*	1-5/1-4/0-3	*0-3/0-1*	2/1/1	*1/0*	1-4/0-4/0-2	*0-2/0-1*	.15/.32/.18	*.04/.70*
Staying asleep	4/2/2	*2/0*	1-6/1-5/0-4	*0-3/0-1*	3/2/1	*1/0*	1-5/0-4/0-3	*0-2/0-1*	.37/.18/.29	*.11/.67*
Social	3/3/2	*2/0*	1-7/1-6/0-5	*0-4/0-2*	4/3/2	*2/0*	1-6/1-6/0-4	*0-3/0-0*	.98/.82/.24	*.65/.23*
Leisure	9/8/7	*6/1*	5-10/3-10/3-10	*2-9/0-4*	10/7/7	*6/0*	5-10/2-10/1-10	*2-8/0-3*	.90/.66/.87	*.94/.57*
Emotional (scale 0-10)*	3/2/1	*1/0*	1-5/0-4/0-3	*0-3/0-1*	1/1/0	*0/0*	0-2/0-2/0-1	*0-1/0-0*	.008/.16/.04	*.02/.72*
Anxious	3/1/1	*1/0*	1-5/0-4/0-3	*0-3/0-1*	1/1/0	*0/0*	0-2/0-2/0-1	*0-1/0-1*	.03/.23/.02	*.02/.32*
Depressed	3/2/1	*1/0*	0-6/0-4/0-3	*0-3/0-1*	1/0/0	*0/0*	0-3/0-3/0-2	*0-1/0-1*	.02/.05/.04	*.05/.76*
Frightened	1/1/0	*1/0*	0-4/0-3/0-2	*0-2/0-0*	0/0/0	*0/0*	0-1/0-1/0-0	*0-0/0-0*	.02/.04/.05	*.005/.28*
Helpless	3/2/1	*1/0*	0-6/0-4/0-3	*0-3/0-0*	0/0/0	*0/0*	0-2/0-2/0-1	*0-1/0-0*	.007/.06/.10	*.04/.29*
Side effects (scale 0-10)*	2/1/1	*1/0*	1-3/0-3/0-2	*0-2/0-1*	2/1/1	*1/0*	1-3/1-2/0-2	*0-1/0-1*	.80/.89/.90	*.95/.99*
Nausea	1/0/0	*0/0*	0-4/0-3/0-2	*0-2/0-0*	1/0/0	*0/0*	0-4/0-4/0-2	*0-1/0-0*	.71/.74/.98	*.99/.89*
Drowsiness	3/2/1	*1/0*	0-5/0-4/0-3	*0-2/0-1*	3/2/1	*1/0*	1-5/0-4/0-3	*0-2/0-1*	.96/.58/.96	*.73/.52*
Itching	0/0/0	*0/0*	0-0/0-0/0-0	*0-0/0-0*	0/0/0	*0/0*	0-0/0-0/0-0	*0-0/0-0*	.43/.32/.30	*.06/.96*
Dizziness	1/0/0	*0/0*	0-4/0-3/0-1	*0-1/0-0*	1/0/0	*0/0*	0-3/0-2/0-1	*0-1/0-1*	.79/.39/.78	*.64/.91*
Perception of care (0-10)*				*7-10/4-9*		*7/7*		*5-8/5-10*		*.35/.49*
Useful information about		*8/5*		*5-9/2-9*		*7/5*		*5-8/1-10*		*.90/.62*
pain management options.		*7/5*		*5-10/3-9*		*8/9*		*5-10/4-10*		*.90/.19*
Useful information about		*7/5*								
medical service.										

PCOA = patient-controlled oral analgesia; IQR = interquartile range; W1 = week 1 after discharge; W4 = week 4 after discharge; NRS = Numeric Rating Scale.
Underline indicate that there was or tended to be a significant difference between the control and the PCOA group.
* Summarized.

The results of the patients' use of analgesics in week 1 after discharge indicated that there was no significant difference between the control group and the PCOA group in regard to percentage of patients using analgesics and the dose used. Patients in both the control and the PCOA groups used paracetamol (acetaminophen; Tylenol) more than nonsteroidal anti-inflammatories (NSAIDs) and opioids in week 1. The use of paracetamol declined from 62% to 35% in the control group and from 84% to 24% in the PCOA group on day 1 and day 7. NSAIDs and opioids had the same pattern in use of analgesics. The use of NSAIDs declined from 27% to 10% in the control group and from 36% to 12% in the PCOA group, whereas the use of opioids was reduced from 21% to 9% in the control group and from 28% to 4% in the PCOA group.

The percentage of patients using nonpharmacologic pain treatment interventions in week 1 and 4 after discharge was 52% and 26% in the control group and 33% and 21% in the PCOA group ($p = .11/0.61$), respectively. In the control group a variety of different methods, such as cold/hot pack, deep breathing, distraction (e.g., TV, reading, music, and visualization), walking, relaxation, and massage, were equally used at week 1 and 4 after discharge. In the PCOA group the variety of methods used was higher in week 1 than in week 4. The most used methods in week 1 were cold pack and distraction, whereas it was walking and distraction in week 4. There were no significant differences between the two groups in regard to type of nonpharmacologic interventions for pain relief.

Discussion

Our study found that for patients with acute abdominal pain, the introduction of PCOA had no significant influence on the quality of pain management after hospital discharge. Some tendencies were found: first, patients in the PCOA group tended to have less pain than patients in the control group; second, patients in the control group were more emotionally affected than patients in the PCOA group 1 week after discharge; and third, in week 1, patients in the PCOA group tended to remember information about pain treatment options and when to seek medical advice better than patients in the control group.

The fact that patients in the PCOA group tended to have less pain than patients in the control group might reflect that the study intervention during the hospital stay resulted in a more effective pain management strategy than standard care after discharge. Another explanation could be differences in background data between the two groups, because adjustments for those reduced differences in pain intensity between the groups. The differences in background data in the two groups could be random, but they could also be due to a resistance to the study intervention among the ward nurses. Such a resistance would explain the lower number of patients in the

PCOA group compared with the control group. Other studies have reported similar findings, with nurses being restrictive (McTier, Botti, & Duke, 2014, 2015; Schultz, Maagaard, Hamid, & Qvist, 2018b) or skeptical (Riemondy, Gonzalez, Gosik, Ricords, & Schirm, 2016; Vanwesemael et al., 2018) about using PCOA because of a negative attitude toward patients' ability to perform PCOA responsibly (Sawhney & Maeda, 2013). Because of nurse resistance to the study intervention, the nurses might have included patients with a more straightforward treatment to the PCOA group and consequently the patients had less pain afterward.

A third explanation for the tendency of less pain in the PCOA group could be that PCOA is a suitable and effective pain management strategy for patients with straightforward treatments but not for patients with complicated trajectories. In the control group, the upper IQR on the NRS scale for worst pain was 7 the two first days after discharge, which may indicate insufficient pain management. Studies with a lager sample size are needed to test this hypothesis.

Patients in the control group tended to be more emotionally affected than patients in the PCOA group. They might have experienced more pain as well as insecurity about how to manage the pain because they had less information compared with the PCOA group. Another explanation could be differences in discharge diagnoses between the two groups. The discharge diagnosis of nonspecific abdominal pain affected the emotional subscale significantly, and nonspecific abdominal pain was only represented in the control group. To be discharged without an explanation for acute abdominal pain can lead to insecurity about whether the pain will return and whether proper examination has been provided during hospitalization. In addition, the patients' everyday lives might be affected if they regularly experience pain (Schultz et al., 2014). The diagnosis of diverticulitis and the category "others" tended to increase the effect on the emotional subscale. Other studies on patients with diverticulitis have reported similar findings (Cohen et al., 2013). Higher anxiety and depression scores were identified in patients with recurrent pain (Humes, Simpson, Neal, Scholefield, & Spiller, 2008).

Patients in the PCOA group tended to recall information on pain management options and when to seek medical advice better than the control group in week 1 after discharge. A reason could be that the PCOA group received more information during admission. Another explanation could be that the emotionally affected patients in the control group could not process the information provided during admission because they were focused on other issues.

Strengths and Limitation

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 have been difficult without a high risk of bias in the PCOA group because the patients stayed in multibed rooms.

The retrospective nature of the questionnaires, particularly for week 4, might have affected the memory of the patients. The small sample size of the PCOA group, which was smaller than anticipated, is also a limitation, and larger studies are needed. According to the power calculation, 56 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/ED observation unit.

Implications for Practice

The use of PCOA requires a number questions to be answered before an optimal effect can be achieved in clinical practice. First, which patients benefit the most from PCOA? Second, when is the optimal time to introduce PCOA to the patient? Third, what is the optimal environment for the use of PCOA?

Based on our study, patients of all ages and social status with a fairly straightforward treatment may benefit the most from PCOA. Whether patients with acute or chronic pain are the most optimal to introduce to PCOA, or if the type of pain makes a difference, is unknown.

The optimal introduction of PCOA to patients requires that nurses take the total situation of the patient into account, such as pain intensity, emotional state, and other issues that might influence the patient's ability to receive adequate information on the intervention. A guideline or a screening tool could be used to assess the patients' eligibility to receive information about PCOA and to perform PCOA. The guideline or screening tool should include instructions on how the patients' eligibility to perform PCOA should be evaluated continuously.

Finally, the attitude and environment of the health care professionals to PCOA must be addressed. The nurses must have communication skills and knowledge about patient-centered care. This could be achieved by education, training, and supervision. In addition, the nurses might need further knowledge about the effects and side effects of the analgesics in order to be comfortable in informing and guiding the patients in the use of the medication.

Conclusions

PCOA during the hospital stay did not improve the quality of pain management after discharge for patients admitted with acute abdominal pain.

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