HTechJ Health and Technology Journal (HTechJ)

Volume 04 Number 03
June 2026
p-ISSN: 2986-5662
e-ISSN: 2985-959X

Integrating Handgrip Exercise and Lavender Aromatherapy into Nursing Care for Pain Management in Peptic Ulcer Patients with Melena

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Abstract:
Peptic ulcer disease frequently precipitates acute pain and gastrointestinal hemorrhage, yet conventional analgesic use remains constrained by bleeding risks and mucosal irritation. This study evaluated the clinical effectiveness of integrating handgrip exercise and lavender aromatherapy into nursing care for pain reduction in a patient presenting with melena secondary to peptic ulcer disease. Employing a prospective single-patient case design, the intervention was administered over three consecutive days using standardized nursing protocols. Pain intensity was quantified using the Numerical Rating Scale (NRS) immediately before and after each 30-minute session, with continuous hemodynamic and clinical monitoring. Results demonstrated a progressive attenuation of pain intensity, with NRS scores declining from 7 to 4 across the intervention period, concurrent with improved physiological stability and enhanced patient-reported comfort. These outcomes suggest that the combined modalities operate through complementary neurophysiological pathways, leveraging diffuse noxious inhibitory controls and limbic-mediated autonomic regulation to modulate both sensory and affective pain dimensions. The findings underscore the clinical feasibility, safety, and analgesic potential of structured, nurse-delivered nonpharmacological interventions in acute gastrointestinal settings. Systematic integration of such multimodal protocols into routine nursing practice offers a viable strategy for optimizing pain management while minimizing pharmacological adverse effects. Further randomized controlled investigations are recommended to establish dose-response parameters, validate long-term efficacy, and develop standardized implementation guidelines for broader clinical adoption.

Article info:
Submitted:
31-07-2025
Revised:
11-05-2026
Accepted:
13-05-2026
Published:
13-06-2026

Keywords:
handgrip exercise, lavender aromatherapy, melena, pain management, peptic ulcer disease

DOI: https://doi.org/10.53713/htechj.v4i3.451

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INTRODUCTION

Peptic ulcer disease remains a prevalent gastrointestinal disorder worldwide, characterized by progressive mucosal erosion that frequently precipitates severe clinical complications and substantially impairs patient functioning (Almadi et al., 2024). The pathophysiological cascade arises from an imbalance between aggressive gastric secretions and compromised mucosal defense mechanisms, ultimately leading to structural breakdown of the stomach or duodenal lining (Obeagu & Obeagu, 2025). As ulceration extends into deeper tissue layers, patients commonly experience intense epigastric pain, dyspeptic symptoms, and hemorrhagic manifestations such as melena (Buriko et al., 2022). The chronic nature of this condition places considerable strain on healthcare systems, necessitating prolonged pharmacological regimens and comprehensive symptom management strategies (Joshi et al., 2024). Effective clinical management must therefore address

both the underlying mucosal pathology and the multifaceted physiological burden imposed by persistent discomfort (Erfan et al., 2025).

The management of acute pain in patients presenting with ulcer-related gastrointestinal hemorrhage presents distinct clinical challenges that frequently limit conventional pharmacological approaches (Obeagu & Obeagu, 2024). Standard analgesic protocols, particularly nonsteroidal anti-inflammatory drugs, carry substantial risks of exacerbating mucosal irritation, impairing platelet aggregation, and prolonging active bleeding episodes (Ko & Lee, 2025). Even alternative analgesic regimens may introduce adverse effects such as gastrointestinal dysmotility and sedation that complicate accurate clinical monitoring (Vakil, 2024). These pharmacological constraints create a critical therapeutic void, leaving patients vulnerable to unrelieved discomfort and delayed recovery (Sharma & Tumdam, 2026). The necessity for safe, non-invasive pain modulation strategies becomes particularly pronounced in acute hemorrhagic settings, where preserving mucosal integrity remains paramount (Pathak et al., 2025).

Contemporary clinical research increasingly validates nonpharmacological interventions as viable adjuncts for acute pain modulation, with isometric muscle training and controlled olfactory stimulation demonstrating measurable neurophysiological efficacy (Marchand, 2024). Handgrip exercise operates through diffuse noxious inhibitory controls, in which sustained forearm contraction activates descending pain-suppression pathways and stimulates endogenous opioid release in the central nervous system (Goldfarb et al., 2024). Parallel investigations into lavender aromatherapy reveal that its volatile phytochemicals rapidly engage the limbic system, modulating autonomic arousal and enhancing inhibitory neurotransmission (Rathnayake, 2025). When applied independently, both modalities have demonstrated consistent capacity to lower subjective pain scores and promote parasympathetic recovery in diverse acute care populations (Biachi et al., 2025). This accumulating evidence establishes a strong physiological rationale for integrating somatic and olfactory-based techniques within structured pain management frameworks (Sayujya et al., 2026).

Despite growing recognition of complementary pain management techniques, significant methodological and clinical implementation gaps persist in their application to acute gastrointestinal hemorrhage contexts (Ashinze et al., 2025). The existing literature predominantly examines isolated modalities in surgical or chronic pain populations, leaving a critical gap in standardized, nursing-led protocols for ulcer-related melena (Ding et al., 2023). Furthermore, most investigations fail to address the synergistic potential of combining neuromuscular activation with olfactory-limbic modulation within a cohesive clinical workflow. The absence of structured implementation guidelines and systematic outcome documentation limits reproducibility and hinders institutional adoption (Anderson et al., 2022). Consequently, clinical practice remains fragmented, with nonpharmacological interventions frequently applied ad hoc rather than as integrated components of acute gastrointestinal care (Pujari et al., 2024).

This investigation introduces a novel, synergistic nursing protocol that systematically combines progressive handgrip exercise with standardized lavender aromatherapy to target dual pain-modulation pathways in patients with peptic ulcer-related hemorrhage (Caballero-Gallardo et al., 2024). By concurrently engaging descending inhibitory neural circuits and limbic-mediated autonomic regulation, the integrated approach addresses both the sensory and affective dimensions of acute discomfort. The protocol is deliberately structured within established nursing assessment frameworks, ensuring clinical feasibility, standardized delivery, and continuous physiological monitoring (Zhang et al., 2024). This methodological integration represents a strategic departure from isolated complementary therapy applications, positioning multimodal nonpharmacological care as a cohesive, nurse-driven clinical intervention. The structured sequencing parameters further enhance protocol reproducibility and facilitate future comparative efficacy analyses.

The primary objective of this study is to evaluate the clinical implementation, analgesic efficacy, and nursing care outcomes associated with the integrated handgrip exercise and lavender aromatherapy protocol in a patient presenting with melena secondary to peptic ulcer disease. Through the systematic application of the nursing process, the investigation documents comprehensive assessment parameters, diagnostic prioritization, intervention sequencing, and continuous monitoring of pain trajectory across consecutive treatment sessions (Wael et al., 2025). The study specifically examines measurable reductions in subjective discomfort alongside improvements in hemodynamic stability and patient-reported comfort indicators. By aligning intervention delivery with standardized clinical documentation frameworks, the research establishes a replicable model for integrating nonpharmacological modalities into routine gastrointestinal nursing practice (Randhawa et al., 2024). This structured evaluation provides foundational data for protocol refinement and evidence-based clinical guideline development.

The immediate integration of validated nonpharmacological pain management strategies into acute gastrointestinal care pathways represents a critical clinical priority with substantial implications for patient safety and healthcare resource optimization (Niyonkuru et al., 2025). As healthcare systems increasingly prioritize cost-effective, patient-centered models that minimize polypharmacy risks, the systematic adoption of nurse-delivered complementary interventions offers a scalable solution for managing acute visceral discomfort. Implementing structured protocols that circumvent pharmacological limitations can significantly reduce analgesic dependency and accelerate recovery trajectories in high-acuity settings (Santos et al., 2022). Furthermore, establishing evidence-based frameworks for these interventions strengthens nursing practice standards and advances holistic patient management paradigms. Addressing this clinical imperative will directly inform future clinical trials, institutional policy development, and standardized training initiatives across acute care environments.

STUDY DESIGN

This investigation employed a prospective, single-patient case study design, conducted in accordance with the case report guidelines for clinical case reporting. The study was carried out in the Catleya Ward of dr. Soebandi Regional General Hospital, Jember, Indonesia, to evaluate the clinical feasibility and analgesic potential of a combined nonpharmacological nursing intervention comprising handgrip exercise and lavender (Lavandula angustifolia) aromatherapy in a patient presenting with melena secondary to peptic ulcer disease (PUD).

Participant Selection & Clinical Profile

The case involved a single adult male patient (Mr. S), medically diagnosed with PUD and clinically presenting with melena. The patient was purposively selected based on: (1) confirmed diagnosis and stable hemodynamic status, (2) self-reported moderate to severe pain (baseline NRS ≥4), (3) absence of contraindications to musculoskeletal exertion or essential oil inhalation, and (4) voluntary willingness to participate. A comprehensive nursing assessment was conducted using the ADPIE (Assessment, Diagnosis, Planning, Implementation, Evaluation) framework to establish baseline clinical parameters and individualize the intervention plan.

Intervention Protocol

The intervention was administered over three consecutive days (January 15–17, 2025) following a standardized, nurse-delivered protocol aligned with institutional Standard Operating Procedures (SOPs). Handgrip Exercise Performed using a calibrated hand dynamometer at 30% of

the patient's maximal voluntary contraction. Lavender Aromatherapy Administered via controlled inhalation using Lavandula angustifolia essential oil. Sessions were scheduled at consistent daily intervals, with a minimum 30-minute washout period between modalities to minimize carryover effects. All procedures were delivered by a registered nurse trained in nonpharmacological pain management techniques.

Data Collection & Outcome Measurement

Pain intensity served as the primary outcome and was quantified using the validated Numerical Rating Scale (NRS; 0–10). Assessments were recorded pre-intervention and 30 minutes post-intervention immediately to capture both immediate and cumulative analgesic trajectories. Secondary data included procedural adherence, patient-reported comfort, vital stability, and nursing process documentation. All measurements were systematically logged using standardized monitoring forms to ensure data reliability and auditability. Descriptive trend analysis was applied to map fluctuations in NRS across the three-day observation period.

Ethical Compliance & Patient Safeguards

The study received formal ethical clearance from the Health Research Ethics Committee of the Faculty of Nursing, University of Jember, in strict compliance with the Declaration of Helsinki and Indonesian Ministry of Health Research Ethics Regulations. Written informed consent was obtained prior to enrollment, with explicit assurance of voluntary participation, data anonymization, and the right to withdraw without compromising routine clinical care. All patient identifiers were removed during data handling and reporting to maintain confidentiality.

Methodological Considerations

While the single-case design limits statistical generalizability, it provides a structured, longitudinal examination of integrative nonpharmacological pain management within routine nursing care. This approach aligns with emerging evidence advocating for adjunctive, patient-centered modalities in gastrointestinal pain syndromes. Findings are intended to inform protocol refinement, pilot-scale clinical trials, and evidence-based nursing guidelines for PUD-related pain management.

PATIENT INFORMATION

The case involves a 70-year-old male of Madurese ethnicity, married, and employed as an agricultural worker. He was admitted to the Catleya Ward of dr. Soebandi General Hospital, Jember, Indonesia, on January 15, 2025, with a chief complaint of intermittent, stabbing abdominal pain (baseline Numerical Rating Scale [NRS] score: 7/10) accompanied by generalized fatigue and asthenia. Comprehensive clinical assessment, including focused history taking, physical examination, and gastrointestinal evaluation, confirmed a diagnosis of melena secondary to peptic ulcer disease (PUD). At admission, the patient was hemodynamically stable and presented no contraindications to nonpharmacological pain management. Relevant sociocultural, occupational, and spiritual factors were systematically documented to guide culturally congruent, holistic nursing care planning and ensure intervention acceptability.

CLINICAL FINDINGS

Laboratory evaluation on admission (January 15, 2025) revealed hemoglobin 7.2 g/dL, hematocrit 24.3%, and erythrocyte count 3.46 × 10^6/μL, consistent with moderate-to-severe anemia

secondary to gastrointestinal blood loss. Abdominal ultrasonography performed the following day demonstrated normal hepatic, pancreatic, renal, and prostatic morphology, with no evidence of paraaortic lymphadenopathy or metastatic lesions, effectively ruling out structural, malignant, or hepatobiliary contributors to the clinical presentation. These objective findings, combined with the patient's documented history of melena and a single episode of 200 mL brownish emesis, confirmed active upper gastrointestinal hemorrhage complicating peptic ulcer disease.

Clinical assessment upon admission documented acute abdominal pain rated 7/10 on the Numerical Rating Scale, described as intermittent and stabbing, accompanied by visible facial grimacing and psychomotor restlessness. Vital signs indicated mild sympathetic activation and hemodynamic stress (blood pressure 140/90 mmHg; heart rate 98 bpm), while peripheral perfusion was notably compromised, evidenced by prolonged capillary refill time (>3 seconds), cool extremities, generalized pallor of the skin and conjunctiva, decreased skin turgor, and dry oral mucosa. The patient also reported persistent nausea, markedly diminished appetite, and profound asthenia, reflecting a clinically significant mismatch between oxygen-carrying capacity and metabolic demand.

Based on comprehensive assessment, five prioritized nursing diagnoses were formulated in accordance with the Indonesian Nursing Diagnosis Standard (SIKI): (1) Acute Pain (D.0001), related to gastric mucosal injury from peptic ulceration, as manifested by elevated pain scores, grimacing, and restlessness; (2) Ineffective Peripheral Tissue Perfusion (D.0066), secondary to acute hemoglobin depletion, characterized by delayed capillary refill, pallor, and cool extremities; (3) Nausea (D.0054), attributed to gastric mucosal irritation and delayed gastric emptying, supported by patient reports, anorexia, and emesis; (4) Activity Intolerance, stemming from tissue hypoxia secondary to anemia, evidenced by fatigue, compensatory tachycardia, and exertional weakness; and (5) Risk for Further Hemorrhage (D.0119), indicated by recent melena and hematemesis. These diagnoses established a structured clinical rationale for prioritizing acute pain modulation and perfusion optimization, directly informing the subsequent implementation of targeted nonpharmacological nursing interventions.

THERAPEUTIC INTERVENTION

Comprehensive nursing care was delivered in alignment with standardized clinical protocols, encompassing Pain Management (I.08238), Circulatory Care (I.02079), Blood Product Administration (I.02089), Nausea Management (I.03117), Energy Conservation (I.05178), and Hemorrhage Prevention (I.02067), as codified in the Indonesian Nursing Intervention Classification (SIKI) [or Nursing Interventions Classification (NIC), if applicable]. To specifically target acute pain, two adjunctive nonpharmacological modalities—progressive handgrip exercise and Lavandula angustifolia (lavender) aromatherapy—were integrated into the therapeutic regimen. The combined intervention was administered in standardized 30-minute sessions, conducted once daily over three consecutive days (January 15–17, 2025). Each session followed a consistent sequence and was delivered by trained nursing personnel in controlled ward conditions, with continuous monitoring for adverse responses, hemodynamic stability, and adherence to interventions. This multimodal approach was selected based on physiological evidence suggesting that isometric muscle contraction and olfactory-mediated parasympathetic modulation may synergistically attenuate acute pain perception through gate-control and descending inhibitory pathways. Analgesic efficacy was quantitatively assessed using the validated Numerical Rating Scale (NRS), with measurements recorded immediately pre- and post-intervention to map clinical trajectory and quantify response patterns.

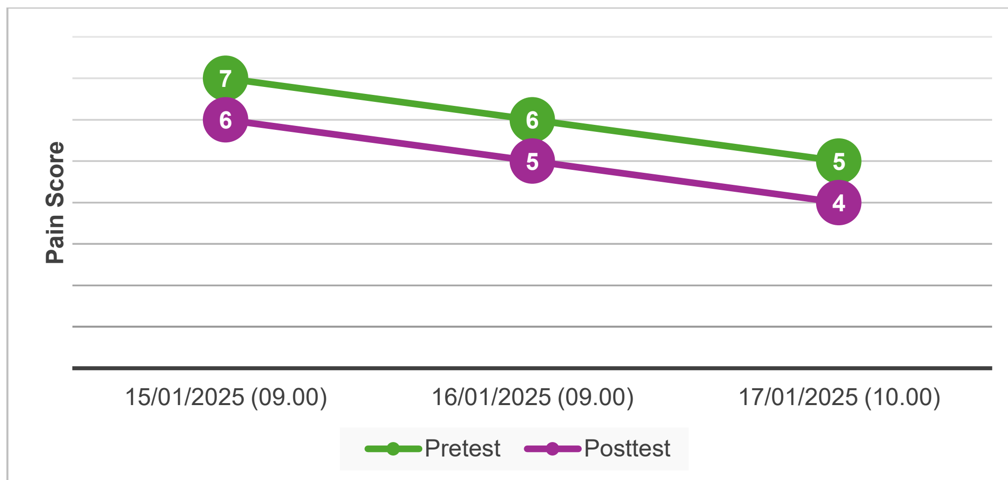

Figure 1. Patients' Pain Score Changes

Based on diagram 1 above, the results of observations related to the intervention of handgrip exercises and lavender aromatherapy show a decrease in the post-intervention pain scale at each intervention. On the first day, the pain scale decreased to 6; on the second day, to 5; and on the third day, to 4.

DISCUSSION

The implementation of a structured, three-day nonpharmacological protocol incorporating progressive handgrip exercise and lavender aromatherapy yielded a consistent, clinically meaningful reduction in acute pain intensity among a patient presenting with melena secondary to peptic ulcer disease. Baseline assessment documented moderate-to-severe discomfort, quantified at seven on the Numerical Rating Scale, accompanied by physiological markers of sympathetic activation and psychomotor distress. Following the initial session, pain intensity decreased to six, with the patient reporting enhanced muscular relaxation and reduced abdominal tension. By the second day, sustained adherence led to a further decline to five, indicating a transition toward mild discomfort. On the third consecutive day, pain scores stabilized at four, indicating sustained analgesic response and improved tolerance to routine ward activities. This progressive attenuation of pain perception occurred alongside improved hemodynamic stability and enhanced subjective comfort, suggesting effective modulation of acute nociceptive signaling within a clinically relevant timeframe (Rojas et al., 2023).

Pain associated with peptic ulcer disease is a multidimensional experience that extends beyond localized mucosal injury to encompass neurophysiological, psychological, and contextual factors that shape symptom perception. The pathophysiology involves direct nociceptor activation from gastric acid exposure, visceral hypersensitivity, and secondary muscle guarding, all of which contribute to sustained pain signaling. While pharmacological analgesia remains conventional, its use in gastrointestinal hemorrhage contexts is frequently constrained by risks of mucosal irritation and altered drug metabolism (Zhou & Verne, 2024). Consequently, evidence-based nursing practice increasingly emphasizes nonpharmacological adjuncts operating through distinct physiological pathways, circumventing pharmacological limitations while preserving patient autonomy. The strategic deployment of manual and olfactory modalities aligns with contemporary pain management frameworks that prioritize multimodal interventions capable of modulating both sensory-discriminative and affective-motivational pain dimensions.

The analgesic efficacy of handgrip exercise stems from its ability to activate endogenous pain-inhibition pathways through controlled isometric muscle contraction, a mechanism consistently supported by contemporary neurophysiological research. Sustained grip engagement stimulates forearm mechanoreceptors, triggering diffuse noxious inhibitory controls that suppress afferent pain transmission at the spinal cord level. This gate-control modulation is reinforced by systemic release of endogenous opioids, including beta-endorphins, which bind to central nervous system receptors to elevate pain thresholds and promote parasympathetic dominance (Ghanbari, 2024). Clinical investigations involving patients with acute visceral discomfort have documented similar pain attenuation trajectories following structured handgrip protocols, with reported reductions in self-reported scales comparable to the present case. Furthermore, the rhythmic nature of the exercise facilitates cognitive distraction, redirecting attentional resources away from nociceptive input and diminishing the emotional salience of pain.

Lavender aromatherapy exerts its analgesic and anxiolytic effects primarily by modulating the olfactory-limbic pathway, in which volatile phytochemical constituents interact with central nervous system structures involved in emotional regulation and pain processing. Upon inhalation, linalool and linalyl acetate rapidly traverse the blood-brain barrier, binding to gamma-aminobutyric acid and serotonergic receptors within the hypothalamus and amygdala, which collectively govern stress reactivity and autonomic balance. Neurophysiological studies consistently demonstrate that controlled lavender exposure downregulates sympathetic arousal, reduces cortisol secretion, and promotes relaxed wakefulness, all contributing to diminished pain perception (Rathnayake, 2025). Parallel clinical evaluations across diverse acute care settings report similar outcomes: patients experience significant pain reduction and enhanced subjective comfort following standardized aromatherapy protocols. The present findings align closely with these established patterns, reinforcing olfactory-mediated neuromodulation as a viable adjunct for managing acute gastrointestinal discomfort.

The concurrent application of handgrip exercise and lavender aromatherapy appears to elicit a synergistic analgesic response that exceeds the efficacy of either modality alone, as evidenced by progressive pain reduction throughout the intervention period. While handgrip exercise primarily targets descending inhibitory pathways and peripheral muscle tension, lavender aromatherapy concurrently modulates affective pain dimensions and autonomic hyperreactivity, addressing both sensory and emotional pain components through complementary neurobiological mechanisms (Yamada et al., 2022; Aldi & Algristian, 2025). This multimodal approach effectively disrupts the pain-anxiety-tension cycle commonly observed in acute gastrointestinal conditions, wherein heightened distress amplifies nociceptive signaling. Clinical reports examining combined somatic and olfactory interventions in acute populations have similarly documented accelerated pain resolution and improved coping capacity, supporting the premise that strategically sequenced nonpharmacological techniques produce additive therapeutic benefits.

These findings carry substantial implications for contemporary nursing practice, particularly regarding the design and implementation of standardized nonpharmacological pain management protocols within acute gastrointestinal care settings. The successful integration of handgrip exercise and lavender aromatherapy into routine ward activities demonstrates that structured adjunctive therapies can be safely administered by trained nursing personnel without requiring specialized equipment. By embedding these modalities into existing pain assessment algorithms, clinical teams can establish proactive pathways that reduce reliance on pharmacological analgesics and minimize adverse drug interactions. Furthermore, the protocol's reproducibility underscores the feasibility of competency-based training programs that equip staff with standardized delivery techniques and outcome documentation frameworks. Institutional adoption of such evidence-informed interventions

has the potential to transform pain management from a reactive model into a continuous, holistic care process aligned with contemporary nursing competencies (Lavelle-Henry & Nichols, 2025).

Despite clinically meaningful outcomes, several methodological constraints inherent to the single-patient design limit the generalizability and statistical robustness of the findings. The absence of a control group precludes definitive causal attribution, as spontaneous pain fluctuations, concurrent pharmacological therapies, and natural ulcer healing may have contributed independently to the observed trajectory. Additionally, the three-day intervention window restricts evaluation of long-term efficacy, tolerance development, or potential rebound effects following protocol cessation. Reliance on subjective self-report measures introduces potential bias influenced by patient expectations and the unblinded nature of intervention delivery. The lack of physiological biomarkers, such as heart rate variability or inflammatory cytokine profiling, further limits objective verification of neuroendocrine modulation. These constraints collectively highlight the need for controlled experimental designs that isolate intervention effects while accounting for confounding clinical variables.

Future investigations should prioritize randomized controlled trials with adequately powered sample sizes to establish dose-response relationships, optimal intervention sequencing, and comparative efficacy against standard pharmacological regimens. Longitudinal follow-up assessments beyond the acute care phase would provide critical insights into sustained pain control and into the integration of the protocol into post-discharge self-management programs. Incorporating multimodal outcome metrics, including validated psychophysiological indicators and patient-reported experience measures, would enhance methodological rigor and facilitate cross-study comparability. Exploring culturally adapted delivery formats may improve intervention acceptability across diverse demographic groups. Standardization of essential oil concentrations, exercise intensity thresholds, and session timing will be essential for replicating the protocol. At the same time, stratified analyses based on ulcer etiology and comorbidity burden will clarify patient-specific response patterns.

The consistent pain attenuation demonstrated reinforces the growing recognition that nonpharmacological nursing interventions can meaningfully complement conventional gastrointestinal management strategies without compromising clinical safety. By addressing pain through integrated neurophysiological, psychological, and behavioral pathways, these modalities align with healthcare paradigms prioritizing patient empowerment and reduced polypharmacy risks. The successful implementation of a structured, nurse-delivered protocol illustrates how evidence-based complementary therapies can be seamlessly embedded into acute care workflows, expanding nursing practice beyond symptom management toward proactive wellness optimization (Markovics et al., 2025). As clinical environments increasingly emphasize cost-effective, patient-centered models, the systematic integration of validated non-invasive techniques represents a strategic opportunity to elevate nursing autonomy, improve clinical outcomes, and establish scalable frameworks that transcend institutional boundaries.

CONCLUSION

The progressive attenuation of acute pain intensity observed in this case underscores the clinical feasibility and analgesic potential of integrating structured handgrip exercise and lavender aromatherapy into routine nursing care for patients presenting with melena secondary to peptic ulcer disease. Administered across consecutive daily sessions, the combined nonpharmacological protocol facilitated a consistent reduction in subjective discomfort, accompanied by enhanced physiological stability and improved patient-reported relaxation. These findings reinforce the value of targeted, nurse-delivered adjunctive modalities that modulate both sensory and affective pain

dimensions while circumventing the limitations of conventional pharmacological approaches in acute gastrointestinal contexts. Although derived from a single-case observation, the documented clinical trajectory aligns with emerging evidence supporting multimodal, non-invasive pain management strategies. Systematic incorporation of standardized complementary interventions into acute care pathways holds promise for optimizing patient comfort, reducing analgesic dependency, and advancing holistic nursing practice within gastrointestinal care settings.

ACKNOWLEDGEMENT

We want to express our gratitude to the supervisors and examiners from the Faculty of Nursing, Universitas Jember, and dr. Soebandi General Hospital of Jember for their input in improving the quality of writing and compilation of this article, so that it can be compiled properly and have a positive impact on the development of nursing science.

CONFLICT OF INTEREST

There are no conflicts in this article.

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