



# The ABCs of Diabetes

Remember these mnemonic devices.

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**M**edical literature is replete with mnemonics and literary devices to make management of patients easier to remember and implement. One easy-to-remember mnemonic are the ABCs of diabetes, a clinical practice guideline published by the American Diabetes Association. Reputable institutions such as the American College of Cardiology have also utilized an ABCDE mnemonic to advocate for improved cardiovascular health through medication, lifestyle modification, and more heavily regulated glycemic management.

As podiatrists, we propose that these guidelines can be made even more comprehensive by including an important letter, “F”, for foot-care. With up to 60% of all amputations being preventable,<sup>1</sup> routine foot care and prophylactic intervention is often limb and life-saving. With the aging population, there is an associated high risk and incidence for diabetes and vascular disease. A multidisciplinary approach emphasizing early active intervention combined with podiatric education will help combat the alarming complications linked to these diseases.

In 2015, the American College of Cardiology developed a guideline to address the rise in cardiovascular-related deaths for the first time since 1999. The ABCDE structured checklist was devised in 2019; it was created as a device or tool to minimize a patient’s risk for atherosclerotic cardiovascular disease. This approach emphasizes shared decision-making, a team-based care approach, and a patient’s socio-economic factors.

## ABCDE

The ABCDE model of primary prevention and lifestyle changes is a global approach to patient care minimizing the risk of a significant cardiovascular event. The A stands for assessment of cardiovascular risk and antiplatelet therapy, particularly with the use of low dose aspirin in the select group of high risk patients.

The B is for maintenance of blood

pharmacological diabetes management advocated by the ACC begins with metformin as a first line agent with the addition of a sodium-glucose co-transporter-2 (SGLT2) or a glucagon-like-peptide-1 (GLP-1) receptor as a secondary agent.

Of note, since the publication of these guidelines, three randomized controlled trials have shown a reduction in cardiovascular events and

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pressure as close to < 130/80 mmHg as possible.

The C is for smoking cessation and cholesterol management. Cholesterol personalization with risk enhancers is used to assess atherosclerotic cardiovascular disease; furthermore, this scheme advocates for the use of the coronary artery calcium (CAC) test as needed. The CAC test is a computed tomography scan to assess for calcium build-up in the coronary arteries, reserved for those who are at risk, especially those with diabetes, very high cholesterol, or who are heavy smokers.

Diabetes, diet, and weight management with an emphasis on consumption of vegetables, fruits, nuts, and legumes falls under the letter D. With regard to diabetes, the ACC recommends control through diet and lifestyle modification with specific pharmacological management. The

heart failure admissions or exacerbations as well as improvement in hemoglobin A1c, body weight, and blood pressure control with SGLT-2 inhibitors.

Finally, the E is for exercise. This guideline maintains that one should perform more than 150 minutes a week of moderate physical activity or greater than 75 minutes a week of vigorous activity.<sup>2</sup> The ACC guideline can be enhanced by including, “F” for feet, in the ABCs for management of cardiovascular disease and diabetes.

## Diabetes and Cardiovascular Effects

The diabetic and dysvascular foot are significant contributors to the modern epidemic of cardiovascular-related deaths. Amputation places substantial strain

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on the cardiovascular system with a predicted five-year mortality rate of 50%.<sup>3</sup> Therefore, it is imperative that education initiatives are implemented and that routine foot surveillance and care be part of the podiatric physician's armamentarium. As podiatric professionals, the "F" for foot care would seemingly play an integral role in the holistic approach of patients with diabetes and cardiovascular risks.

Diabetes is a complex disease, and it is important to involve ancillary services and take a multidisciplinary approach in treating patients. The ACC guideline touches on the micro- and macro-vascular complications. This is where foot care and awareness fits into cardiovascular health. Acute and chronic diabetic foot infections are known to cause fluctuations in a patient's glycemic profile. It is therefore critical to communicate and consider how the foot may be affecting this critically important glycemic profile.

According to the CDC there are 100 million people



Figure 1: The dry and stable eschar to her right hallux on initial presentation.

in the U.S. living with either diabetes or pre-diabetes, a condition that if not treated, often leads to diabetes within the next five years. Diabetes is still the seventh leading cause of death in the U.S.<sup>4</sup> Furthermore, the complications of diabetes, such as diabetic foot ulcers, carry a relatively high morbidity and mortality rate. Jupiter, et al. reported in their systematic review that there is a staggering five-year mortality rate of 40%-50% in patients with a new diagnosis of a diabetic foot ulceration.<sup>5</sup>

Even a simple toe amputation carries the risks and complications associated with surgery, including death.

With this information in mind, a multidisciplinary approach with an emphasis on early intervention and amputation prevention is paramount in keeping our patients alive and on their feet. A strong referral network—including vascular surgeons, endocrinologists,

internists, and ancillary services—is important in the coordination of care for our patients.

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### Comprehensive Foot Exams

The American Diabetes Association recommends that every diabetic patient has a comprehensive foot exam at least once a year; including an examination of skin, muscles and bones, blood flow, and sensations.<sup>6</sup> Routine foot screenings have been shown to prevent hospitalizations and delay or prevent amputations. Both macro- and micro-vascular disease are known culprits in diabetic foot complications.

Macro-vascular disease is often the product of atherosclerotic occlusive disease leading to reduced nutrient capillary blood flow and the loss of protective sensation. Additionally, this high risk patient population often presents with both sensory and autonomic neuropathies. The sensory neuropathy predisposes patients to loss of protective sensation, whereas the autonomic neuropathy affects the micro-neurovasculature.

Sensory neuropathy manifests with wound and skin complications. In the absence of sensations, patients are more predisposed to developing blisters, wounds, and foreign body contacts from stepping on items without feeling or noticing them. The autonomic neuropathy affects the capillary basement membrane and will manifest as dystrophic skin changes and with neuropathic edema. Furthermore, patients with loss of protective sensations, altered biomechanics in the presence of neuropathy, evi-

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dence of callus formation, bony deformity, absent pulses or peripheral vascular disease, a history of ulcers or amputations, and those with severe nail pathology should be monitored more frequently for signs of infection.

At-risk foot care is strongly recommended. Loss of limb secondary to foot infection places significant strain on the cardiovascular system. One must maintain that

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the foot is literally and intrinsically connected to the body and recognize that amputation carries a high five-year mortality rate.

Diabetes management and foot care can be complicated and challenging for patients. Emphasis is frequently placed on having patients check their feet, wear shoes, and avoid barefoot walking. Little should be left to patient interpretation when it comes to self-directed care of diabetes, including foot health.

## ABCs of Diabetes

The onus is on patients to take part in improving their health. The relatively simple mnemonic devised by the American Diabetes Association encourages patient engagement. The ADA has recommended that patients know their

ABCs of diabetes. These numbers should be recorded by patients and routinely reviewed with their physicians.

The A stands for A1c. The aim is for this value to be below 7 mg/dl.

B for blood pressure < 130/80 mmHg, which should be checked at each physician visit. Hypertensive patients should be recording their own blood pressures at home.

C for cholesterol, specifically LDL levels below 100 mg/dl<sup>7</sup>. The ADA encourages patients to know these numbers and discuss management methods with their physicians to achieve these target numbers. Studies have shown that patients meeting their ABC goals had reduction in micro-vascular complications, cardiovascular-related events such as stroke, diabetes-related deaths,



Figure 2: Status post partial 1st ray resection left open in the setting of infection.

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heart failure, and vision loss. A 2013 report, however, showed that 81% of Americans with diabetes did not meet their ABC goals.<sup>8</sup> It is no wonder that diabetes-related complications remain a problem throughout the healthcare system.

## Diabetic Foot-Related Hospitalizations

Diabetic foot-related hospitalizations are among the leading causes for diabetes-related hospitalizations. These types of hospitalizations can often be avoided. In a nationwide study, between 2005-2010, it was determined that care of diabetic foot ulcers cost the Medicare system approximately \$1.5 billion per year.<sup>9</sup> The rise in cost of treatment of these ulcerations has been attributed to the push for limb salvage and the expenses associated with these efforts.

Furthermore, the majority of these costs are associated with the treatment of infected diabetic foot ulcerations. Unfortunately, many of these wound infections are preventable. Education initiatives and compliance



Figure 3: 1 month status post partial 1st ray amputation with vacuum assisted closure and infection at the amputation site.

ankle. After vascular intervention, she underwent a partial 1st ray amputation with vacuum assisted closure (Figure 2). One month later, she returned with a post-operative infection (Figure 3) and underwent subsequent guillotine transmetatarsal amputation. Repeat right lower extremity angioplasty was indicated to restore patency of blood flow to the right foot.

The patient was taken off of her anticoagulation for her third foot surgery where a Chopart's amputation and definitive wound closure was performed (Figure 4). Shortly after her third foot surgery, her hospital course was complicated by a cerebrovascular event due to an embolic stroke. She was transferred to the intensive care unit for persistent hypotension and stroke management.

Shortly afterwards, the patient went

into cardiogenic shock and passed several days later.

This patient unfortunately died in less than two years after developing an ulcer to her right hallux from routine nail care. Her foot ulcer and cardiovascular disease ultimately led to one complication after another and to her eventual death. This case study illustrates how important the ABCDE and "Fs" truly are. This patient's poor cardiovascular status was a product of years of neglect of her ABCs with manifestations in her feet. Prolonged immobilization after each successive surgery and hospitalization negatively impacted the patient's overall health and condition leading to her demise. The amputation itself was not the direct cause of death, which is typical of patients like this. Her death was related to a catastrophic cardiovascular event.

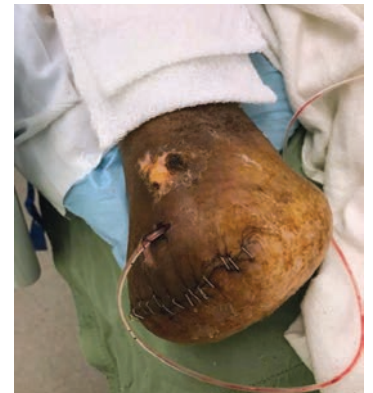


Figure 4: This is the right foot Choparts amputation closed primarily with a 7 french JP drain.

## The rate of hospital admissions for a patient with a diabetic foot ulcer is 11 times higher in a population of patients with diabetes.

on an outpatient basis with a multidisciplinary approach targeted at these high-risk populations are important in preventing what is already a disproportionate economic burden. The rate of hospital admissions for a patient with a diabetic foot ulcer is 11 times higher in a population of patients with diabetes.

### Case Presentation

The following is a case presentation that features cardiovascular complications that led to the eventual death of a patient who had poorly managed ABCs. A 74-year-old female with a past medical history of peripheral arterial disease with three vessel infrapopliteal disease, hyperlipidemia, hypertension, type 2 diabetes mellitus with a HbA1c of 9.8, atrial fibrillation on anticoagulants, and end stage renal disease on hemodialysis presented to the hospital with wet gangrene of the hallux.

She had a non-healing wound of one-year duration after injury from routine foot care by her local podiatrist (Figure 1). She underwent right lower extremity angioplasty and had a two-vessel runoff to the level of the

Foot health is a good predictor of overall health. Literature and this case support that when cardiovascular disease manifests in the lower extremity, a person's overall health condition is likely in jeopardy.

Multidisciplinary care approaches to identify, educate, and treat at-risk patients before ulceration or skin lesions appear are key to preserving limb and life.

Knowing and following the ABCDE and "Fs" of diabetes and cardiovascular health can lead to better results, treatment, and management of a difficult disease process that affects the entire body. It is imperative that the feet are included in diabetes care to address economic bur-

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dens associated with diabetes related complications, but more importantly prolong life and maintain a quality of life. Mnemonics for guidelines can be very helpful to physicians but also to patients. Patient engagement is crucial in diabetes care and foot health. So, the message to patients is “know your numbers and your ABCs!” **PM**

## References

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