Limb Loss and the Effect of a Multidisciplinary Treatment Approach on Global Populations

A team approach can reduce diabetic morbidity globally.

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A prospective case control study examined the rate of mortality after diabetic lower extremity amputations in Barbados, West Indies. The results of this particular study demonstrated a higher rate of mortality after limb amputation for Barbados, due to delayed treatment, than any other country in the world. The delay in treatment can be devastating on patient quality of life as well as overall outcome. Due to barriers beyond control, the underserved patient population usually presents for treatment at the later stage of disease, thus making the likelihood of amputation high.

Some reasons for delayed treatment may include a lack of education, screening, home support, access to visiting nurse assistance, adherence to treatment plan or access to adequate treatment; and/or inappropriate offloading or no off-loading. Multi-disciplinary limb preservation programs should possess the ability to provide immediate treatment and make informed decisions in order to progress quickly from standard of care to advanced therapies. Such programs should also offer evidence-based treatment to improve the best outcome.

A retrospective study in the United States examined the incidence of lower extremity amputation at Madigan Army Medical Center between 1999 and 2003. The results of this particular study demonstrated that a multidisciplinary approach to diabetic foot care caused an 82% decrease in lower extremity amputations (LEAs) even though the number of patients diagnosed with diabetes increased 48% during the same time period.

Limb Preservation Programs

More recently, organizations around the world have been developed with the mission of limb preservation. Some of these organizations work to prevent amputations and others target the issues of those currently affected by amputation. One such organization is the Amputee Coalition, whose mission is "to reach out to and empower people affected by limb loss to achieve their full potential through education, support, advocacy, and endorsing..."
Limb Loss (from page 77)

A well-designed multidisciplinary limb preservation program will address causal factors that lead to amputation and provide options for prevention as well as promote the best patient outcome. Such programs will provide, for example: access to treatment for the aged underserved population, specialist intervention (endocrinologist, infectious disease specialist, vascular surgeon, podiatric surgeon, psychiatrist, nursing, case management, pedorthist, diabetes educator, dietitian), advanced treatment therapies, and evidence-based treatment options that promote the best outcome as well as active research to promote a reduction in limb amputation globally.

A well-rounded limb preservation program should have multiple providers from a variety of disciplines to work as a team to address individual patient needs in order to provide the best immediate treatment to encourage limb preservation. Some of the disciplinary services provided by a limb preservation program should include: management of diabetes, infectious infection control, vascular intervention, advanced wound care, prophylactic or limb-sparing surgery, psychological evaluation and treatment, social work management as well as visiting nurses for home support, off-loading footgear, diabetes education, and nutritional counseling (see the chart on page 77).

Primary providers should work with multidisciplinary programs to understand the causal pathways which lead to diabetic ulcers and amputation as well as to recognize high risk patients through screening for depression. This screening can assist in the reduction of overall amputation incidence.7,4

A wide range of multidisciplinary treatment options exist around the globe and contribute to the movement for limb preservation but these programs are sparsely distributed. Some programs are community-based or hospital-based, while others are national programs. However, with diabetes progressing towards being the seventh leading cause of global death, much work still needs to take place.19

Growing Epidemic

According to the United States Census Bureau (USCB) and the United Nations Population Fund (UNPF), the world population reached 7.089 billion in 201211,12 and is projected to reach 10.7 billion by 2050.10 One of the reasons for this population growth is due to improvement of the economy and healthcare across the globe. But there has also been a trend to a more sedentary lifestyle combined with the consumption of energy-rich food. Due to this, there is a growing epidemic of obesity and diabetes. According to World Health Organization (WHO), worldwide obesity has nearly doubled since 1980.14 By 2011, 65% of the world population was classified as overweight.15

As obesity rates climb, so does the incidence of diabetes and inevitable morbidity and mortality associated with diabetes. Economic and social burden is increasing, and will increase, on a massive and worldwide scale. The total estimated cost of diagnosed diabetes in 2012 is $245 billion, which includes direct medical costs and reduced productivity, according to the American Diabetes Association.16 Of this staggering sum, approximately 33% will be spent on the cost of diabetes-related foot ulcers.17

There is a 25% chance of a diabetic person developing foot ulcers, and sadly, there is a limb amputated every 30 seconds somewhere in the world due to complications from diabetes.

Economic Burden and Human Suffering

The rising economic burden and human suffering was noted by Zimmet in 1992.17 His article clearly states that diabetes care accounted for 2.7% of the total national healthcare budget in Western European nations. This issue will undoubtedly continue to expand as a burden to the economy and the world healthcare system unless there are structural changes in healthcare delivery. As the number of patients diagnosed with diabetes continues to increase in developed and developing countries, the challenge will be how to put in place more cost-effective ways to implement screening, prevention, continued education, and advanced treatments in all parts of the global economy.

In the European Society of Cardiology, Van Dieren, et al. (2010) discussed that global health expenditures used to treat and prevent complications of diabetes will exceed 302 billion U.S. dollars by the year 2025. Approximately 80% of those expenditures will be spent by wealthy countries and very little in low and middle income countries—where 80% of the people with diabetes live.20

This further suggests that we need to identify effective new strategies to increase education and screening globally so we can treat patients more cost-effectively.

The emphasis of the team approach is primary prevention and secondary prevention. Primary prevention is the most cost-effective form of healthcare prevention and is focused on quality diabetes man...
Secondary prevention includes screening, proper shoes, regular self-checks, routine follow-up with a physician, education, and counseling. According to Jeffocate and Harding, improved blood-glucose control reduces microvascular complications and cardiovascular risk factors that can cause ischemic foot.

**Clinical History:** Past illnesses and surgeries, social history  
**Diabetes History:** Rx and complications, surgeries, glycemic control  
**Assessment of patient’s diabetes knowledge and risk perception**

**Current History:** Present illness, HbA1c

**Foot Exam**  
1. skin, hair and nail condition  
2. Musculoskeletal Deformities  
3. sensory and motor exam, including semmes Weinstein (10g)  
4. Vision and Gait Evaluation  
5. Vascular assessment including ABI, toe pressure, pedal pulses  
6. Ulcer assessment: wound tracing, photography, culture as needed

**Risk Categorization**  
**Low**  
Diabetes  
Intact sensation  
Intact pulses  
Absence of foot deformity  

**Moderate**  
Diabetes  
Intact Sensation  
Intact Pulses  
Presence of Foot deformities  

**High**  
Diabetes  
Absence of sensation  
Absence of pulses  
Presence of Foot deformity  
Previous or current ulcer with or without infection  
History of limb modifying surgery  

**Diabetes/ Foot Care Education**

**Foot Wear Assessment**

**Management Plan**  
1. Self-management Education  
2. Diagnostic studies if required  
3. Foot wear recommendation, orthotic if required  
4. Nail, skin and ulcer care  
5. Follow up dates: Low Risk- 1 yr.; Moderate – 6 weeks; High Risk – 3 weeks

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**Figure 1:** Five-step evaluative process for determining suitability of partnership.
The diabetic foot

Limb Loss (from page 80)

Physician, and proper and timely referral to specialist care once a problem arises. However, secondary prevention needs added emphasis on physician and patient education so as to create a more cost-and time-effective treatment plan. This concept is illustrated by Driver et al. (2005) in Figure 1. This chart divides patients into low, moderate or high risk categories according to examination and patient history.

In addition, Figure 1 shows the management plan detailing frequency of future examination, education counseling, diagnostic tests, footwear modification, and specialist referral as necessary. Driver, et al. clearly state that the intervention of a limb preservation service or multidisciplinary group needs to begin at the first signs and symptoms of diabetic neuropathy.

Multidisciplinary diabetic teams have been well-established in the United Kingdom. This has reduced amputation by approximately 50% after diabetic foot clinics were established. This is also shown by Yesil, et al. where diabetic foot ulcers were managed by a diabetic foot care team over a ten-year period of time with comparison to amputation rates of previous years. The results showed that minor amputation rates were similar, but major amputation rates decreased from 20.4% to 12.6% after the involvement of a multidisciplinary team.

Secondary prevention includes screening, proper shoes, regular self-checks, routine follow-up with a physician, proper and timely referral to specialist care once a problem arises.

Secondary prevention needs added emphasis on physician and patient education so as to create a more cost-and time-effective treatment plan. This created an improvement in quality of life due to a decrease in major amputation and in a reduction in treatment cost. Yesil also stated that minor amputation was unavoidable in some of the patients as they first presented to the clinic with deep ulcers and/or gangrene.

This further proves the fact that early intervention with a multidisciplinary team approach is key to reducing costs and decreasing amputation.
tation rates as explained by Driver, et.al (see Figure 1 on page 80).

Conclusion

The success of diabetic ulcer treatment is related to its ability to effectively reduce lower extremity amputations and improve patient quality of life. The development of a successful multidisciplinary team model warrants further research into the ideal combination of advanced wound care treatment resources as well as appropriate timing of interventions. In addition, the model will need to show benefits in cost structure, patient satisfaction, and improved outcomes before the model can truly begin to populate the landscape of global healthcare. Future research is still needed to further define evidence-based treatment via a multidisciplinary team model. PM

References

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