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# Protocols for treating the postoperative pain of fractures in Dutch hospitals

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**Introduction:** Every year, over 260,000 patients in the Netherlands are diagnosed with a traumatic fracture. Many patients are treated surgically and need postoperative treatment of pain. Research suggests postoperative pain is often under-treated, leaving a significant proportion of patients in moderate to severe postoperative pain. Specialized, evidence-based pain-management protocols offer patients the best possible pain management, and significantly reduce the risk of pain-related health complications.

**Objective:** Our objective was to review the range of postoperative pain protocols that are currently being used to treat postoperative fracture pain within the Netherlands, and investigate whether a specialized, evidence-based protocol for treating postoperative fracture pain exists within this sample.

**Methods:** A written request for the protocol currently being used for the treatment of postoperative pain following the surgical treatment of a fracture was sent to 101 Dutch hospital departments. The administration and dosage of pain medications used during postoperative pain management were then identified and summarized.

**Results:** Of the contacted hospitals, 57% sent in protocols; 45% of these were eligible for analysis. All of the departments sent a general or acute pain protocol rather than a specialized protocol for the treatment of postoperative pain associated with the surgical treatment of fractures. A total of 22 different analgesics were used for pain management in 135 different administration schemes. Paracetamol, diclofenac, and morphine were used in the majority of protocols. Medication was given via oral, rectal, intravenous, subcutaneous, intramuscular, and epidural routes, amongst others.

**Conclusion:** No specialized, evidence-based protocols for the treatment of postoperative fracture pain were found in this Dutch sample. A wide variety of medications, dosages, and administration schemes were used to manage postoperative pain following the surgical treatment of a fracture. The importance of developing a clear, specialized, evidence-based protocol for the treatment of postoperative pain following fracture surgery is discussed.

**Keywords:** pain management, postoperative pain, fracture, protocol

## Introduction

A recent review of surgical inpatients in the Netherlands found that moderate to severe postoperative pain was reported by up to 41% of patients who were receiving postoperative pain treatment according to an acute pain protocol.<sup>1</sup> Moreover, 14% of patients reported persistence of pain 4 days later. Despite the fact that acute pain management has become an increasingly important focus of postoperative medical care, postoperative pain management is often unsatisfactory<sup>2</sup> and puts patients at risk for developing chronic pain conditions.<sup>3-5</sup>

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According to the Dutch Bureau of Statistics,<sup>6</sup> up to 260,000 patients are diagnosed with a traumatic fracture each year, and a significant portion of these fractures are treated surgically. Brown et al<sup>7</sup> concluded that fractures are frequently accompanied by pain, ranging from mild to severe. Using the above-reported rates of postoperative pain as a guide, up to 100,000 patients admitted to hospital for the surgical treatment of fractures could be at risk for moderate to severe postoperative pain each year. Clear, evidence-based postoperative pain treatment protocols provide patients with the best care possible, and minimize postoperative complications, length of inpatient care, and risk of developing chronic pain. Over the past decade, protocols for treating pre- and postoperative pain have been developed for a number of acute pain conditions. However, to our knowledge, a specialized protocol for the treatment of postoperative fracture pain has not been developed in the Netherlands.

The current research conducts a review of the pain protocols currently used for the treatment of postoperative fracture pain in larger Dutch general hospitals. The goal of this work is to review current approaches to the management of postoperative fracture pain, and to investigate the existence of specialized treatment protocols. By reviewing and categorizing the range of protocols that are currently in use in the Netherlands, we provide a platform for future research to analyze the relative efficacy of different approaches to the management of pain following the surgical treatment of fractures. Upon this basis, a specialized protocol for the postoperative treatment of pain after surgery of fractures may be developed.

## Methods

A letter specifically requesting information about a specialized protocol for postoperative treatment of pain after surgery of fractures was sent to 101 Dutch hospital departments, including all academic hospitals. However, if hospitals did not follow a specific pain protocol for postoperative fractures, they were encouraged to send in their general postoperative pain protocol, since this would be applied in the absence of a specialized fracture pain protocol.

Letters were sent to all departments that handle traumatic fractures, such as general surgery, trauma surgery, and oral- and maxillofacial surgery departments, as well as larger anesthesiology departments. After initial replies, a second letter was sent out in order to achieve the highest possible participation. Numerous hospitals were contacted by telephone if there was no response after the second round.

The eligibility of all of the protocols received by email and postal mail were evaluated for inclusion in the study. Protocols were marked as eligible when specific pain medications were mentioned in a postoperative or acute pain protocol. While the mode of administration for each drug was compulsory, the dosage was not. Each protocol was searched for the type of analgesics used, doses, and administration schemes. These were then divided into subgroups by their administration methods.

## Results

A total of 58 (57%) hospital departments replied to the requests for information about their postoperative pain protocols, and 26 protocols (45%) were eligible for analysis. Out of all responders, the majority (62%) sent a general postoperative pain protocol, non-specific for fracture treatment. The remainder of the departments sent in acute pain protocols that were being used as general postoperative protocols. One department labeled their protocol as specialized for the management of pain subsequent to the surgical treatment of fractures. However, upon further inspection, it was discovered that the protocol was instead specialized for the treatment of traumatic fracture pain rather than postoperative pain following the surgical treatment of fractures. Hence, we found no specialized pain protocols for the treatment of post-surgical fracture pain. However, two responders did state they were currently working on the development of a specific protocol for the treatment of postoperative fracture pain.

Medications used in the protocols were divided into subgroups according to route of administration: oral, rectal, subcutaneous, intramuscular, intrathecal, epidural, and intravenous. All analgesics are specified in Table 1. Some protocols did not specify the use of a specific analgesic and were not included. Further, others included multiple dosage schemes for medication and therefore both are taken into account.

A total of 22 different analgesics were used in 135 different administration schemes; 12 different analgesics were used within the oral administration category, six in the rectal group, 12 intravenously, three subcutaneously, five were intramuscular, five were epidural, one was used cutaneously and nasally, and one sublingually.

Within the oral group, paracetamol and diclofenac were represented in 100% and 77% of protocols, respectively. Tramadol was used in 17 of 26 protocols (65%). Other frequently used oral medications included oxycodone (23%), naproxen (15%), and morphine (12%). Etoricoxib, meloxicam, metamizole, and methadone were all mentioned

**Table 1** Variety of used medication in protocols

Medication	Dose (min–max)	Administration routes	Variety in schemes	Total inclusions (N)
Paracetamol	1,000–4,000 mg	PO, SUPP, IV	12	60
Paracetamol/codeine	3,000 mg/120 mg	PO, SUPP, IV	2	1
Diclofenac	50–200 mg	PO, SUPP, IM, IV	17	45
Naproxen	300–1,000 mg	PO, SUPP	4	8
Ibuprofen	400–2,400 mg	PO	2	2
Metamizole	4,000 mg	PO	1	1
Meloxicam	15 mg	PO, SUPP	1	2
Tramadol	50–400 mg	PO, SUPP, IM, IV	15	28
Morphine	Multiple units	PO, SUPP, IM, IV, SC, EPI	27	38
Piritamide	1.5 µg/kg–20 mg	IM, SC, IV	13	16
Etoricoxib	90 mg	PO	1	1
Methadone	0.4–3 mg/kg	PO, IM, IV	4	4
Fentanyl	2–50 µg/kg	CUT, NAS, IV	6	8
Esketamine	Multiple units	IV	5	7
Oxycodone	5–60 mg	PO	6	6
Sufentanil	Multiple units	IV, EPI	6	7
Bupivacaine	0.125%–0.75%	EPI	3	6
Levobupivacaine	1.25 mg/mL	EPI	1	1
Ropivacaine	0.2% or 20 mg/hour	IV, EPI	4	5
Buscopan	80 mg	IV	1	1
Buprenorfine	75 µg/hour or 0.2 mg	SL, IV	2	2
Lidocaine	120 mg/hour or 0.5 mg/kg/hour	IV	2	2
Total			135	251

**Abbreviations:** CUT, cutaneous; EPI, epidural; IM, intramuscular; IV, intravenous; NAS, nasal; PO, oral; SC, subcutaneous; SL, sublingual; SUPP, supplement.

in one protocol (4%). The rectal administration group showed similar patterns of medication use, with paracetamol (85%) and diclofenac (65%) making up the majority, followed by tramadol (23%) and naproxen (15%), amongst others. Diclofenac and morphine accounted for 60% when used via intra-muscular injection, but were only mentioned in 19% of all protocols. Morphine (50%), piritamide (27%), and methadone (4%) were the only medications injected subcutaneously. Fentanyl was also applied nasally and cutaneously in one protocol. Major epidural drugs were sufentanil (31%), bupivacaine (23%), and ropivacaine (12%) in a total group of five different types of medication. Intravenous medication consisted of 12 different types, out of which morphine (58%) and paracetamol (46%) were used in the majority. Piritamide (19%), fentanyl (19%), tramadol (15%), and diclofenac (12%) made up the second-largest group.

As for the administration schemes, many different notations, dosages, time schedules, and concentrations were used. For instance, eight different administration schemes for intravenous morphine were identified. The protocols we received used a wide variety of dose notations, including milligram (mg), mg per milliliter (mg/mL), mg per kilogram bodyweight (mg/kg), and percentages, and were all combined with a timeframe (per hour). Some protocols mentioned

consulting an anesthesiologist when certain medications were used in order to provide clarity on doses.

In general, all eligible protocols mentioned using a numeric rating scale or visual analog scale in order to assess pain. However, cut-off scores for upgrading analgesic effect were often not mentioned, leaving pain scores unused. Furthermore, just 12 of 26 protocols included a visual diagram for quick overview. Only 17 protocols mentioned contraindications for all medications used. All others cited contraindications but lacked explicit clarification or alternative medication.

## Discussion

The present research reviewed the postoperative pain protocols for surgically treated fractures in Dutch hospitals in order to gain insight into the specificity of postoperative fracture pain management in the Netherlands. Results indicated that a wide variety of protocols are used for the treatment of postoperative pain after fracture surgery in Dutch hospitals, and that no single hospital in the current sample employed an evidence-based, specialized protocol for postoperative fracture pain. In each case, the analgesics used to treat postoperative fracture pain were dosed and administered using a general protocol for treating acute pain, rather than

a specialized, evidence-based protocol for the treatment of post-surgical fracture pain. An additional finding of our survey was that several protocols did not clarify dosages, and did not include an examination of side effects, contraindications, or patient attributes, such as age, that may significantly influence the effect of pain medications.

Even though the majority of protocols provided the necessary information, the ease and efficiency with which protocols could be used to guide clinical decision making left ample room for improvement. Protocols were often over 20 pages in length and did not include an overview or reference index, making it practically impossible for nursing staff to choose a correct drug or administration efficiently. In 12 of the 26 protocols reviewed, dosages and administration schemes were not recommended for all drugs and contraindications were not always noted. Finally, pain scales were used incorrectly to decide on medication by failing to mention cut-off points and not asking for re-evaluation after pain medication was applied. Once again, this leaves many patients under-treated for pain and at risk for postoperative pain and complications, which may increase treatment costs.

Several studies have shown that a significant proportion of patients being medicated for postoperative pain – including those who have undergone surgery for fractures – still report moderate to severe postoperative pain.<sup>8,9</sup> The under-treatment of pain is a matter of great concern, because moderate to severe postoperative pain is associated not only with patient distress and discomfort, but also with the development of postoperative complications, and puts patients at risk for the development of chronic pain syndromes post-surgery.<sup>3-5</sup> One of the best ways to tackle the under-treatment of postoperative pain is to use evidence-based, specialized pain protocols. A recent study by Stadler et al<sup>10</sup> showed that comprehensive, evidence-based postoperative pain management by an acute pain service showed significant improvement in postoperative pain and morbidity of postoperative complications. The results show that there is great variability in postoperative protocols, and no specialized protocol for treating postoperative fracture pain, at least in the sample of hospitals used in the present research. This may explain why pain is not being adequately treated in a significant percentage of patients within the Netherlands.<sup>11</sup> The current research therefore highlights a need for the improvement of protocols used for the management of postoperative pain, and, ideally, the research-based development of a specialized postoperative pain management protocol for traumatic fractures.

## Conclusion

The present study reviewed the status of postoperative pain protocols currently used in Dutch hospitals, both to evaluate the current state of pain management practice in the Netherlands, and to search for a specialized postoperative pain protocol. Our review revealed that many of the pain protocols for the management of post-surgical fracture pain were incomplete and inefficient, and all were non-specific to postoperative fracture pain. Pain-treatment procedures varied widely across hospitals, with over 22 different types of medications being administered in over 130 administration schemes. The authors emphasize the importance of developing such an evidence-based, clear, and specific protocol for the treatment of pain after surgical treatment of traumatic fractures. This protocol should include a quick overview algorithm and all major contraindications, and should use pain scores to correctly monitor discomfort.

## Disclosure

None of the participating authors have received either financial or personal benefit with regard to this article and thus do not have any conflicts of interest.

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