

# INTEGRATING CONSERVATION AND CULTURAL CARE THEORIES IN NURSING MANAGEMENT OF DIABETIC FOOT ULCER: A CASE STUDY

Lenny Nurhandayani<sup>a\*</sup>, Dina Dewi Sartika Lestari Ismail<sup>b</sup>, Heri Kristianto<sup>c</sup>

<sup>a</sup>Polytechnic of Health Ministry of Health Jayapura, Papua, Indonesia.

<sup>b,c</sup>Nursing Masters Study Program, Universitas Brawijaya, Indonesia,

\*Corresponding author: l3nny.kmbprodiwatmimika@gmail.com

## Abstract

**Introduction:** Managing severe neuro-ischemic diabetic foot ulcers (DFUs) with metabolic and behavioral barriers requires bridging pathophysiology with holistic nursing models. **Objectives:** This study aims to evaluate the integration of Myra Levine's Conservation Model and Madeleine Leininger's Cultural Care Theory in DFU management. **Methods:** A qualitative case study approach was used for an 81-year-old male with a severe neuro-ischemic DFU, metabolic exhaustion, and behavioral non-compliance. **Results:** Integration of the frameworks allowed for metabolic stabilization, wound bed improvement (tracked via LUMT), and behavioral restructuring regarding dietary habits. **Conclusions:** Combining objective clinical metrics with dual nursing frameworks addresses the complexities of geriatric diabetic care. Practical **Recommendations:** Nursing practice should incorporate transcultural assessments and theory-guided frameworks to improve outcomes in culturally diverse populations.

**Keywords:** diabetic foot ulcer; nursing theory; case study; conservation model; cultural care

## INTRODUCTION

Diabetes mellitus (DM) remains one of the most significant global health challenges, with an estimated 852.5 million adults projected to be living with diabetes by 2050 (IDF Diabetes Atlas, 2024). One of its most serious complications is diabetic foot ulcer (DFU), affecting 15–25% of people with diabetes and accounting for more than 85% of non-traumatic lower-extremity amputations worldwide (Dawi et al., 2025). Although the global prevalence of DFU is 6.3% (Maldonado et al., 2023), the prevalence in Indonesia reaches 26%, highlighting the need for effective nursing interventions to improve patient outcomes (Sari et al., 2022). DFUs are associated with impaired quality of life, frequent recurrence, prolonged hospitalization, and increased mortality, particularly among older adults with diabetes (McDermott et al., 2022).

DFU healing is a complex process influenced by peripheral neuropathy, peripheral arterial disease, persistent hyperglycemia, chronic inflammation, and impaired tissue regeneration (Liang et al., 2024; Dawi et al., 2025). However, physiological factors alone do not determine healing outcomes. Patients' medication adherence, dietary practices, cultural beliefs, and family support also play important roles in diabetes self-management and wound recovery. Therefore, effective nursing care should address both physiological problems and the psychosocial and cultural factors influencing treatment adherence (Silva et al., 2022).

Among nursing theories, **Levine's Conservation Model** and **Leininger's Culture Care Theory** provide complementary approaches for managing patients with diabetic foot ulcers. Levine's Conservation Model focuses on conserving energy and maintaining structural, personal, and social integrity to support physiological recovery and wound healing (Monaro et al., 2021). However, the model provides limited guidance for addressing patients' cultural beliefs and health behaviors. In contrast, Leininger's Culture Care Theory emphasizes culturally congruent nursing care by integrating patients' beliefs, values, and family practices into

clinical decision-making, thereby improving communication and treatment adherence (Nuuyoma et al., 2024). Nevertheless, this theory provides less emphasis on the physiological processes involved in wound healing. Previous studies have reported the benefits of each theory separately, with Levine's model supporting physiological adaptation and Leininger's theory improving culturally appropriate care and patient self-management (Monaro et al., 2021; Nuuyoma et al., 2024). However, evidence regarding the integration of these two theories in managing severe neuro-ischemic diabetic foot ulcers remains limited.

Therefore, this case report presents the integrated application of **Levine's Conservation Model** and **Leininger's Culture Care Theory** in the nursing management of an older adult with a severe neuro-ischemic diabetic foot ulcer complicated by uncontrolled hyperglycemia, inappropriate dexamethasone use, and poor dietary adherence. The novelty of this report lies in combining complementary nursing theories with objective wound assessment using the **Leg Ulcer Measurement Tool (LUMT)** to support individualized nursing care. This study aims to describe the implementation of this integrated nursing approach and its contribution to holistic, evidence-based, and culturally congruent nursing care for patients with complex diabetic foot ulcers.

## CASE PRESENTATION

Mr.L 81-year-old retired corporate employee with an unmonitored 20-year history of Type 2 Diabetes Mellitus (T2DM) presented with severe, progressive left foot pain (pain scale 4/10) that exacerbated upon ambulation. One week prior, a thermal-like bulla formed on the dorsum of his left foot, ruptured, and was inappropriately cleansed with a household cloth, warm water, and unknown ointment. This triggered rapid tissue expansion, peri-ulcer necrosis, and purulent bloody drainage, leading to admission via the surgical clinic with a critically elevated random.

On assessment, the wound dressing was saturated with yellowish-brown purulent drainage. The patient exhibited grimacing and guarding during light palpation, alongside dizziness and anorexia. The patient demonstrated poor metabolic control and low dietary adherence, frequently consuming high-glycemic foods (donuts and sweetened tea) while relying solely on daily metformin. He also engaged in risky self-medication using over-the-counter dexamethasone and mefenamic acid. His lifestyle history included past heavy smoking (2 packs/day, ceased in 2001) and daily coffee intake. Significant chronic weight loss was noted (85 kg to 68 kg; height 160 cm). Vital signs revealed: BP 120/90 mmHg (MAP 100 mmHg), HR 96 bpm, RR 24 breaths/minute (tachypnea), temperature 36.7 °C, and CRT < 2 seconds.

## DIAGNOSTIC ASSESSMENT

The baseline evaluation of the patient involved a comprehensive combination of hematological analysis, metabolic profiling, and a validated wound measurement instrument to track objective clinical progression.

**Table 1.** Summary of relevant diagnostic findings

| Examination                       | Result                                                            | Clinical Interpretation                                                                                   |
|-----------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Laboratory test                   | GDS 324 mg/dL<br>Albumine 2,5 g/dL                                | Hyperglycemia<br>Hypoalbuminemia                                                                          |
| Clinical scoring/other assessment | wound evaluation using the Leg Ulcer Measurement Tool (LUMT) = 40 | Severe category characterized by secondary infection, extensive necrosis, high-volume exudate, and severe |

|  |  |              |
|--|--|--------------|
|  |  | hyperalgesia |
|--|--|--------------|

### THERAPEUTIC INTERVENTION

Describe pharmacological therapy, medical procedures or interventions, dosage and duration of therapy, patient monitoring, and the rationale for choosing the intervention. Therapeutic information must be written clearly and in accordance with patient safety principles.

### THERAPEUTIC SEQUENCE

Upon admission, management immediately focused on stabilizing metabolic derangements, eradicating polymicrobial infection, and initiating advanced tissue resuscitation. Intravenous fluid resuscitation with Ringer's Lactate (22 gtt/min) was commenced to maintain hemodynamic stability. To treat the extensive liquefactive necrosis and purulent drainage, broad-spectrum empiric antibiotics—intravenous Ciprofloxacin (400 mg q12h) and Metronidazole (500 mg q8h)—were initiated to target aerobic and anaerobic pathogens.

Concurrently, to combat severe glucotoxicity (RBG 325 mg/dL) and insulin resistance driven by infection and prior dexamethasone abuse, long-acting Insulin Detemir (Levemir, 10 units SC nightly) was introduced. Simvastatin (20 mg PO) was added for macrovascular risk management. Locally, addressing the maximum LUMT score of 40, an amorphous hydrogel dressing was applied to promote autolytic debridement of blackened necrosis and alleviate hyperalgesia, paired with an absorbent secondary dressing to safely manage high-volume exudate.

### CASE TIMELINE

Here is the chronological sequence of clinical events and management formatted into a structured table 2.

**Table 2.** Clinical case timeline

| Time             | Clinical Event                                                                                                           | Investigation                                                        | Treatment                                                                                            | Outcome                                                                                                                  |
|------------------|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Day -7 to Day -3 | Formed a thermal-like bulla on the left foot dorsum due to unperceived trauma. Bulla ruptured the following day.         | Inpatient diagnostic workup not yet performed (pre-admission phase). | At-home cleansing using an unsterile household cloth, warm water, and unknown topical ointment.t ... | Ruptured bulla evolved rapidly; progressive tissue breakdown and initiation of peri-ulcer skin necrosis (blackening).    |
| Day -3 to Day 0  | Developed severe, progressive localized left foot pain (pain scale 4/10) that significantly exacerbated upon ambulation. | Self-medication phase; no objective laboratory monitoring.           | Frequent self-administration of over-the-counter (OTC) dexamethasone and mefenamic acid.             | Steroids temporarily masked systemic inflammation but induced profound localized immunosuppression and metabolic crisis. |

|                      |                                                                                                                                                                           |                                                                                                                                                                     |                                                                                                                                                                                                                                          |                                                                                                                                                                      |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Day 0<br>(Admission) | Patient presented to the outpatient surgical clinic due to an expanding, highly painful ulcer with purulent, bloody drainage; subsequently admitted to the surgical ward. | Random Blood Glucose (RBG): 325 mg/dL<br>2. Serum Albumin: 2.5 g/dL<br>3. Total LUMT Score: 40/40 (Severe)<br>4. Vital signs: BP 120/90 mmHg, HR 96 bpm, RR 24 cpm. | 1. IVFD Ringer's Lactate (RL) 22 gtt/min.<br>2. IV Ciprofloxacin 2x400 mg & IV Metronidazole 3x500 mg.<br>3. SC Insulin Detemir (Levemir) 10 units nightly.<br>4. Oral Simvastatin 20 mg.<br>5. Amorphous Hydrogel dressing application. | Stabilization of systemic fluid volume, initiation of broad-spectrum aerobic/anaerobic microbial coverage, and targeted autolytic debridement of blackened eschar.   |
| Follow-up            | Ward-based observation for metabolic stabilization and local infection control. Patient reports persistent dizziness and anorexia.                                        | Serial bedside clinical assessments; monitoring of wound dressing saturation and localized hyperalgesia during dressing changes..                                   | Maintenance of the systemic multi-drug regimen (antibiotics, insulin, and statin) coupled with daily advanced moisture-balance wound care.                                                                                               | Pending evaluation: Targeted reduction in glucotoxicity, improvement in nutritional metrics, control of purulent exudate, and systematic decrease of the LUMT score. |

## OUTCOME AND FOLLOW-UP

Following the initiation of the combined regimen, the patient's clinical parameters demonstrated a steady, positive progression. Within 72 hours, scheduled subcutaneous Insulin Detemir stabilized random blood glucose levels below 180 mg/dL, while vital signs normalized, indicating the resolution of acute systemic inflammation.

Objective wound evaluation via the Leg Ulcer Measurement Tool (LUMT) on Day 7 revealed significant improvements. The amorphous hydrogel dressing effectively facilitated autolytic debridement, noticeably reducing the blackened peri-ulcer necrotic tissue and softening the wound bed. Purulent drainage decreased to a minimal serosanguinous volume, lowering the total LUMT score from 40/40 to 24/40 (severe to moderate). No acute complications, such as sepsis or osteomyelitis, occurred. Short-term follow-up prioritized high-protein dietary adjustments to correct hypoalbuminemia (2.5 g/dL). Long-term plans mandate bi-weekly outpatient wound care and strict metabolic monitoring, objectively demonstrating the utility of the LUMT in managing severe neuro-ischemic diabetic foot ulcers.

**Table 3.** Application of Cultural Care Theory Stages

| Stage                       | Clinical Application                                                                                   |
|-----------------------------|--------------------------------------------------------------------------------------------------------|
| Cultural Care Preservation  | Maintaining respect for the patient's seniority and familial role while identifying dietary risks.     |
| Cultural Care Accommodation | Negotiating specific glycemic boundaries and integrating insulin schedules into family-led meal times. |
| Cultural Care Repatterning  | Restructuring the misconception that oral medication allows for unrestricted high-glycemic intake.     |

## ***DISCUSSION***

The clinical management of this 81-year-old patient demands a comprehensive approach that bridges advanced pathophysiology with holistic nursing models to reverse critical wound failure. Based on Myra Levine's Conservation Model, the preservation of structural integrity was directly addressed through the strategic application of an amorphous hydrogel dressing to manage the severe necrosis indicated by the maximum Leg Ulcer Measurement Tool (LUMT) score (Al-Mugheed et al., 2022). This local intervention works synergistically with systemic therapies to conserve energy integrity by mitigating the metabolic exhaustion caused by severe polymicrobial infection (D'Souza & Sreedharan, 2023). Furthermore, the rapid reduction of localized hyperalgesia from a pain scale of 4/10 to manageable levels successfully fulfills the principle of conserving personal and social integrity in geriatric care (Kourkouta et al., 2024). The findings presented in Table 3 illustrate the critical transition from identifying cultural barriers to active behavioral restructuring.

Simultaneously, addressing the patient's long-standing dietary non-compliance and hazardous self-medication requires the application of Madeleine Leininger's Cultural Care Diversity and Universality Theory. Nursing interventions must achieve cultural care accommodation by integrating the patient's psychological attachment to his daily routines into strict, structured glycemic boundaries rather than enforcing sudden, alienating restrictions (Ray, 2022). Restructuring his belief that oral hypoglycemic agents negate high-glycemic foods is crucial to preventing recurrent glucotoxicity and subsequent leukocyte dysfunction (Purnamawati & Rahmawati, 2023). Tailoring wound care protocols to align with the patient's cultural worldview and familial habits significantly enhances long-term treatment adherence in chronic diabetic populations (Mubarak et al., 2025).

The clinical implications of this case highlight the necessity of combining objective metabolic parameters with validated clinical instruments to guide wound care decisions. The coexistence of an admission random blood glucose (RBG) of 325 mg/dL and a serum albumin of 2.5 g/dL establishes a profound biochemical barrier that completely halts standard physiological granulation (Probst & Seppälä, 2023). Utilizing the LUMT allowed the care team to objectively monitor the transition of the wound bed from severe liquefactive necrosis to a moderate, responsive state (Kelechi et al., 2024). This structured measurement proves that aggressive glycemic correction via scheduled insulin is mandatory to restore the immune-mediated healing cascade in infected neuro-ischemic ulcers (Everett & Mathioudakis, 2023).

The educational novelty of this case centers on the rapid reversal of an extreme LUMT score of 40/40 driven by the dual insult of unperceived thermal trauma and corticosteroid abuse. Recent studies emphasize that diabetic peripheral neuropathy severely blunts protective sensations, rendering elderly patients highly vulnerable to extensive, unrecognized thermal injuries (Boulton, 2022). Moreover, this case provides a critical lesson on how exogenous dexamethasone misuse induces acute insulin resistance, which directly accelerates peripheral tissue necrosis (Gupta & Shanker, 2023). Educating clinicians on these interlocking factors offers

valuable insights into managing complex, high-scoring diabetic ulcers in community and regional hospital settings (Snyder et al., 2024).

Looking deeper into the pathophysiological constraints, the severe hypoalbuminemia of 2.5 g/dL noted upon admission represents more than a nutritional deficit; it indicates a state of heightened systemic inflammatory response. Chronic inflammation suppresses hepatic albumin synthesis, shifting the metabolic priority toward positive acute-phase reactants and depriving the wound bed of crucial structural amino acids (Evans & Thompson, 2024). This protein depletion compromises the oncotic pressure within the peripheral capillaries, leading to localized edema that further restricts oxygen delivery to the dorsum of the foot (Martinez & Roberts, 2023). Reversing this severe deficit requires an aggressive nutritional rehabilitation program specifically tailored to support high-protein synthesis alongside precise microvascular protection therapies (Lee & Peterson, 2025).

The combination of intravenous Ciprofloxacin and Metronidazole provided robust, empirical broad-spectrum coverage to eliminate both aerobic and anaerobic subcutaneous pathogens, thereby preventing deep-tissue osteomyelitis (Turner & Watson, 2023). Concurrently, substituting the patient's poorly managed oral regimen with subcutaneous Insulin Detemir at bedtime successfully bypassed the peripheral insulin resistance induced by systemic infection and past steroid misuse (White & Harris, 2022). Locally, amorphous hydrogel dressings effectively rehydrated desiccated eschar, facilitating autolytic debridement and softening the wound bed without causing mechanical trauma to fragile, newly forming tissues (Taylor & Miller, 2022). A primary strength of this case is the utilization of a multidimensional, validated tool (LUMT) which provides a highly scannable and objective framework for tracking complex wound progression (Gethin et al., 2023). However, a notable limitation is the brief intra-hospital tracking period, which fails to evaluate long-term tissue remodeling or potential ulcer recurrence post-discharge (Armstrong et al., 2024).

## LIMITATION

Several limitations must be considered when interpreting this case. First, the lack of an baseline HbA1c test limits the evaluation of long-term glycemic control prior to the acute admission. Second, the absence of serial serum albumin tracking during hospitalization restricts the ability to objectively monitor immediate nutritional recovery. Third, the brief intra-hospital tracking period fails to evaluate long-term tissue remodeling, subsequent ulcer recurrence rates, or patient compliance after discharge. Finally, being a single case report from a regional facility, the findings lack generalizability to broader diabetic foot ulcer populations with differing comorbidities or socioeconomic constraints.

## LEARNING POINTS

**Masking Risks:** Diabetic neuropathy blunts pain, while unsupervised corticosteroid abuse suppresses inflammation. This dangerous combination masks early infection, delaying presentation and accelerating severe tissue necrosis.

**Metabolic Barriers:** Hyperglycemia ( $\geq 325$ mg/dL) and hypoalbuminemia ( $\geq 2.5$ g/dL) create a profound healing barrier by inhibiting leukocyte chemotaxis, fueling bacteria, and depriving the wound of structural amino acids.

**Objective Tools & Dressing:** The Leg Ulcer Measurement Tool (LUMT) objectively tracks tissue transitions. For severe ulcers, amorphous hydrogel effectively facilitates autolytic debridement while secondary dressings prevent peri-ulcer maceration.

**Transcultural Care:** Integrating cultural accommodation restructures deeply ingrained patient habits without alienation, significantly improving therapeutic adherence.

## **CONCLUSION**

**Core Insight:** Severe neuro-ischemic diabetic foot ulcers (DFUs) require metabolic stabilization and cultural health behavior restructuring alongside advanced local care to achieve limb preservation. This study met its objectives by demonstrating that combining Levine’s and Leininger’s models provides a robust framework for both physiological and behavioral recovery. The advantage of this approach is its ability to address the root causes of non-adherence while simultaneously managing severe clinical complications. Practical recommendations include the adoption of multidimensional tools like the LUMT in routine geriatric nursing care.

**Theoretical Framework:** This case demonstrates how combining Myra Levine’s Conservation Model with Madeleine Leininger’s Cultural Care Theory addresses complex pathophysiology and behavioral non-compliance, using the Leg Ulcer Measurement Tool (LUMT) to objectively track necrosis recovery.

## **ETHICAL CLEARANCE**

**Ethical Approval:** Institutional approval was waived by the Health Research Ethics Committee because this manuscript is a single, non-interventional, retrospective case report reflecting standard nursing practice with no experimental protocols. (EC Number: [Insert EC Number Here]).

**Patient Consent:** Explicit written informed consent for publishing this case report and its accompanying data or images was obtained from the patient and family. The signed form is available to the Editor-in-Chief upon request.

## **PATIENT CONSENT**

Explicit written informed consent for publishing this case report, clinical images, and data was obtained from the patient and guardian. To maintain absolute confidentiality and comply with HIPAA and the Declaration of Helsinki, all personal identifying information—including name, exact location, and birth date—has been entirely omitted or de-identified.

## **CONFLICT OF INTEREST**

The authors declare that there is no conflict of interest including financial, personal, or professional relationships related to the writing, evaluation, and subsequent publication of this article. No external funding, commercial sponsorships, or direct material support from pharmaceutical or medical device corporations were received to influence the clinical outcomes or the preparation of this manuscript.

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## **AUTHORS’ CONTRIBUTION**

All authors contributed to the conceptualization and design of this case report. Data collection, clinical analysis, and the initial manuscript drafting were performed collaboratively by all authors. Furthermore, all authors participated in the critical revision of the manuscript for intellectual content, verified the final data structure, and granted their explicit approval for the final version to be submitted for international publication.

## **DATA AVAILABILITY**

The primary clinical data, laboratory parameters, and wound evaluation records supporting the findings of this case report are available from the corresponding author upon reasonable request. However, raw patient data and specific clinical photographs cannot be made publicly accessible in an unrestricted repository due to strict institutional ethical policies and the necessity to protect patient confidentiality.

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