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Review Article

Pain Management in Medical-Surgical Nursing: A Comprehensive Review

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Abstract

Pain management is a critical component of medical-surgical nursing, directly influencing patient outcomes, recovery, and quality of care. This comprehensive review explores the classification, physiology, and pathophysiology of pain, emphasizing its relevance in postoperative and chronic conditions. It highlights evidence-based pharmacological and non-pharmacological strategies, including multimodal analgesia and cognitive-behavioral interventions. Accurate pain assessment, patient education, and interdisciplinary collaboration are central to effective nursing practice. Special attention is given to managing pain in vulnerable populations such as the elderly, children, and patients with chronic or cancer-related pain. The review also addresses barriers to optimal pain control and recent advancements such as Enhanced Recovery After Surgery (ERAS) protocols and digital therapeutics. Nurses, as frontline caregivers, play a vital role in assessing, managing, and advocating for holistic, patient-centered pain relief in diverse clinical settings.

Keywords: Pain Management, Medical-Surgical Nursing, Multimodal Analgesia, Pain Assessment, Non-Pharmacological Interventions

Introduction

Definition and types of pain

Pain is a complex, multifaceted experience that serves as a protective mechanism but can also become a significant clinical challenge, especially in medical-surgical settings. Pain is typically classified by duration – acute (short-term, often related to injury or surgery) and chronic (persistent, lasting beyond normal tissue healing) – and by pathophysiology, namely nociceptive and neuropathic pain.[1]

- Acute pain is usually sudden in onset and is associated with a specific cause, such as surgery or trauma. It generally resolves as the underlying cause heals.[2]
- Chronic pain persists for more extended periods, often beyond the expected period of healing, and may not have a clear cause.[1,2]
- Nociceptive pain arises from actual or threatened damage to non-neural tissue and is due to activation of nociceptors, typically presenting as somatic (musculoskeletal) or visceral (organ) pain.[3]
- Neuropathic pain is caused by a lesion or disease affecting the somatosensory nervous system, often described as burning, shooting, or electric-like sensations, and is frequently chronic.

Significance of pain management in medical-surgical nursing

Effective pain management is a cornerstone of medical-surgical nursing, directly impacting patient comfort, recovery speed, and overall outcomes. Nurses play a critical role in early recognition, assessment, and management of pain, particularly in post-operative care. Their responsibilities include regular pain assessment using validated tools (such as the numeric pain scale), careful observation of surgical sites,

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and identification of factors that exacerbate or relieve pain. Proper pain management not only alleviates suffering but also reduces complications, accelerates recovery, and improves patient satisfaction.[4]

Moreover, pain management in this context requires a multidisciplinary approach, involving collaboration among nurses, physicians, pharmacists, and therapists, as well as engagement with patients and their families. This holistic strategy ensures that pain is addressed from multiple angles – pharmacological, physical, psychological, and educational.[5]

Purpose and scope of the review

The purpose of this review is to provide a comprehensive overview of pain management principles and practices in medical-surgical nursing. The scope includes:

- Defining and classifying pain relevant to the medical-surgical setting
- Highlighting the importance of pain management for patient outcomes
- Reviewing evidence-based strategies for assessment and intervention, including pharmacological and non-pharmacological approaches
- Discussing the role of the nurse in multidisciplinary pain management teams
- Addressing challenges and recommendations for improving pain management competency among medical-surgical nurses.

Physiology and Pathophysiology of Pain

Pain pathways

Pain processing involves four stages as follows:

1. Transduction: Noxious stimuli (mechanical, thermal, chemical) activate nociceptors in peripheral tissues. These receptors convert stimuli into electrical signals through ion channels (e.g., Transient Receptor Potential Vanilloid 1 [TRPV1], ASIC3).[6]
2. Transmission: Signals travel through Aδ (fast, sharp pain) and C fibers (slow, dull pain) to the spinal cord. Glutamate and substance P amplify signals at dorsal horn synapses.
3. Perception: Thalamocortical pathways relay signals to the postcentral gyrus (sensory discrimination), limbic system (emotional response), and reticular formation (arousal).
4. Modulation: Descending pathways from the periaqueductal gray and rostral ventral medulla release serotonin and norepinephrine to inhibit pain. The gate control theory explains how non-noxious stimuli (e.g., touch) reduce pain through spinal interneurons.[7]

Pain receptors and neurotransmitters

Nociceptors

Express transient receptor potential (TRP) channels and acid-sensing ion channels (ASICs) activated by tissue damage or inflammation.

Key neurotransmitters

- Excitatory: Glutamate (spinal cord), substance P (peripheral inflammation)
- Inhibitory: Endogenous opioids (μ, δ, κ receptors), norepinephrine (α_2-adrenoceptors), and endocannabinoids
- Serotonin has dual roles, facilitating or inhibiting pain depending on receptor subtype.[8]

Mechanisms in surgical and medical conditions

Post-operative pain

- Tissue incision lowers local pH (~6.8) and increases lactate, sensitizing muscle C-fibers through ASIC3 channels. Spontaneous nerve firing causes guarding behavior.[9]
- AMPA (α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid) receptor trafficking in spinal neurons enhances nociceptive signaling, perpetuating hyperalgesia.
- Proinflammatory cytokines (interleukin [IL]-1, IL-6) upregulate TRPV1 in nociceptors, amplifying mechanical sensitivity.[7]

Chronic/neuropathic pain

- Nerve injury during surgery (e.g., stretching, compression) triggers neuroimmune interactions, leading to central sensitization and glial cell activation. Microglia shift to a proinflammatory state, releasing cytokines that sustain pain.
- Diabetic neuropathy involves peripheral nerve damage coupled with altered central processing, often resistant to opioids.[6]

Inflammatory pain

- Prostaglandins (from cyclooxygenase-2) and cytokines (tumor necrosis factor alpha, IL-1β) lower nociceptor thresholds, causing allodynia. Corticosteroids and nonsteroidal anti-inflammatory drugs (NSAIDs) mitigate this by suppressing inflammation.[4]

Clinical implications

- Surgical techniques minimizing nerve injury (e.g., nerve-sparing mastectomy) reduce persistent post-surgical pain.[10]
- Multimodal analgesia (e.g., combining NSAIDs, local anesthetics, and α_2-agonists) targets multiple pathways to improve efficacy.[6]
- Emerging therapies focus on glial modulation and ASIC3 inhibition to address chronic pain.[10]
- This integration of physiology and pathophysiology equips nurses to anticipate pain mechanisms, tailor interventions, and advocate for evidence-based practices in medical-surgical settings.[9]

Table 1: Common pain assessment tools: target populations, scale ranges, and key features

Tool	Population	Scale range	Key features
Numeric rating scale	Adults, children ≥8 years	0–10	Simple verbal/written scale; correlates with VAS; suitable for telemedicine.[12]
Visual analogue scale (VAS)	Adults, adolescents	0–10 (10 cm line)	Continuous scale for nuanced intensity measurement; sensitive to treatment effects.[13]
FLACC scale	Non- verbal patients (e.g., infants, intubated adults)	0–10 (sum of 5 criteria)	Observational tool assessing face, legs, activity, cry, consolability.[14]
Wong–Baker faces scale	Children ≥3 years, cognitively impaired	0–10 (6 faces)	Visual faces representing pain levels; culturally validated for diverse groups.[15]

VAS: Visual Analog Scale, FLACC: Face, legs, activity, cry, and consolability

Pain Assessment

Importance of accurate pain assessment

Accurate pain assessment is foundational to effective pain management in medical-surgical nursing. It directly influences treatment efficacy, patient recovery, and satisfaction. Nurses play a pivotal role in identifying pain characteristics (intensity, location, duration) and contextual factors (psychosocial influences, cultural beliefs, past experiences) that shape pain perception [Table 1]. Poor assessment can lead to undertreatment or overtreatment, exacerbating complications such as delayed healing or opioid dependence. Regular reassessment using validated tools ensures interventions are tailored and responsive.[11]

Pain assessment tools

Several validated tools are available to assess pain across different patient populations, considering age, cognitive status, and communication ability. The table below summarizes commonly used pain assessment tools, including their target groups, scoring systems, and key features for effective clinical use.

Patient-centered approaches

- Active listening: Prioritize patient narratives to understand pain descriptors (e.g., "burning," "throbbing") and contextual triggers.[16]
- Shared decision-making: Collaborate on treatment plans, respecting preferences for pharmacological/non-pharmacological interventions.
- Communication adaptations: Use professional interpreters for language barriers and visual aids for low literacy.[8]

Cultural, psychological, and age-related considerations

Cultural sensitivity

Pain expression varies by cultural norms (e.g., stoicism in some groups vs. vocalization in others). Assessment tools must align with patients' communication styles.[17]

Psychological factors

Anxiety, depression, and trauma history can amplify pain perception. Differentiate pain from distress using behavioral cues (e.g., guarding, facial tension).[18]

Age-specific adaptations

- Pediatrics: Face, legs, activity, cry, and consolability (FLACC) and Wong–Baker scales address developmental limitations in self-reporting.[17]
- Elderly: Adjust for cognitive decline (e.g., pain assessment in the advanced dementia scale for dementia) and comorbidities masking pain.[18]

Pharmacological Management of Pain

Analgesic categories: Non-opioids, opioids, adjuvants

Non-opioids

- NSAIDs (e.g., ibuprofen, aspirin, naproxen) reduce pain and inflammation by inhibiting prostaglandin synthesis.
- Acetaminophen is effective for mild-to-moderate pain and fever but lacks anti-inflammatory properties. It is often preferred for patients with gastrointestinal risks or those who cannot tolerate NSAIDs.[19]

Opioids

Opioids include morphine, codeine, oxycodone, hydrocodone, and fentanyl. These drugs bind to opioid receptors in the central nervous system, blocking pain signals. Opioids are reserved for moderate-to-severe pain due to risks of tolerance, dependence, and side effects.[20]

Adjuvants

Medications not primarily designed for pain relief but that enhance analgesic effects or target specific pain types. Examples include antidepressants, anticonvulsants, and muscle relaxants, especially useful in neuropathic pain.[21]

Multimodal analgesia

Combines medications from different classes (e.g., NSAIDs, acetaminophen, opioids, adjuvants) to target multiple pain pathways, improving pain control while minimizing opioid requirements and side effects.

Pre-emptive analgesia

Involves administering analgesics before surgical procedures to prevent central sensitization and reduce post-operative pain intensity and analgesic requirements.[7]

Routes of administration

- Oral: Tablets, capsules, liquids; convenient for most patients with stable pain.
- Intravenous: Rapid onset; used for acute or severe pain, especially postoperatively.
- Patient-controlled analgesia (PCA): Allows patients to self-administer predetermined doses of IV opioids, enhancing autonomy and responsiveness to pain.[21]

- Epidural: Delivers analgesics directly into the epidural space for regional pain control, often used in major surgeries.
- Topical: Creams, gels, or patches (e.g., lidocaine, capsaicin) for localized pain relief.[22]

Side effects and nursing considerations

- NSAIDs: Gastrointestinal bleeding, renal impairment, and hypersensitivity reactions. Monitor for GI symptoms and renal function.
- Acetaminophen: Hepatotoxicity with overdose. Monitor total daily dose, especially in patients with liver disease.
- Opioids: Respiratory depression, constipation, nausea, vomiting, sedation, and risk of dependence. Monitor respiratory rate, sedation level, bowel function, and signs of misuse.[22]
- Adjuvants: Side effects depend on the specific agent (e.g., sedation with anticonvulsants, anticholinergic effects with some antidepressants).[23]

General nursing considerations

- Assess pain regularly using validated tools
- Educate patients about medication use, side effects, and the importance of reporting inadequate pain relief or adverse reactions
- Monitor for drug interactions, especially in polypharmacy
- Adjust regimens for age, comorbidities, and renal/hepatic function.[24]

Non-Pharmacological Pain Management (NPPM) Strategies

NPPM encompasses a range of interventions that do not involve medications but can be highly effective in reducing pain, enhancing comfort, and improving quality of life for medical-surgical patients [Table 2]. These strategies are often used alongside pharmacological treatments, especially for moderate-to-severe pain, and can be used alone for mild pain.[25]

Cognitive-behavioral therapies (CBT)

- CBT helps patients modify negative thoughts and behaviors related to pain, improving coping skills and reducing pain perception

Table 2: Non-pharmacological pain management methods

Method	Example interventions	Evidence/Benefits
Cognitive-behavioral	CBT, guided imagery, distraction	Reduces pain perception, improves coping
Physical	Cold/heat, massage, TENS, reposition	Relieves muscle tension, blocks pain signals
Relaxation	Deep breathing, meditation	Activates relaxation response, lowers pain/anxiety
Complementary	Acupuncture, aromatherapy, music	Effective in cancer/chronic pain, enhances comfort

TENS: Transcutaneous electrical nerve stimulation, CBT: Cognitive-behavioral therapies

- Techniques include patient education, relaxation training, attention distraction, and guided imagery.[26]
- Psychological therapies also address anxiety, depression, and stress, which can exacerbate pain.

Physical methods

- Cold/heat therapy: Application of cold reduces inflammation and numbs pain, while heat relaxes muscles and increases blood flow.[27]
- Massage: Promotes relaxation, reduces muscle tension, and has been shown to significantly decrease pain, especially in cancer patients.[28]
- Transcutaneous electrical nerve stimulation: Delivers mild electrical currents to block pain signals and stimulate endorphin release
- Repositioning and movement restriction/rest: Adjusting patient positioning or limiting movement can relieve pressure and pain
- Physical and Occupational Therapy: Includes exercise, stretching, and strengthening to improve function and reduce pain.

Relaxation techniques

- Deep breathing: Diaphragmatic or "belly" breathing activates the parasympathetic nervous system, reducing muscular tension and pain.[7]
- Guided imagery: Involves visualizing calming scenes or experiences to shift focus from pain.
- Meditation: Mindfulness and meditation help decrease pain intensity and improve emotional well-being.

Complementary therapies

- Acupuncture and acupressure: Stimulate specific points on the body to relieve pain; supported by evidence for effectiveness in cancer and chronic pain.[26]
- Aromatherapy: Use of essential oils (e.g., lavender) for relaxation and pain relief, especially in palliative care.[29]
- Music therapy: Listening to or creating music can distract from pain, reduce anxiety, and enhance mood.[22]
- Reflexology: Manual stimulation of specific points on the feet or hands shown to reduce pain in some clinical populations.[5]

Benefits and nursing considerations

- NPPM strategies are generally safe, low-cost, and easy to implement at the bedside.
- They address not only physical but also cognitive, affective, and sociocultural aspects of pain, promoting a sense of control and autonomy for patients.[29]
- Nurses should educate patients about these options, tailor interventions to individual preferences and needs, and integrate them into comprehensive pain management plans.[10]

Integrating these evidence-based non-pharmacological strategies can significantly enhance pain management

outcomes and patient satisfaction in the medical-surgical setting.[27]

Role of Nurses in Pain Management

Advocacy and patient education

- Nurses serve as advocates for patients, ensuring their pain is recognized, accurately assessed, and appropriately managed, regardless of personal or institutional biases.[30]
- Patient education is central: nurses teach patients about pain management options, medication use, side effects, and self-care strategies, empowering them to participate actively in their care.[31]

Monitoring and documentation

- Continuous pain assessment and meticulous documentation are critical nursing responsibilities.[7] Nurses use validated pain scales, monitor treatment effectiveness, and record patient responses, which guide ongoing pain management and interdisciplinary communication.[32]

Collaborating with interdisciplinary teams

- Nurses work closely with physicians, pharmacists, physical therapists, and other healthcare professionals to develop and implement individualized pain management plans. Their insights from direct patient care are vital for tailoring interventions and adjusting therapies as needed.[31]

Addressing barriers to effective pain control

- Nurses identify and help overcome barriers such as misconceptions about pain, fear of addiction, inadequate assessment, and institutional limitations. They foster open communication, challenge stigma, and advocate for evidence-based practices to improve pain outcomes.[33]

Pain Management in Special Populations

Elderly patients

- Older adults may have atypical pain presentations and are at increased risk for undertreatment due to cognitive impairment, communication barriers, or concerns about medication side effects. Nurses must use age-appropriate assessment tools and adjust pain management plans to account for comorbidities and polypharmacy.[31]

Pediatric patients

- Children require developmentally appropriate assessment tools (e.g., FLACC, Wong–Baker Faces) and interventions. Nurses play a key role in involving families, using non-pharmacological measures, and ensuring safe medication dosing.[32]

Post-operative patients

- Nurses are responsible for early recognition, assessment, and management of acute post-operative pain, which is critical for patient comfort and recovery.[34] They implement both pharmacological and non-pharmacological interventions and monitor for complications.[28]

Patients with chronic illnesses or cancer

- Chronic and cancer pain management requires a holistic, multidisciplinary approach. Nurses provide ongoing assessment, support for self-management, and address physical, emotional, and psychosocial needs.[27]

Barriers and Challenges in Pain Management

- Misconceptions and stigma: Persistent myths about pain expression and opioid use can lead to undertreatment and patient suffering.
- Inadequate assessment: Failure to use appropriate tools or to recognize non-verbal cues, especially in vulnerable populations, remains a significant barrier.
- Fear of addiction or side effects: Both patients and providers may hesitate to use effective analgesics due to concerns about dependence or adverse effects.
- Institutional policies and resource limitations: Restricted access to pain medications, lack of staff training, and time constraints can impede optimal pain management.[10]

Recent Advances and Innovations in Pain Management

- Enhanced recovery after surgery protocols: Multimodal, evidence-based pathways that optimize pain control, reduce opioid use, and promote faster recovery.[5]
- PCA: Allows patients to self-administer pain medication, improving autonomy and satisfaction.[30]
- Virtual reality and digital therapeutics: Emerging tools for distraction and cognitive-behavioral interventions, especially in pediatric and chronic pain populations.
- Evidence-based nursing interventions: Nurses increasingly lead initiatives in implementing non-pharmacological strategies, patient education, and individualized care plans.[32]

Conclusion

Summary of key points

Nurses are central to pain management in medical-surgical settings, from assessment and advocacy to intervention and education. Their role is multifaceted and essential for optimal patient outcomes.[34]

Importance of holistic, patient-centered pain care

Effective pain management requires a holistic, individualized approach that addresses physical, psychological, and social dimensions of pain. [34]

Recommendations for nursing practice, education, and research

- Ongoing education and training in pain assessment and management for nurses
- Greater emphasis on interdisciplinary collaboration and patient-centered care

- Continued research into innovative pain management strategies and overcoming barriers to effective pain relief.

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