Treating the absence of pain while keeping people moving: worth a life's work

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Q How did you first become interested in the field of diabetic foot care? Your father was a podiatrist, how did he inspire you?

I grew up in my father's office and so I saw just what a doctor taking care of people's feet could do; how someone could walk in hurting and leave feeling better. This appealed to me because it fit really well into my world view of instant gratification, especially as a kid. What is funny is that over the course of my career, I have gravitated away from this idea of instant reward and more towards the exact opposite; with the diabetic foot really bad things can happen very quickly, but really good things generally take time and happen slowly, so this has surprised even me, because that is the opposite of my nature I think.

I became really interested in the diabetic foot when I was a first year resident in Detroit (MI, USA). I remember very well that on my second day as an intern I had an experience that was almost an epiphany. I had spent the day before in surgery helping to put a screw in a young man's foot. It was really exciting as I was

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a new resident; it felt great to be treating the patient. I was changing the man's dressing the next day in the clinic. He was a big guy, a college athlete of about 6'9" or 6'10" and he was writhing in pain after his operation. While I was helping out in the clinic I walked into the room next door and there a woman with diabetes who was maybe only 4'9", she was a slight lady so the difference was quite striking. She had a wound on her foot and as I was trimming and debriding her wound and talking to her and her family, I noticed that her hands were burnt. The burns looked really severe and I struggled to work out what could have happened. The patient had just arrived in the country from India and I found out by chatting to her son that she had been a cook's assistant when she lived in India, and she would often reach into the oven and flip over the naan breads with her hands. That is how she sustained such bad burns. Her foot wound was bleeding on the floor yet she was so peaceful and relaxed because she couldn't feel a thing. Her hands were burnt to a crisp because she couldn't feel those either. Then I step out of the room and I see the young man right next door, suffering so much from the injury to his foot. It was at that moment when I looked between them that I realized that this guy was acting just the way he was supposed to, but I found this woman, with an absence of pain, to be fascinating. That is why I decided to choose the diabetic foot. As doctors and nurses we are taught to treat the symptoms, if something hurts we go and treat it, but the challenge with diabetes and what makes it so sinister is that we have to accept the absence of symptoms. It is easy to talk about, but it is so difficult to do, and this is the challenge that has occupied most of my life.

Q What do you think has been your biggest achievement in your career so far?

It is a difficult question to answer, but I think there are probably a couple of main achievements that we have had to date. We have carried out a lot of work in classification, trying to create therapeutic and diagnostic labels, and I think myself and my colleagues have had some impact here. When working on wounds, the things that are important to classify are how we describe depth, infection and ischemia, as well as possibly location and size of the wound. The key aspects in classifications for risk of getting a wound are peripheral myopathy, deformity, history of previous complications and ischemia. Putting these things into one common language in the simplest way possible is difficult, it's a bit like trying to take a novel and turn it into a poem.

In addition to the work on classification systems, I think the work that the team have done in wound healing has been important. People always talk about working together through interdisciplinary and team approaches; however, very often the words are there but the action unfortunately is not. I think what we've really tried to do is to highlight out interdependence in this area, in diabetes in general and in the diabetic foot specifically. A person's foot is quite literally 'out on a limb', it is an anatomic peninsula and anyone who works on the body and has to address that part of the anatomical geography is hostage to everything that comes from the anatomic mainland. A diabetic foot specialist is very dependant upon others in the medical team. Getting that message out there is something that we have really tried to consistently do.

Q Why is care of the diabetic foot so important?

It occupies up to a third of the entire diabetes budget; in my opinion, it is so poorly addressed that it is astonishing. Within noncommunicable diseases, which of course are our biggest health threat now and, for the first time in the history of humanity, kill more people than communicable disease, I would challenge anyone to look for an area that is so poorly addressed, but has such an outsize, fiscal and social impact as the lower extremity in diabetes. In the USA alone, and this is only a small fraction of even the developed world, we are talking about a budget for diabetes that is approximately US$2–3 billion (depending on whose math one is looking at), and that is

direct rather than indirect costs. Of that amount, approximately $1 in $3 seems to go towards caring for the extremities. We have so much further to go now because people are living longer with these complications; even if we can manage to reduce the number of amputations, people may still be living longer with wounds.

Q What do you think have been the biggest advances in diabetic foot examinations over the last decade?

I think that the biggest advances have been in our ability to classify, as well as identify referral pathways from generalists to specialists and back again. Those two things have been really important because if you look at the population-based data that exist now, it appears that we have more success if patients go and see their podiatrist coupled with another member of the diabetes team. If we have a common language of risk and the specialist realises that it is important to communicate that to the generalist, then we find that the patient is more likely to return for care. Looking at data across many tens or even hundreds of thousands of lives, it looks as though these improved referral pathways are associated with a significant reduction in the risk for amputation. I think this important advance has played a part in the reduction of high-level amputations in some parts of the world, including in the USA, which has been a wonderful and pleasant surprise to many of us over the past 5–10 years.

Where I see real excitement right now is in screening, prevention and even care for the patient who has had a previous wound or amputation (the patient in remission). There are some really exciting technologies that merge mobile health with the work that we have done over the past 15–20 years, and the work that others, including my mentors, have carried out over the past two generations.

We have known for some time that many wounds will heat up before they break down, and you can detect that with a thermometer. We've had three separate randomized studies now in the USA that have suggested that by giving a patient a thermometer we can really reduce the risk for ulceration or re-ulceration. What we have tried to do now is to develop that device into a form that could be useful in the home. We have a device that we have been working on, along with colleagues of ours from MIT and Harvard Business School (MA, USA), it looks a bit like a bathmat, believe it or not, and the idea is that someone just stands on it and it can measure and record information about the feet, sending that information on to the patient, to his or her smart phone or computer, and of course to the doctor or nurse, if the patient agrees to this option. An operator or a nurse may then call the patient, telling them, "Mrs Smith, your right big toe is hotter than your left big toe and it seems you've had quite a lot of activity recently, which is unusual for you, perhaps you can spread that out a little bit and maybe grab that specially made boot from your closet? We'll make an appointment for you with Dr Jones." It is a little like a home security system for the body. We think that this is a really significant tool and platform, because it gives people peace of mind. It wouldn't necessarily be funded by the NHS in the UK or by people's insurance companies in the USA, but it could be a method for prevention or reduction in complications that people choose to purchase themselves – as a subscription, if you will. We think that will be a significant advance moving forwards, but we've been saying this for the last 15 years. We have now had the devices mocked up, we are testing them and it's a very exciting time, but I couldn't say how much longer it might take before they are widely available.

It would be a lot easier for some patients to look after their feet if they had a monitoring system such as this. It has been one of our goals to try to simplify foot care, because we know that patients should be evaluating their feet everyday if they can, just as they might comb their hair or brush their teeth, but we also know that many of our patients cannot do this as easily as they get older, so our goal is to give them the tools to do so. The mat would also allow family members to evaluate things from a distance and would give the patient a greater degree of independence.

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There is also a related study going on at the moment regarding what we call 'smart socks'. These are socks that look like any other pair of socks, they're washable but they have fiber-optic sensors in them that can measure almost anything that you want – it's so much fun at the moment.

Q Among other projects you have been involved in founding the Southern Arizona Limb Salvage Alliance, which encourages collaboration in clinical care. Could you tell us more about the work it does?

I started Southern Arizona Limb Salvage Alliance (SALSA) with my clinical partner and friend, renowned vascular surgeon Joseph L Mills, when we discovered the importance of managing the 'toe and flow'. We have probably the most productive research unit in the world dedicated to this area.

It works like this: we have a toe mechanic, such as myself, who manages the structural components, the wound in the foot and the infections, and then we have someone like Joe who manages the vascular components, the 'flow' if you will. The work of both doctors overlaps beautifully. This exciting approach really works because it really is a team approach. The secret to SALSA is the fact that we have all of these specialities in one single clinical service so there is no referral phone call because we're seeing people, generally speaking, at the same time. We have our clinicians in the same area, so we are forced to bump into each other and have what we call 'forced curbside consultations'. It may sound easy to put two clinicians together, but it's really not. We're constantly arguing and fighting and we have different views, but it is so much fun at the same time and we wouldn't have it any other way.

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Q Have you seen the model replicated elsewhere?

Yes, that is what is so great. Every week we have people visiting our unit from different parts of the world, trying to make this work in their own units, with their accent in their specific part of the world. And it can work. Just recently, we had clinicians from Afghanistan, India and Pakistan in our unit at the same time. It is great to see.

Q How did you go about starting the International Diabetic Foot Conference (DFCon)? What is the conference's main aim and how has it developed over the last few years?

The meeting has now been running more than a decade and it has almost become more than a meeting. It feels more like a revival than a meeting, in that every year we have clinicians and scientists, and even analysts from industry, all at the top of their fields, who work in 50 different countries coming to DFCon, the speakers come from upwards of 12–20 different countries, and it is broadcast all over the world. It is very interdisciplinary and everyone brings their A game. I don't think there are too many meetings like that. It's not a massive meeting, only approximately 1000 people, but it has an outsized influence because you have such a range of experts attending. For example, last year we had two people who were running for different US congressional and senate seats – politicians who also happen to be clinicians – and they were talking about policy and patients alongside basic scientists, world-renowned surgeons and stock analysts. All these different people are coming closer together and working and sharing ideas, and that is what makes the meeting terrific. Our goal is to bring people together and there's something great and liberating about that. Plus, we have friends in the movie and television industry who participate in DFCon every year. For example, Edward James Olmos, who is an academy award nominee, has been involved in the meeting every single year and we now have a highly coveted award in his name. Everyone who goes to the meeting enjoys it; they love to see the titles we come up with, it has become a bit of a tradition to have a bit of a sense of fun as well.

Q Could you explain your role as the Chair of the World Diabetic Foot Commission of the Federation of International Podiatrists? What do you hope to achieve in this role?

This is a relatively new kind of role because you have foot care providers all

over the world, and our goal is to bring these 80,000 or 90,000 providers from 30 or more countries together to create one voice. I just try to play a small part in it. It is a wonderful opportunity to be able to participate with colleagues around the world and to make a difference, to project positively on bringing about positive change to care. It is everything else we have been talking about, just magnified a little.

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