Integrated Patient Centred Management in The Care, of Complex Multimorbidity

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Abstract

Background: This case report highlights the care of a woman in her late 40s with Type 2 Diabetes Mellitus, hypertension, and obesity, presenting with a left foot wound and pain, with a diagnosis of diabetic foot syndrome and sepsis. She was managed through Integrated Patient-Centered Management and multidisciplinary and family-oriented care approach.

Case Presentation: This is a case of a 49-year-old woman with Type 2 Diabetes Mellitus, hypertension, and obesity, who presented with a left foot wound and pain. Random blood glucose at presentation was unrecordably high. A multidisciplinary team, coordinated by a Family Physician, managed her complex condition and prevented impending mortality. This care included intensive medical care, daily wound debridement, and ultimately, a left below-knee amputation due to severe sepsis and suboptimal glycemic control.

Discussion: The case highlights the critical role of a multidisciplinary approach and the Family Physician's coordination in integrating specialist care and involving the patient's family in the management of patients with complex multimorbidity. Family members provided crucial emotional and practical support, significantly aiding her recovery and rehabilitation.

Conclusion: This case underscores the importance of patient-centered, coordinated, and continuous care led by a Family Physician, with strong family integration, and multidisciplinary approach for achieving optimal outcomes in complex multimorbidity like diabetic foot syndrome.

Keywords: Multimorbidity, Diabetic Foot Syndrome, Patient-Centered Care, Family Physician, Integrated patient centred management

Introduction

Chronic non-communicable diseases (NCDs) such as diabetes mellitus, obesity, and hypertension represent a formidable and escalating global health challenge, contributing significantly to morbidity, mortality, and healthcare expenditure. The co-existence of multiple chronic conditions, termed multimorbidity, further complicates patient management, often leading to polypharmacy, conflicting treatment guidelines, increased healthcare utilization, and a diminished quality of life. Among the myriad complications of diabetes, diabetic foot syndrome (DFS) stands out as a particularly devastating sequela, characterized by infection, ulceration, and/or destruction of deep tissues associated with neurological abnormalities and various degrees of peripheral vascular disease in the lower limb. DFS is a leading cause of hospitalization among diabetic patients and the most common cause of non-traumatic lower extremity amputations worldwide, underscoring the urgent need for prompt, effective, and continuous management to prevent catastrophic long-term consequences and facilitate comprehensive rehabilitation.

This case report aims to illuminate the profound importance of a well-coordinated, multidisciplinary and integrated patient centred approach in addressing complex cases of multimorbidity, specifically focusing on a patient with DFS. It particularly emphasizes the pivotal role of the Family Physician in orchestrating this intricate care, providing not only medical oversight but also ensuring coordinated and continuous care, and crucially, integrating the patient's family members into the care plan. The narrative will delve into the clinical presentation, diagnostic challenges, therapeutic interventions, and the long-term outcomes, demonstrating how a holistic and patient-centered strategy can optimize care delivery and enhance recovery in the face of severe chronic illness.

Case Presentation

A 49-year-old woman, with a known 6-year history of Type 2 Diabetes Mellitus, hypertension, and obesity (BMI 35 kg/m^2), presented to the emergency department with a two-week history of a progressively worsening left foot wound on the sole and severe, throbbing pain in the left leg. Her medical history included suboptimal glycemic control despite being on oral hypoglycemic agents and insulin, and intermittently controlled hypertension. She reported that the wound

originated from a minor trauma to the left sole approximately two weeks prior, which she initially dismissed. Over the subsequent days, the wound failed to heal, became increasingly painful, and was accompanied by swelling and redness extending up her leg. She also reported general malaise, fever, and chills in the 24 hours prior to presentation.

On examination, the patient appeared acutely ill and distressed. Her vital signs were: temperature 40°C, heart rate 110 bpm, blood pressure 155/95 mmHg, respiratory rate 28 breaths/min, and oxygen saturation 96% on room air. General examination revealed signs of dehydration and poor peripheral perfusion. Her left lower limb showed significant generalized edema extending to the mid-calf, marked erythema, warmth, and tenderness on palpation. Inspection of the plantar surface of the left foot revealed a deep, necrotic wound measuring approximately 6 cm x 6 cm, with pockets of abcess, foul odor, and extensive blackish discoloration consistent with gangrene involving the forefoot and midfoot. Scarification marks, indicative of previous attempts at self-treatment or traditional remedies, were also noted around the wound periphery. Peripheral pulses (dorsalis pedis and posterior tibial) were diminished on the left foot. Neurological examination revealed significant loss of sensation in both feet, worse on the left, consistent with diabetic peripheral neuropathy.

Initial laboratory investigations were alarming: Random Blood Glucose (RBG) was unrecordably high (>600 mg/dL), with severe hyperglycemia, hyperosmolality (serum osmolality calculated at 350 mOsm/kg), and absence of significant ketonuria or acidosis, leading to a diagnosis of Hyperglycemic Hyperosmolar State (HHS). Her HbA1c was 11.5%, indicating chronically poor glycemic control. Full blood count showed leukocytosis (WBC 16,400/m^3) with neutrophilia and a left shift, and moderate anemia (21%), consistent with severe systemic infection. Electrolytes, urea and creatinine were normal and fasting lipid profile revealed hypercholesterolemia. Blood cultures were drawn, and a wound swab was sent for culture and sensitivity. Plain radiographs of the foot showed soft tissue swelling, but no overt osteomyelitis at this stage. A Doppler ultrasound of the left lower limb revealed significant peripheral arterial disease with reduced blood flow.

The immediate diagnostic impression was severe diabetic foot syndrome complicated by soft tissue gangrene, and Hyperglycemic Hyperosmolar State, sepsis. The urgency of the situation necessitated immediate and aggressive intervention.

Medical Management

The patient received comprehensive and intensive management, orchestrated through a highly coordinated multidisciplinary team approach.

Multidisciplinary Team Collaboration

Upon admission, a dedicated multidisciplinary team was immediately convened and remained actively involved throughout her ongoing hospitalization. This team comprised:

- **Family Physician:** Served as the primary coordinator of care, overseeing the patient's overall management, facilitating communication among specialists, and ensuring continuity of care.
- **Endocrinologist:** Provided expert guidance on the management of HHS and long-term glycemic control.
- **Orthopedic Surgeon:** Assessed the extent of the foot infection and gangrene, performed surgical intervention, a below knee amputation with Burgess flap.
- **Wound Specialist (Nurse Specialist):** Provided daily specialized wound care, debridement, and dressing management.
- **Physiotherapist:** Initiated early mobilization and rehabilitation planning.
- **Dietitian:** Provided nutritional assessment and guidance, crucial for wound healing and diabetes management.

Daily team rounds ensured seamless communication, shared decision-making, and a unified approach to the patient's complex needs.

Pharmacological Interventions

- **Intravenous Fluids:** Aggressive intravenous fluid resuscitation with normal saline was initiated immediately to correct dehydration and hyperosmolality associated with HHS. Fluid balance was meticulously monitored.
- **Insulin Therapy:** An intravenous insulin infusion protocol was started to achieve gradual and controlled reduction of blood glucose levels, avoiding rapid shifts that could exacerbate cerebral edema. Once stable, the patient transitioned to a basal-bolus insulin regimen.
- **Antibiotics:** Empiric broad-spectrum intravenous antibiotics (e.g. ceftriaxone, metronidazole, vancomycin) were commenced immediately to cover potential polymicrobial infections, including Gram-positive, Gram-negative, and anaerobic bacteria. Once wound and blood culture results became available, the antibiotic regimen was de-escalated and tailored to the specific sensitivities of the isolated organisms (e.g., *Staphylococcus aureus* and *Pseudomonas aeruginosa*). Antibiotics were continued for weeks post-amputation.
- **Antihypertensive Medications:** Her hypertension was managed with appropriate antihypertensive agents, carefully selected to avoid exacerbating renal dysfunction or interfering with other medications.

- **Anticoagulants:** Given her immobility and risk of deep vein thrombosis (DVT), prophylactic low molecular weight heparin was administered.
- **Statins:** Lipid-lowering therapy with a high-intensity statin was optimized to address her dyslipidemia and reduce cardiovascular risk.
- **Antidepressants:** Recognizing the psychological impact of her severe illness, chronic pain, and impending amputation, a selective serotonin reuptake inhibitor (SSRI) was initiated to address emerging symptoms of depression and anxiety.
- **Blood Transfusion:** She required several units of packed red blood cells due to anemia secondary to chronic disease and surgical blood loss.

Wound Care and Surgical Intervention

Meticulous wound care was a cornerstone of her management. This included:

- **Daily Wound Dressing:** Advanced wound dressings, often incorporating silver or iodine preparations for antimicrobial properties, were applied daily following thorough cleansing.
- **Debridement:** Serial surgical debridement of necrotic tissue was performed by the orthopedic surgeon and wound specialist to remove devitalized tissue, reduce bacterial load, and promote healthy granulation. Despite aggressive debridement and comprehensive medical management, the severe sepsis originating from the wound proved difficult to control, and her glycemic control remained suboptimal in the acute phase due to overwhelming infection.
- **Surgical Intervention:** After extensive discussions within the MDT and with the patient and her family, it was determined that limb salvage was no longer a viable option due to the overwhelming infection, progressive tissue necrosis, and persistent systemic sepsis. The decision was made to proceed with a left below-knee amputation (BKA) as a life-saving measure to control the source of infection and prevent further systemic deterioration. The procedure was performed successfully, and the surgical stump was managed meticulously to promote healing.

Outcome

The patient underwent a left below-knee amputation, which successfully controlled the severe infection and stabilized her systemic condition. Post-operatively, she remained in the hospital for several weeks, receiving intensive post-amputation care, including:

- **Pain Management:** A multimodal approach to pain control, including opioid and non-opioid analgesics, was implemented to manage both acute surgical pain and phantom limb pain.
- **Infection Control:** Intravenous antibiotics were continued until clinical and laboratory markers of infection normalized. The surgical stump was meticulously monitored for signs of infection.
- **Nutritional Support:** Her nutritional status was optimized through dietary counseling and oral nutritional supplements to support wound healing and overall recovery.

Following the amputation, there was a significant improvement in her glycemic control. With the removal of the major septic focus, her insulin sensitivity improved, allowing for a more stable and manageable basal-bolus insulin regimen. Her HbA1c, while still requiring ongoing management, showed a downward trend. The surgical stump healed well, without complications.The physiotherapist worked closely with her to improve upper body strength, balance, and mobility.

Crucially, the patient's family members continued to provide unwavering emotional support and practical care throughout her recovery. They participated in rehabilitation sessions and provided encouragement during moments of despair. Their active involvement significantly contributed to her adherence to the rehabilitation program and her overall psychological well-being. The Family Physician maintained continuous oversight, coordinating care settings and ongoing support.

Currently, the patient is learning to ambulate independently with crushes before her prosthetic limb will be fitted, is achieving significant improved glycemic control (HbA1c around 7.5%), and is actively engaged in her self-management. While she faces ongoing challenges related to her multimorbidity and the psychological adjustment to amputation, her quality of life has substantially improved compared to her pre-amputation state, largely due to the integrated and supportive care she received.

Fig 1: Before Amputation

Fig 2: After Amputation

Discussion

This case vividly illustrates the profound complexities inherent in managing patients with multimorbidity, particularly when complicated by acute, life-threatening conditions like severe diabetic foot syndrome. It underscores several critical implications for clinical practice, which are supported by existing research.

The **indispensability of the Multidisciplinary Team (MDT)** is a central finding. The rapid deterioration of the patient's foot, coupled with her underlying multimorbidity (diabetes, hypertension, obesity), demanded a coordinated response that no single specialty could provide effectively. The seamless collaboration between the Family Physician, Endocrinologist, Orthopedic Surgeon, Wound Specialist, and other allied health professionals was paramount.[1] Each member contributed their specialized expertise, allowing for comprehensive assessment, timely intervention, and holistic management, which ultimately led to the control of sepsis and stabilization of her chronic conditions. This aligns with numerous studies demonstrating the efficacy of the MDT approach in improving outcomes for complex conditions like diabetic foot syndrome.[2,3] For instance, studies have consistently report that MDT care for diabetic foot ulcers leads to significant reductions in amputation rates and improved wound healing times compared to standard care.[2,4] This case, despite resulting in amputation, reinforces that even in severe presentations, MDT coordination is crucial for controlling infection and stabilizing the patient.

The **centrality of the Family Physician** as the primary coordinator and continuous care provider was foundational to this patient's successful outcome. They acted as the central point of contact, ensuring that all specialist recommendations were integrated into a cohesive care plan, preventing fragmented care and potential conflicts. The Family Physician's long-standing relationship with the patient likely facilitated trust and adherence, and their understanding of her broader social context enabled effective family integration.[5] This aligns with the principles of primary care, where the Family Physician serves as the patient's medical home, providing comprehensive, continuous, and coordinated care.[5,6] Research on primary care models for multimorbidity emphasizes the Family Physician's role in reconciling conflicting guidelines, managing polypharmacy, and ensuring patient-centered care, all of which were evident in this case.[7]

The **paramountcy of patient-centered care and family support** is also clearly demonstrated. Despite the severity of her condition and the necessity of a life-altering amputation, the patient's preferences and values were considered throughout the decision-making process. The open communication and shared decision-making, facilitated by the MDT, ensured she and her family were well-informed and actively involved.[8,9] The crucial role of the patient's family members in providing emotional support, practical assistance, and encouraging adherence cannot be overstated. Their involvement significantly cushioned the psychological impact of the illness and amputation, fostering resilience and contributing to her successful outcome. [5,10–12] This reinforces extensive evidence that strong social support networks are vital for patients navigating chronic illness, particularly those facing significant life changes like amputation. Studies on caregiver burden and family involvement in chronic disease management highlight that empowered and informed families lead to better patient outcomes and improved quality of life.[8,9]

Furthermore, this case highlights the **challenges of multimorbidity and glycemic control**. The inherent difficulty in achieving optimal glycemic control in the presence of severe infection and acute stress, as seen during her HHS and septic episode, was a significant hurdle.[13,14] The interplay between uncontrolled diabetes, obesity, and hypertension created a fertile ground for the rapid progression of DFS. This underscores the need for aggressive management of all co-existing conditions and proactive screening for complications in patients with multimorbidity.[13–16] Clinical guidelines for diabetes management emphasize the importance of tight glycemic control to prevent microvascular complications like neuropathy and nephropathy, which contribute to DFS.[14,17–19] This case serves as a stark reminder that acute infections can severely destabilize chronic conditions, necessitating intensive, tailored management.

While this case involved a severe presentation, it implicitly emphasizes the **importance of early intervention and prevention**. The initial minor trauma that led to the wound, combined with underlying neuropathy and vasculopathy, rapidly escalated. This highlights the need for robust patient education on daily foot checks, appropriate footwear, and immediate reporting of any foot lesions, alongside regular podiatric screening for high-risk diabetic patients.[20] Prevention strategies for DFS are well-documented and include regular foot examinations, patient education, appropriate footwear, and prompt management of any foot lesions. This case underscores the devastating consequences when these preventive measures are insufficient or delayed.

Finally, the case demonstrates the **importance of holistic rehabilitation**. Recovery from a major amputation extends far beyond surgical wound healing. It encompasses physical rehabilitation, psychological adjustment, and social reintegration.[20] The ongoing involvement of physiotherapists, and the continuous support from the family and Family Physician are critical in enabling the patient to regain mobility and improve her quality of life.[21] Comprehensive rehabilitation programs, including physical therapy, occupational therapy, and psychological counseling, are recognized as essential components of post-amputation care,

aiming to maximize functional independence and psychosocial well-being.[22] This patient's positive long-term outcome, despite the amputation, is a testament to the effectiveness of such a holistic approach.

Role of the Family Physician

The Family Physician's role in this complex case was multifaceted and absolutely crucial, embodying the core principles of primary care:

Coordinated Care: The Family Physician acted as the central orchestrator of care. They facilitated seamless communication among the diverse multidisciplinary team members.[21,23]

Continuous Care: The Family Physician provided ongoing support and management throughout the patient's entire care journey, from her initial presentation in the emergency department, through her intensive hospital stay, the surgical intervention, and her subsequent ongoing rehabilitation.[23]

Integrated Care: Beyond medical management, the Family Physician played a vital role in integrating the patient's family members into the care plan. They ensured that the family was kept fully informed about the patient's condition, treatment options, and prognosis, particularly during the critical decision-making process regarding amputation.[24]

Conclusion

This case report powerfully demonstrates the imperative of an integrated, patient-centered, and multidisciplinary approach in the management of complex multimorbidity, particularly when complicated by severe conditions like diabetic foot syndrome. The patient's journey, from acute presentation to life-saving amputation and subsequent rehabilitation. This case serves as a compelling testament to the enduring value of comprehensive primary care in achieving optimal outcomes for patients facing the profound challenges of complex chronic illness.

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