

Observational study

New approach for treatment of prolonged postoperative pain: APS Out-Patient Clinic



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HIGHLIGHTS

- The APC-OPC is an outpatient clinic for subacute postoperative pain management.
- Of the first 200 patients treated at the APS-OPC, 70% had neuropathic pain.
- The median duration of follow-up was 2.8 months.
- Pain medications, including strong opioids, were successfully tapered off.
- The APS-OPC enables an easy transfer to chronic pain services if pain persists.

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ABSTRACT

Background and aims: Persistent postoperative pain (PPP) is a significant clinical problem. Several patient-related risk factors for PPP have been identified, including a previous chronic pain problem, young age, female gender and psychological vulnerability. Intra- and postoperative risk factors include surgical complications such as infections, haematoma, nerve damage and repeated surgery. As the length of hospital stay has been shortened, some patients may be discharged despite ongoing pain and insufficient analgesic medication. The challenge is to identify patients at high risk of developing PPP and to create a targeted care pathway to ensure effective and safe pain treatment especially in the subacute postoperative phase at home. This observational study describes the first two years of the Acute Pain Service Out-Patient Clinic (APS-OPC) at the Helsinki University Hospital.

Methods: Patient characteristics, known risk factors, and details of treatment of PPP for the first 200 patients referred to our APS-OPC were retrospectively collected from the medical records. The APS-OPC clinic functions in close collaboration with the Multidisciplinary Pain Clinic (MPC), and the number of patients in need of physiotherapist, psychologist or psychiatrist counselling was recorded, as well as the number of patients referred to the MPC for further PPP management.

Results: Patients were referred to the APS-OPC from different surgical specialities, the two most common being thoracic and orthopaedic surgery. Seventy per cent of the patients (139/200) presented symptoms indicating neuropathic postsurgical pain. The patients had, on average, five risk factors for PPP. The median time from surgery to the first contact to the APS-OPC was two months, and the median duration of follow-up was 2.8 months (0–16 months). The median number of contacts with APS-OPC was 3 (range 1–14). Every fourth patient needed only one contact to the APS-OPC. Nineteen per cent of the patients had an appointment with the physiotherapist and 20% with a psychologist or psychiatrist. At discharge after surgery, 54% of the patients were using weak opioids, 32% strong opioids and 71% gabapentinoids; at discharge from the APS-OPC, these numbers were 20%, 6% and 43%, respectively. Twenty-two per cent of the patients were referred to the MPC for further pain management.

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Conclusions: The APS-OPC provides a fluent fast-track method of ensuring effective multimodal analgesia in the subacute recovery phase after surgery. Even strong opioids can be safely used after discharge and then tapered off in close supervision of the APS-OPC anaesthesiologist. As the APS-OPC was implemented in close collaboration with the MPC, the multidisciplinary resources are easily available during the course of the APS-OPC treatment.

Implications: The first two years of the APS-OPC have shown that a significant number of surgical patients benefit from continuing active pain management after discharge from hospital. This fast-track service provides physician-supervised titration of analgesics to improve pain relief in the subacute phase. An important task of the APS-OPC is to ensure that strong opioids are not inappropriately continued after recovery. Another goal of the APS-OPC is to identify patients in need of multidisciplinary pain management services to prevent chronification.

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1. Introduction

The ability to control acute perioperative and postoperative pain has made modern surgery possible. Nowadays, in most cases it is possible to provide good postoperative analgesia, but some patients still experience severe pain after surgery or postoperative pain persists longer than expected. Besides, the length of postoperative hospital stay after many operations has been significantly shortened, leading to new challenges in postoperative pain management. There is great individual variation in the intensity and duration of pain after certain types of surgery. In addition to the type of operation, several factors that affect the postoperative pain experience have been identified (Fig. 1).

Persistent postoperative pain is a significant clinical problem ([1–5], Table 1). It is defined as pain that develops after a surgical procedure and lasts at least 2 months, with other causes for the pain excluded [6]. Continued noxious input from the postoperative injury may lead to sensitization of the central nervous system and pain spreading to a wider area (secondary hyperalgesia). This phenomenon is a dynamic reflection of neuroinflammatory changes and central neuronal plasticity, which is considered to be the basis for chronic postsurgical pain [7–10]. The progression from acute to chronic pain involves various risk factors, including surgical, psychosocial, socio-environmental and patient-related ones ([2,3,11]; Fig. 1).

Most of the analgesics used to alleviate postoperative pain are not very effective for secondary hyperalgesia. Also, nerve

injury may be a significant factor in the development of chronic postoperative pain [12–15]. Few studies provide data on the management of pain in the *sub-acute phase* when patients are at home recovering and rehabilitating from surgery. Systematic pain management with individualized analgesic titration improves rehabilitation and decreases incidence of chronic post-surgical pain after knee and hip surgery [12]. Effective pain management extended to the home for the first week after discharge could be more important than any analgesic method per se in preventing chronic postsurgical pain after thoracotomy [13].

A follow-up service for persisting postoperative pain has been proposed [16,17]. This concept involves preoperative identification of patients at risk of severe acute pain and/or persisting postoperative pain, and effective and safe pain management in the subacute phase. This includes appropriate and controlled use of strong opioids and antihyperalgesic drugs (e.g. gabapentinoids), also at home. It provides a way to monitor the link between preoperative risk factors, perioperative analgesia, and persistent postoperative pain. One model for this kind of service has been recently described [18].

A follow-up service for patients with severe pain and/or need of strong opioids and large doses of neuropathic pain medication at discharge after surgery was established in 2012 at the Helsinki University Hospital. This observational study describes the two first years of our follow-up service named Acute Pain Service Out-Patient Clinic (APS-OPC).

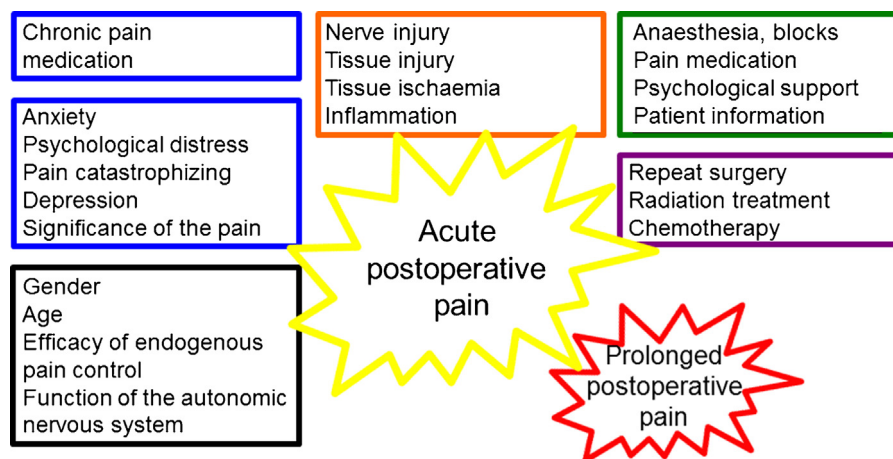


Fig. 1. Factors that affect acute and prolonged postoperative pain. There is a very strong association between intense acute postoperative pain and prolonged chronic pain. This could indicate causality, or common risk factors. So of these factors, such as anxiety or perioperative analgesic treatment can be modified, whereas others, such as genetic construction of the patient or need for repeat surgery in practice cannot be altered, but still need to be taken into account when planning and executing the treatment of the patient.

Source: Adapted from Kontinen V, Hamunen K. Leikkauksen jälkeisen kivun hoito. Duodecim 2015 Oct 13;131:1921–8.

Table 1

Reported incidences of chronic pain 3–12 months after surgery.

Type of operation	Incidence of chronic pain (%)	Incidence of severe (disabling) chronic pain (NRS > 5/10 [2]) (%)
Limb amputation	30–85	5–10
Thoracotomy	5–65	10
Mastectomy	11–57	5–10
Major abdominal surgery	7–14	NA
Craniotomy	7–29	NA
Knee arthroplasty	13	NA
Hip arthroplasty	12	NA
Caesarean section	4–10	4
Inguinal hernia	5–63	2–4
Coronary bypass	30–50	5–10
Cholecystectomy	3–50	NA
Vasectomy	0–37	NA
Dental surgery	5–13	NA

Source: Adapted from Refs. [2–4].

NA: data not available.

2. Methods

According to the Finnish regulations, formal assessment of the study protocol by the local ethical committee was not necessary or possible, as the study is descriptive, the patients were not randomized to any intervention and all received the ordinary treatment. This was confirmed by the chair of the ethical committee in a telephone conversation with VK. The committee does not assess protocols that are considered not to require assessment. Appropriate institutional permission to review patient records was obtained.

2.1. Setting

The surgical services at the Helsinki University Hospital perform some 60 000 operations yearly. All units (five hospitals) performing major surgery have Acute Pain Service (APS) teams. The multidisciplinary pain clinic serves the whole University Hospital district for the treatment of chronic cancer and non-cancer pain, with 1500 out-patient referrals per year. The Acute Pain Service Out-Patient Clinic (APS-OPC) in Helsinki began in September 2012 as a collaboration combining expertise and resources of APS teams and the multidisciplinary pain clinic. The service is provided by operating room anaesthesiologists with expertise in acute postoperative pain management. Multidisciplinary pain management resources including nursing, psychology and physiotherapy are provided by the multidisciplinary pain clinic. The APS-OPC operates one day per week at the pain clinic. The patients are referred to the APS-OPC by the anaesthesiologists or surgeons, or by general practitioners whose patients are still in the sub-acute phase of their pain (less than three months postoperatively). Patients whose pain problems do not resolve within 3–4 months in the care of APS-OPC, are transferred directly to the multidisciplinary pain clinic without any referral process.

2.2. Patients

Demographic characteristics of the first 200 patients referred to our APS-OPC (from September 2012 to August 2014) were collected from medical records after appropriate institutional approval. The presence of risk factors for prolonged postoperative pain for each patient was systematically determined from the medical records using a pre-defined list compiled from earlier studies ([2,3,11]; Table 2). Details of the treatment of pain during the perioperative period, and the treatment and use of multidisciplinary resources during the APS-OPC follow-up were

Table 2

Risk factors for chronic postsurgical pain [2,3,11]. Factors used in this study marked with *.

Preoperative factors
Preoperative pain, moderate to severe, lasting more than 1 month in the surgical area (*)
Preoperative chronic pain in other locations (*)
Repeat surgery (e.g. cancer recurrence) (*)
Psychological vulnerability (e.g. pain catastrophizing, anxiety), mentioned in medical records (*)
Female gender (*)
High BMI (>30) (*)
Young age (adults <40 yrs) (*)
Workers' compensation
Genetic predisposition
Inefficient DNIC, diffuse noxious inhibitory control (=CPM, conditioned pain modulation)
Intraoperative factors
Nerve damage after surgery (*)
Tissue ischaemia
Proinflammatory state
Postoperative factors
Acute pain (moderate to severe), hyperalgesia (*)
Radiation therapy to the surgical area (*)
Neurotoxic chemotherapy (*)
Sensory disturbances after surgery (*)
Surgical complications (infection, seroma, haematoma) (*)
Repeat surgery (*)
Psychological vulnerability, anxiety (mentioned in medical records) (*)

recorded. The criteria used for referrals to APS-OPC are shown in Table 3. Data are presented as median (range) or number of patients.

3. Results

3.1. Patient and pain characteristics

The demographic characteristics of the patients are presented in Table 4. Patients were referred to the APS-OPC from a wide range of surgical specialities (Fig. 2). Eighty-two out of 200 patients (41%) had undergone thoracic surgery: of these, 39% were open thoracotomies, 52% video-assisted thoracic surgeries (VATS), and the others were laparotomies, pectus excavatum operations or multiple rib fractures without surgery. Sixteen per cent of the thoracic patients were young adults (mean age 33 years) who were operated on for thoracic outlet syndrome (TOS). Twenty per cent had had reoperation, and 16% had a pre-existing chronic pain condition. Most orthopaedic operations were spine or limb surgery. The majority of the patients (139/200) presented symptoms (for instance, allodynia and hyperalgesia) suggesting neuropathic post-surgical pain: 66% of the thoracic, 72% of the orthopaedic, 35% of the gastrointestinal, 69% of the vascular, and all of the breast surgery patients. Most patients were referred to the APS-OPC by anaesthesiologists at the time of discharge from the hospital. In the early

Table 3

Criteria for referral to the Acute Pain Service Out-Patient Clinic.

- Nerve damage and sensory disturbances from the surgery: allodynia and/or hyperalgesia (primary or secondary) around the surgical area – prolonged need for neuropathic pain medication
- Need of strong opioids at home after discharge for postoperative pain
- Pain at discharge that disturbs the patient's daily activities and/or sleep
- Severe acute postoperative pain, and the patient has risk factors for persistent postoperative pain (PPP; Table 2), or the patient has undergone surgery with high risk for persistent postoperative pain (e.g. thoracic surgery with emphasis on thoracic outlet syndrome operation, mastectomy, leg amputation; Table 1)

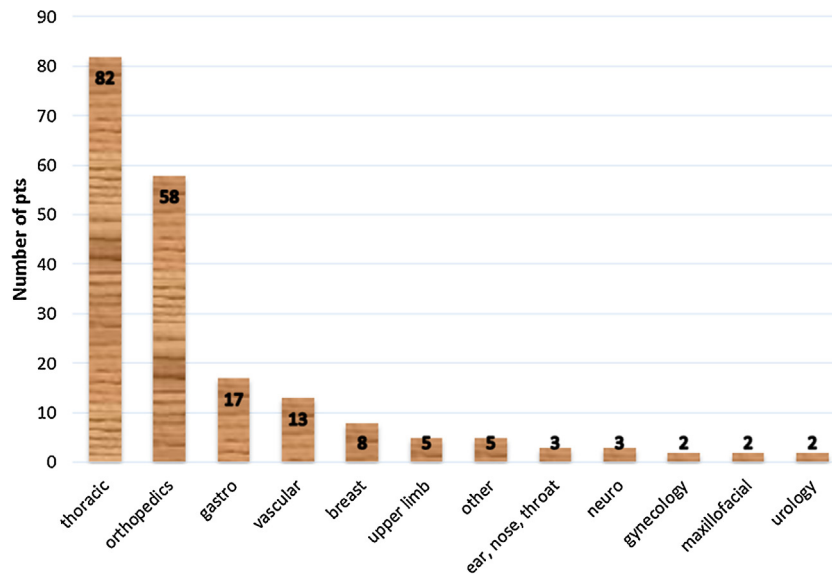


Fig. 2. Type of surgery undergone by the first 200 patients referred to the Helsinki APS-OPC.

Table 4

Demographic and treatment factors of the first 200 patients. Data are median (range) or number of patients (percentage).

Age (years)	46 (15–83)
Male/female	84/116 (42%/58%)
Time from surgery to first contact in the APC-OPC (months)	2 (0, 5–24)
Risk factors for persistent postoperative pain/patient	5 (0–9)
Duration of treatment (months)	2, 8 (0–16)
Number of contacts	3 (1–14)
Total number of physician appointments	240
Scheduled phone calls	463
Patients with only one contact	48 (24%)
Physiotherapist consultations	37 (19%)
Psychologist/psychiatrist consultations	39 (20%)
Patients referred to the multidisciplinary pain clinic	43 (22%)

phase of the APS-OPC service, a few patients ($n=16$) with postoperative pain for more than 3 months were admitted. These 16 patients excluded, the median time from surgery to the first APS-OPC contact was 2 months.

3.2. Details on treatment in the APS-OPC

Data on appointments and consultations in the APS-OPC are presented in Table 4. The scheduled phone calls were more numerous than physician appointments, since we wanted to emphasize the early and flexible availability of the first APS-OPC contact to the patient after discharge from the hospital. The patients had an average of five risk factors for persistent postoperative pain (see Table 2). If the duration of the postoperative pain treatment was predicted to last over three months, the patients were referred to the multidisciplinary pain clinic. Medical treatment included tapering off of acute pain medications (Table 5) and, if necessary, introduction of neuropathic pain medications, psychological or physiotherapeutic treatment (Tables 4 and 5). Neuropathic medications prescribed included gabapentinoids (86 patients, amitriptyline 41 patients, venlafaxin 15 patients, duloxetine 5 patients, lamotrigine 9 patients, mirtazapine 2 patients and oxcarbazepine 1 patient. Five patients were treated with capsaicin 8% patch.

Table 5

Pain medication of the first 200 patients.

	Weak opioids	Strong opioids	Gabapentinoids
At discharge from the hospital after surgery	107 (54%)	64 (32%)	142 (71%)
At end of the Out-Patient Clinic treatment	40 (20%)	10 (6%)	86 (43%)

4. Discussion

4.1. The Acute Pain Service Out-Patient Clinic (APS-OPC) model

APS-OPC is a novel “bridge” between acute and chronic pain management. It offers an effective and safe way to extend multimodal postoperative analgesia to home, covering also the critical sub-acute phase. Importantly, physician-supervised tapering off of medications, especially strong opioids, is achieved. This model seems to be able to provide a fast-track service with a median number of three contacts (appointments and calls), 24% of the patients requiring only one contact, and a median duration of treatment of 2.8 months.

In our model, the APS-OPC is managed by APS anaesthesiologists who also work in the operating room. They are familiar with surgical procedures and perioperative pain management. Working in APS-OPC gives them an opportunity to get feedback on acute pain management protocols and to further develop these. These physicians also acquire knowledge of the management of chronic pain and can transfer this experience to the perioperative environment and to APS work. In our APS-OPC model, the APS physicians have easy access to consultation and can discuss the management of individual patients with the multidisciplinary staff of the pain clinic. Since every fifth patient needed consultation with a physiotherapist or a psychologist/psychiatrist during APS-OPC treatment, and 22% of the patients were transferred for continued treatment by the pain clinic, this close collaboration of APS-OPC and the multidisciplinary pain clinic seems optimal, both in terms of treatment of patients and use of resources. Since the early days of the APS-OPC, the system has evolved so that patients with postsurgery pain for more than 3 months will be admitted directly to the

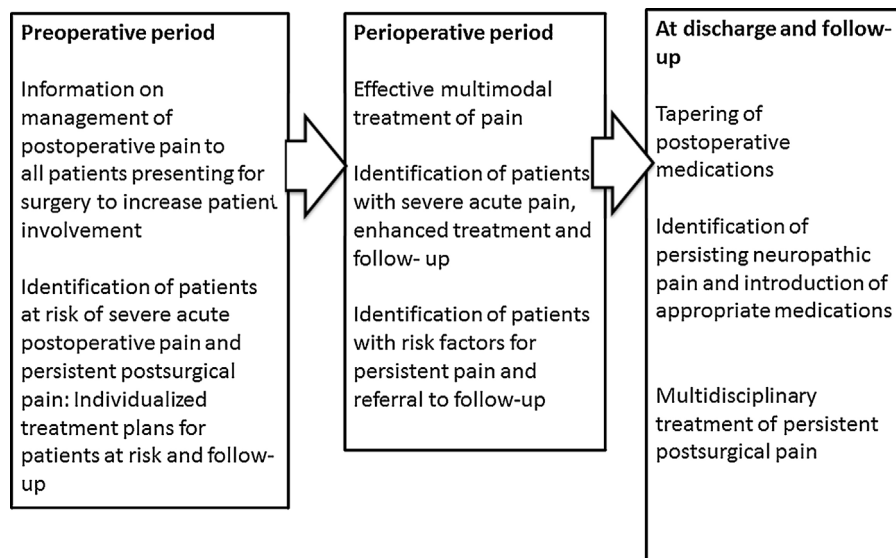


Fig. 3. Clinical pathway for postoperative pain with identification of risk patients.

multidisciplinary pain clinic whereas those whose pain has lasted less than 3 months will be admitted to APS-OPC.

4.2. Neuropathic postsurgical pain

According to a recent review, persistent postoperative pain has neuropathic features in 6–70% of patients, depending on the type of the operation: thoracic surgery 66%, breast surgery 68%, groin hernia repair 31% and hip or knee arthroplasty 6% [15]. Persistent neuropathic pain has a significant impact on patients' overall health, functioning and well-being, not to mention the economic burden to society [20]. Searle et al. found that 8% of patients developed acute neuropathic pain characteristics after major thoracic surgery in the immediate postoperative period at hospital, but 22% of them had features of chronic neuropathic pain three months after the operation [21]. The authors also demonstrated that acute postoperative neuropathic pain may predict persistent neuropathic pain, which may be difficult to treat.

Forty-one per cent of patients visiting our APS-OPC had undergone thoracic surgery, and 66% of these had persistent neuropathic pain (based on a clinical examination) during the sub-acute phase, in accordance with other studies [15,19,20]. Young adults operated for TOS by VATS were overrepresented among the APS-OPC patients (16% of thoracic patients). These incidences should draw attention to the need for such operations: patients should have information about the risk of prolonged pain before their operations.

4.3. Medications

One important target of the APS-OPC is to ensure the safe use of strong opioids for a restricted period of time at home after surgery [22]. The early discharge of patients after major painful surgery is possible with the tapering off of strong opioids and, for instance, gabapentinoids at home. Close scrutiny is warranted in view of the risk of inappropriate opioid use after the sub-acute pain phase. In the study of Clarke et al. [23], 49% of Canadian patients were prescribed opioids after major surgery and 3% of them continued using these for more than 3 months. In elderly patients, opioid prescription for pain after ambulatory surgery predicted long-term opioid use at one year [24]. Furthermore, left-over tablets from a short period of opioid use may be diverted [25–27]. Proper patient information and close follow-up during the

sub-acute phase a few weeks postoperatively may prevent these problems.

4.4. The future of APS-OPC

Acute pain services should have a central role in preoperatively identifying patients at high risk of prolonged postoperative pain. An APS organization can also develop risk assessment tools to identify patients in need of multimodal or invasive interventions for their pain management during the perioperative phase [17,19]. The evaluation of patients at risk of persistent postsurgical pain is not yet systematic in our hospital. Considering the number of risk factors for persistent postsurgical pain in the patients in the present study, patient selection seems appropriate. A future challenge is to implement a risk evaluation tool for persistent postsurgical pain into clinical practice and to systematically screen all patients (Fig. 3). A further step will be to study various APS interventions in decreasing persistent postsurgical pain. We believe that it is possible to prevent or mitigate the development of persistent postoperative pain by early recognition and multidisciplinary treatment of persisting sub-acute pain, before plastic changes in the central nervous system lead to a more persistent or even permanent condition.

5. Conclusions

The APS-OPC provides a fluent fast-track method of ensuring effective multimodal analgesia in the subacute recovery phase after surgery. Even strong opioids can be safely used after discharge and then tapered off in close supervision of the APS-OPC anaesthesiologist. As the APS-OPC was implemented in close collaboration with the MPC, the multidisciplinary resources are easily available during the course of the APS-OPC treatment. Approximately every fifth of the study patients was considered to need further treatment for PPP and were easily transferred from the APS-OPC to the MPC.

6. Implications

The first two years of the APS-OPC have shown that a significant number of surgical patients benefit from continuing active pain management after discharge from hospital. This fast-track service provides physician-supervised titration of analgesics to improve pain relief in the subacute phase. An important task of the APS-OPC

is to ensure that strong opioids are not inappropriately continued after recovery. Another goal of the APS-OPC is to identify patients in need of multidisciplinary pain management services to prevent chronification. In light of the Helsinki APS-OPC experience, allocating resources to maintain an APS-OPC service is well-founded.

Conflict of interest

No external funding and no competing interests declared.

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