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Salvaging the Diabetic Limb: An Interdisciplinary Review of the Integrated Foot Clinic Model for Amputation Prevention

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Abstract

Background: Diabetic foot complications, driven by a triad of neuropathy, ischemia, and infection, represent a global crisis in diabetes management, culminating in a lower limb amputation every 20 seconds. The traditional siloed approach—where patients navigate disparate specialists—fails to address the complexity of these wounds, leading to preventable morbidity, mortality, and staggering healthcare costs. **Aim:** This narrative review aims to synthesize contemporary evidence on the multidisciplinary diabetic foot clinic (MDFC) as a paradigmatic model of integrated care. **Methods:** A systematic search of peer-reviewed literature (2010-2024) was conducted across PubMed, CINAHL, Scopus, and The Cochrane Library. **Results:** The review establishes that MDFCs significantly reduce major amputation rates (40-60%), hospitalizations, and costs compared to usual care. Key success factors include: 1) Co-location of specialists enabling same-day, collaborative assessment; 2) Protocol-driven workflows for infection control, offloading, and revascularization; 3) Robust data systems for tracking outcomes; and 4) The integration of behavioral and social determinants of health into the treatment plan. Barriers include funding models, workforce shortages, and ensuring equitable access. **Conclusion:** The MDFC is not merely a clinic but a healthcare delivery system engineered to confront a multifaceted disease process. Its effectiveness validates the principle that amputation is more often a systems failure than an inevitable outcome. Widespread implementation requires policy reform to incentivize integrated, value-based care and a commitment to interdisciplinary education.

Keywords: diabetic foot; multidisciplinary communication; amputation; wound healing; patient care team

Introduction

The diabetic foot ulcer (DFU) is a sentinel event in the natural history of diabetes mellitus, signaling a convergence of microvascular, macrovascular, neurological, and immunological pathology (Godavarty et al., 2023). It is a portal to catastrophic outcomes: infection, osteomyelitis, and ultimately, lower extremity amputation (LEA). Globally, a person with diabetes undergoes a LEA approximately every 20 seconds, a statistic that underscores a profound failure in preventive and therapeutic care (Armstrong et al., 2017). These amputations are preceded by immense human suffering and are followed by a dismal five-year survival rate of less than 50%, rivaling many cancers (Rogers et al., 2011; Meloni et al., 2022). The economic burden is similarly staggering, with the cost of managing a single non-healing DFU over two years exceeding that of many common cancers (Syed et al., 2020).

Historically, care for the diabetic foot has been fragmented and reactive. Patients are referred

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sequentially—from primary care to podiatry, then to vascular surgery, then to infectious disease—in a protracted, inefficient process during which the wound often deteriorates. This siloed approach fails to address the simultaneous and interacting pathologies: ischemia cannot be corrected without addressing infection, and offloading is ineffective without adequate perfusion. Consequently, the traditional model implicitly accepts amputation as a frequent, almost inevitable endpoint.

In response, the Multidisciplinary Diabetic Foot Clinic (MDFC) has emerged as a gold-standard, systems-based intervention. It reconceptualizes the DFU not as a isolated wound but as a symptom of a systemic disease requiring a coordinated, simultaneous assault from multiple fronts. This narrative review, synthesizing literature from 2010-2024, deconstructs the MDFC model through its essential, interdependent components. We argue that its efficacy stems from the intentional integration of ten disciplines: General Medicine & Surgery (Podiatry, Vascular Surgery, Endocrinology); Nursing; Physiotherapy; Medical Laboratory; General Practice; Dental; Health Administration/Medical Secretarial; and Psychosocial Support/Peace & Security. By examining their roles, interactions, and the evidence supporting this model, we provide a blueprint for transforming the desperate trajectory of the diabetic foot from amputation to salvage.

The Interdisciplinary Architecture of the Salvage Clinic

The Clinical Core: Podiatry, Vascular Surgery, and Endocrinology

The MDFC's clinical engine is powered by the simultaneous presence of its three principal specialties. Podiatric medicine & surgery provides the foundational wound expertise (Rogers et al., 2023). The podiatrist performs sharp debridement to create a viable wound bed, diagnoses and manages osteomyelitis, performs minor amputations (toe, ray resections) to control infection, and prescribes definitive offloading devices (total contact casts). Their work is contingent on adequate blood flow (Lavery et al., 2020).

Vascular Surgery addresses the macrovascular component (Almasri et al., 2019). Through non-invasive vascular lab testing and angiography, they diagnose peripheral arterial disease (PAD) and perform revascularization—endovascular (angioplasty, stenting) or open bypass—to restore in-line flow to the foot. Timely revascularization is the single most important factor in healing ischemic ulcers and preventing major amputation (Berchiolli et al., 2023). Their input is needed at the first visit, not after weeks of failed wound care (Simons et al., 2019).

Endocrinology/General Medicine focuses on systemic optimization. Rapid glycemic control (addressing both hyperglycemia and dangerous hypoglycemia), management of cardiovascular risk factors (hypertension, dyslipidemia), and nutritional assessment (particularly protein levels for healing) are critical co-interventions (Sorber & Abularrage, 2021). The endocrinologist ensures the metabolic milieu supports, rather than undermines, the local efforts of the podiatrist and vascular surgeon (Wang et al., 2020). Figure 1 illustrate the integrated structure of the Multidisciplinary Diabetic Foot Clinic (MDFC).

Figure 1. Core Disciplines of the Multidisciplinary Diabetic Foot Clinic (MDFC)

The Engines of Continuous Care and Biomechanical Correction

Specialized Nursing is the glue that binds the clinic's recommendations to daily practice. Advanced practice nurses or wound care nurses provide continuity between weekly or bi-weekly clinic visits (Shapoval et al., 2021). They perform detailed wound assessments using validated tools (the University of Texas Wound Classification System), apply advanced dressings, administer antibiotic therapy, and, most crucially, provide intensive and repetitive patient education on foot inspection, hygiene, and the dire consequences of non-adherence (Dixon & Edmonds, 2023). They are often the first to detect subtle signs of deterioration.

Physiotherapy/Physical Therapy addresses the biomechanical etiology of ulceration. Therapists conduct gait analysis to identify areas of abnormal pressure (Jarl et al., 2023). They fabricate and modify custom offloading orthotics and footwear, teach safe mobility techniques to protect the wounded limb, and design individualized exercise programs to improve strength, balance, and cardiovascular health without jeopardizing the foot (Bus et al., 2024). Their role transforms the clinic's plan into a sustainable, functional reality for the patient (Tansley et al., 2023).

The Foundations of Diagnosis and Longitudinal Continuity

The Medical Laboratory provides the objective data that guides every decision. Rapid processing of wound cultures (with tissue biopsy preferred over swab) and bone biopsy for suspected osteomyelitis is essential for targeted antibiotic therapy (Lipsky et al., 2012). Serial monitoring of HbA1c, inflammatory markers (ESR, CRP), and nutritional markers (albumin, prealbumin) provides

feedback on systemic control. The lab's timely, accurate work directly informs antibiotic choice and the assessment of healing potential (Maurer et al., 2022).

The general practitioner (GP) plays two vital roles. First, as the source of appropriate and timely referral to the MDFC, recognizing high-risk feet before ulceration occurs (Vossen et al., 2023). Second, as the longitudinal care coordinator, the GP manages the patient's overall diabetes, hypertension, and other comorbidities outside the foot-specific focus of the MDFC, ensuring seamless care integration. This partnership prevents the MDFC from becoming another silo (Crawford et al., 2022).

Addressing the Systemic and Human Context

Emerging evidence solidifies the role of dental health. Periodontal disease is a source of chronic inflammation that impairs glycemic control (Elnour & Mirghani, 2023). Treating periodontitis can lead to measurable reductions in HbA1c, thereby indirectly supporting foot ulcer healing (Simpson et al., 2022). The MDFC model thus legitimately expands to include oral health as part of total inflammatory load management (Zhang et al., 2023).

The inclusion of Psychosocial Support—encompassing the roles of health psychology, social work, and the principles of peace & security—is what elevates a clinic from good to great (Roy et al., 2021). DFUs are associated with high rates of depression, anxiety, and diabetes distress. Cognitive-behavioral strategies can improve self-care adherence (Hamilton et al., 2022). Furthermore, social determinants are paramount: homelessness, inability to afford appropriate shoes or medications, and health literacy barriers directly cause treatment failure. Social workers or dedicated coordinators address these "real-world" obstacles, ensuring the biomedical plan is executable in the patient's life (Ahmed et al., 2021).

The Architects of Flow and Sustainability

The operational viability of the MDFC rests on Health Administration and Medical Secretarial excellence. This involves complex scheduling to co-locate multiple specialists, managing high-volume referral intake, and navigating insurance authorizations for expensive diagnostics, revascularization procedures, and custom footwear (Carls et al., 2011). Administrators also track clinic metrics (healing rates, time-to-revascularization, amputation rates) for quality improvement and advocate for sustainable funding models, often arguing for value-based reimbursement that rewards limb salvage and prevents costly hospitalizations (Jodheea-Jutton et al., 2022). Table 1 & Figure 2 present the standardized care pathway employed in the MDFC, beginning with comprehensive patient evaluation and progressing through wound debridement, infection control, vascular assessment and revascularization, pressure offloading, and therapeutic footwear.

Table 1: The Interdisciplinary Workflow of a Multidisciplinary Diabetic Foot Clinic (MDFC)

Clinic Phase	Podiatry/Vascular/Endocrinology (Core Triad)	Nursing & Physiotherapy	Support & Diagnostic Services	Coordination & Context
Initial Assessment	Simultaneous exam: Podiatry (wound grade, infection), Vascular (perfusion), Endo (glycemic/metabolic control).	Nursing: Comprehensive health & social history. Physio: Gait, footwear, and pressure assessment.	**Lab:** Stat HbA1c, CBC, CRP/ESR. **Medical Secretary:** Ensures all prior imaging/reports are available.	**GP:** Provides referral summary. **Social Work/Peace & Security:** Screens for psychosocial barriers.
Diagnostic & Planning	Vascular orders angiography; Podiatry orders MRI for osteomyelitis; Team agrees on integrated plan (debride? revascularize? antibiotics?).	Physio: Begins design for offloading device.	**Lab:** Processes deep wound/tissue cultures. **Radiology:** Performs urgent imaging.	**Administration:** Expedites prior auth for procedures. **Dental:** Receives referral for periodontal eval.
Active Treatment	Podiatry performs debridement/surgery; Vascular performs revascularization; Endo adjusts medications.	Nursing: Provides advanced dressing changes and patient education. Physio: Fits and trains with an offloading device.	**Lab:** Monitors drug levels (e.g., vancomycin), inflammatory markers.	**Social Work:** Secures resources for medications, shoes, housing. **Secretary:** Schedules follow-up.
Healing & Prevention	Monitor healing progress; plan definitive wound	Nursing: Transitions to	**Lab:** Tracks improvement in	**GP:** Assumes long-term metabolic

closure (e.g., skin graft).	self-care education. Physio: Prescribes long-term therapeutic footwear & exercise.	nutritional markers (albumin).	management. **Admin:** T racks outcome data for quality reporting.

Figure 2. Clinical Care Pathway in the Multidisciplinary Diabetic Foot Clinic

Efficacy, Challenges, and the Mechanisms of Success

The collective evidence is compelling: MDFCs reduce major amputation rates by 40-60%, decrease hospital admissions and length of stay, and are cost-effective despite higher upfront operational costs (Moore et al., 2021). The mechanism of success is not merely the sum of individual expertise but its integration. Key elements include: simultaneity of care, eliminating delays; a shared, protocol-driven mental model for infection classification (IDSA/IWGDF guidelines) and treatment pathways; formalized communication through weekly team meetings; and a unified patient record accessible to all team members (Monteiro-Soares et al., 2020).

However, significant implementation challenges persist. Financial sustainability is a primary hurdle, as fee-for-service models poorly reimburse the coordination time central to the MDFC. Workforce shortages, particularly in podiatry and vascular surgery, limit scalability. Equitable access remains problematic, with rural and socioeconomically disadvantaged populations often excluded. Furthermore, measuring success requires long-term follow-up to capture prevented amputations, a metric not always captured in short-term funding cycles (Table 2).

Table 2: Barriers to MDFC Implementation and Interdisciplinary Solutions

Barrier Category	Specific Challenges	Interdisciplinary Mitigation Strategies
Financial & Reimbursement	Fee-for-service punishes coordination; high upfront costs for staffing/space.	**Administration/Health Policy:** Advocate for bundled payments or capitated models for diabetic foot care. Demonstrate cost-effectiveness through robust data on reduced hospitalizations and amputations.
Workforce & Training	Shortage of key specialists (podiatrists, vascular surgeons); lack of interdisciplinary training.	**Education/Professional Bodies:** Develop integrated fellowship programs. Utilize telehealth to expand specialist reach (e.g., virtual vascular consultations). Train GPs and nurses in basic high-risk foot screening.
Operational & Access	Co-location logistics; scheduling complexity; geographic/rural access barriers.	**Medical Secretary/Administration:** Implement advanced scheduling software and "one-stop-shop" clinic designs. Develop "hub-and-spoke" models with central MDFCs supporting community satellite clinics.
Patient-Level Adherence	Psychosocial barriers, depression, low health literacy, and financial constraints.	**Social Work/Psychology/Peace & Security:** Integrate these professionals into the core team. Develop personalized, culturally competent education materials. Create patient navigation programs.
Data & Outcomes Measurement	Lack of standardized data collection; difficulty tracking long-term prevention outcomes.	**Informatics/Administration:** Implement a dedicated MDFC registry within the EHR to track healing times, amputation rates, and patient-reported outcomes. Align metrics with value-based payment goals.

Conclusion and Future Directions

The Multidisciplinary Diabetic Foot Clinic stands as a powerful testament to the principle that complex chronic disease complications demand complex, integrated solutions. It successfully demonstrates that most amputations are not

biologically inevitable but are failures of care delivery systems. By structurally enforcing collaboration among podiatry, vascular surgery, endocrinology, nursing, therapy, and supportive services, the MDFC creates a resilient network around the vulnerable patient.

The future of this model lies in its expansion and evolution. First, a paradigm shift from salvage to primary prevention is needed, with MDFCs developing outreach programs to identify and manage the "high-risk foot" before ulceration occurs. Second, technological integration through remote wound monitoring, AI-assisted image analysis of ulcers, and telehealth follow-ups can enhance efficiency and reach. Third, health policy must catch up, creating payment structures that financially reward the prevention of catastrophic, costly outcomes like amputation.

Ultimately, the MDFC is more than a clinic; it is a philosophy of care. It asserts that saving a limb requires saving the whole person—addressing not just the wound on the foot, but the glucose in the blood, the plaque in the arteries, the grief in the mind, and the barriers in the community. In doing so, it offers a replicable blueprint for managing other complex, multi-morbid conditions, proving that when disciplines unite with a common purpose, the results can be transformative.

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