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Clinical Guideline for Perioperative Pain Management in Diabetic Foot Ulcers

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Abstract: This guideline outlines the pathophysiology and classification of neuropathic, ischemic, inflammatory, and procedural pain, and proposes a risk-stratified assessment using NRS/VAS combined with ulcer severity and comorbidities. Core recommendations emphasize preventive multimodal analgesia, prioritization of regional anesthesia, systematic management of neuropathic pain, protocolized procedural analgesia, and multidisciplinary collaboration.

Keywords: Diabetic foot ulcer; Perioperative pain; Procedural pain; Multimodal analgesia

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1. Introduction

Diabetic foot ulcer (DFU) is one of the most serious complications of diabetes, with high disability and amputation rates [1]. The mechanisms of DFU-related pain are complex and often coexist in the same patient, including burning or electric-shock neuropathic pain due to peripheral neuropathy, rest and nocturnal pain caused by limb ischemia, throbbing or tearing pain related to infection and inflammation, and procedure-related pain during dressing changes, debridement, toe amputation, and negative-pressure wound therapy (NPWT) [2]. Poor pain control reduces tolerance and adherence to dressing changes and debridement, impairs wound healing through stress responses, and exacerbates glycemic fluctuations and cardiovascular risk. It also markedly affects sleep and overall quality of life [3].

2. Scope and target population

This guideline applies to adult patients (≥ 18 years) with a confirmed diagnosis of DFU, including infection-predominant, ischemic, neuropathic, and mixed types, and focuses on perioperative and procedure-related pain

management [4]. The covered procedures include: Routine outpatient or ward dressing changes and bedside minor debridement; operative debridement and incision and drainage of abscesses; minor amputations such as toe or partial metatarsal resection; split-thickness skin graft harvesting and grafting, local flap reconstruction; application and change of NPWT and negative-pressure irrigation systems; management of foot wounds during and after revascularization procedures directly related to DFU [5].

The guideline does not primarily apply to: non-diabetic etiologies of foot ulcers; major amputations, where perioperative analgesia should follow anesthesia and surgical guidelines; or patients with chronic diabetic peripheral neuropathic pain without open wounds [6].

3. Pathophysiological basis and pain classification

Perioperative pain in DFU usually reflects the superimposition of chronic baseline pain and acute nociceptive pain from tissue injury [4]. Many patients have moderate-to-severe chronic pain before surgery; intraoperative and postoperative cutting, excision, and traction further increase pain intensity and complexity [7]. Conversely, excessive sedation or inappropriate drug use may increase the risk of falls, respiratory depression, and other complications. Effective management therefore requires a careful balance between analgesia and safety [7,8].

From the perspective of dominant mechanism, perioperative DFU pain can be classified as: Predominantly neuropathic pain; predominantly ischemic pain; predominantly infection- and inflammation-related pain; predominantly procedural pain; mixed-mechanism pain [9].

4. Preoperative assessment and risk stratification

Pain evaluation should include intensity, quality, duration, and precipitating or aggravating factors, with separate recording of rest pain and activity/procedural pain [10]. Medication history and previous analgesic use are equally important. Clinicians should clarify whether the patient has been receiving opioids, gabapentin/pregabalin, duloxetine, or other agents in order to judge tolerance, potential dependence, and the risk of cumulative adverse effects. Psychological state and cognitive function should also be assessed, as they significantly influence pain perception and cooperation [9].

5. Principles and clinical scenarios in perioperative pain management

Perioperative pain control in DFU should be based on multimodal analgesia while safeguarding hemodynamic stability and wound healing. In the absence of contraindications, paracetamol and NSAIDs may be combined, supplemented as necessary with agents for neuropathic pain and short-course, low-dose short-acting opioids, thereby minimizing the dose and adverse effects of any single drug [10].

Analgesia should be pre-emptive rather than purely reactive. For procedures expected to cause moderate-to-severe procedural pain, medications should be given 30–60 minutes before the intervention to avoid exacerbating pain during or after the procedure [11]. Whenever possible, local or regional anesthesia—such as ankle block, popliteal sciatic block, or dorsal/plantar foot nerve blocks—should be prioritized, with careful monitoring of limb perfusion, to reduce systemic opioid requirements. All analgesic decisions must balance pain relief against perfusion and healing, avoiding deep sedation or hypotension that may cause falls and cardiovascular events, while also preventing sympathetic overactivation from uncontrolled pain [12].

For outpatient or bedside dressing changes and small-area debridement, a graded approach based on risk stratification is recommended. In low-risk patients, oral paracetamol with short-term NSAIDs is often sufficient [3]. For patients who are pain-sensitive or have had poor previous dressing-change experiences, local measures such as topical lidocaine gel or spray, or small-field infiltration anesthesia before the procedure, can reduce procedural pain. In moderate-risk patients, procedural analgesia should be emphasized: control irrigant temperature and irrigation pressure, avoid vigorous wiping and prolonged exposure, and break long procedures into stages with brief rest intervals as needed [12].

For operative large-area debridement and minor amputations, regional nerve block combined with light sedation should be considered a first-line option [9]. Scheduled dosing or patient-controlled analgesia is preferred over purely as-needed dosing, and existing neuropathic-pain regimens should be continued or adjusted to prevent rebound pain and disruptive nocturnal pain that may impair sleep and glycemic control [13].

For NPWT application and changes, negative-pressure irrigation, and skin grafting, these procedures should be assumed to cause at least moderate procedural pain [14]. Standard practice should include pre-procedure oral analgesics combined with local anesthesia; for patients with high baseline pain or prior poor tolerance, a short-acting opioid may be added briefly. During NPWT, attention must be paid to pain at both donor and recipient sites [15]. If patients report intolerable traction-type pain under suction, negative pressure can be reduced, interface layers can be thickened, or intermittent rather than continuous suction can be used [16].

6. Non-pharmacological interventions and patient education

Non-pharmacological strategies are an important adjunct in perioperative pain management. Clear, explanatory communication about procedural steps, expected pain intensity, and planned analgesic measures can markedly reduce fear, catastrophic thinking, and anticipatory anxiety related to dressing changes and debridement [17].

7. Special populations and high-risk situations

Elderly patients and those with renal impairment or heart failure have reduced tolerance to NSAIDs and opioids. In such cases, doses and duration should be strictly limited, with a greater reliance on paracetamol, local anesthetics, and regional blocks [18].

8. Summary of recommendations (OCEBM and Delphi)

Evidence levels are assigned according to the OCEBM framework, integrating data from systematic reviews, cohort studies, and case series (see **Table 1**).

Table 1. Recommendations for procedural pain management in diabetic foot ulcers (DFU)

No.	Summary of recommendations	Level of evidence (OCEBM)	Strength of recommendation	Delphi Consensus (%)
R1	All DFU patients scheduled for procedures should undergo standardized pain assessment and classification (by source and intensity).	3B	A	94
R2	For procedures expected to cause at least moderate procedural pain, preventive multimodal analgesia should be used rather than single-agent, rescue-only analgesia.	2B	A	91
R3	For moderate-to-severe debridement and minor amputations, regional nerve blocks should be prioritized and, where appropriate, combined with light sedation to reduce systemic opioid exposure.	2C	A	90
R4	Ongoing neuropathic pain should be managed according to pathways for painful diabetic peripheral neuropathy (PDPN) and integrated with perioperative analgesic planning.	2C	B	88
R5	Procedural pain should be routinely assessed before dressing changes and debridement, and managed with oral analgesics and/or local anesthesia as procedural analgesia.	3B	A	92
R6	For high-risk patients (elderly, multimorbid, or long-term opioid users), individualized analgesic plans should be developed with participation from anesthesia/pain services.	3C	B	89
R7	NPWT application and changes should be regarded as procedures causing at least moderate pain; preventive analgesia and local anesthesia should be provided, and negative-pressure settings adjusted according to tolerance.	3B	B	86
R8	A system for NRS-based pain recording and follow-up should be established, and pain control incorporated into the comprehensive outcome assessment of DFU management.	3C	B	90

9. Future directions and updating plan

High-quality evidence specifically addressing perioperative pain management in DFU remains limited. Existing studies focus mainly on neuropathic pain or general perioperative analgesia, with very few prospective data on dressing changes, debridement, NPWT, and minor amputations in DFU. Future research should include multicenter prospective cohorts or randomized controlled trials comparing different multimodal analgesic combinations, regional anesthesia techniques, and non-pharmacological interventions, and their impact on pain control, glycemic stability, and wound healing.

Disclosure statement

The authors declare no conflict of interest.

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