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REVIEW

# Pain management in foot and ankle surgery: a multidisciplinary approach

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## Abstract

Foot surgery is the 10th most frequent day-hospital procedure, and the 39th most common in-hospital surgical procedure in Italy. Despite significant advancements in surgical and anesthetic techniques, foot and ankle post-operative pain remains intense and prolonged. Post-operative pain could extend hospital stays, delay a complete functional recovery and increase the risk of chronic post-operative pain. Above all, postponing the resumption of weight-bearing activities could undermine the very effectiveness of the procedure. Effectively managing post-operative pain is a multi-faceted challenge and requires collaborative efforts among various specialists, along with surgeons, anesthesiologists, pharmacologists, nutritionists, and general practitioners. This narrative review summarizes current literature on pain management in foot and ankle surgeries and provides expert opinions drawing from the guidelines established by the Italian Society of Anesthesia, Analgesia, Resuscitation and Intensive Care (SIAARTI), the American Pain Society (APS), and the European Society of Regional Anaesthesia (ESRA) Procedure-specific postoperative pain management (PROSPECT), an approach inspired by the Enhanced Recovery After Surgery (ERAS) paradigm. In addition to suggesting a pharmacological framework for managing peri- and post-operative pain, this expert group offers recommendations about the patient at-home nutrition, interactions between the healthcare team and patients/caregivers, as well as exploring perspectives to improve patient care in the territory.

## Keywords

Foot and ankle surgery; Pain management; Post-operative pain; Neuropathic pain; Analgesia; Paracetamol; Non-steroidal anti-inflammatory drugs (NSAIDs)

## 1. Introduction

Foot and ankle surgeries are among the most frequent orthopedic procedures, with foot surgery being the 10th most common day-hospital intervention and the 39th most frequent in-hospital procedure in Italy [1]. Despite advances in surgical techniques and anesthesia, post-operative pain management remains inadequate [2], with many patients experiencing intense, difficult-to-control, and long-lasting (>24 h) pain after surgery [3]. Notably, the burden of post-operative pain in foot and ankle surgery is higher compared to other surgical procedures [4], with up to 80% of patients undergoing forefoot surgery experiencing severe pain post-operatively [5], and with patients suffering from both inflammatory and neuropathic pain [6].

Inadequate post-operative pain control can lead to adverse events that may delay recovery, prolong hospital stays, and increase the post-operative hospital burden and healthcare costs due to re-admissions [4, 7]. Poorly controlled pain can have significant physiological and psychological consequences, including increased post-operative morbidity, reduced patient satisfaction, and delayed return to daily activities. This includes a delay in resuming weight-bearing activities, which may compromise the outcomes of the surgical intervention [8]. In addition, many patients require high doses of opioids post-operatively, which can lead to complications, such as opioid dependence and tolerance [9]. The persistence of pain may also cause chronic post-surgical pain (CPSP), a condition that affects up to 21% of patients undergoing elective mid/hindfoot and ankle surgery [10].

Several guidelines have been established to promote effective management of post-operative pain through various pre-operative, intra-operative, and post-operative interventions and strategies [8, 11, 12]. These include both pharmacological approaches, such as regional anesthesia, systemic non-opioid analgesics, and weak opioids, as well as non-pharmacological strategies, including physical therapy, patient education, and cognitive-behavioral modalities [8, 11, 12]. Literature also supports the implementation of enhanced recovery after surgery (ERAS) programs, which


  

focus on effective pain management, mobilization, and nutrition as the three key components to improve patient outcomes after surgery. These programs help reduce the stress response, facilitate early rehabilitation, and increase patient satisfaction [13].

This paper aims to review current literature on pain management in foot and ankle surgeries and provide expert opinions on the best approach for improving patient outcomes. It includes an evaluation of both pharmacological and non-pharmacological strategies for managing peri- and post-operative pain, emphasizing the importance of a multidisciplinary and multidimensional approach throughout the patient's treatment journey. Key areas of focus include personalized and continuous communication between patients and physicians, regular assessment of analgesia, patient education, and the integration of post-operative non-pharmacological therapies, such as physical therapy and nutrition.

This narrative review and expert opinion was conducted by a multidisciplinary expert panel composed of a general practitioner (GP), a pharmacologist, a pain therapist, and a nutritionist. The panel aimed to review key recommendations and publications on pain management in foot and ankle surgery, with the objective of developing a comprehensive, patient-centered pain management strategy that integrates pharmacological and non-pharmacological interventions throughout the patient's journey, from initial diagnosis to complete healing.

Experts conducted an extensive literature review on clinical guidelines, research articles, and expert consensus documents relevant to pain management in foot and ankle surgery. The primary resources included:

1. The Italian Society of Anesthesia, Analgesia, Resuscitation, and Intensive Care (SIAARTI) guidelines, which provides comprehensive guidelines on anesthetic and analgesic techniques tailored to specific surgical procedures [12].

2. The American Pain Society (APS) guidelines, which offer evidence-based recommendations for post-operative pain management, including multimodal analgesia and opioid-sparing strategies [8].

3. The European Society of Regional Anaesthesia and Pain Therapy (ESRA) Procedure-specific postoperative pain management (PROSPECT), guidelines, which provide specific recommendations for loco-regional anesthesia techniques [11].

4. Literature evidence on Enhanced Recovery After Surgery (ERAS) protocols, which promote faster recovery through early mobilization and optimized pain control [13, 14].

5. Peri-operative pain management in adults: a multidisciplinary consensus statement from the Association of Anaesthetists and the British Pain Society. This multidisciplinary consensus statement consent safer and more effective outcomes [15].

The experts met a total of 3 times over a period of 6 months to select the initial documentation, discuss the content and develop suggestions based on both available literature and their clinical experience in their respective fields. Meetings focused on key aspects of pain management, such as initial patient assessment, pre-operative and peri-operative strategies, post-operative pain control, rehabilitation, and nutrition. The discussions prioritized multidisciplinary approaches, patient education, and the importance of patient-clinician communication. Recommendations were developed during each meeting and further reviewed and refined in a final meeting where consensus was reached through iterative discussions and a collaborative review process.

Limitations of this study: the initial review process finished at the end of the year 2023, then a revision of the text was done at the beginning of the year 2025, so the study represents the current snapshot of surgical techniques and pharmacological pain therapies about common surgical interventions with bone/joint resections; however, we can't exclude that in the near future, with less invasive methods on joints and bone structures, the destructive nature of the tissues will be more limited.

## 2. Literature review

### 2.1 Patient characteristics influencing surgery outcomes

Various characteristics of patients can significantly influence the outcomes of post-operative pain. Patients with a long history of pain and high levels of psychological distress before surgery are at a higher risk for acute and chronic postoperative pain [8, 16, 17]. This is especially relevant for patients with a neuropathic pain component, as it is a known risk factor for the development of CPSP [18]. Interestingly, CPSP is not closely associated with the invasiveness of the surgical procedure, but it is strongly linked with suboptimal peri- and post-operative pain control [19].

Pre-operative opioid use can also complicate post-operative pain management, as it has been associated with increased post-operative morbidity, mortality, and negative outcomes [20]. This issue is more prevalent among orthopedic surgery patients, who are at a greater risk of developing opioid tolerance, leading to decreased analgesic effects over time [19] and the need for dose escalation to achieve adequate pain control [21].

Guidelines suggest that patients' characteristics that may affect surgery outcomes should be thoroughly evaluated during a pre-operative meeting. This serves to collect essential anamnestic information, including the patients' algological history, to inform the patient about the surgery and post-operative management and address any questions [8]. Notably, a recent study showed that participating in a "foot school", a program involving a multidisciplinary team focused on educating patients about surgical procedures, rehabilitation, and discharge, led to a reduction in hospital stays in patients undergoing foot and ankle surgery [22].

### 2.2 Pre- and peri-operative pain management

The type of anesthesia used during surgery significantly influences post-operative pain, and effective peri-operative pain management is critical for optimal recovery following surgical procedures [23]. Preemptive analgesia, which involves administering analgesic interventions prior to surgical trauma, has been shown to reduce post-operative pain by mitigating

pain signal amplification in the central nervous system [24, 25] (**Supplementary material**). Loco-regional anesthesia, particularly through nerve blocks, is another highly effective method for managing pain in foot and ankle surgery. Advances such as ultrasound-guided blocks (USGB) allow for more precise placement of local anesthetics near the targeted nerves, thereby increasing the success rate of the blocks while utilizing lower concentrations of anesthetic agents [26]. Ankle blocks are especially beneficial for providing intra-operative anesthesia as well as extended post-operative pain relief, thus minimizing anesthesia-related time in the operating theater and reducing side effects associated with systemic anesthetics [26].

Additional pharmacological agents recommended during surgery include systemic steroids, particularly intravenous dexamethasone, which should be administered pre-operative to prevent post-operative nausea and vomiting (PONV) and to enhance regional analgesic techniques [11, 27, 28]. Paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs) are also recommended for their opioid-sparing effects [29, 30], and according to the ESRA study group, they should be started pre- or intra-operatively and continued in the post-operative period, if no contraindications exist [11].

Immediately post-surgery, perineural catheters or adjuvants can be used to prolong analgesia for up to 24 to 48 hours [26], thereby contributing to a reduction in opioid consumption. Another interesting option is patient-controlled analgesia (PCA), an innovative approach to help patients self-administer analgesics as needed or receive preset doses of opioids or NSAIDs. Transdermal PCA (TPCS), which uses iontophoresis for drug delivery, offers similar outcomes without the use of needles [12].

## 2.3 Post-surgical pain management

### 2.3.1 Pharmacological approaches

A standardized multi-modal pharmacological approach is an essential and central component of all ERAS pathways, aimed at optimizing pain relief while reducing opioid use and side effects [14]. This strategy combines non-opioid analgesics that target peripheral mechanisms, such as NSAIDs and steroids, with agents affecting the central nervous system, such as paracetamol or opioids, to achieve additive or synergistic effects, thereby leading to enhanced analgesia with reduced opioid consumption [7, 31]. This multimodal strategy has proven to be effective in foot and ankle surgery, employing a combination of paracetamol, NSAIDs, opioids, $\alpha 2$-$\delta$ ligands, and regional anesthesia [4].

This strategy should follow a flexible, three-stage approach tailored to mild, moderate, or severe pain, with treatment plans regularly reassessed and adjusted based on patient outcomes and adherence [6]. A summary of pharmacological recommendations is provided in Table 1.

#### 2.3.1.1 Paracetamol

Paracetamol is recommended as a first-line analgesic by the ESRA PROSPECT methodology, due to its favorable risk-benefit profile, particularly for long-term use [23]. It acts centrally by enhancing the endocannabinoid system, providing analgesic and antipyretic effects, but without displaying anti-inflammatory properties [32].

#### 2.3.1.2 NSAIDs

Non-steroidal anti-inflammatory drugs (NSAIDs) are a diverse group of anti-inflammatory, analgesic, and antipyretic agents that act by inhibiting COX (cycloxigenasis) enzymes, with both non-selective (*e.g.*, ibuprofen) and selective COX-2 inhibitors (*e.g.*, COXIBs). Although initial concerns have been reported with the use of COXIBs, due to multiple cases of cardiovascular events in patients with low cardiovascular risk, recent studies highlighted their advantages over traditional NSAIDs, reintroducing them as drugs that can be used in the treatment of post-operative pain [33].

Nimesulide is another NSAID frequently used as an alternative to opioids due to its suitability for long-term at-home therapy [12] and its favorable cardiovascular safety profile, which is superior to other NSAIDs [34, 35]. Despite some concerns regarding liver toxicity, recent evidence suggests that the risks are similar to those of other NSAIDs, and a full assessment from the European Medicine Agency's (EMA) has confirmed that the benefits of nimesulide outweigh the risks in treating acute pain [36].

#### 2.3.1.3 Paracetamol + NSAIDs

For the management of intra-, peri-, and post-operative pain (*e.g.*, after foot and ankle surgery), experts advocate an opioid-sparing analgesic regimen, discouraging the use of pure opioids and gabapentinoids because of their risks. Instead, they suggest relying on paracetamol and NSAIDs alone or in combination according to a combined treatment approach.

Specifically, in patients with poor NSAID tolerance, experts suggest combining paracetamol and ibuprofen, as this fixed dose combination, due to pharmacokinetic and pharmacodynamic synergy, provides enhanced analgesia while maintaining a favorable safety profile [37, 38].

The use paracetamol and ibuprofen combination at the 1000 + 300 dose has been shown to be particularly effective in the management of acute moderate pain [38].

Furthermore, it could facilitate the transition to home therapy managed by general practitioners (GPs) as, in addition to improved clinical efficacy (enhanced by the 1000/300 mg dosage) and a favourable safety profile, the fixed-dose combination offers additional advantages, such as an NSAID and opioid sparing effect and greater ease of use.

Clinical studies have shown that this combination provides faster and longer lasting pain relief than ibuprofen alone, with similar tolerability and better functional outcomes in conditions such as acute low back pain [39, 40].

A Cochrane review also confirms that the combination of paracetamol and ibuprofen produces superior analgesia, reduces the need for additional analgesics, and decreases the risk of adverse events in patients with acute postoperative pain, thus suggesting that it could optimize postoperative pain management and be a viable option for subsequent home pain management [41].

**TABLE 1. Summary of pharmacological recommendations.**

| | Mild pain | | Moderate pain | | Severe pain/rescue | |
|---|---|---|---|---|---|---|
| | 0–48 hours after surgery | After discharge, at home | 0–48 hours after surgery | After discharge, at home | 0–48 hours after surgery | After discharge, at home |
| Paracetamol | Oral: 1000 mg × 3/day<br>IV: 1 g × 3–4/day | Oral: 1000 mg × 3/day | Oral: 1000 mg × 3/day<br>IV: 1 g × 3–4/day | Oral: 1000 mg × 3/day | I Oral: 1000 mg × 3/day<br>IV: 1 g × 3–4/day | Oral: 1000 mg × 3/day |
| NSAIDs | Ibuprofen orally 600 mg × 2/day or 400 mg × 3/day<br>Ketorolac IV up to 90 mg in 3–4 doses (not more than 2 days)<br>Ketorolac orally 10 mg × 4/day (not more than 5 days) | / | Ibuprofen orally 600 mg × 2/day or 400 mg × 3/day<br>Ketorolac IV up to 90 mg in 3–4 doses (not more than 2 days)<br>Ketorolac orally 10 mg × 4/day (not more than 5 days) | / | Ketorolac IV up to 90 mg in 3–4 doses (not more than 2 days) | / |
| Paracetamol + "weak" Opioids | / | / | 1–2 × Paracetamol/codeine 500/30 mg × 3/day<br>Paracetamol/oxycodon 325/10 mg × 2/day<br>Paracetamol/tramadol 325/37.5 mg × 2/day | 1–2 × Paracetamol/codeine 500/30 mg × 3/day | Morphine IV 0.1–1.15 mg/kg in 100 mL PS 2–3 mL/hour | 1–2 × Paracetamol/codeine 500/30 mg × 3/day |
| Paracetamol + NSAIDs | / | / | Paracetamol/ibuprofen 1000/300 mg max 3/day | Paracetamol/ibuprofen 1000/300 mg max 3/day | Paracetamol/ibuprofen 1000/300 mg max 3/day | Paracetamol/ibuprofen 1000/300 mg max 3/day |

*IV: intravenous; NSAID: non-steroidal anti-inflammatory drugs; PS: physiological solution.*

In a double-blind, placebo-controlled study to evaluate the effect of post-operative administration of either ibuprofen at mg 1200 per day or celecoxib at mg 400 per day on the severity of pain, the need for rescue analgesics, and clinically relevant patient outcomes after ambulatory surgery, it has been demonstrated that the two drugs produced similar analgesic responses [42]. This demonstrates that ibuprofen is a suitable NSAID for post-operative pain and its combination with paracetamol expands its analgesic effect, keeping low the dose and reducing adverse drug reactions.

#### 2.3.1.4 Opioids

Opioids, such as morphine, promote analgesia by acting on $\mu$ type opioid receptors in the brain, in the brainstem and in the spinal cord, thus activating the main endogenous analgesic system [32]. According to ESRA pathways, opioids should be used as needed for rescue analgesia when non-opioid medications are insufficient [7]. Moreover, "weak opioids" such as codeine and tramadol can be combined with NSAIDs or paracetamol to enhance analgesia and minimize opioid-related side effects, such as nausea and sedation [43, 44].

The combination of codeine and paracetamol is the reference treatment for moderate to severe pain, and should always be considered before introducing major opioids to address severe major pain [34]. Notably, codeine is not exactly a "weak" opioid but rather a short-acting, low-dose opioid that acts as a pro-drug, rapidly crossing the blood-brain barrier and converting to morphine in the central nervous system, which allows it to deliver a quicker analgesic effect than morphine itself [31]. Clinical evidence has shown that a paracetamol-codeine combination (500/30 mg) is as effective as ketorolac for non-traumatic pain and offers superior relief for fractures and muscular pain [45]. These findings are particularly important for patients with cardiovascular risk factors, high risk of gastrointestinal (GI) bleeding or with any other comorbidities contraindicating the use of NSAIDs [45].

#### 2.3.1.5 Gabapentinoids

Gabapentinoids, originally approved for treating neuropathic pain, have gained popularity for managing peri-operative pain due to their analgesic properties [2]. However, meta-analyses have raised questions about their routine use in these settings, also considering the risk of adverse effects, such as sedation, dizziness, and peripheral edema [7].

### 2.3.2 Physical therapy

Post-operative physical therapy is a well-established method for restoring function after surgical interventions in the musculoskeletal system [46]. In the context of foot and ankle surgery, physiotherapy plays a crucial role in the rehabilitation process, helping to reduce pain, restore function, and prevent complications [47]. Different techniques can be implemented by physiotherapists, such as manual lymphatic drainage and elevation to minimize swelling [48, 49]. Recently, early mobilization and weight bearing activities have been shown to be beneficial and safe in many post-operative protocols regarding foot and ankle surgery [50].

However, the physiotherapy approach is feasible only when effective analgesia is provided [51]. Unrelieved post-operative pain can significantly hinder participation in rehabilitation programs, leading to poor functional outcomes [23]. Non-adherence to post-operative physiotherapy, but also pharmacological regimens, is a widespread issue, also recognized by the World Health Organization as a significant global challenge, particularly in long-term therapies [52]. Adequate pain control is therefore crucial to facilitate patients' compliance with the physiotherapy instructions.

### 2.3.3 Nutrition

Nutritional management plays a pivotal, yet underappreciated, role in the recovery process following foot and ankle surgery. Pre-operatively, assessing the patient's nutritional status is essential. Key conditions to evaluate include obesity, which can increase stress on the lower extremities and impair healing, and insulin resistance or impaired sensitivity, which may lead to peri-operative hyperglycemia, increasing surgical risk [53]. Testing for serum albumin, vitamins, iron, zinc, magnesium, and other key nutrients, as well as complete blood count, liver function test, and metabolic and lipid panel is also important, as alterations in these parameters may influence clinical outcomes [53].

Post-operatively, nutritional challenges include reduced physical activity and the need for adequate nutrition to promote the healing process while minimizing the side effects from medications like NSAIDs and opioids. Due to the unavoidable reduction in physical activity, it is important for physicians to inform patients about the need to control energy intake during discharge and follow-up visits to prevent unnecessary weight gain. Ensuring an adequate protein intake is also essential to support tissue healing and muscle mass restoration [53, 54].

Nutritional supplements can be prescribed when necessary to promote healing in patients with nutritional deficiencies [55]. Moreover, immunonutrition (IMN), which involves the enteral administration of specific substrates, may aid recovery, thanks to the anti-inflammatory and antioxidant properties particularly from omega-3 fatty acids, although evidence in orthopedic surgery remains limited [56].

Managing gastrointestinal side effects from NSAIDs is also crucial to protect the gastric mucosa, especially considering the long duration of certain analgesic therapy. Proton pump inhibitors, such as omeprazole, can be used to counteract the NSAIDs-included gastric damage and should be administered for at least one week after the end of the NSAID therapy [32]. Additionally, testing for *Helicobacter pylori* is recommended before prolonged NSAIDs use [57], along with advising patients to consume smaller, fat-restricted meals to avoid opioid-induced nausea [58].

## 2.4 Importance of the multidimensional approach

A multidimensional approach to pain management is critical for optimizing post-surgical outcomes. This approach combines pharmacological interventions, physical therapy, patient education, and psychological support. By addressing the physical, emotional, and cognitive aspects of post-operative pain, this multidimensional strategy promotes faster recovery,

reduces the risk of complications, and enhances patient satisfaction [13]. Coordination among surgeons, anesthesiologists, physical therapists, and nutritionists ensures that patients receive comprehensive care throughout their recovery, from pre-operative planning to post-operative rehabilitation [6].

## 2.5 Expert opinion and suggestions

The expert panel provided several key suggestions to optimize pain management and patient recovery in foot and ankle surgery (Fig. 1).

### 2.5.1 Pre-operative meeting: far beyond anesthesiology

Experts emphasize the importance of a comprehensive pre-operative assessment that goes beyond planning anesthesiology. The pre-operative anesthesiologic visit should include active listening, essential to fully understand the patient's history with pain and medication use. The information provided should be tailored to the patient's age, level of understanding, overall health literacy, and cultural and linguistic background.

Implementing a preoperative "foot school", where patients and caregivers receive comprehensive information about the surgery, pain management strategies, and rehabilitation is recommended.

### 2.5.2 Assessing pain magnitude

Accurate pain assessment is fundamental to effective pain management. Experts recommend utilizing the Visual Analog Scale (VAS), specifically the VAS-FA "Richter scale", which should be taught to patients for assessing their pain levels before surgery, during their hospital stay, and after discharge [59].

### 2.5.3 Pre-operative analgesia

The goal is to minimize pain during and immediately after surgery, enhancing patient comfort and early mobilization. During surgery ultrasound-guided loco-regional anesthesia alongside preemptive analgesia is suggested, while catheters and pumps are viewed as an effective option post-surgery to prolong analgesia and contribute to reducing opioid consumption. PCA is another interesting strategy for post-surgery pain management; however, its broader implementation is still challenged by the need for a network of resources.

### 2.5.4 Post-operative pain management

#### 2.5.4.1 The discharge letter and "the conversation"

Experts underscore the importance of a well-structured discharge letter and an in-depth conversation between the patient and healthcare team.

The discharge letter must be clear, accessible, and tailored to the patient's health literacy. It should be written in large and well-spaced characters, with diagrams and tables, and should provide the patient with clear indications on pain management, contact points at the hospital, and the planned follow-up visits. A thorough conversation, should accompany the letter, ensuring the patient understands the importance of adhering to the prescribed pain management and rehabilitation plan. During this interaction, it is also important to assess the patient's ability to assess and report pain using the VAS, and to inform patients about the potential for prolonged pain.

#### 2.5.4.2 Pharmacological management

According to experts the same scheme should govern the management of intra-, peri-, and post-operative pain after foot and ankle surgery. Experts advocate for an opioid-sparing analgesia regimen, discouraging the use of pure opioids and gabapentinoids due to their risks. Instead, they suggest relying on paracetamol and NSAIDs either alone or in combination, such as paracetamol with ibuprofen. Specifically, in patients with poor tolerance to NSAIDs, experts suggest combining paracetamol and ibuprofen (500/150 mg), as this fixed-dose combination, due to the pharmacokinetic and pharmacodynamic synergy, provides enhanced analgesia while maintaining a favorable safety profile [37, 38]. In addition to improved clinical efficacy and a favorable safety profile, the fixed-dose combination offers additional benefits, such as a NSAID-sparing effect and greater ease of use, which facilitates the transition to home-based therapy managed by GPs. Weak opioids, such as codeine and tramadol, can also be considered to provide effective pain relief with fewer side effects.

#### 2.5.4.3 Rehabilitation

In terms of rehabilitation, the panel emphasized the importance of pain-free physiotherapy, noting that effective pain management allows patients to follow post-operative care instructions more closely and actively engage in therapy. Adequate pain control also promotes early joint mobilization, which reduces stiffness and aids in rebuilding muscle strength and endurance. Starting rehabilitation early is crucial, as it leads to faster and more successful recovery outcomes.

### 2.5.5 Nutrition

Experts highlight the critical role of nutrition in optimizing recovery following foot and ankle surgery. They suggest conducting a thorough pre-operative assessment to identify and address imbalances, such as obesity or insulin resistance, which can impair healing and elevate surgical risks. Additionally, optimal post-surgical nutrition is essential for patient recovery and should be incorporated into discharge planning to counteract reduced physical activity, support the healing process, and mitigate the side effects of analgesic medications.

### 2.5.6 The multidimensional approach

Finally, the experts proposed a multidimensional approach to post-operative care at home. This approach involves supporting patients through a multidisciplinary network involving GPs, emergency care units (EUs), and physiotherapists, with acute pain services (APS) acting as the cornerstone of this network.

GPs, due to their close relationship with patients, are well-positioned to oversee post-operative management, monitor recovery, address patients' concerns, and ensure adherence to the post-operative plan. EUs can also play a significant role in managing patients suffering from severe pain, serving as an alternative to hospitals or GPs. The APS, as the central co-

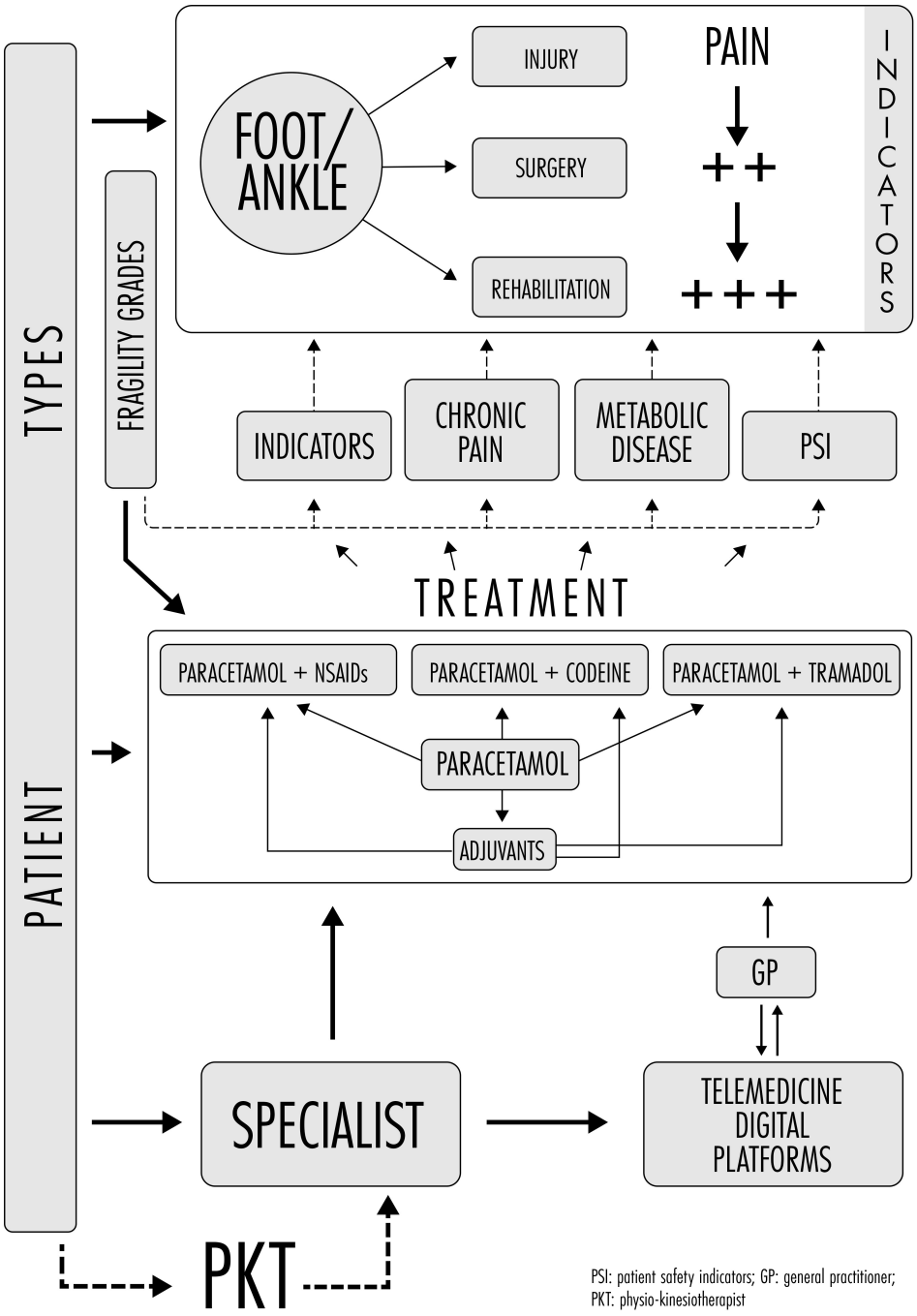


**FIGURE 1. Summary of the panel recommendations.** NSAIDs: Non-steroidal anti-inflammatory drugs; GP: general practitioner. ++: moderate pain; +++: severe pain.

ordinating hub, should involve anesthetists, surgeons, nurses, physiotherapists, and possibly other specialists. They should maintain close communication with GPs and EUs, and provide continuous support to the patient and caregivers, facilitating seamless care.

Lastly, it's very useful to well inform patients about their post-surgery needs through tailored materials—such as leaflets, videos, and online content.

## 3. Conclusions

In conclusion, despite significant advancements in surgical and anesthetic techniques, foot and ankle post-operative pain remains challenging. This expert panel, after a thorough literature review, emphasizes the need for a multidisciplinary and multidimensional approach that extends beyond pharmacological solutions. Key elements for optimal recovery include comprehensive pre-surgical assessment, a consistent multimodal analgesic strategy before, during, and after surgery, as well as nutritional and physical support. Addressing both patient and provider education, along with continuous communication and coordination among healthcare professionals, is essential for achieving better outcomes and facilitating full recovery. As stated in the introduction, the study could be updated if new surgical techniques become available, but the proposed approach remain appropriate in this context.

## AVAILABILITY OF DATA AND MATERIALS

Not applicable.

## AUTHOR CONTRIBUTIONS

DM, DMMF and PAG—contributed to the manuscript editing. RC and IC—contributed equally to the study conception and design. All authors read and approved the final manuscript to submission.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest. Diego Maria Michele Fornasari is serving as one of the Editorial Board members of this journal. We declare that Diego Maria Michele Fornasari had no involvement in the peer review of this article and has no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to OK.

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## SUPPLEMENTARY MATERIAL

Supplementary material associated with this article can be found, in the online version, at https://oss.signavitae.com/mre-signavitae/article/1991424931219292160/attachment/Supplementary%20material.docx.

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