

The Next Global PANDEMIC

Diabetes, ulcers, and amputations are poised to overwhelm nations and cripple health-care budgets

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Need to Know:

- The number of diabetes cases is skyrocketing worldwide and is predicted to hit 592 million by 2030. In addition, the five-year mortality rate of a diabetes-related lower-extremity amputation is as high as 80 percent, second only to lung cancer.
- Type 2 diabetes is no longer a disease of affluence isolated to Western culture. China and India now have the highest incidence of diabetes, far surpassing the U.S. diabetic population of 24 million.
- Practitioners need to be examining patients' feet earlier, more regularly, and in more detail. Most patients do not fully understand peripheral neuropathy and the impact of unmanaged blood sugars on their peripheral nerves, and many have never had proper foot care or comprehensive foot check-ups.
- A critical paradigm shift in treating the diabetic foot is necessary to prepare for the increasing incidence and severity of the disease and its complications. Putting the money upstream in preventative care, preventative devices, and devices that will close the ulcers more quickly will reduce overall costs and make health care sustainable in the future as the disease progresses on a global level.

IN 2009, INTERNATIONAL DIABETES

Federation (IDF) President Jean Claude Mbanya voiced his concerns about the global threat of diabetes: "... The epidemic is out of control. We are losing ground in the struggle to contain diabetes. No country is immune, and no country is fully equipped to repel this common enemy."

At that time, there were 300 million diabetes cases worldwide, up from 30 million in 1985, according to the IDF. Mbanya was trying to sound the alarm to world health leaders on the diabetes epidemic as a global health emergency because most countries' health-care systems are not equipped to handle the extent of the threat. Diabetes and its complications will overwhelm and cripple most nations' health-care budgets.

In 2009, diabetes cases around the world were predicted to grow to 435 million by 2030. In 2014, the number of cases is now predicted to hit 592 million by 2030, according to the World Diabetes Foundation. One can only wonder if, in the next five years, another 160 million will be added to the 2030 predictions?

We have nothing short of a global pandemic on our hands, an epidemic that has crossed international borders and is affecting many, if not all, countries of the world at the same time. But with a better understanding of the disease and a global standard in preventative and ongoing care, practitioners are in a position to fight back against this deadly disease.

How Did We Get Here?

Diabetes is a metabolic disease. Although it affects every part of the body, it tends to strike the feet first, leading to complications such as foot ulcers and eventually amputations. These complications, resulting mainly from diabetic peripheral neuropathy, are extremely problematic and lead to very high mortality and morbidity rates.

The five-year mortality rate of a diabetes-related lower-extremity amputation is as high as 80 percent, according to Diabetes UK. That is, up to 80 percent of these patients will not be alive in five years. This staggering statistic is second only to lung cancer, which has a five-year mortality rate of 86 percent, and it is higher than the five-year mortality rates of breast, colon, and prostate cancers, according to the Southern Arizona Limb Salvage Alliance.

This disease and its menacing complications are now represented as a percentage of the population in every country in the world, and the numbers are increasing in almost every country. Type 2 diabetes, which represents 95 percent of diabetes cases, is no longer a disease of affluence isolated to Western culture. China and India now have the highest incidence of diabetes, far surpassing the U.S. diabetic population of 24 million. China has 98 million diabetics, and India has 65 million, according to the IDF.

The obesity epidemic may be fueling the diabetes pandemic in the Western world, but in the East, the number of new Type 2 diabetes cases



is exploding for multiple reasons. One is the link between undernutrition in utero and early life, combined with overnutrition in later years, according to American Diabetes Association. In response to fetal undernutrition, the body develops insulin resistance, which serves people well in times of scarcity of food and limited glucose availability. However, with increasing economic development and rapid urbanization in these countries, people now have increased access to fast foods, sugars, animal fats, polished rice, refined wheat, and low-energy foods. When these same people are exposed to a nutritionally rich environment later in life, the insulin resistance that they developed at a young age in response to inconsistent food supply will substantially elevate their risk for developing Type 2 diabetes as adults.



Implications for Practitioners

Those of us on the ground treating the diabetic foot and its complications need to be examining patients' feet earlier, more regularly, and in more

detail. We should expect to see more patients who are undiagnosed, pre-diabetic, or diabetic—all exhibiting various stages of diabetic foot disease. That means more patients with foot deformities, stiffened feet, and peripheral neuropathy—all of which elevate their risk of ulcerations and amputations.

To complicate matters, most patients do not fully understand peripheral neuropathy and the impact of unmanaged blood sugars on their peripheral nerves, and many have never had proper foot care or comprehensive foot check-ups. For these and many other reasons, we have a perfect storm brewing, and it is going to be a big one. Consider the following:



- **It is costly to treat diabetes and its complications.** In 2012, \$471 billion USD was spent due to diabetes, according to the IDF. As 80 percent of the cases are in low- to middle-income countries (70 percent of that 80 percent are in low-income countries), this has the potential to devastate the health-care systems of many nations as they are not equipped to deal with this disease and its impacts in such staggering numbers.
- **Complications from peripheral neuropathy and the loss of protective sensation happen without warning.** Persistent hyperglycemia damages the microvascular circulation, which damages the small nerves in the foot. As the sensory nerves die, protective sensation disappears. Once patients have lost protective sensation, the simple act of walking puts them at risk. With normal protective sensation, when our feet are sore, we rest, get off our feet, and change our footwear. Without this feedback mechanism, patients put task over body and power through normal activities such as walking the dog, mowing the lawn, or pressure washing

the driveway. The task takes precedence, as the body is silent and gives no warning of the damage occurring.

- **The clear relationship among limited foot joint mobility, peripheral neuropathy, and peak pressures in the feet increases risks for ulcers.** In the diabetic foot, glucose reacts with the collagen in the connective tissue in a process called glycosylation. This leads to the formation of AGEs (advanced glycosylated end products), which increase collagen cross-linking, causing both inelasticity and toughness in the foot's connective tissue. This subsequently weakens the muscles and stiffens the joints, reducing mobility. This affects the patient's ability to adapt to terrain, absorb shock at heel strike, and dissipate peak pressure during the gait cycle. The degradation of this function allows peak pressures to develop in the feet that are highly predictive of diabetic foot ulcers.



Healthy skin is tough and can withstand up to 500 pounds of pressure per square inch. In rat pad studies conducted by Paul Brand, MD, and published in *Pain: The Gift Nobody Wants*, researchers anaesthetized rats and strapped a mechanical device to their foot fat pads, applying a steady rhythmic force to constantly tap the feet while they slept. Brand found that a pressure as low as one pound per square inch would damage the plantar surface of the foot if it was consistent and persistent. If he





Diabetic Foot Screen

PHOTO: Katia Langton, DC, C.Ped

We need to better educate our patients on how to best protect their insensate feet. Health-care providers and patients must understand how to manage simple foot problems and how to use off-loading devices to increase surface area to decrease peak pressure areas.

- **We lack systematic adherence to best practice guidelines at a global level.** Research indicates that patient outcomes and how the patient is treated (off-loading devices, modalities, medication, or amputation) are determined by location and by chance. The chance is based on the clinician's interest and understanding of the assessment, appropriate treatment, and preventative off-loading of the diabetic foot. Individual clinicians with a special interest and specific training in treating the diabetic foot can greatly influence the amputation rate.

If a few individuals can make a difference, consider the difference we could make if a larger proportion of the global health-care community treated the diabetic foot in accordance with proven best practice guidelines. A critical paradigm shift in treating the diabetic foot is necessary now to prepare for the increasing incidence and severity of this disease and its complications.

All diabetic patients need access to regular foot screening exams, including strength tests; assessments for physical deformities and evaluations of nail structure; footwear assessments; range of motion tests in



paused the tapping, a callus would form, but if the machine kept on tapping, an ulcer would eventually open up. This study mimics the lack of response to the repetitive stress of walking for the patient with the insensate foot. Limited joint mobility in the foot, coupled with lack of adaptation to areas of peak pressure due to poor protective sensation, can lead to tissue breakdown and, subsequently, the development of foot ulcers.


- **The general public and health-care providers have little understanding of diabetic peripheral neuropathy.** We are dealing with predictable patterns and predictable outcomes once the foot becomes insensate. This is tricky for most patients to understand, but many health-care providers don't fully understand it either. Neuropathy strikes the most distal nerves first. Sensory neuropathy destroys the ability to protect the foot from injury. Motor neuropathy deforms the foot into the "intrinsic minus" foot that further increases areas of peak pressure, which increases risk. Concurrently, autonomic neuropathy decreases the ability of the skin to sweat, leading to epidermal dryness and increase risk of fissuring—a potential open pathway for bacteria.

the foot; and pulse checks. The most important assessment, however, is to test for light pressure sensation using a 5.07 monofilament exerting 10 grams of pressure.

Looking to the Future

Diabetic foot screening needs to become a fully funded service in all health-care systems to remove barriers for all people with diabetes, so that they can be seen regularly based on their risk category for ulceration. Diabetes UK has a well-organized, comprehensive program with highly trained foot protection teams that focus on prevention. They triage and stratify patients based on international risk categories and then refer high-risk patients to multidisciplinary teams for thorough treatment.

This approach is needed in all countries. We need funding support for off-loading and pressure redistribution devices. Putting the money upstream in preventative care, preventative devices, and devices that will close the ulcers more quickly will reduce overall costs and make health care sustainable in the future as this disease progresses both in our backyard and on a global level.

It behooves all of us to better understand diabetic foot disease and pass that knowledge on to the general population, health-care providers, and policy makers alike. The diabetic foot and the consequences of peripheral neuropathy must be more universally understood and managed effectively. When we all truly understand the predictable complications and serious outcomes, we will all be treating these patients in a systematic and standardized manner so that no one falls through the gaps in diagnosis and treatment. 



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