

CADTH Reference List

# Patient-Controlled Analgesia in the Emergency Department

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## Key Messages

- Six randomized controlled trials and 1 non-randomized study were identified regarding the clinical effectiveness of patient-controlled analgesia for adult patients with pain in the emergency department.
- No evidence-based guidelines describing patient-controlled analgesia for patients with pain in the emergency department was identified.

## Research Questions

1. What is the clinical effectiveness of patient-controlled analgesia for patients with pain in the emergency department?
2. What are the evidence-based guidelines describing patient-controlled analgesia for patients with pain in the emergency department?

## Methods

### Literature Search Methods

A limited literature search was conducted by an information specialist on key resources including MEDLINE, the Cochrane Library, the University of York Centre for Reviews and Dissemination (CRD) databases, the websites of Canadian and major international health technology agencies, as well as a focused internet search. The search strategy comprised both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concepts were emergency departments and patient-controlled analgesia. No filters were applied to limit the retrieval by study type. Comments, newspaper articles, editorials, and letters were excluded. The search was also limited to English language documents published between January 1, 2011 and September 1, 2021. Internet links were provided, where available.

### Selection Criteria and Summary Methods

One reviewer screened literature search results (titles and abstracts) and selected publications according to the inclusion criteria presented in Table 1. Full texts of study publications were not reviewed. The Overall Summary of Findings was based on information available in the abstracts of selected publications. Open access full-text versions of evidence-based guidelines were reviewed when abstracts were not available, and relevant recommendations were summarized.

## Results

Six randomized controlled trials<sup>1-6</sup> and 1 non-randomized study<sup>7</sup> were identified regarding the clinical effectiveness of patient-controlled analgesia for adult patients with pain in the

**Table 1: Selection Criteria**

Criteria	Description
Population	Adult patients in the emergency department with pain
Intervention	Patient-controlled analgesia (i.e., any device, any dose, any frequency)
Comparator	Q1: Standard care (i.e., clinician administered analgesia) Q2: Not applicable
Outcomes	Q1: Clinical effectiveness (e.g., pain, pain control), harms (safety and adverse events) Q2: Recommendations describing best practices, appropriate use (mode, administration), training requirements, etc.
Study designs	Health technology assessments, systematic reviews, randomized controlled trials, non-randomized studies, evidence-based guidelines

emergency department. No relevant health technology assessments, systematic reviews, or evidence-based guidelines were identified.

Additional references of potential interest that did not meet the inclusion criteria are provided in Appendix 1.

## Overall Summary of Findings

Six randomized controlled trials<sup>1-6</sup> and 1 non-randomized study<sup>7</sup> were identified regarding the clinical effectiveness of patient-controlled analgesia (PCA) for adult patients with pain in the emergency department (ED). The randomized controlled trials assessed pain and pain relief over a 2-hour period<sup>1,4-6</sup> and 12-hour period.<sup>2,3</sup> Three randomized controlled trials<sup>2,3,5</sup> found that patients in EDs treated with PCA experienced less total pain, but only the findings of 1 study<sup>2</sup> were statistically significant. Four randomized controlled trials reported greater pain decline throughout the study period when patients were given PCA compared to physician administered pain relief<sup>1,4</sup> and titrated pain management.<sup>5,6</sup> One study<sup>3</sup> reported that patients treated with PCA spent significantly less time in moderate or severe pain compared to patients treated with nurse-titrated analgesia. All randomized controlled trials<sup>1-6</sup> found higher patient satisfaction or better experience with pain management when PCA was used. The non-randomized study<sup>7</sup> found no significant difference in the development of persistent pain post ED admission between the PCA and usual treatment group. A detailed summary of these studies can be found in Table 2.

No evidence-based guidelines describing PCA for patients with pain in the ED were identified; therefore, no summary can be provided.

**Table 2: Summary of Included Studies**

First author, year	Study population	Intervention and comparator(s)	Relevant outcomes	Author's conclusions
<b>Randomized Controlled Trials</b>				
Bijur, 2017 <sup>1</sup>	Patients with acute pain requiring IV opioid administration N = 636	<b>Intervention:</b> PCA <b>Comparator:</b> opioid dosed at physician's discretion	Pain decline 30 to 120 minutes after initial administration (numeric rating scale), patient satisfaction with pain management, adverse events.	PCA was associated with a greater rate of pain decline, but this finding did not meet the author's threshold for clinical significance. More patients treated with PCA reported satisfaction with pain management. Eleven adverse events were reported from the PCA group.
Smith, 2015 <sup>2</sup>	Patients with moderate-to-severe non-traumatic abdominal pain N = 200	<b>Intervention:</b> PCA <b>Comparator:</b> nurse-titrated analgesia	Total pain experienced over the 12-hour study period and percentage of study period in moderate/severe pain (visual analogue scale), patient satisfaction with pain management.	PCA was associated with significantly less total pain, less time in moderate/severe pain and higher patient satisfaction with pain management.
Smith, 2015 <sup>3</sup>	Patients with moderate-to-severe pain from traumatic injuries N = 200	<b>Intervention:</b> PCA <b>Comparator:</b> nurse-titrated analgesia	Total pain experienced over the 12-hour study period and percentage of study period in moderate/severe pain, patient satisfaction with pain management.	Patients in the PCA group experienced less total pain, less time in moderate/severe pain and reported higher satisfaction with pain management but findings were not significant.
Birnbaum, 2012 <sup>4</sup>	Patients with abdominal pain of 7 days or less N = 211	All patients received an initial dose of 0.1 mg/kg IV morphine followed by physician-managed analgesia as needed. <b>Intervention:</b> IV morphine with on demand doses of 1.0 mg or 1.5 mg with a 6 minute lockout between doses <b>Comparator:</b> 0.1 mg/kg/IV morphine followed by physician-managed analgesia as needed	Pain intensity over 120 minutes, satisfaction with pain treatment, and desire for the same treatment.	Patients in the PCA group experienced significantly greater net decline in pain intensity compared with the non-PCA group. No clinically or statistically significant difference between patients receiving 1.0 mg and 1.5 mg of morphine via PCA. More patients in the PCA group reported satisfaction with pain treatment.

First author, year	Study population	Intervention and comparator(s)	Relevant outcomes	Author's conclusions
Rahman, 2012 <sup>5</sup>	Patients with acute traumatic pain in the ED N = NR	<b>Intervention:</b> morphine via PCA <b>Comparator:</b> Boluses of morphine via titration method	Pain levels at intervals of 0, 15, 30, 45, 60, 90, and 120 minutes (visual analogue scale) and patient experience with pain relief.	Patients in the PCA group experienced faster and greater pain relief. The PCA group was more satisfied with using PCA for pain relief.
Rahman, 2012 <sup>6</sup>	Patients with acute traumatic pain in the ED N = 47	<b>Intervention:</b> PCA system <b>Comparator:</b> Boluses of analgesia via titration method	Pain levels at 15-minute intervals over 120 minutes, patient experience with pain relief.	Decline in pain levels in the PCA group was significantly greater than the non-PCA group. Patients in the PCA group were more satisfied using PCA for pain relief.
<b>Non-Randomized Studies</b>				
Rockett, 2019 <sup>7</sup>	Patients with traumatic injuries or abdominal pain N = 286	<b>Intervention:</b> PCA <b>Comparator:</b> usual treatment (not specified)	Persistent pain 6 months post ED admission.	No significant difference in the development of persistent pain between groups.

ED = emergency department; PCA = patient-controlled analgesia; NR = not reported.

## References

### Health Technology Assessments

No literature identified.

### Systematic Reviews and Meta-analyses

No literature identified.

### Randomized Controlled Trials

1. Bijur PE, Mills AM, Chang AK, et al. Comparative Effectiveness of Patient-Controlled Analgesia for Treating Acute Pain in the Emergency Department. *Ann Emerg Med*. 2017 Dec;70(6):809-818.e802. [PubMed](#)
2. Smith JE, Rockett M, Creanor S, et al. PAIn SoluTions In the Emergency Setting (PASTIES)—patient controlled analgesia versus routine care in emergency department patients with non-traumatic abdominal pain: randomised trial. *Bmj*. 2015 Jun 21;350:h3147. [PubMed](#)
3. Smith JE, Rockett M, S SC, et al. PAIn SoluTions In the Emergency Setting (PASTIES)—patient controlled analgesia versus routine care in emergency department patients with pain from traumatic injuries: randomised trial. *Bmj*. 2015 Jun 21;350:h2988. [PubMed](#)
4. Birnbaum A, Schechter C, Tufaro V, Touger R, Gallagher EJ, Bijur P. Efficacy of patient-controlled analgesia for patients with acute abdominal pain in the emergency department: a randomized trial. *Acad Emerg Med*. 2012 Apr;19(4):370-377. [PubMed](#)
5. Rahman NH, DeSilva T. A randomized controlled trial of patient-controlled analgesia compared with boluses of analgesia for the control of acute traumatic pain in the emergency department. *J Emerg Med*. 2012 Dec;43(6):951-957. [PubMed](#)
6. Rahman NH, DeSilva T. The effectiveness of patient control analgesia in the treatment of acute traumatic pain in the emergency department: a randomized controlled trial. *Eur J Emerg Med*. 2012 Aug;19(4):241-245. [PubMed](#)

### Non-Randomized Studies

7. Rockett M, Creanor S, Squire R, et al. The impact of emergency department patient-controlled analgesia (PCA) on the incidence of chronic pain following trauma and non-traumatic abdominal pain. *Anaesthesia*. 2019 Jan;74(1):69-73. [PubMed](#)

### Guidelines and Recommendations

No literature identified.

## Appendix 1: References of Potential Interest

### Previous CADTH Reports

- Canadian Agency for Drugs and Technologies in Health. Patient-controlled Analgesia for Acute Injury Transfers: A Review of the Clinical Effectiveness, Safety, and Guidelines. *Canadian Agency for Drugs and Technologies in Health*. 2014 08 11;08:11. [PubMed](#)

### Randomized Controlled Trials

#### Alternative Population

- Viscusi ER, Grond S, Ding L, Danesi H, Jones JB, Sinatra RS. A comparison of opioid-related adverse events with fentanyl iontophoretic transdermal system versus morphine intravenous patient-controlled analgesia in acute postoperative pain. *Pain manag*. 2016;6(1):19-24. [PubMed](#)
- Ebrahimzadeh MH, Mousavi SK, Ashraf H, Abubakri R, Birjandinejad A. Transdermal fentanyl patches versus patient-controlled intravenous morphine analgesia for postoperative pain management. *Iran*. 2014 May;16(5):e11502. [PubMed](#)

### Non-Randomized Studies

#### Alternative Population

- Chang SH, Chang TC, Chen MY, Chen WC, Chou HH. Comparison of the Efficacy and Safety of Dinalbuphine Sebacate, Patient-Controlled Analgesia, and Conventional Analgesia After Laparotomy for Gynecologic Cancers: A Retrospective Study. *J Pain Res*. 2021;14:1763-1771. [PubMed](#)
- Schultz H, Abrahamsen L, Rekvad LE, et al. Patient-controlled oral analgesia at acute abdominal pain: A before-and-after intervention study of pain management during hospital stay. *Appl Nurs Res*. 2019 04;46:43-49. [PubMed](#)
- Schultz H, Schultz Larsen T, Moller S, Qvist N. The Effect of Patient-Controlled Oral Analgesia for Acute Abdominal Pain after Discharge. *Pain Manag Nurs*. 2019 08;20(4):352-357. [PubMed](#)
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- Asha SE, Curtis KA, Taylor C, Kwok A. Patient-controlled analgesia compared with interval analgesic dosing for reducing complications in blunt thoracic trauma: a retrospective cohort study. *Emerg Med J*. 2013 Dec;30(12):1024-1028. [PubMed](#)

#### Alternative Comparator – Emergency Department Compared to Hospitalization

- Santos J, Jones S, Wakefield D, Grady J, Andemariam B. Patient Controlled Analgesia for Adults with Sickle Cell Disease Awaiting Admission from the Emergency Department. *Pain Res Manag*. 2016;2016:3218186. [PubMed](#)

### Guidelines and Recommendations

#### Intervention Not Specified

- Sickle cell disease: managing acute painful episodes in hospital. Clinical guideline [CG143]. London: National Institute for Health and Care Excellence; 2012. <https://www.nice.org.uk/guidance/cg143/chapter/1-Recommendations#reassessment-and-ongoing-management> Accessed 2021 Sep 3.

### Review Articles

- Bender, M & Papa, L. The Utility of Patient-Controlled Analgesia for Managing Acute Pain in the Emergency Department. In: From Conventional to Innovative Approaches for Pain Treatment. Cascella M, editor. 2019. <https://www.intechopen.com/chapters/65153> Accessed 2021 Sep 3.

#### Alternative population

- Zassman SM, Zamora FJ, Roberts JD. Inpatient pain management in sickle cell disease. *Am J Health-Syst Pharm*. 2019 Nov 13;76(23):1965-1971. [PubMed](#)

#### Not Specific to Patient Controlled Analgesia

- Ducharme J. Acute Pain Management in the Year 2018-A Review. *J Acute Med*. 2018 Jun 01;8(2):53-59. [PubMed](#)
- Glassberg J. Evidence-based management of sickle cell disease in the emergency department. *Emerg*. 2011 Aug;13(8):1-20; quiz 20. [PubMed](#)

### Additional References

#### Article

- University of Plymouth. Patient controlled analgesia in the emergency department is effective: Twin studies show that PCA is an option for treating pain in emergency. *ScienceDaily*; 2015 Jun 22. [www.sciencedaily.com/releases/2015/06/150622101044.htm](http://www.sciencedaily.com/releases/2015/06/150622101044.htm) Accessed 2021 Sep 3.