

# Sockwear Recommendations for People With Diabetes

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## Case Presentation

A.B., a 55-year-old man who had been diagnosed with type 2 diabetes 6 months ago, was a new patient in the foot clinic of the Durham VA Medical Center. At the time of his first visit, he was taking metformin, 500 mg twice a day, and maintained

adequate blood glucose control. His most recent HbA<sub>1c</sub> was 6.5%.

The skin on his feet was intact, without redness, and its texture was smooth and soft. His nails were intact without signs of onychomycosis. The shape of his feet was normal, and

monofilament testing confirmed that foot sensation was intact. He had easily palpable pedal pulses and no edema.

During routine discussion of foot-care precautions, he asked what kind of socks he should wear to prevent problems.

## Discussion

Good foot care practices are important for people with diabetes. A large percentage of diabetic patients undergo nontraumatic amputation after diabetic neuropathy renders them unable to feel festering foot injuries. What's more, within 3 years of a first amputation, up to half of these patients have a second either new same side or contralateral amputation. Within 5 years, as many as 80% have died.<sup>1,2</sup>

As care providers, we are responsible for the self-care practices our patients use every day. Pronouncements such as, "People with diabetes need to keep their feet dry" and "Moisture promotes fungal growth" are common, and it is widely assumed that the sock fabric our patients wear determines how moist or dry the skin on their feet will be.

There are three schools of thought regarding the best fabric for socks worn by people with diabetes. Some professionals recommend cotton/wool socks. Others recommend socks or stockings of acrylic or a synthetic blend. And still others advise their patients to wear comfortable, well-fitting socks without regard to the type of fabric.

### Sockwear Recommendation Survey

Diabetes care providers often answer questions such as A.B.'s without considering whether there are any research data to support their answer. We conducted an informal survey of

physicians, podiatrists, staff nurses, and certified diabetes educators (CDEs) from Duke University Medical Center, the Durham VA Medical Center, and surrounding areas to explore providers' sockwear recommendations and the reasoning behind them.

### Physicians and podiatrists

Our survey of 12 physicians and podiatrists revealed that sockwear is not a subject about which physicians feel particularly concerned. Most said they never make sock recommendations. One said he was more likely to make a comment on socks if a patient had signs of tinea pedis.

Of those who do make recommendations, one said she usually asks patients to wear cotton or wool socks because they are associated with less moisture and because she prefers natural fibers. Another recommends and wears acrylic socks because these were recommended to him by staff at an athletic shoe store. A podiatrist said he prefers a cotton/wool/acrylic blend.

Doctors who suggest that patients wear particular socks recommend comfort above all else. Two physicians mentioned that socks should not be too tight.

### General staff nurses

When we performed the same survey with 11 general staff nurses, it became clear that nurses had a different focus.

Although they expressed concern that socks should be comfortable, they were also likely to recommend specific fabric types. Most of the nurses thought people with diabetes should wear cotton or wool socks. But those recommending acrylic fabrics said they were "better," more absorbent, and more comfortable.

### Diabetes educators

Our third survey involved 11 CDEs, who were the most vocal group on the subject of sockwear. Like the general staff nurses, most of the CDEs thought that cotton or wool socks were preferable. The main reason for their recommendation was absorbency. Several CDEs referred to perspiring feet or excess moisture and said that cotton was better at addressing this problem.

However, some of the CDEs surveyed did recommend acrylic socks. One educator said she had changed her advice regarding cotton versus acrylic based on an article she had read in the American Diabetes Association (ADA) magazine *Diabetes Forecast*, which stated that people with diabetes should not wear cotton.<sup>3</sup>

One CDE warned against wearing dark socks "because of the dye." That recommendation, outdated by at least 50 years, is based on the fear that dyes will not be colorfast and will "bleed" into open wounds.

At least one person in each of our

three surveyed groups mentioned Thorlo socks. However, these professionals seemed unaware that Thorlo socks are made of an acrylic/nylon/spandex blend; they recommended that people wear this brand while also recommending cotton/wool fabrics.

### Educational Materials Review

A sampling of patient education materials from different sources also suggests that patients are not getting uniform information about sockwear.

### Government and pharmaceutical company literature

Government sources recommend cotton and wool socks for diabetic patients to help keep feet dry.<sup>4,5</sup> They also reinforce the need to wear socks at all times.

Health care providers often use general diabetes care and diabetes foot care literature provided by pharmaceutical companies in making recommendations to patients. Virtually all of these materials make some reference to wearing socks.<sup>6-11</sup>

Many do not make specific fabric recommendations, but they do suggest that people avoid tight socks. Some suggest that white cotton or wool socks are preferable, saying this is because "cotton socks allow feet to breathe and helps prevent sweating."

Rarely do these materials cite research data for what they present. Roche Diagnostics/Boehringer Mannheim Corporation lists an Accu-Chek Amputation Prevention Initiative Advisory Board on the back page of its foot care pamphlet.<sup>9</sup> The Takeda/Lilly<sup>10</sup> diabetes care materials contain a fairly lengthy bibliography. Unfortunately, their only reference to socks is a warning that people should not go barefoot.

### Books and magazines for patients

A wealth of health care information, including sockwear recommendations, can be found in the numerous books and periodical publications produced for people with diabetes. Recent articles in *Diabetes Forecast*,<sup>3,12</sup> for example, have offered several common-sense tips on choosing socks.

One article<sup>3</sup> reminded readers to wear socks that fit well, so that lumps and seams in the material do not increase pressure on the foot. It also

noted that, although cushioned socks can help prevent callus formation, they may be too tight in some shoes.

The article also cautioned against wearing cotton socks during exercise. The rationale was that the cushioning fibers compress over time, and cotton does not wick away moisture; therefore, feet remain moist. (Wicking is the ability of the fiber to pull moisture from the skin's surface toward the outer surface of the fabric, where it can evaporate.<sup>13</sup>)

The most recent *Diabetes Forecast* article on this topic<sup>14</sup> suggests that any sock fabric is fine for everyday wear, whereas acrylic or polypropylene fabrics are best for exercising.

Articles in other publications for people with diabetes also offer differing recommendations. One article in *Diabetes Self-Management*,<sup>15</sup> for example, advised wearing only cotton socks and recommended avoiding knee-high and tight socks and changing socks frequently for people who tend to perspire heavily. The article noted that tight socks are more constricting, and cotton allows air to penetrate and absorb perspiration. Another article from the same publication<sup>16</sup> recommended wearing socks made of synthetic fibers that wick away moisture when participating in active sports.

In her book *101 Foot Care Tips for People With Diabetes*,<sup>17</sup> advanced practice diabetes nurse Jessie H. Ahroni offers perhaps the most comprehensive set of foot care recommendations for people with diabetes. Echoing the *Diabetes Forecast* articles mentioned above, she advises people whose feet perspire excessively to wear acrylic blends because of the wicking action of acrylic fibers. She recommends socks with cotton or wool because these fibers are "breathable," but she notes that the sock fabric should include some acrylic or other synthetic for its wicking action. She also notes the importance of keeping feet dry to prevent fungal growth.

### Professional education materials

Many educators at programs officially recognized by the ADA or the American Association of Diabetes Educators generally advise patients to wear good-fitting socks with shoes

and to select socks made from materials that will wick moisture away from the skin, such as cotton or wool and synthetic/acrylic blends.

Although diabetes educators base their practices on many sources, one important source is the handbook titled *A Core Curriculum for Diabetes Educators*.<sup>18</sup> This resource advises diabetes educators to teach people to wear cotton or wool socks. It does not mention fabrics with wicking action.

In another text on diabetes foot care, McDermott<sup>2</sup> offers an interesting cautionary note: people with diabetes are often given "misinformation" that is not scientifically based. He advises educators to recommend cotton but notes that blends are also acceptable.

Haas and Ahroni<sup>19</sup> advise educators to teach patients who have a tendency toward "sweaty" feet to wear cotton or wool socks to absorb moisture.

Clearly, then, the people educating the diabetes educators also have differing opinions on the most appropriate fabric for socks.

### The Research

Luckily, some research-based evidence is available on this topic. A few studies have looked at what happens to feet wearing socks of differing fabrics and constructions. Also, the textile industry has conducted research into fiber composition and characteristics.

In 1989, Veves et al.<sup>20</sup> used Thorlo socks to show that cushioning decreased vertical pressure to the diabetic foot. They concluded that in conjunction with wearing proper orthoses, cushioning can help to prevent ulcer formation.

In 1990, the same authors<sup>21</sup> looked at the duration of cushioning effects. In this study, they found that a cushioned sock, while losing some of its effects, provided more pressure relief than being barefoot, even after 6 months. They concluded that a high-density sock is probably the best choice for the insensitive foot.

Murray et al.<sup>22</sup> also used Thorlo socks to look at the acceptability of cushioned socks for people with diabetes who have insensitive feet. They found a high acceptance of these socks over time.

Herring and Richie conducted two

studies<sup>23,24</sup> comparing the degree of moisture on feet and socks, foot temperature, and blister formation resulting from wearing acrylic and cotton socks. In the first study,<sup>23</sup> they used socks with thickly padded cushioning in the soles. In the second study,<sup>23</sup> the socks had no extra padding. Interestingly, in the study using padded socks, they found a significant advantage to using acrylic, whereas in the study of generic cushioned socks, they found no demonstrable difference in moisture.

Herring and Richie's results agreed with textile industry claims that natural cotton and wool fibers absorb moisture from the skin.<sup>13</sup> However, socks are like towels. If a cotton towel is used to dry the skin after a bath, the cotton does well at absorbing the water from the skin, but the towel is then damp because it retains the moisture. A characteristic of acrylic is that it does not absorb moisture well. However, it is able to wick moisture from the skin. Herring and Richie concluded that people whose feet are exposed to increased moisture because of exercise should wear socks that are not only made of acrylic fabric, but also densely padded.

### Summary

Clearly, diabetes educators and other health care professionals often base advice on tradition rather than on scientific evidence. The available evidence suggests that people with diabetes who have "normal" feet should be able to wear whatever socks they find to be comfortable. Socks should fit well, without constricting cuffs, lumps, or uncomfortable seams. Therefore, fitted socks are preferable to tube socks. Lighter-colored socks may alert wearers with compromised sensation to a draining wound. Patients can judge for themselves

which type of fabric feels the most comfortable.

Patients who are at risk for ulcer development because of decreased pressure sensation should be advised to wear densely padded socks. In the studies cited here, the padded socks used were the Thorlo brand, which are made of 100% acrylic fiber with nylon and spandex for elasticity. Because cotton was not used, it is difficult to say whether a 100% cotton padded sock would also produce less vertical pressure.

Herring and Richie found that padded acrylic socks produce less moisture at the skin surface and less blistering in runners than do cotton socks. Therefore, educators should recommend that their patients wear padded acrylic socks when engaging in vigorous exercise.

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