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REVIEW

# Prevention and Management of Wound Procedural Pain Management in Adult Patients with Open Wounds: Integration of the Latest Clinical Evidence

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**Purpose:** To retrieve, evaluate, and integrate the best available evidence on prevention and management of wound procedural pain management in patients with open wounds, providing evidence-based guidance for clinical practice.

**Patients and Methods:** Following the "6S" pyramid model, we systematically searched guideline websites, professional association websites, and databases for guidelines, clinical decision aids, expert consensus statements, evidence summaries, recommended practices, and systematic reviews related to wound procedural pain management in patients with open wounds. The search period was from the establishment of the database to July 2025. Two researchers independently conducted literature quality assessment, evidence extraction, and synthesis.

**Results:** A total of 23 documents were included: 5 guidelines, 1 expert consensus, 3 recommended practices, 3 clinical decisions, 6 evidence summaries, and 5 systematic reviews. Thirty-two best evidence statements were summarized across six aspects: pain assessment and documentation, education and training, dressing selection and replacement, wound cleansing, debridement, and negative pressure therapy, pharmacological intervention strategies, and non-pharmacological intervention strategies.

**Conclusion:** This study reviews the best available evidence on managing procedural pain in open wounds. It offers guidance on the principles of pain management, standardization of procedural techniques, and the timely application of analgesic, emphasizing the importance of pain awareness. The research serves as a reference for developing specialized pain management protocols to improve wound care quality.

**Keywords:** wound procedural pain, open wounds, evidence-based nursing, clinical evidence

## Introduction

Open wounds, caused by damage to the skin, mucous membranes, or soft tissues from external forces or cuts, are exposed to the external environment.[1] These include abrasions, lacerations, puncture wounds, lacerations, and avulsion. In China, approximately 200 million trauma cases, such as car accidents, falls, and occupational injuries, occur annually.[2] In developed countries like the United States, wounds are a leading cause of emergency medical visits.[3] Procedural pain in open wounds is highly prevalent in trauma patients, with clinical reports indicating an incidence of 80–95%. In patients with moderate to severe injuries, nearly all experience significant pain during wound management. Similarly, the incidence of wound procedural pain remains high among outpatients undergoing dressing changes, with approximately 76% reporting moderate to severe pain.[4] The cost increases significantly with infectious complications.[5] Thus, emergency management of open wounds has become a critical global public health concern.

Pain, a complex bio-psycho-social phenomenon, significantly impacts both the physiological and psychological well-being of the patient, as well as the wound healing process.[6] Wound procedural pain refers to the intense discomfort caused by

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healthcare procedures such as dressing changes, debridement, and diagnostic or therapeutic interventions, representing a form of severe acute pain.[7] Wound procedural pain may arise from the inflammatory response in difficult-to-heal wounds, where inflammatory mediators stimulate exposed nerve endings, causing intense pain in both the wound and surrounding tissues.[8,9] Additionally, healthcare procedures such as dressing removal, wound cleaning, debridement, bandaging, and frequent treatments further stimulate nerve endings, increasing skin sensitivity and worsening pain.[10] Cultural, psychological, and cognitive factors also influence a patient's perception and response to wound procedural pain. Studies[11,12] indicate that 74% of patients experience severe to intense procedural pain, with 36% reporting severe pain. This pain can delay wound healing, exacerbate anxiety and fear, and heighten psychological stress, which in turn intensifies the perceived pain during dressing changes. Delays in medication changes increase exposure to medical injuries, and inadequate pain relief during such procedures may lead to negative attitudes toward treatment, reducing patient compliance and quality of life.[8] The Wound Healing Society (WHS)[13] emphasizes the need for routine assessment and prophylactic analgesia for open wounds. However, many primary cares facilities regard pain as an inevitable aspect of wound procedures, providing analgesia only in response to strong patient complaints. As a result, the rate of prophylactic analgesia remains below 30%.

Analgesic medications, including pharmacological and nonpharmacological, remain central to clinical pain management and can effectively alleviate acute pain. However, in patients with large, deep open wounds, severe operative pain, prolonged treatment cycles, and frequent dressing changes, the high doses required for pain relief can lead to side effects, limiting their use and complicating pain management.[14] Non-pharmacological interventions have gained increasing attention for their ability to reduce pain, improve adherence, and be easily implemented by clinical caregivers. These approaches are cost-effective, have minimal side effects, and can be applied to a broad range of patients.[15] Therefore, enhancing healthcare professionals' awareness of wound procedural pain, standardizing pain management protocols, and developing individualized analgesic plans based on comprehensive patient assessments are essential for reducing pain and improving wound care quality.

## Materials and Methods

The PIPOST model, developed by the JBI Center for Evidence-Based Nursing at Fudan University in Shanghai, provided the framework for constructing evidence-based queries.[16] (Registration number: ES20245389).

### Evidence-Based Problem Establishment

Using the PIPOST model, the issue of wound procedural pain management in patients with open wounds was framed as a structured evidence-based question. Target population for evidence application Patient (P): patients with open wounds experiencing wound procedural pain, age ≥ 18; Intervention (I): assessment, management, and intervention for wound operative pain; Performer of evidence (P): wound therapy and nursing staff; Outcome (O): pain scores, anxiety level, and degree of wound healing; Site of evidence application (S): wound specialist outpatient clinics and hospital wards; Type of evidence (T): guidelines, clinical decision, expert consensus, systematic reviews, recommended practices, and evidence summaries.

### Search Strategy

The search strategy was developed by two master's students trained in evidence-based methodology and reviewed by an expert in evidence-based nursing. Following the "6S" classification model for evidence-based resource searching,[17] a top-down approach was employed to search computerized decision support systems, guideline websites, specialized wound protocol sites, and comprehensive Chinese and English databases, included UpToDate, BMJ Best Practice, Guidelines International Network (GIN), National Comprehensive Cancer Network (NCCN), National Institute for Health and Care Excellence (NICE), Scottish Intercollegiate Guidelines Network (SIGN), Registered Nurses' Association of Ontario (RNAO), Canadian Medical Association: Clinical Practice Guideline (CMA Infobase), Medical Pulse Communication, World Health Organization (WHO), European Wound Management Association (EWMA), The American Professional Wound Care Association (APWCA), Wound, Ostomy, and Continence Nurses Society (WOCN), International Association for the Study of Pain (IASP), Joanna Briggs Institute (JBI), Cochrane Library, CINAHL, PubMed, Embase, Web of science, China National Knowledge Infrastructure (CNKI), China Biology Medicine disc (CBM-disc), Wan-fang Database, VIP database. The search timeframe is from the establishment of the database to July 1,

**Box 1** PubMed Search Formula

| |
|---|
| #1 wounds and injuries OR pressure ulcer OR bruise OR lacerations OR diabetic foot [MeSH Term] |
| #2 wound* OR open wound* OR opened injury OR bruise* OR incision* OR lacerated* OR puncture* OR avulsion* OR burn* [Title/Abstract] |
| #3 #1 OR #2 |
| #4 pain OR pain management OR pain, procedural [MeSH Term] |
| #5 operative pain OR wound relation OR wound related procedural OR wound dressing pain OR debridement[Title/Abstract] |
| #6 #4 OR #5 |
| #7 nursing care[MeSH Term] |
| #8 nurs* OR assessment OR management OR intervention OR therapy OR treatment[Title/Abstract] |
| #9 #7 OR #8 |
| #10 #3 AND #6 AND #9 |

2025. Keywords included terms such as "wounds and injuries/wound*/open wound*/opened injury/bruise/incision/ lacerated wound/puncture wound/avulsion wound/burn wound/pressure ulcer" "pain, procedural/operative pain/wound-related pain/wound-related procedural pain/dressing pain/debridement" "nursing care/ nurs*/ assessment/ management/ intervention/ therapy/ treatment". PubMed search formula is provided in Box 1.

## Inclusion and Exclusion Criteria of Evidence

Inclusion criteria for this study were: (1) the study population consisted of patients with open wounds; (2) the content focused on operative pain management for open wounds; (3) the study type included guidelines, expert consensus, clinical decisions, recommended practice, evidence summarization, and systematic reviews.

Exclusion criteria are: (1) literature not available in full text or with low-quality ratings; (2) repetitive publications or literature that has been updated.

## Quality Evaluation of the Literature

References for retrospective evidence and recommendations were selected based on their type, using appropriate literature quality evaluation tools. Appraisal of guidelines for research and evaluation II (AGREE II) was used to evaluate guidelines quality,[18] and Intraclass Correlation Coefficient (ICC) was applied to test the inter-rater consistency. The JBI Evidence-Based Health Care Center Systematic Evaluation Tool (2020)[19] and the Expert Consensus Evaluation Tool (2020)[20] were used to assess the methodological quality of the included systematic reviews and expert consensus. Two researchers, both holding master's degrees and trained in evidence-based nursing methodology, conducted the evaluations independently. Disagreements were resolved by a third expert in evidence-based nursing.

## Evidence Extraction and Summary

Literature reading, evidence screening, and extraction were independently performed by two researchers using a self-developed evidence extraction form, which included details such as literature type, publication time, source, and topic. A third evidence-based nursing expert conducted a semantic review and content verification. In cases of cultural or translation discrepancies, senior experts with PhDs or master's degrees in English were consulted until a team consensus was reached. Evidence integration followed specific protocols: consistent evidence was summarized and condensed, complementary evidence was logically integrated, and conflicting evidence was prioritized based on urgency, quality, and recency. The Australian JBI 2014 pre-grading system for interventional studies was used to categorize evidence into grades 1 to 5 based on study design. For evidence extracted according to the JBI grading system, the original grading was retained.

# Results

## Search Results

A total of 7355 relevant papers were initially identified. After eliminating duplicates, 5912 papers remained. Following an initial exclusion based on titles and abstracts, 310 articles were selected for full-text review and quality assessment.

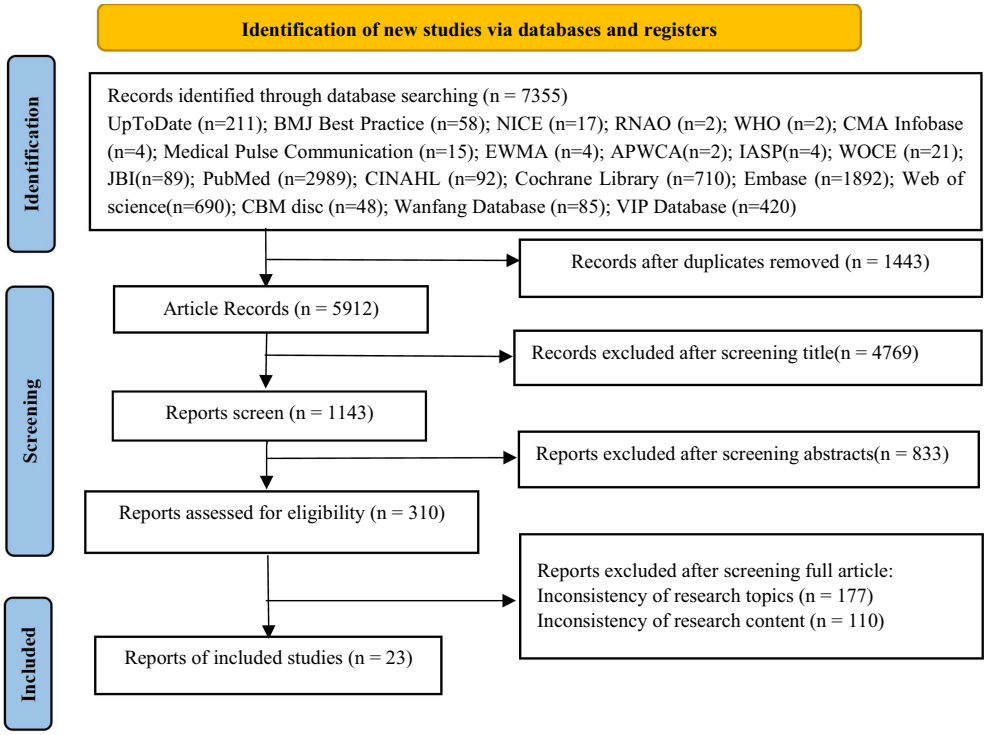


**Figure 1** Literature search flowchart.

Ultimately, 23 papers were included in this study: 5 guidelines,[21–25] 1 expert consensus,[26] 3 recommended practices,[27–29] 3 clinical decisions,[30–32] 6 evidence summaries,[16,33–37] and 5 systematic reviews.[38–42] The flowchart of the literature search is presented in Figure 1, and the basic characteristics of the included literature are detailed in Table 1.

**Table 1** General Characteristics of the Included Literatures (n=23)

| Author | Year | Country | Source | Type | Theme |
|---|---|---|---|---|---|
| Benbow et al[22] | 2009 | England | PubMed | Guideline | Reducing pain in patient with wound |
| NICE[23] | 2016 | England | NICE | Guideline | Major trauma: assessment and initial management |
| HSE[24] | 2018 | Ireland | HSE | Guideline | HSE national wound management guidelines |
| Hasegawa et al[25] | 2020 | Japan | PubMed | Guideline | Wound guideline |
| Romanowski et al[21] | 2020 | America | PubMed | Guideline | American burn association guideline of acute pain in the adult burn patient. |
| Eriksson et al[26] | 2022 | America | IASP | Consensus | Consensus on chronic wound treatment |
| Woo et al[27] | 2008 | Canada | PubMed | Recommended practice | Minimize wound-related pain during dressing changes |
| JBI[29] | 2021 | - | JBI | Recommended practice | Wound dressing: minimizing wound pain |
| Wrona et al[28] | 2022 | America | PubMed | Recommended practice | Operant Pain Clinical Management Practice Recommendations |
| Evans et al[30] | 2022 | America | UpToDate | Clinical decisions | Overview of Chronic Wound Treatment |
| Armstrong et al[31] | 2022 | America | UpToDate | Clinical decisions | Basic principles of wound management |
| Gestring et al[32] | 2022 | America | UpToDate | Clinical decisions | Negative pressure therapy for wounds |
| Jayasekara[33] | 2021 | Australia | JBI | Evidence summaries | Wound management: pain assessment during dressing changes |

(*Continued*)

**Table 1** (Continued).

| Author | Year | Country | Source | Type | Theme |
|---|---|---|---|---|---|
| Moola et al[43] | 2021 | Australia | JBI | Evidence summaries | Pain management in wound care: a nonpharmacologic adjunctive intervention |
| Moola et al[35] | 2021 | Australia | JBI | Evidence summaries | Pain management in wound care: wound care techniques |
| Jayasekara[34] | 2021 | Australia | JBI | Evidence summaries | Wound management: pain assessment during dressing changes |
| Koh[36] | 2022 | Australia | JBI | Evidence summaries | Wound management: dressings |
| Slade[37] | 2022 | Australia | JBI | Evidence summaries | Wound care: standardized care |
| Provencal et al[38] | 2018 | Canada | PubMed | Systematic review | Hypnosis for burn wound care pain and anxiety. |
| Gasteratos et al[39] | 2022 | America | PubMed | Systematic review | Adjunctive Nonpharmacologic interventions for the management of burn pain |
| Admassie et al[40] | 2022 | Ethiopia | Embase | Systematic review | Wound-related operative pain management |
| Ma et al[42] | 2023 | China | PubMed | Systematic review | Effects on non-pharmacological intervention on pain during dressing change. |
| Taşçı et al[41] | 2024 | England | PubMed | Systematic review | Efficacy of virtual reality for pain relief in medical procedures. |

# Quality Evaluation Results of the Included Literature

## Quality Evaluation Results of Clinical Guidelines

Five guidelines were included,[21–25] and both investigators demonstrated high interrater reliability (ICC > 0.750), qualifying the guidelines for inclusion. The results of the quality assessment are presented in Table 2.

## Quality Evaluation Incorporating Expert Consensus

One expert consensus[26] was included, except for entry 6, "Is there any inconsistency between the ideas presented and previous literature", which was rated as "unclear". All other entries were rated as "yes", indicating high overall quality, and the paper was included.

## Quality Evaluations Integrated into Systematic Reviews

Five systematic evaluations were included. The study by Provencal et al[38] was rated "yes" for all entries except entry 10, "Are there recommendations for policy and/or practice supported by reported data?" The studies by Gasteratos et al[39] and Ma et al[42] were evaluated with "yes" for all entries. The study by Admassie et al[40] was rated "yes" except for entry 7, "Are measures taken to minimize errors when extracting data?" The study by Taşçı et al[41] was rated "yes" except for entry 9, "Is the possibility of publication bias ruled out?" Overall, the design of the five systematic evaluations was comprehensive and of high quality, justifying their inclusion.

**Table 2** Quality Evaluation Results of Clinical Guidelines (n=5)

| Guideline | Standardized Scores in Various Domains (%) | | | | | | ≥60% | ≤30% | All quality | Quality Evaluation | ICC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Scope and Purpose | Stakeholder Involvement | Rigour of Development | Clarity of Presentation | Applicability | Editorial Independence | | | | | |
| Benbow et al[22] | 72.22 | 61.11 | 40.63 | 66.67 | 35.42 | 91.67 | 4 | 0 | 5 | B | 0.921 |
| NICE[23] | 88.89 | 83.33 | 75.00 | 86.11 | 70.83 | 79.17 | 6 | 0 | 6 | A | 0.825 |
| HSE[24] | 75.93 | 57.41 | 43.54 | 61.11 | 41.67 | 50.00 | 2 | 6 | 5 | B | 0.911 |
| Hasegawa et al[25] | 79.63 | 59.26 | 43.06 | 64.23 | 41.67 | 52.78 | 2 | 6 | 5 | B | 0.971 |
| Romanowski et al[21] | 92.59 | 74.07 | 61.11 | 94.44 | 55.56 | 91.23 | 5 | 6 | 5 | B | 0.889 |


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### Quality Assessment of the Inclusion of Additional Literature

Three clinical decisions from UpToDate[30–32] were included due to their high level of evidence and were directly applied to the clinical scenarios of this study. Six evidence summaries[33–37,43] and 1 recommended practice[29] from the JBI Center for Evidence-Based Health Care were selected based on their original level of evidence and strength of recommendation. Additionally, 2 recommended practices from PubMed,[27,28] were included, except for entry 6, "Are the points raised inconsistent with previous literature", which was rated as "unclear". All other entries were rated "yes". The overall design of these studies was comprehensive and of high quality, justifying their inclusion.

## Summary and Description of Evidence

The final 32 pieces of best evidence were summarized across six areas: pain assessment and documentation, education and training, dressing selection and change, wound cleansing, debridement and negative pressure therapy, and both pharmacological and nonpharmacological intervention strategies, as detailed in Table 3.

**Table 3** Summary of Evidence for Wound Procedural Pain Management in Patients with Opened Wound

| Category | Content of Evidence | Level | Recommendation Level |
|---|---|---|---|
| Pain assessment and documentation | 1. Before medication changes, an experienced physician conducts a thorough pain assessment, identifying its nature and marking pain sites on a body schematic while scoring pain intensity in different areas. This assessment and documentation are an ongoing process, conducted before, during, and after medication changes.[24,33] | 5 | B |
| | 2. Comprehensive assessment and documentation of pain related to wound dressing changes include the pain site, extent, nature, intensity, source, irritants, and duration,[25,33] as well as the impact on quality of life (eg, sleep, appetite, work, daily activities)[26] and patients' attitudes toward pain management, knowledge of, and preferences for analgesic methods.[36] | 5 | B |
| | 3. When selecting a pain assessment tool, consider the patient's age, language, education, cognitive and sensory abilities, and level of intelligence.[24,25,33] | 5 | B |
| | 4. Pain assessment tools should be patient-centered, holistic, consistent, and explicit. Standardized tools, such as the visual analog scale, numeric rating scale, verbal rating scale, and facial expression scale, should be used consistently for the same patient. The visual analog scale is suitable for most patients, the numeric rating scale is the most used, and the facial expression scale is ideal for children and cognitively impaired patients.[25,33] | 4 | B |
| | 5. A pain management program should be based on changes in pain scores. When changes in pain are detected, the timing of intervention should be reassessed.[24,28] | 5 | B |
| | 6. Pain assessments should be documented, with an individualized pain management plan for each patient. Nursing staff should regularly reassess pain and review the management plan.[29] | 5 | B |
| | 7. Patient psychological stress should be assessed before dressing changes, during wound cleaning and debridement, and incorporated into the wound management program.[24,28] | 5 | B |
| Education and training | 8. Education and training for wound care personnel should focus on standardized assessment and management of operative wound pain.[28] | 5 | B |
| | 9. Wound care providers should offer patients guidance on managing operative pain during dressing changes, including the use of pain assessment tools, pharmacological and non-pharmacological analgesia, while emphasizing the role of pain management in promoting healing, increasing pain awareness, and reducing anxiety.[43] | 5 | B |
| Dressing selection and change | 10. Determine the frequency of dressing changes based on the outcomes of each change and care goals, aiming to minimize unnecessary interventions.[24,25,37] | 5 | B |
| | 11. When selecting a dressing, consider the indications, contraindications, and instructions for use,[24,29] along with the balance between adherence, wound exudate volume, and absorbency, to maintain a moist wound environment and minimize trauma and pain during dressing changes.[25,26,31,35–37] | 5 | B |
| | 12. During dressing removal, thoroughly wet the entire dressing, especially the inner layer in contact with the wound. Apply and remove the dressing gently and at a consistent speed.[24,25] | 5 | B |

(*Continued*)

**Table 3** (Continued).

| Category | Content of Evidence | Level | Recommendation Level |
|---|---|---|---|
| | 13. When the dressing adheres to the wound, use warm saline to moisten the entire layer before removal.[24] | 5 | B |
| | 14. If the dressing causes pain, bleeding, or trauma during removal, or requires soaking, a dressing change should be considered.[35] | 5 | B |
| | 15. Gauze removal can cause wound pain,[25] and highly absorbent dressings should be avoided on dry wounds,[24] Wet dressings, hydrocolloid, or antimicrobial dressings are recommended.[30] | 5 | B |
| | 16. Alginate dressings are largely rinsed off with cleaning solutions, reducing pain and dressing change frequency;[31] Silicone dressings are less painful to change, reusable, and allow easier wound inspection;[25] However, film dressings may adhere to dry wounds and cause damage upon removal.[31] | 5 | B |
| | 17. Avoid prolonged exposure of the wound during dressing changes.[24–26,29,37,40] | 5 | B |
| Wound cleansing, debridement and negative pressure therapy | 18. Timing and frequency of wound cleansing should be based on wound assessment results and an individualized management plan.[24] | 5 | B |
| | 19. Gentle wound cleansing with saline, distilled, or potable water is recommended[24] to minimize gauze wiping and prevent manipulative injury. Use warm solutions, close to body temperature, and avoid cryogenic cleansing solutions.[25,29,35,40] | 5 | B |
| | 20. When selecting a debridement method, consider the indications, wound condition, urgency of contaminant and tissue removal, bleeding risk, and potential for operative pain.[24,25,35] | 5 | B |
| | 21. Self-soluble debridement, using hydrogel or hydrocolloid dressings, reduces pain and tissue damage by maintaining a moist wound environment, but is contraindicated in infected wounds.[25] | 5 | B |
| | 22. Topical application of a 5% lidocaine and proparacaine mixture before debridement reduces pain during venous debridement of the lower extremities.[25,34] | 5 | B |
| | 23. Depending on the clinical situation, the dressing and suction tube are typically changed every 48–120 hours (2–5 days). During changes, turn off the equipment, remove the semi-closed dressing, and carefully extract the sponge. If the sponge adheres to granulation tissue, moisten it with saline before removal. For severe pain, apply topical lidocaine (without epinephrine) before removal or suction.[32] | 5 | B |
| Pharmacological intervention strategies | 24. During wound dressing changes, healthcare professionals should select appropriate pharmacological analgesics based on medical advice and patient needs, considering feasibility and acceptability, while informing patients of the potential side effects and risks of short- and long-term opioid use.[34] | 5 | B |
| | 25. Local anesthetics (eg, lidocaine, procaine) before dressing changes can reduce pain.[28,30,40] Healthcare professionals should follow the WHO three-step analgesic ladder, considering the patient's needs. For mild pain, non-opioid drugs (if no contraindications) can be used, followed by opioids if pain persists, based on the drug's duration and half-life, to minimize pain during medication changes.[24–26,28–30,34,40] | 5 | B |
| | 26. Multimodal analgesia, combining opioid and non-opioid analgesics to target different pain pathways, optimizes acute pain outcomes, reduces opioid-related side effects, and prevents chronic pain.[28,29] | 5 | B |
| Nonpharmacological intervention strategies | 27. Select nonpharmacologic interventions based on patient preference, professional judgment, and their feasibility and acceptability.[29,42,43] | 5 | B |
| | 28. Listening, encouraging pain expression, interacting, and gentle touch help alleviate patient tension.[25] | 5 | B |
| | 29. Hypnotherapy reduces baseline pain and trauma re-experiencing scores in burn patients.[39] | 5 | B |
| | 30. Distraction techniques (eg, virtual reality, music therapy, relaxation training, animated videos) can reduce pain during wound dressing changes.[28,39–41,43] | 5 | B |
| | 31. Aromatherapy promotes relaxation, reducing pain during medication changes.[43] | 5 | B |
| | 32. Electrical nerve stimulation before dressing changes effectively relieves pain.[43] | 5 | B |


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## Discussion

This study reviews evidence on the prevention and management of procedural pain in patients with open wounds, focusing on effectiveness, personalization, comfort, and collaboration. Pain is both a sensory and emotional experience, and accurate assessment is essential for developing effective interventions.[44] Healthcare professionals should prioritize communication during medication changes to ensure patient comfort, assess pain levels, and identify specific needs for pharmacological and non-pharmacological analgesia. Collaborative, individualized pain management plans tailored to the patient's condition can help reduce wound procedural pain. Often, clinical staff underestimate self-reported pain, making objective pain assessment crucial for effective management.[45] Pain assessment should include intensity, character, location, duration, and patterns, with individualized tools like the visual analog scale or numeric rating scale. Although current evidence lacks a specific pain assessment tool for wound dressing changes, future research should aim to standardize assessment practices for wound operative pain.

Standardized and regulated operational techniques are essential for effectively managing wound procedural pain. High-quality evidence, such as that from entry 20, should be promoted and clinically applied, while the remaining evidence, although of lower grade, is practical, easy to implement, and greatly beneficial to patients. Every aspect of the medication change process directly influences the patient's pain experience. Therefore, refining and standardizing each technique is crucial in reducing pain. Hasegawa et al[25] demonstrated that dry dressings, scabs formed by exudate, and strong adhesion can not only cause pain during dressing changes but may also damage granulation tissue and delay healing. Healthcare professionals should therefore remove the inner layer of dressings gently and uniformly, minimizing unnecessary contact to prevent damaging new tissue. When dressings adhere to the wound surface, moisten them with saline before removal. Improper application or removal of medical adhesives is the primary cause of Medical Adhesive-Related Skin Injury (MARSI), including epidermal detachment, erythema, and blistering. To prevent MARSI, prioritize low-allergenic, low-tack tapes or silicone-based adhesives for fragile skin.[46] During removal, apply a gentle, parallel-to-skin pulling force and avoid vertical tearing. Sterile adhesive removers are recommended to minimize epidermal damage by dissolving adhesive components. If MARSI occurs, promptly assess injury severity, switch to non-adhesive dressings, and enhance local skin moisturization and protection. Additionally, studies[47,48] suggest that novel dressings, by maintaining a moist environment, can reduce adhesion and minimize pain during dressing changes. In conclusion, adopting comprehensive, evidence-based operational techniques will guide healthcare professionals in delivering standardized care, continuously improving pain management, and enhancing patient experience during wound dressing changes.

Timely and correct interventions are essential for effectively managing wound procedural pain, primarily through pharmacologic and non-pharmacologic interventions. The choice of treatment should combine medical advice, professional judgment, and the patient's needs. The WHO's three-step analgesic ladder is widely recommended[24–26,28–30,34,40] for managing wound procedural pain. However, in clinical practice, nurses often face limitations in their authority and responsibility regarding analgesic medications, necessitating communication with physicians. Additionally, high doses of pharmacologic analgesics can have side effects, limiting their use and dosage, which complicates pain management.[14] Non-pharmacologic interventions, such as supportive psychotherapy and distraction techniques,[39,40] have gained attention for their effectiveness in pain relief and their ability to be implemented independently by caregivers. These interventions offer wide applicability, cost-effectiveness, and few side effects. However, evidence on various non-pharmacological approaches remains scarce, and a comprehensive, systematic pain management program is still lacking. Recent advancements in pain relief technologies aim for precise and long-term pain control, addressing the limitations of traditional methods, such as slow onset, significant side effects, and short duration. Notable examples include nanocarrier drug delivery dressings, iontophoresis therapy, transcutaneous electrical nerve stimulation, and low-temperature plasma technology. These innovations offer potential improvements in the management of wound procedural pain, more high-quality studies are needed to explore specific, safe, and effective non-pharmacological treatments tailored to different wound types and treatment stages, including optimal intervention modalities, duration, and frequency.

Positive pain perception is crucial for the effective management of wound procedural pain. Broderick, Keefe, Bruckenthal, Junghaenel, Schneider, Schwartz, Kaell, Caldwell, McKee, Reed and Gould[49] found that healthcare workers' understanding of wound procedural pain is still relatively low, with a gap in pain management knowledge. To

address this, it is recommended that the best evidence for managing wound procedural pain in patients with open wounds be integrated into clinical practice. Efforts should focus on enhancing healthcare workers' knowledge through the development of educational materials, organizing training sessions, and evaluating the effectiveness of these learning interventions. Simultaneously, barriers to implementing best practices should be identified, and strategies developed to ensure continuous evidence translation into practice. Furthermore, improving both the healthcare providers' and patients' pain awareness can significantly enhance the effectiveness of pain management. It is suggested that healthcare professionals use a variety of methods to provide health guidance to patients before and after medication changes, thereby improving their understanding of pain management and reducing anxiety levels.

## Strengths and Limitations

The primary benefit of summarizing evidence-based pain management for procedural pain in open wounds is to provide a framework that enhances the scientific rigor of analgesia, reduces procedural harm, and improves patient outcomes. Supported by multicenter research, this approach clarifies analgesic protocols for various procedural scenarios. By integrating both pharmacological and non-pharmacological interventions tailored to wound type, patient conditions, and pain sensitivity, it minimizes iatrogenic injury and provides healthcare providers with a scientifically grounded process for assessment, intervention, and monitoring. This study has some limitations: (1) Only English-language literature was included, which may have resulted in the exclusion of high-quality findings published in other languages; (2) There is a relative scarcity of high-quality primary literature, leading to a lower overall level of evidence; and (3) The evidence formation process did not incorporate the perspectives of key stakeholder populations, such as the preferences and wishes of patients. This should be addressed in future clinical applications to ensure a more comprehensive and patient-centered approach.

## Conclusion

This study provides a comprehensive summary of the best available evidence on the management of wound procedural pain in patients with open wounds, following a strictly evidence-based approach. When managing procedural pain in open wounds, healthcare providers should follow the principle of "evidence-based core and individualized adaptation". Protocols should be adjusted based on patient age, underlying conditions, wound type, and procedural context. Clinicians must be mindful of evidence gaps and avoid rigidly applying standardized protocols. Simultaneously, through quality monitoring, case accumulation, and small-scale studies, they should refine management workflows. This approach ensures the safety and efficacy of clinical decisions while contributing to the advancement of evidence-based practice.

## Ethical Statement

"Not applicable" in this section for this systematic review because manuscript does not report on or involve the use of any animal or human data.

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## Disclosure

The authors declare that they have no known competing commercial interests or personal relationships that could have appeared to influence the work reported in this study.

## References

1. Roberts DJ, Leppäniemi A, Tolonen M, et al. The open abdomen in trauma, acute care, and vascular and endovascular surgery: comprehensive, expert, narrative review. *BJS Open*. 2023;7(5). doi:10.1093/bjsopen/zrad084
2. Jiang Q, Dumville JC, Cullum N, Pan J, Liu Z. Epidemiology and disease burden of complex wounds for inpatients in China: an observational study from Sichuan province. *BMJ Open*. 2020;10(11):e039894. doi:10.1136/bmjopen-2020-039894

3. Cai P, Wu X, Liu Z, et al. Analysis of the burden and trend of injury in Sichuan, China, from 2006 to 2015: results from the national injury surveillance system. *BMJ Open*. 2019;9(11):e031184. doi:10.1136/bmjopen-2019-031184
4. Lo J, Chan L, Flynn S. A systematic review of the incidence, prevalence, costs, and activity and work limitations of amputation, osteoarthritis, rheumatoid arthritis, back pain, multiple sclerosis, spinal cord injury, stroke, and traumatic brain injury in the United States: a 2019 update. *Arch Phys Med Rehabil*. 2021;102(1):115–131. doi:10.1016/j.apmr.2020.04.001
5. Naghavi M, Kyu HH, Aalipour MA, et al. Global burden of 292 causes of death in 204 countries and territories and 660 subnational locations, 1990-2023: a systematic analysis for the global burden of disease study 2023. *Lancet*. 2025;406(10513):1811–1872. doi:10.1016/s0140-6736(25)01917-8
6. Kaplan CM, Kelleher E, Irani A, Schrepf A, Clauw DJ, Harte SE. Deciphering nociplastic pain: clinical features, risk factors and potential mechanisms. *Nat Rev Neurol*. 2024;20(6):347–363. doi:10.1038/s41582-024-00966-8
7. Practice Guidelines Committee I; Ahuja RB, Gibran N. ISBI practice guidelines for burn care. *Burns*. 2016;42(5):953–1021. doi:10.1016/j.burns.2016.05.013
8. Wei M, Zheng H, Xu X, et al. Assessment of wound-related pain experiences of patients with chronic wounds: a multicenter cross-sectional study in Eastern China. *J Wound Ostomy Continence Nurs*. 2024;51(2):111–116. doi:10.1097/won.0000000000001059
9. Tegegne BA, Lema GF, Fentie DY, Bizuneh YB. Severity of wound-related pain and associated factors among patients who underwent wound management at teaching and referral hospital, Northwest Ethiopia. *J Pain Res*. 2020;13:2543–2551. doi:10.2147/jpr.S276449
10. Leren L, Johansen EA, Eide H, Sørum Falk R, Ljoså TM. Prevalence and factors associated with ulcer-related pain in persons with chronic leg ulcers-an explorative study. *J Clin Nurs*. 2021;30(17–18):2732–2741. doi:10.1111/jocn.15787
11. Gardner SE, Abbott LI, Fiala CA, Rakel BA. Factors associated with high pain intensity during wound care procedures: a model. *Wound Repair Regen*. 2017;25(4):558–563. doi:10.1111/wrr.12553
12. Li P, Zhang Q, Li D. Epidemiology and prognosis of burn injuries in China: a meta-analysis. *Eur J Med Res*. 2025;30(1):581. doi:10.1186/s40001-025-02741-x
13. Gould LJ, Alderden J, Aslam R, et al. WHS guidelines for the treatment of pressure ulcers-2023 update. *Wound Repair Regen*. 2024;32(1):6–33. doi:10.1111/wrr.13130
14. Krane EJ. The opioid debate-PRO: opioids have an important role in pain management in children. *Clin J Pain*. 2019;35(6):468–472. doi:10.1097/ajp.0000000000000700
15. van Veen S, Drenth H, Hobbelen H, Finnema E, Teunissen S, de Graaf E. Non-pharmacological interventions feasible in the nursing scope of practice for pain relief in palliative care patients: a systematic review. *Palliat Care Soc Pract*. 2024;18:26323524231222496. doi:10.1177/26323524231222496
16. Munn Z, Lockwood C, Moola S. The development and use of evidence summaries for point of care information systems: a streamlined rapid review approach. *Worldviews Evid Based Nurs*. 2015;12(3):131–138. doi:10.1111/wvn.12094
17. Dicenso A, Bayley L, Haynes RB. Accessing pre-appraised evidence: fine-tuning the 5S model into a 6S model. *Evid Based Nurs*. 2009;12(4):99–101. doi:10.1136/ebn.12.4.99-b
18. Brouwers MC, Kho ME, Browman GP, et al. AGREE II: advancing guideline development, reporting and evaluation in health care. *Can Med Assoc J*. 2010;182(18):E839–E842. doi:10.1503/cmaj.090449
19. Aromataris E, Fernandez R, Godfrey CM, Holly C, Khalil H, Tungpunkom P. Summarizing systematic reviews: methodological development, conduct and reporting of an umbrella review approach. *Int J Evid Based Healthc*. 2015;13(3):132–140. doi:10.1097/xeb.0000000000000055
20. McArthur AKJ, Yan H, Florescu S. *Chapter 4: Systematic Reviews of Text and Opinion*. Aromataris E, Munn Z Editors. JBI;2019.
21. Romanowski KS, Carson J, Pape K, et al. American burn association guidelines on the management of acute pain in the adult burn patient: a review of the literature, a compilation of expert opinion, and next steps. *J Burn Care Res*. 2020;41(6):1129–1151. doi:10.1093/jbcr/iraa119
22. Benbow M. A practical guide to reducing pain in patients with wounds. *Br J Nurs*. 2009;18(11):S20,S22,S24passim. doi:10.12968/bjon.2009.18.Sup4.42729
23. National Clinical Guideline C. National Institute for Health and Care Excellence: guidelines. In: *Major Trauma: Assessment and Initial Management*. National Institute for Health and Care Excellence (NICE) Copyright © National Clinical Guideline Centre, 2016; 2016.
24. Health Service Executive Ro I. HSE national wound management guidelines 2018; 2025. Available from: https://www.hse.ie/eng/services/publications/nursing-midwifery-services/wound-management-guidelines-2018.pdf. Accessed September 26, 2018.
25. Hasegawa M, Inoue Y, Kaneko S, et al. Wound, pressure ulcer and burn guidelines - 1: guidelines for wounds in general, second edition. *J Dermatol*. 2020;47(8):807–833. doi:10.1111/1346-8138.15401
26. Eriksson E, Liu PY, Schultz GS, et al. Chronic wounds: treatment consensus. *Wound Repair Regen*. 2022;30(2):156–171. doi:10.1111/wrr.12994
27. Woo KY, Harding K, Price P, Sibbald G. Minimising wound-related pain at dressing change: evidence-informed practice. *Int Wound J*. 2008;5(2):144–157. doi:10.1111/j.1742-481X.2008.00486.x
28. Wrona SK, Quinlan-Colwell A, Brown L, Jannuzzi RGE. Procedural pain management: clinical practice recommendations American society for pain management nursing. *Pain Manag Nurs*. 2022;23(3):254–258. doi:10.1016/j.pmn.2021.11.008
29. JBI. Recommended practice. Wound dressing change: minimizing pain; 2025. Available from: https://ovidsp.dc2.ovid.com/ovid-a/ovidweb.cgi?&S=MBNLFPMMEFEBAACCJ-PLJLGJEEHNDAA00&Link+Set=S.sh.80%7c1%7csl_190. Accessed May 18, 2021.
30. Evans KPK. Overview of treatment of chronic wounds; 2025. Available from: https://www-uptodatecom.webvpn.sjlib.cn/contents/overview-of-treatment-of-chronic-wounds?search=Overview%20of%20treatment%20of%20chro-nic%20wounds&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1. Accessed July 13, 2022.
31. Armstrong GDMJ; 2025. Available from: https://www-upto-da-tecom.webvpn.sjlib.cn/contents/zh-Hans/basic-principles-of-wo-undmanagement?search=Basic%20principles%20of%20wound%20management&source=search_result&selectedTitle=1~150&u-sage_type=default&display_rank=1. Accessed June 09, 2023.
32. G M. Negative pressure wound therapy; 2025. Available from: https://www-uptodate-com.webvpn.sjlib.cn/contents/zh-Hans/negative-pressure-wound-therapy?search=Negative%20pressure%20wound%20therapy&source=search_result&selectedTitle=1~74&usage_type=default&display_rank=1. Accessed September 23, 2022.
33. Jayasekara. Wound management: assessment of pain during dressing change; 2025. Available from: https://ovidsp.dc2.ovid.com/ovid-a/ovidweb.cgi?&S=HFBOFPLEKAEBOPIIJPKJJHJEKMCIAA00&Link+Set=S.sh.21%7c1%7csl_190. Accessed March 23, 2021.

34. Jayasekara. Pain management during wound care: pharmacological management of pain during dressing change; 2025. Available from: https://ovidsp.dc2.ovid.com/ovid-a/ovidweb.cgi?&S=MBNLFPMMEFEBAACCJPLJLGJEEHNDAA00&Link+Set=S.sh.85%7c1%7csl_190. Accessed January 11, 2021.
35. Moola S. Pain management during wound care: wound care technique; 2025. Available from: https://ovidsp.dc2.ovid.com/ovid-a/ovidweb.cgi?&S=MBNLFPMMEFEBAACCJPLJLGJEEHNDAA00&Link+Set=S.sh.90%7c1%7csl_190. Accessed April 06, 2022.
36. K G. Wound management: dressing; 2025. Available from: https://ovidsp.dc2.ovid.com/ovid-a/ovidweb.cgi?&S=MBNLFPMMEFEBAACCJPLJLGJEEHNDAA00&Link+Set=S.sh.65%7c1%7csl_190. Accessed March 20, 2022.
37. S S. Wound care: standardized delivery of care; 2025. Available from: https://ovidsp.dc2.ovid.com/ovid-a/ovidweb.cgi?&S=MBNLFPMMEFEBAACCJPLJLGJEEHNDAA00&Link+Set=S.sh.70%7c1%7csl_190. Accessed July 15, 2022.
38. Provençal SC, Bond S, Rizkallah E, El-Baalbaki G. Hypnosis for burn wound care pain and anxiety: a systematic review and meta-analysis. *Burns*. 2018;44(8):1870–1881. doi:10.1016/j.burns.2018.04.017
39. Gasteratos K, Papakonstantinou M, Man A, Babatsikos E, Tamalonis A, Goverman J. Adjunctive nonpharmacologic interventions for the management of burn pain: a systematic review. *Plast Reconstr Surg*. 2022;149(5):985e–994e. doi:10.1097/prs.0000000000009059
40. Admassie BM, Ferede YA, Tegegne BA, Lema GF, Admass BA. Wound-related procedural pain management in a resource limited setting: systematic review. *Int J Surg Open*. 2022;47:100549. doi:10.1016/j.ijso.2022.100549
41. Taşçı Ö, Özer N, Çoğaltay N. The effect of virtual reality application on pain during wound care dressing change: a systematic review and meta-analysis of randomized controlled trials. *Pain Manag Nurs*. 2024;25(2):e99–e107. doi:10.1016/j.pmn.2023.11.008
42. Ma Y, Li Y, Wang C, et al. Effects of non-pharmacological interventions on pain in wound patients during dressing change: a systematic review. *Nurs Open*. 2024;11(2):e2107. doi:10.1002/nop2.2107
43. Moola S. Pain management during wound care: non-pharmaco logical adjunct interventions; 2025. Available from: https://ovidsp.dc2.ovid.com/ovid-a/ovidweb.cgi?&S=LHOGFPGEGJEBOPKNIPKJAFLENMNIAA00&Link+Set=S.sh.52%7c1-%7csl_190. Accessed April 06, 2021.
44. Hausteiner-Wiehle C, Henningsen P. Nociplastic pain is functional pain. *Lancet*. 2022;399(10335):1603–1604. doi:10.1016/s0140-6736(21)02500-9
45. Farley P, Abraham P, Griffin RL, Jansen JO. Pain in trauma patients: measurement and predisposing factors. *J Surg Res*. 2023;291:321–329. doi:10.1016/j.jss.2023.06.008
46. Gray M. Medical adhesive-related skin injury (MARSI) at 10 years, progress, and challenges: editorial context for a supplement to JWOCN. *J Wound Ostomy Continence Nurs*. 2024;51(5S Suppl 5):S1. doi:10.1097/won.0000000000001109
47. Lima Júnior EM, de Moraes Filho MO, Costa BA, et al. Nile tilapia fish skin-based wound dressing improves pain and treatment-related costs of superficial partial-thickness burns: a Phase III randomized controlled trial. *Plast Reconstr Surg*. 2021;147(5):1189–1198. doi:10.1097/prs.0000000000007895
48. Malek Hosseini A, Rostam Khani M, Abdi S, Abdi S, Sharifi N. Comparison of aloe vera gel dressing with conventional dressing on pressure ulcer pain reduction: a clinical trial. *BMC Res Notes*. 2024;17(1):25. doi:10.1186/s13104-023-06682-8
49. Broderick JE, Keefe FJ, Bruckenthal P, et al. Nurse practitioners can effectively deliver pain coping skills training to osteoarthritis patients with chronic pain: a randomized, controlled trial. *Pain*. 2014;155(9):1743–1754. doi:10.1016/j.pain.2014.05.024