TELEMEDICINE
IN THE CARE OF
THE DIABETIC FOOT

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Introduction

About me

I currently work as a trainee in general surgery in the Queen Elizabeth Hospital in Woolwich, London. Part of my training has been in the subspecialty of vascular surgery, where I have cared for many patients who have suffered from what is known as ‘diabetic foot’.

Diabetic foot

Diabetic foot is a term used to describe the spectrum of signs and symptoms that people with diabetes may experience in their feet. These range from diminished sensation, to bony deformity, ulceration and gangrene. Amputation of the foot or most of the lower limb is the most catastrophic of these. Indeed, a patient with diabetes is 20 times more likely to require amputation. Given that the need for amputation is nearly always preceded by some of the aforementioned pathology, this is clearly a preventable consequence.

The charity, Diabetes UK, surveyed 206 hospitals in England and Wales. Of these hospitals, 84 – around 40% - did not have a specialist foot service for these patients. One case study cited a hospital that had spent £33,000 per year on their specialist foot team; the estimated savings from preventing an amputation equates to £250,000 per year.

Essentially, in the UK, the diabetic foot is managed poorly. Recent National Health Service reforms are increasingly likely to compromise budgets. This should place the onus on preventing amputation even further, as this is truly cost effective. However, hospitals that do have specialist teams in place are barely coping – in 2013, I worked at the Queen Elizabeth Hospital in Birmingham, one of the biggest hospitals in the country; the hospital has only one podiatrist to look after patients with diabetic foot.

Telemedicine

Telemedicine can be literally interpreted as ‘medicine at a distance.’ At its most basic, this can simply involve a telephone consultation between a doctor and a patient, or a phone discussion between two healthcare professionals regarding a clinical situation.
It has grown to encompass the use of technology in a number of formats to provide a range of clinical services – these include information technology, video conferencing and smart phones for diagnostic, monitoring and even therapeutic purposes. All medical subspecialties have the potential to make use of telemedicine.

**Why diabetic foot and telemedicine?**

Careful, regular monitoring of the diabetic foot is the key to preventing amputation. A big problem is that many patients simply do not have access the relevant healthcare professionals who can make simple interventions or recommendations to prevent deterioration.

Diabetic foot is a very ‘visual’ disease – one simply needs to look for the distinctive ulcers, deformities or tissue necrosis to know things may be getting worse.

Telemedicine thus has the potential to lend itself well to the monitoring and diagnosis of these problems – one could make use of photography, videos and a whole host of technology to assess the patient remotely.

Unfortunately, telemedicine is under-utilized in the UK; not just for the care of the diabetic foot, but in many realms of medicine. The general aim of my Churchill Fellowship was to see if and how telemedicine could be used to improve outcomes in patients with diabetic foot.

**Why North America?**

Hospitals and healthcare institutions in North America have made huge strides in the use of telemedicine. Indeed, many parts of their healthcare system are heavily reliant on telemedicine. This is because of the sheer size of the country, which means some patients would otherwise have to travel vast distances to see a doctor in person.

Many networks and private companies are focussed on telemedicine exclusively, outsourcing to institutions around the continent.
Aims of my Fellowship

The aims of the Fellowship were:

1) *Examine the effectiveness of an established telemedicine service for diabetic foot*

Has telemedicine made a difference? Are patient needs truly met? Continuity of care is an essential precept in all medical fields, not just for the diabetic foot; therefore I wish to see if it is indeed improved by telemedicine.

2) *Understand the infrastructure required to establish a telemedicine service*

What technology is required? What are the financial costs and resource implications? Telemedicine has been cited as an example of reverse innovation, so it is necessary to determine if it is indeed cost effective.

3) *Assess the feasibility of a telemedicine service in the UK*

Are the ideas that I aim to explore transferable to the NHS? My overall aim is to push the field of telemedicine in the UK further; therefore I need to be certain that it is applicable to our culture of healthcare.

Institutions visited – September to October, 2013

1. The Mayer Institute, 20 Railway St., Hamilton, Ontario L8R 2R3, Canada

2. The University of Arizona Medical Centre, 1501 North Campbell Avenue, Tucson, Arizona, USA

3. Southern Arizona VA Health Care System, 3601 South 6th Avenue, Tucson, Arizona, USA
The Mayer Institute, Hamilton, Canada

Hamilton is a city in the Canadian province of Ontario, with a population of just over half a million.

*Picture 1: Hamilton, Ontario, Canada*
It was here that I came to visit Dr Perry Mayer and his team at the Mayer Institute (TMI).
The institute was founded in 2006 by Dr Perry Mayer. It is a clinic that solely treats diabetic foot.

**Canadian healthcare**

Some basic understanding of the Canadian healthcare is needed prior to going into my experience at TMI. Like the UK, Canada has a universal, publically funded system of healthcare. However, control over it comes regionally from the provinces and territories, rather than the central government. The government does subsidize some of the system, whilst the rest comes from private insurance premiums – the government subsidy keeps prices down. What is provided for by the universal “Medicare” system is determined by local government. The public can receive private insurance through their employer.

It helps to have this understanding because it is a system that allows a clinic like TMI to come into existence and thrive. There has been a growing push for ‘super-specialization’ in medicine throughout the world, including the UK. The institute is an example of a super-specialized clinic that delivers results.

**My visit**

Upon walking into the building, I’m struck by how different the entire overall setup is to anything seen in the NHS. My initial impression is that TMI resembles a private dentist, or any other private healthcare provider in the UK. However, TMI is very much a typical Canadian clinic, which is essentially free at the point of use, and bills to either Medicare or the patient’s insurer.

The building (picture 2) is not huge, yet as I am about to find out, a huge amount goes on inside. There is a spacious waiting area and reception at the front.

*Picture 3: the waiting area*
It is the reception and waiting area that might give the impression that one was on Harley Street – well kept, clean and comfortable. It certainly is different from the crowded, noisy waiting areas that I am used to back home.

Again, behind the reception, where the patients are seen and treated, is very different to clinics in NHS hospitals:
The clinic itself consists of 5-6 cubicles as depicted in picture 4. Each is stocked with all the equipment needed to treat an individual patient, including surgical equipment, dressings, observation machines etc. as well as computers to enter and record all observations and consultations. A patient is brought to a cubicle by one of the highly trained nurses, dressings are taken down, and the consultation is started by the nurse. It is an open layout, which allows Dr Mayer to move from patient to patient with speed and make rapid assessments.

Like the entrance, the layout of the clinic itself is dramatically different to that seen in the NHS – where patients are usually brought into isolated, closed off rooms for assessment by the doctor.

One of the aims of my Fellowship was to find out if practices in treatment of the diabetic foot in North America could translate to the NHS (though the focus is on telemedicine, there is no reason why other aspects cannot be discussed), and one of my initial thoughts when I witnessed the setup was whether patients in the UK would tolerate being assessed in open cubicles in this manner, with Dr Mayer moving from patient to patient, rather than sitting in a room with them, and them alone. British patients have a certain expectation of privacy that is unlikely to be fulfilled in TMI’s setting.

However, there are a number of factors that make Dr Mayer’s process work. Firstly is the expert nursing – again, the notion of super-specialization comes into play here. The nurses of TMI are highly trained in the care of the diabetic foot. It is they who lead the consultation with the patient, and actually perform the majority of procedures, such as debridement. What is it about this that aids the process? Quite simply, it frees Dr Mayer up to work at speed, allowing TMI to reach its impressive volume of patients seen each day, and, when needed, devote his time to the more complex patients.

Secondly, Dr Mayer appears to know each and every patient inside out – there is no need to stop and go back over previous history. In the UK, we are frequently faced with problems of continuity of care; patients who come to clinic every few weeks might be seen by a different doctor each time, which slows the process down, as well as exposing the patient to haphazard management plans, and unfortunately, even error. However, this is not a problem here. Dr Mayer seamlessly moves into the consultation, recalls with
ease what stage of the management plan the patient is in, makes his recommendation, and even manages to fit in some small talk with the patient.

The Mayer Institute – the background

The beginning

TMI is at the stage where they are looking into implementing telemedicine into their practice – unfortunately for me, they were at the planning stage during my visit. However, there was still much to learn from Dr Mayer and his team. I sat down with him to learn the history and background to TMI.

Dr Mayer’s interest in diabetic foot-care began during his residency in family medicine. He set up a podiatry clinic in parallel to his own practice once he became an independent clinician. The clinic was a success, and he learnt a great deal from a specialist nurse, who taught him about wound care and many of the procedures involved in his practice. In 2003, Dr Mayer relocated to Hamilton with his family. Though reluctant to give up family medicine, he also did not wish to undergo the task of re-establishing himself in the specialty in a new city; simultaneously, he spotted the opportunity to undertake something innovative in setting up a clinic that specialised in diabetic foot care.

The layout

Personally, I was greatly intrigued by the layout of the clinic. “I like space,” was Dr Mayer’s initial response to my question regarding this. He found the traditional method of seeing individual patients in isolated rooms “cumbersome” and prevented him from knowing what each nurse and patient were doing during the consultations. On visits to similar clinics, he noted how some podiatrists would line patients up in chairs or beds side by side, and would just move down on a chair on wheels assessing and treating them.

Patient compliance and regular follow up is crucial in management of the diabetic foot. Dr Mayer states that he realised unless attention is paid to the environment – if it appears unclean, messy – then the chances of patients coming back are reduced. “I wanted the clinic to be a place where patients come in and say, “This is really nice”,” Dr Mayer told me, and so to some degree, the reception is modelled after a hotel.
**The finances**

The building itself was bought using a loan, which was the beginning point. From there on, TMI bills the Ontario Health Insurance Programme for assessments and procedures such as debridement, with payments for debridement depending on complexity of each wound.

One term that continually crops up is ‘metrics.’ Dr Mayer quotes a management maxim, which he picked up from one of his mentors, Professor David Armstrong (whom I’d be visiting later in the Fellowship): “If you can’t measure it, you can’t manage it” – and so the staff at TMI ensures that all procedures are recorded in detail, including time taken. This is helps TMI bill accurately.

**The future**

In the next 5 to 10 years, Dr Mayer sees his role “fading” – thinking he’ll only work for another 10 years. He hopes to generate some interest and momentum regionally and nationally, with a focus on social media to get the word out regarding the satisfaction and benefit of this subspecialty.

He also hopes to develop preceptorships – similar to my own visit, where a clinician visits TMI and takes skills and knowledge back to their own institution. He acknowledges that he was not taught as such, and undertook a good degree of self-directed learning, but such an approach is not for everyone, and in order to disseminate such knowledge, structured teaching is essential.

*Picture 6: Dr Mayer in the TMI*
Final thoughts and lessons learnt from TMI

In just a short period of time, the learning points gleaned from my visit to TMI put the lack of telemedicine experience far into the background.

Specifically, it demonstrated the importance of focused, specialised – virtually super-specialised – care. No patient is straightforward, no matter what their condition. What appears to be a simple ulcer secondary to diabetes is absolutely not simple – and it takes an expert to realise that and craft appropriate plans for that patient. Expertise can only arise from dedicated time. Once that expertise is attained, the process can move at great speed without compromising quality, something that the NHS certainly strives for.

Clinicians may not aspire to super-specialisation because they fear that without a range of conditions to treat, boredom may set in. However, Dr Mayer and his team have revealed that within seemingly small specialties lies a vast array of knowledge, which can result in deeply rewarding outcomes for the physician – during my time with him, Dr
Mayer highlighted the personal satisfaction he gets from making a difference to a patient’s quality of life with the skills and knowledge he has built up over the years.

Another lesson learnt was the potential of nurses. At TMI, the team of nurses worked non-stop to provide the practical care for each patient, which is precisely what nurses do best. They demonstrated that a caring attitude, enthusiasm and basic skills in minor surgery go a long way.

Thirdly, TMI demonstrated the scope for innovation, even within what could be considered a small specialty. The layout of the clinic, if adopted by British institutions, would certainly be a radical shift that may take some getting used, and though it may not work for all patients and all conditions, it certainly appeared to work at TMI. In combination with the highly skilled nurses, TMI can see up to 100 patients a day, all within a normal working day.

Lastly, TMI has shown the importance of attention to detail when assessing the patient with a diabetic foot.

The University of Arizona Medical Centre/Southern Arizona VA Healthcare System, Tucson, Arizona, USA

It was actually Dr Mayer who suggested that the next stage of my Fellowship should be at the University of Arizona Medical Centre – in particular, with Professor David Armstrong, who is professor of surgery at the University of Arizona, and a bona fide leader in the field of diabetic foot.

Another reason for my visit to Tucson was to assess telemedicine and diabetic foot care at tertiary, hospital level. Both the University of Arizona Medical Centre and the Southern VA Healthcare System are hospitals that provide a whole range of telemedicine services in a variety of specialties such as cardiology, dermatology and trauma.

Tucson is in the state of Arizona, home to between 500,000 and one million people. It is known for its surrounding desert beauty and searing summers – I was certainly struck by both as I came off the plane.
The University of Arizona Medical Centre is a private, non-profit hospital providing acute services, with nearly 500 beds. It is, in many ways, an excellent starting point to assess the general use of telemedicine.

Arizona is the 6th largest state in the USA – thus much larger than Great Britain, but crucially, with a much lower population density – 57 people per square mile, compared to Great Britain’s 782 per square mile. This equates to a significant number of people living far from the specialised medical services in the city, such as the ones provided the Medical Centre. Around 25% of the state is made up of Indian reservations where several Native American tribes reside. Thus, telemedicine is genuinely something that the state needs to look after its population. This is demonstrated by the established telemedicine network, depicted in picture 9:
Picture 9: A pictorial representation of the Arizona telemedicine network
On my arrival at the Medical Centre, one of the first people Professor Armstrong directs me towards in order to expand my knowledge of telemedicine is Dr Eric Brody, a cardiologist, and also director of the hospital’s Native American Cardiology and Medical Service Programme.

**Telemedicine in Arizona**

Dr Brody explains that the telemedicine he and the institution have practiced varies in its complexity – from the basic faxing of ECGs from peripheral clinics; to real time echocardiography, as well as “store and forward” echocardiography and dobutamine stress echocardiography – all undertaken at a distance. These peripheral clinics serve the Native American population, and are sometimes well over 5 hours’ drive away from the Medical Centre in Tucson. The set up would consist of a technician and a general physician performing the echo on a patient whilst administering dobutamine, with the specialist i.e. Dr Brody watching in real time. Of course, the most obvious benefit from a service like this is that it saves patients the cost and time of travel. From Dr Brody’s perspective, it provided the opportunity to establish a relationship with the patient – as they could see the specialist on the other side of the video link. This meant that if the patient did need to go to Tucson for an official consult, they were not travelling huge distances to meet a complete stranger, and Dr Brody was very keen to highlight this as one of the big benefits of an interactive telemedicine service – “a rewarding aspect”, is how he described it. Another advantage to the peripheral clinics is that allows them to retain a service that makes them money – they are still able to bill for undertaking the procedure. Though much is made of the differences between the USA’s private healthcare service and our free service, parallels still exist. There is a drive to taking specialist services out of smaller hospitals in the UK and locating them in bigger hospitals – this of course means the smaller hospitals are at risk of losing money and subsequently closing down, which has ramifications for those employed by the smaller hospitals – telemedicine allows for ‘stretching’ the specialisation over multiple centres, each still remaining involved in the patient’s care.

Though not directly addressing diabetic foot, I can easily see the parallels between telemedicine for rural Arizona, and British care for diabetic foot. This pathology requires close monitoring, and a genuine hurdle to this is the distances some patients have to travel to receive this assessment.
Difficulties in arranging telemedicine include the logistics of coordinating multiple parties and the technology. Dr Brody points out that telemedicine is very much a team effort – the ‘provider’ – that is the nurse, the clinician, or the technician who is on site with the patient – needs to be on the same page as the specialist at a distance, and be reliable and trustworthy.

The other problem can lie in the technology itself – all it takes is for one piece of faulty equipment to play up, and the consult or session can be obliterated.

**Setting up a telemedicine network**

My next interview and visit at the Medical Centre was to Phyllis Webster, who is the Telemedicine Case Coordinator for the hospital’s telemedicine programme. She is the primary contact for incoming referral cases, and oversees the administrative operations of the clinics across all the specialties.

She states that very first aspect to consider when establishing a telemedicine programme is to undertake a thorough “needs assessment” – exactly why do we need a telemedicine programme, where will the benefit lie, and will the needs justify the resources going into the programme?

Secondly, maintaining security is an absolute must – in the USA, all patient information needs to be ‘HIPAA compliant’ – that is, compliant with the Health Insurance Portability and Accountability Act i.e. patient confidentiality must be maintained at all times. Thus, the encryption technology used must be robust.

How a telemedicine programme might be financed in the UK in comparison to one in the USA is difficult to understand, but Ms Webster makes it clear that there were a number of contributors to the initial setup, including academic grants. It is important to note that reimbursement from health insurance providers was only given for real-time video conference consultations – hence, there would technically be no payment for, say Dr Brody’s interpretation of an ECG via email.

Another crucial factor is ensuring decent technology is used – Ms Webster stresses the need for high resolution photography and video technology if one is to use telemedicine for diagnostic purposes. Also, the accessory tool e.g. stethoscopes, ophthalmoscopes must be adequately integrated and be compatible with the conferencing technology. As a
surgeon, I’m always keen to play with novel technology, and Ms Webster demonstrated some of these to me:
Pictures 10-13: In order – Phyllis Webster demonstrates the camera used for video conferencing; the apparent resolution from the camera; an otoscope; and the view provided by the scope.
The camera in picture 10 costs roughly $4500 – which is cheap by most medical technology standards.

The network has also created set protocols and guidelines to avoid technological problems, and what to do if they occur. The clinics are set up 30 minutes before patients arrive to ensure a ‘stable link’ is in place; and if there is a technological problem, engineers are on site, and are available to fix any problems.

*Picture 14: How the telemedicine clinic appears*

**Technology and telemedicine – for the diabetic foot**

By this point, I had spent a good amount of time exploring telemedicine in general, and extrapolating what I could learn to my experience at TMI. So I certainly relished the opportunity to explore some of the technology and gadgets that could directly benefit patients with this disease.

Professor Armstrong put me in contact with Dr Bijan Nafaji, who has a background in biomedical engineering, and oversees most of the research in this field. He is especially
interested in the use of ‘bio-inspired’ sensors to evaluate patients objectively, particularly those with problems with the limbs.

I have discussed repeatedly the importance of stringent monitoring in caring for the diabetic foot. I therefore thought the use of a bathmat, fitted with biosensors to detect changes in temperature in a patient’s feet, was ingenious in its simplicity, design and what it could offer:

*Pictures 15 and 16: The Podimetrics mat with guide for use*
We understand that changes in the shape of the foot in a patient with diabetes are what ultimately leads to ulcers and other problems. This can manifest itself as heat, indicating perhaps inflammation, and so by assessing the heat pattern in a patient’s foot, the Podimetrics mat keeps a close eye on this. It is then transmitted back to the clinic or the hospital, where a record is constructed. By coming in the form of a bathmat, it is non-invasive and non-obtrusive.

The photo of the department’s research poster below also shows what other pieces they are working on:

![Research Poster]

*Picture 17: Some of the research that Dr Nafaji’s department are conducting into preventing diabetic foot ulcers*

**Telemedicine in the Veterans’ Affairs Healthcare System**

As well as spending time at the University of Arizona, I was also able to visit the Southern Arizona Veterans’ Affairs Healthcare System.
The Veterans’ Affairs (VA) system is probably the healthcare system that resembles our NHS the most – it is, essentially, government funded and is for those who have served in the US military. Thus, it is an entirely separate hospital in Tucson.

The hospital itself is one of the most striking I’ve seen. It is housed in an abandoned recreation spot, formerly known as Pastime Park, which featured a skating rink, a bowling alley and a tavern up till 1919. It is, also, a strangely warm pink:
My key contact at this hospital is Dr Divya Kapoor, a cardiologist who has been heavily involved in setting up the telemedicine service at the VA hospital, as she also has some
experience in medical informatics. She allowed me to see how their clinic works, with one of her nursing colleagues, Barbara, demonstrating tele-scanning and ECGs etc.

Interesting points of discussion included what do when a patient suddenly becomes sick – suffers a cardiac arrest, for example. Such safety nets need to be in place if a telemedicine service is to work.

I asked Barbara and Dr Kapoor what the initial response was when the service was set up. Unsurprisingly, some patients found the service “impersonable”, and confusing, and that actually still happens now. However, once the consultation is undertaken, patients normally seem to see the upsides of it, to the point where the demand for extending the service is noticeable. The advance of similar technology outside of medicine e.g. Skype, has also contributed to a more positive response.

The entire VA healthcare records are accessible electronically across the country. This is one thing that that the US has that we don’t that places them in a position to set up a telemedicine service. It allows them to screen patients, who may have been in some other part of the country, and deem whether they are indeed appropriate for the telemedicine clinic – for example, very sick or complex patients should not be seen at a distance, but of course in person. The NHS still relies entirely on a paper system, which means we would not be able to screen and select patients effectively.

Referring back to, in some part, to the issue of safety, is also the issue of appropriateness – the patient, the clinician and the telemedicine service all need to be appropriate for each other, and Dr Kapoor is keen to emphasise the importance of patient selection in this process, or “triage”, as she puts it.

Discussing telemedicine with VA healthcare professionals is particularly useful, because many of their patients are elderly; the UK, like most other western countries, is experiencing an increasingly elderly population, and certainly this is one demographic who would vastly benefit from telemedicine. Another nursing colleague of Dr Kapoor, Russell, took the time to explain briefly the Care Coordination/Home Telehealth (CCHT) programme, which serves 30,000 veterans with chronic conditions. The main conditions served are diabetes, high blood pressure and heart failure. Eligible patients are given home health technology such as messaging/monitoring equipment and videoconferencing/videophoning equipment. Each patient has a care coordinator, and
each patient is also ‘risk-stratified’ – so that when there is an objective change in the patient’s symptoms, the coordinator can contact the relevant clinician. The CCHT programme reports a reduction in hospital admissions of nearly 20%, and bed-day occupancy of around 25%.

**Patients’ perception of telemedicine**

Dr Kapoor was able to provide some figures that demonstrate a generally high level of satisfaction with the telemedicine service at the VA hospital, as depicted in picture 19, which are results for a survey of 271 patients. Essentially, the light blue equates to ‘strongly agree’ with the statement:
Results of a patient satisfaction survey on the telemedicine service at the VA hospital

Telemedicine for the veterans

One of the most important jobs – and certainly the most memorable – I have ever done was at the Queen Elizabeth Hospital in Birmingham, where for 4 months, I worked with the military in the Military Trauma unit. I am not in the military myself, and it was indeed an honour to be the first civilian to take up the role of Military Surgery Registrar at the Queen Elizabeth.

Though long departed from that post, it remains close to my heart and the memories of caring for British soldiers injured in Afghanistan – many much, much younger than myself – will remain with me forever. I was thus deeply interested to hear about the VA’s telemedicine service for American veterans who had also suffered life changing injuries in more recent conflicts, such as Iraq and Afghanistan, known as “post-deployment care”.

I met with Adrienne Weede, who is the programme manager for the post-deployment clinic. I was certainly pleased to hear about the focus on mental health of the veterans coming back from tours. These patients also may have physical injuries requiring physiotherapy and rehabilitation, which is less easy (though not necessarily impossible) to undertake via telemedicine. Thus if telemedicine can be used to conduct mental health consultations, this helps to cut down the number of journeys to and from the hospital.
Overall, the telemedicine service for post-deployment veterans is another useful adjunct in consolidating the transition back to civilian life.

Though privacy issues are certainly more sensitive amongst those with a military background, with potential mental health issues, such as post-traumatic stress disorder, Ms Weede points out that actually this demographic have been keen to take up the telemedicine service – because of their familiarity with technology.

During my time with the military unit, I noticed that a pattern for patients who had served, and had been out of the ‘military fold’ for quite some time that was in contrast to those just coming over from conflict. The latter group, even with the most severe of injuries, usually arrived back in the country on a wave of adrenaline and surrounded by great comradery. But months, and years down the line, that comradery would fade, and especially those who were unmarried, young, and from the north of the country (most of the military is based in the south of England, particularly the medical facilities in Birmingham and Headley Court) would return for their follow up, displaying signs and symptoms of depression. Certainly telemedicine has a clear application here, and that is simply as a tool to maintain contact with those who have been severely scarred by war, yet are no longer serving in a military environment.

**Back to the diabetic foot**

Towards the end of my visit, I was able to sit down with Professor David Armstrong, who is almost a superstar in the world of podiatric surgery and diabetic footcare. He has produced over 300 peer-reviewed research papers and nearly 30 book chapters. He has chaired and founded numerous committees, conferences and symposiums, which of course, makes him an extraordinarily busy man, so I was grateful for his time.

When it comes to the care of diabetic foot, Professor Armstrong is a strong advocate of “forced proximity” – pushing specialties together so that they can combine to provide high quality care. He believes that siphoning patients off to singular specialties is not a good idea and that a multi-disciplinary approach is essential. The NHS has introduced this to many sectors, yet it is not yet fully formed in the care of the diabetic foot. In many institutions I have worked in, podiatrists, vascular surgeons and diabetologists still communicate through the old fashioned referral system, rather than reviewing and discussing patients together.
A man with Professor Armstrong’s achievements is clearly a smart one; and like many genuinely smart people, he has a knack of pointing out the obvious facts that everyone else has missed. For all the discussions revolving around budgets, technology, logistics, Armstrong states that it’s “the thing in your pocket” that will be the key to telemedicine becoming a norm – that thing being one’s phone. He relays several small anecdotes of patients simply taking photos on their phone and sending them to physicians, and the subsequent impact on their clinical care. The technology, he states, is already with us and is “ubiquitous”; as well as our phones, Armstrong cites FaceTime, Skype and all other kinds of internet technology that could make medicine at a distance a reality. It is actually parameters such as being HIPAA compliant and monetary issues that are the constraints – so really what will bring telemedicine to the forefront will be a shift in culture, and the ability to work around and with essential constraints such as HIPAA.

Conclusions and lessons learnt

At this point, it would make sense to re-visit the aims of the Fellowship to assess what has been achieved:

The aims of the Fellowship were:

1) *Examine the effectiveness of an established telemedicine service for diabetic foot*

Where a telemedicine service has been established, it would appear as though a difference has been made. A state such as Arizona, with its rural pockets needs a telemedicine service, and has saved patients from making arduous journeys and saved them money.

The future for telemedicine is bright, with a number of technologies pending, but also at our disposal already.

2) *Understand the infrastructure required to establish a telemedicine service*

The range of technology is vast – from simple to complex, thus the financial and resource implications are equally varied. There is no need for it to be complicated; as discussed, the technology is in our hands already. It would make more sense to find ways of using existing technology such as smart phones and internet telecommunications
to work around the necessary constraints that exist in providing clinical services. This requires working on existing cultures and mentalities, and working closely with the private sector.

3) Assess the feasibility of a telemedicine service in the UK

The notion of ‘feasibility’ of a telemedicine service in the UK is perhaps the most challenging one. The healthcare culture in this country is in a relatively turbulent state, with much concern over the future of the NHS as a system where clinical care can remain free at the point of delivery. There are plenty of potential cost benefits to telemedicine, but our service has typically been risk averse, and issues surrounding confidentiality, as well as the lack of computerised records across the country really mean that implementing a genuine, fully functioning telemedicine service similar to the one in the States right now, is not feasible.

However, innovation can thrive in terms of turbulence, and in my last meeting, with Professor Armstrong, he rightly points out that just a small amount of momentum is needed initially.

I take heart from his words, as well as the actions of Dr Mayer, who had demonstrated to me the importance of striking out one’s own; that there is much value in trying to do things just a little bit different.

The future: recommendations and dissemination

Though I have concluded that a telemedicine service in the UK is not feasible right now, in no way does this mean that there is no future for it; indeed I feel the exact opposite, that it is the future. I do not hold reservations regarding telemedicine; merely caution and a desire to pursue it with care, thought and attention to detail.

Recommendations for establishing a telemedicine service could be summarised as follows:

- Identify where it is needed: it will certainly fail if it simply is a reinvention of the wheel; one such area is diabetic foot care
- Start small and grow: a service that is not hugely resource intensive and straightforward is less likely to fail and will likely provide a less steep learning curve, therefore do not begin in a specialty with fragile, highly complex patients
- The service should start in a hospital or health care setting which has excellent documentation and patient record facilities

Implementing these recommendations is easier said than done. Certainly as a relative junior clinician, I have the time to seek out the appropriate moment and setting to get this going.

Next is the dissemination of what I have learnt, which I hope will be done through talks, and the writing of further reports and papers. With the completion of the report, I will be seeking relevant societies and interested organisations. My plan is to approach these to see if they are willing to work alongside me in implementing the aforementioned plans, as well as letting me present my findings to them.

Most thrillingly, as I mature as a clinician, I feel that I will be able to establish an innovative service that provides care at a distance. Of course, it will not be achieved by me alone; thus, the building of teams of skilled individuals to plan and implement such a service is certainly another crucial stage that I look forward to pursuing.