The Impact of Implementing a Diabetic Limb Preservation Team on Amputation Outcomes at an Academic Institution

[1]Eric Lew, DPM, FACFAS; [2]John Marek, MD; [3]Nathaniel Perryman Collins, MD; [1]Rick Murdoch, DPT

[1]Department of Orthopaedics and Rehabilitation, [2]Department of Surgery-Vascular, [3]Department of Internal Medicine
The University of New Mexico: Center for Healing In the Lower Extremity (CHILE)

Statement of Purpose

Diabetic foot osteomyelitis may precede major limb amputations and lengthy hospital admissions. These complications impact patients' lives and increase mortality rates. Health care institutions with dedicated limb preservation teams realize reduced amputation rates and improved quality of care of the diabetic foot. The purpose of this study evaluates the outcomes on amputation rates and hospital length of stay following the implementation of a multidisciplinary diabetic limb preservation program at an academic institution.

Methodology & Procedures

315 patients with diabetes admitted for osteomyelitis of the lower extremity were identified during the period of Dec 2013 – Nov 2017 and included for retrospective review. Anatomic location of amputations, hospital length of stay, and patient complexity were evaluated. Outcomes of the 24 months before and 24 months after the integration of a diabetic limb preservation service were compared. The Hi-Lo amputation ratios were calculated and compared. Patient complexity was calculated utilizing the institutional case mix index (CMI). Statistical analysis included a standard z-test for the difference in proportions and a t-test was utilized for the difference in means. P values were calculated where <0.05 was statistically significant.

Results

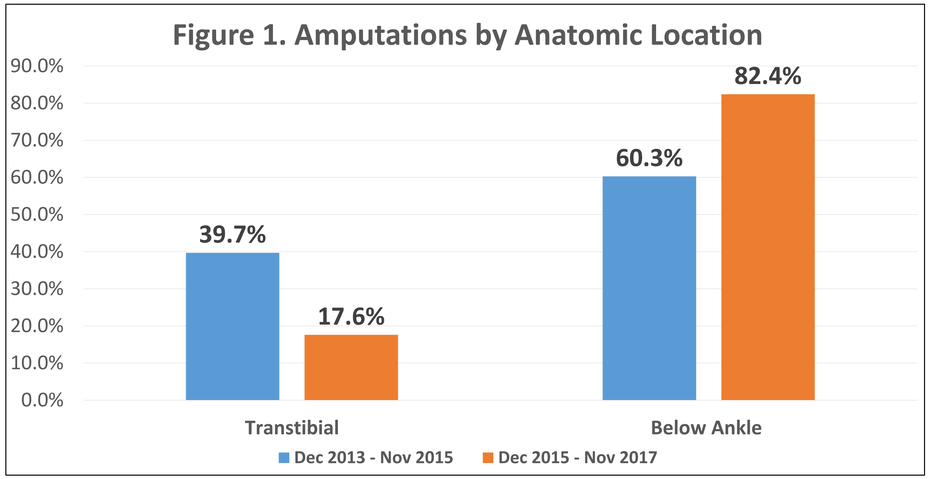

Figure 1. The Hi-Lo amputation ratio at this institution decreased from 0.66 to 0.21. This significant change in the ratio indicates an improved limb preservation rate.

Table 1. Lower Extremity Osteomyelitis Cases

Date Range	Total Cases	Overall Amputations	Transtibial	Foot	Toe
Dec 2013 – Nov 2015	120	63	25	8	30
Dec 2015 – Nov 2017	195	108	19	37	52

Table 2. Outcomes and Statistics

Outcomes	Dec 2013 - Nov 2015	Dec 2015 – Nov 2017	*p* value
Overall Amputation Rate (%)	52.5	55.4	0.605
Transtibial (%)	39.7	17.6	0.002
Overall Below Ankle (%)	60.3	82.4	0.002
Foot (%)	12.7	34.3	0.003
Toe (%)	47.6	26.7	0.007
Hi-Lo amputation ratio	0.66	0.21	0.0001
Hospital Length of stay (days)	11.7	9.8	0.069
Patient Complexity (CMI)	3.07	3.14	0.798

120 patients (65 amputations) during the 24 month period prior to implementation of the program and 195 patients (108 amputations) during the 24 month period after were evaluated (see Table 1). Amputation rates at the transtibial level significantly decreased from 39.7% (n=25) to 17.6% (n=19) (p=0.002). Amputation rates that occurred distal to the ankle significantly increased from 60.3% (n=38) to 82.4% (n=89) (p=0.002). Average hospital length of stay decreased from 11.7 days to 9.8 days (p=0.069). There was no significant difference in patient complexity between the two groups (see Table 2). The Hi-Lo amputation ratio decreased from 0.66 to 0.21 demonstrating statistical significance (p = 0.0001; 95% CI: 34.15 – 54.39) (see Figure 1).

Literature Review

Diabetic foot ulcers are antecedent of deep infection which may lead to drastic minor and major lower extremity amputations (1,2). These complications are common and costly for health care institutions (3,4). The 5-year mortality rate after a minor or major amputation in patients with diabetes and peripheral vascular disease ranges from 53% to 100% (5). Moreover, the 5-year mortality rate after ulceration in patients with diabetes was shown to be around 40% (6). The mortality risk at 10 years for patients with diabetic foot ulcers is twice as high when compared to patients without a history of an ulcer (7). Implementation of interdisciplinary diabetic foot surgical teams have been shown to reduce high level amputations and improve clinical outcomes in patients suffering from lower extremity complications at other institutions (8-15).

Analysis & Discussion

Diabetic foot osteomyelitis and amputations severely affect patients' lives and mobility. Prior to initiating a dedicated limb preservation team at this institution, major limb amputation rates and average hospital length of stay were excessive. The implementation of a limb preservation program demonstrated a notable shift in the anatomic level of amputation. There was a significant decrease in transtibial amputation rates and increase in amputation rates below the ankle. This improved Hi-Lo amputation ratio indicates a noticeable focus on limb preservation. The average hospital length of stay also decreased. At this academic institution, the integration of a multidisciplinary team has reduced high level amputations and improved clinical care and outcomes in patients with lower extremity osteomyelitis.

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