Unmasking the impact of clinical non-attendance on neuropathic diabetes foot ulcer management

Benjamin Bullen and Matthew Young

Citation: Bullen B, Young M (2019) Unmasking the impact of clinical non-attendance on neuropathic diabetes foot ulcer management. *The Diabetic Foot Journal* 22(4): 28–33

Article points

1. Poor clinical attendance precludes 'best practice' management of neuropathic diabetes foot ulceration.
2. Interrupted wound management is associated with poor wound healing.
3. Shared responsibility differs from personal responsibility, including responsible service use.

Key words

- Behavioural agreements
- Concordance
- Diabetic foot ulceration
- Diabetic peripheral neuropathy
- Non-attendance
- Total contact casting

Authors

Benjamin Bullen is Lecturer in Podiatry, Cardiff School of Sport and Health Sciences, Cardiff Metropolitan University, UK; Matthew Young is Consultant Physician, NHS Lothian Diabetes Foot Service, New Royal Infirmary of Edinburgh (NRIE), Edinburgh, UK

This negative case study illustrates the far-reaching impact of poor clinical attendance on the management of neuropathic diabetes foot ulceration (DFU), reinforcing key priorities for clinical care. While a weekly hospital-based podiatry and/or multidisciplinary diabetes foot ulcer clinic (MDFC) review remained the local standard, in this case, failure to attend scheduled appointments proved to be the rule, rather than the exception. Sporadic podiatry and MDFC clinical attendance prevented regular expert foot assessment, sharp wound debridement, timely microbiological sampling, antibiotic monitoring and total contact casting (TCC); essential cornerstones of 'best practice.' Opportunistic wound surface area (SA) measurement demonstrated subsequent failure to heal over a 306-day period. This case study reinforces the adage that, when it comes to DFU management, "it's not what you put on, it's what you take off." Let this individual's inappropriately self-applied masking tape serve as a metaphor for the perils of TCC when clinical attendance is poor. Applied ironically to improve adherence, this tape caused restriction, maceration, an ideal breeding ground for bacteria and prevented timely wound assessment. Coupled with irregular expert review, this masking tape illustrates the importance of appropriate patient selection when electing for a TCC to manage neuropathic DFU.

The International Working Group on the Diabetic Foot (IWGDF) recently launched updated guidelines for the prevention and management of diabetes foot ulceration (DFU) (IWGDF, 2019a). Offloading guidance recognised, "multiple interventions are typically required to effectively heal a DFU, including local wound management, infection management, revascularisation and pressure offloading," however, "in people with neuropathic DFUs, pressure offloading is arguably the most important of these interventions" (IWGDF, 2019c). For the individual with a non-infected, non-ischaemic plantar DFU, a non-removable total contact cast (TCC) or below-knee offloading device was again advised as 'first-line' therapy, unless expressly contraindicated (IWGDF, 2019c).

While the IWGDF may consider offloading to be the most important aspect of neuropathic DFU management, the case has also been made for sharp debridement of devitalised tissues and marginal hyperkeratosis, which is "considered the first and the most important therapeutic step leading to wound closure in patients with DFU" (Frykberg and Banks 2016). An initial IWGDF Wound Healing Interventions recommendation explicitly promoted "sharp debridement in preference to other methods, taking relative contraindications such as pain or severe ischaemia into account" (IWGDF, 2019b). Increased frequency of debridement, preferably at weekly intervals, has been associated with shorter time to healing (Falanga, 2005; Warriner et al, 2012; Wilcox et al, 2013), further permitting collection of deep tissue samples to guide targeted antibiotic therapy.

Weekly foot inspection, sharp wound debridement and microbiological sampling, as necessary, may be readily undertaken by appropriately trained individuals

at cast changes, however, non-attendance precludes all of the above. When clinicians are not confident an individual will attend scheduled clinical reviews, non-removable offloading is, quite simply, out of the question. Melodie Blakely (2010) considered poor attendance a 'deal-breaker,' observing that "TCCs carry enough risk; applying one to someone who has already missed 3 weeks' worth of appointments, someone who has removed their own cast with a kitchen utensil or power tool or someone who consistently returns to the clinic 'swimming' in their broken down, waterlogged cast is just not wise". When attendance is poor, safety concerns outweigh the potential benefit of 'enforced compliance' with offloading. The primary concern for practitioners being the very real risk of unrecognised, limb- and life-threatening infections masked by the TCC.

A question of compliance?

Controversy shrouds the term 'compliance' throughout the academic literature and clinical practice, alike (Donovan and Blake, 1992; Mullen, 1997; Bell et al, 2007; Segal, 2007). While the term 'adherence' may be less prescriptive and more closely associated with shared decision-making strategies, it too fails to adequately capture the active involvement demanded of people with diabetes to engage with self-management practices (Walker and Usher, 2003). Furthermore, the terms 'compliance' and 'adherence' are frequently used interchangeably, adding to confusion (Epstein and Cluss, 1982). Such passive terms are also incongruent with the principles of person-centred care, implying a paternalistic approach to healthcare, with the patient's role relegated to obedient care recipient.

'Concordance,' has been suggested as a preferred term, recognising "that the doctor and the patient are equals, and that the patient makes informed decisions" (Chatterjee, 2006). The management plan described employed such a partnership approach, including a verbal behavioural agreement between podiatrist and patient, reinforcing the need to attend future clinical appointments. Despite this agreement, attendance remained sporadic, with associated poor wound outcomes and considerable associated wastage of healthcare resources.

Medical history

This case study conforms to The Declaration of Helsinki guidelines and the individual concerned provided verbal and written informed consent for publication of this case and associated images. This 49-year-old male had a positive family history of type 2 diabetes mellitus (T2DM), himself diagnosed in 2012. The subject reported his father, now deceased, had previous experience of lower-extremity amputation (LEA), which the subject attributed to diabetes and peripheral arterial disease (PAD). The subject was obese, with a body mass index (BMI) of 32.2, and associated diabetes comorbidities, including hypertension, hyperlipidaemia, erectile dysfunction (ED), painful diabetic peripheral neuropathy (PDPN), non-proliferative retinopathy and macular oedema.

Diabetes control remained poor despite diet and oral hypoglycaemic agents, metformin and gliclazide. The most recent glycated haemoglobin (HbA_{1c}) value, recorded in October 2018, was 68 mmol/mol. Current medications included sildenafil for ED, duloxetine for PDPN and atorvastatin for hyperlipidaemia, however, no antihypertensive or antiplatelet medications were prescribed at this time. This individual was densely neuropathic and insensate to a 10 g monofilament at all standard sites tested. All pedal pulses were palpable and Doppler ultrasonography revealed biphasic flow at the level of the ankle and toe. An ankle brachial pressure index (ABPI) of 1.31 and toe brachial pressure index (TBPI) of 1.29 indicated incompressibility of both ankle and digital arteries.

Previous foot ulceration

Shortly following T2DM diagnosis, the subject presented to community podiatry services in October 2012 with a plantar right foot wound. They were familiar with this service, having accompanied their father to several previous appointments. This first instance of neuropathic DFU was attributed to trauma, with the subject reporting a puncture wound after standing on a nail. Wound deterioration prompted referral to a hospital-based MDFC on January 30, 2013. The following years would be marked by sporadic attendance at podiatry, orthotics and diabetes foot services and repeated refusal of a TCC, due to restrictions with driving.

Appointment non-attendance was all-too-common and, on challenging this behaviour, clinicians were typically informed the subject was "too busy" to attend or that appointment times offered were unsuitable. Every attempt was made to offer appointments at mutually agreed times, however, considerable

Page points

1. 'Compliance' is a controversial term
2. 'Concordance' suggests shared decision-making
3. Behavioural agreements do not guarantee 'compliance' nor 'concordance.'

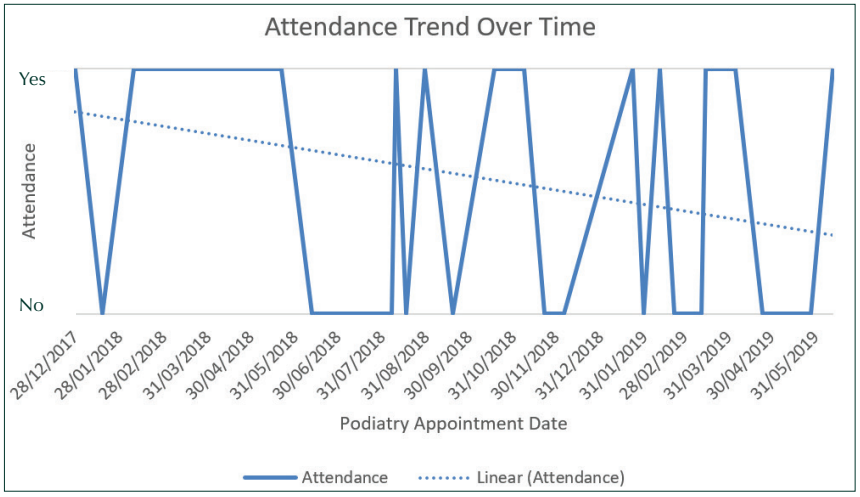

Figure 1. Steadily reducing podiatry appointment attendance between December 28, 2017 and June 12, 2019.

opportunities to intervene were missed and healthcare resources wasted due to missed appointments. Podiatry clinical attendance data for the 562-day period between December 28, 2017 and June 12, 2019 are included in *Figure 1*. Over this period, only 22 of 37 (59.4%) scheduled podiatry appointments were attended, trending towards non-attendance over time.

Target foot ulcer history

The subject failed to attend a series of podiatry and orthotist appointments before finally presenting to the MDFC on August 10, 2018, 80 days later, with a new plantar left 1st metatarsal head wound. On arrival, this neuropathic DFU was left undressed and was visibly contaminated with sock lint. Marginal tissue was heavily hyperkeratotic and macerated and, following sharp wound debridement, a superficial wound measured 4.9 cm^2 in surface area (SA). Given this individual's history of repeat non-attendance, a verbal behavioural agreement was entered into at this time, whereby the subject agreed to routinely attend hospital-based podiatry and orthotic services, rest and wear their prescribed offloading, a removable cast walker (RCW; Bullen et al, 2019).

Despite this agreement, the subject failed to attend their next podiatry appointment, later stating they were in police custody at this time. The wound was next reviewed on August 30, at which time wound SA had reduced to 3.2 cm^2, with no clinical signs of infection. While a previously supplied RCW was apparently being worn at home, the subject presented to this appointment in a pair of their own trainers and reported also wearing work boots. The subject further failed to attend a subsequent podiatry appointment on the morning of October 9 before telephoning to request an emergency appointment later this same day. An emergency appointment offered for that afternoon was declined due to work commitments, however.

Throughout this period, wound dressings were predominantly changed by the subject's partner, as was their preference. While community nursing support was offered, this was repeatedly refused. The subject later failed to attend an orthotist appointment on October 15, meaning this had to be rescheduled for the following month. At their next attended podiatry appointment on October 18, the wound had regressed, with marked malodour, increased depth, now involving tendon, and increased SA, now measuring 9.3 cm^2. Daily 100 mg Doxycycline was commenced and the subject's General Practitioner (GP) asked to continue this therapy prior to their next MDFC review.

Attendance at a 1-week review on October 25 permitted repeat wound observation and SA measurement, calculated to be 5.8 cm^2. Wound depth had also significantly reduced and deeper structures were no longer visible within the wound bed. The wound was next reviewed 2 weeks later, with SA increasing to 6.8 cm^2. At this appointment, the subject also consented to participate in an advanced wound therapy randomised controlled trial (RCT), however, failed to attend three consecutive weekly review appointments, thereafter, reporting they "had a cold" or offering no explanation for non-attendance. They were subsequently excluded from this RCT on December 6, 2018.

Despite multiple attempts to reschedule, subsequent review was not achieved until 76 days later, on January 23, 2019. On arrival, a soiled dressing was removed and marked malodour noted. The wound had become static, antibiotic therapy had ceased "months ago" and wound SA was 6.5 cm^2. Over the coming months, while weekly hospital-based podiatry reviews were never achieved, attendance became more frequent with reviews undertaken approximately monthly on February 11, March 1 and April 5. With more frequent wound assessment, review of offloading and sharp wound debridement, wound SA steadily reduced to 4.6 cm^2, however, a subsequent gap of 68 days lapsed before the most recent MDFC review on June 12. At this time, the wound was again malodourous and the dressing sodden with exudate.

Figure 2. Pre-debridement image of a neglected, neuropathic plantar left first metatarsal head ulcer.

Figure 3. Post-debridement image of a plantar left first metatarsal head ulcer, revealing deeper structures.

Of particular concern, the subject had "run out of tape" and had affixed their dressing with circumferential, inelastic, non-porous and non-sterile masking tape. While adherence to appointment attendance was sub-optimal, the adherence and non-permeability of the tape created its own issues. A large, fibrous flap of tissue covered the wound bed and malodour was marked (*Figure 2*). Sharp resection of this non-viable tissue again revealed tendon and an increased wound SA of 7.3 cm^2 (*Figures 3* and *4*). Of further concern, a final yet significant factor in this individuals DFU management was their determination to enjoy a 14-day holiday abroad, 6 days following this appointment. Their determination was a key driver for their belated engagement with care, immediately prior to leaving the country and any attempts to dissuade them from doing so were swiftly extinguished.

Wound management

Over a 306-day period, from August 10, 2018 to June 12, 2019, several opportunities were seized to implement appropriate local wound management, however, continuity of care was never achieved. One notable driver for diabetes foot review, it is believed, was malodour, rather than particular concerns regarding infection, wound regression or non-healing. At each clinical presentation following a substantial lapse in treatment, the wound was malodourous, prompting post-debridement, deep microbiological sampling to target antibiotic therapy. At the time of final presentation, wide patterns of antibiotic resistance significantly limited available oral options. For this reason, antibiotic therapy was not immediately commenced, rather, followed reporting of cultures and sensitivities.

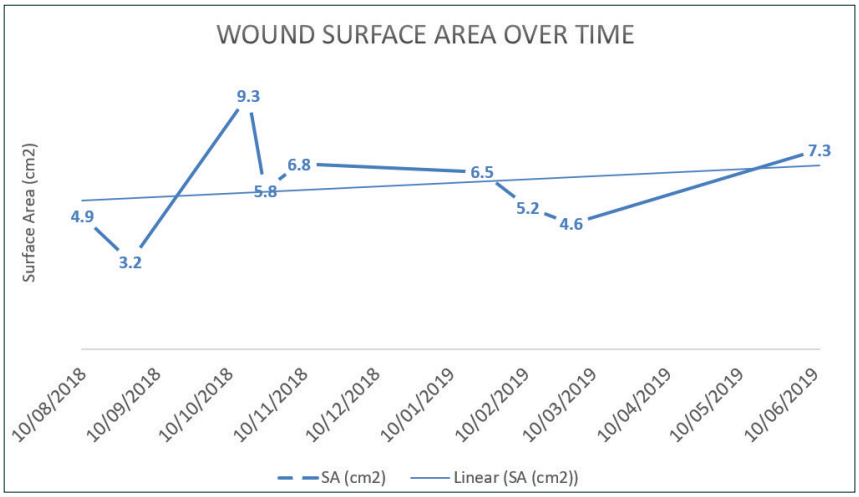

Figure 4. Upward trend of wound surface area (cm^2) over time.

Key: SA = surface area.

Table 1. Available wound cultures and associated antibiotic sensitivities.

Date	Bacteria Isolated	(S) Sensitive to	(R) Resistant to/ (I) Intermediate to
July 12, 2016	Methicillin-resistant *Staphylococcus aureus* (MRSA)	(S) Clindamycin (S) Daptomycin (S) Gentamycin (S) Vancomycin	(R) Doxycycline (R) Flucloxacillin (R) Fusidic Acid (R) Rifampicin (R) Trimethoprim
	Enterococcus faecalis	Not reported	Not reported
October 19, 2017	*Enterococcus sp.*	Not reported	Not reported
February 7, 2018	*Corynebacterium amycolatum*	(S) Doxycycline (S) Rifampicin (S) Vancomycin	(R) Ciprofloxacin (R) Penicillin
	Enterococcus faecalis	(S) Amoxicillin	(R) Doxycycline (I) Trimethoprim
August 10, 2018	*Staphylococcus aureus*	(S) Clarithromycin (S) Doxycycline (S) Flucloxacillin	Not reported
January 23, 2019	*Proteus sp.*	Not reported	Not reported
June 17, 2019	*Proteus mirabilis*	(S) Amoxicillin	Not reported
	Streptococcus anginosus	(S) Amoxicillin (S) Clarithromycin (S) Clindamycin (S) Penicillin (S) Vancomycin	(R) Doxycycline
	Staphylococcus aureus	(S) Clarithromycin (S) Clindamycin (S) Doxycycline (S) Flucloxacillin (S) Vancomycin	Not reported
	Staphylococcus simulans	(S) Doxycycline	Not reported

Key: (I) Intermediate; MRSA = Methicillin Resistant Staphylococcus Aureus; (R) Resistant; (S) Sensitive; sp. = species.

Cultures and sensitivities were available on June 17, including large numbers of *Proteus mirabilis* and moderate numbers of *Streptococcus anginosus, Staphylococcus aureus* and *Staphylococcus simulans*. Cultures and sensitivities were scrutinised within the context of previous microbiological reports, available since prior admission for management of acute left first metatarsal osteomyelitis and abscess in July 2016 (*Table 1*). The patient's GP was contacted to request a 14-day course of 500 mg Amoxicillin three times daily and 100 mg Doxycycline daily. The potential for photosensitivity while in sunnier climes and the need for skin coverage and sun protection factor (SPF) 50 sunblock were advised. The subject again failed to attend a final review on June 17 before making telephone contact later that day to enquire about potential antibiotic therapy. Risk of a photosensitivity reaction during doxycycline therapy was verbally reinforced again at this time.

A swab taken on admission on July 12, 2016 was positive for Methicillin resistant *Staphylococcus aureus* (MRSA), resistant to doxycycline, flucloxacillin, fusidic acid, rifampicin and trimethoprim. *Enterococcus* species were also isolated and were again present in October of 2017. Tissue cultures from February 2018 featured *Corynebacterium* species, resistant to ciprofloxacin and penicillin antibiotics, and *Enterococcus* species again, with a note from the medical microbiologist stating: "Clinical significance uncertain. Debridement key." Sensitive *Staphylococcus aureus* species were later cultured on October 10, 2018, followed by *Proteus* species on January 23, 2019.

Time will tell whether debridement is in fact key, as within the outpatient setting this critical aspect of management relies heavily on clinical appointment attendance. At this time, concerns remain regarding the threat of significant deterioration within a TCC in the event of non-attendance at cast changes, continuing to preclude non-removable offloading.

Discussion

Within the authors' centre, the medical microbiologist is a remote member of the multidisciplinary team, yet independently concurred that debridement was a necessary aspect of management in this case. Despite a bipartite verbal behavioural agreement between a diabetes specialist podiatrist and the subject, podiatric, orthotic and MDFC reviews continued to be missed, resulting in chronic ulceration and a series of potentially avoidable setbacks. In contrast to most diabetes foot case studies, reporting positive clinical outcomes, this negative case study rather sought to document the reverse side of the concordance coin, attributing non-healing neuropathic plantar DFU with insufficient opportunities to intervene. Unattended appointments represented missed opportunities to provide effective sharp wound debridement, culture-guided antibiotic therapy and non-removable offloading, ultimately resulting in wound chronicity and recurrent infection.

Conclusion

While behavioural agreements were championed within a recent narrative review (Bullen et al, 2019), this case demonstrates one limitation of this approach. On considering this case, we are reminded of the adage "you can lead a horse to water, but you can't make it drink." Rather than non-concordance, this individual's actions perhaps sit more comfortably with a traditional definition of non-compliance, namely "the point below which the desired preventative or therapeutic result is unlikely to be achieved" (Gordis, 1976). While we should continue to strive for a shared decision-making approach, we must remain mindful that, "shared responsibility is not the same as personal responsibility, which places the onus on people to 'look after themselves' and 'use services responsibly'" (Ham et al, 2018). ■

Bell JS, Airaksinen MS, Lyles A et al (2007) Concordance is not synonymous with compliance or adherence. *Br J Clin Pharmacol* 64(5): 710–1

Blakely M (2010) A practical guide to total contact casting: a risk vs. benefit approach. *Today's Wound Clinic* 4(8): 22–6

Bullen B, Young M, McArdle C, Ellis M (2019) Overcoming barriers to self-management: The person-centred diabetes foot behavioural agreement. *Foot (Edinb)* 38: 65–9

Chatterjee JS (2006) From compliance to concordance in diabetes. *J Med Ethics* 2006 32(9): 507–10

Donovan JL, Blake DR (1992) Patient non-compliance: deviance or reasoned decision-making? *Soc Sci Med* 34(5): 507–13

Epstein LH, Cluss PA (1982) A behavioural medicine perspective on adherence to long term medical regimens. *J Consult Clin Psychol* 50(6): 950–71

Falanga V (2005) Wound healing and its impairment in the diabetic foot. *Lancet* 366(9498): 1736–43

Frykberg RG, Banks J (2016) Management of diabetic foot ulcers: a review. *Fed Pract* 33(2): 16–23

Gordis L (1976) Methodological issues in the measurement of patient compliance. In: Sackett DL, Haynes RB (eds.) *Compliance with therapeutic regimens*. Baltimore: Johns Hopkins University Press. pp51–66

Ham C, Charles A, Wellings D (2018) *Shared Responsibility for Health: The Cultural Change We Need*. The Kings Fund. Available at: https://www.kingsfund.org.uk/publications/shared-responsibility-health (accessed 30.09.2019)

International Working Group on the Diabetic Foot (2019a) *International Working Group on the Diabetic Foot: Guidelines.* Available at: https://iwgdfguidelines.org (accessed 30.09.2019)

International Working Group on the Diabetic Foot (2019b) *IWGDF Guideline on Interventions to Enhance Healing of Foot Ulcers in Persons with Diabetes*. Available at: https://bit.ly/2n3zD1C (accessed 30.09.2019)

International Working Group on the Diabetic Foot (2019c) *IWGDF Guideline on Offloading Foot Ulcers in Persons with Diabetes*. Available at: https://bit.ly/2mjSxkH (accessed 30.09.2019)

Mullen, PD (1997) Compliance becomes concordance: making a change in terminology produce a change in behaviour. *BMJ* 314(7082): 691–2

Segal JZ (2007) "Compliance" to "concordance": a critical view. *J Med Humanit* 28(2): 81–96

Walker EA, Usher JA (2003) Understanding and enhancing adherence in adults with diabetes. *Curr Diab Rep* 3(2): 141–8

Warriner III RA, Wilcox JR, Carter MJ, Stewart DG (2012) More frequent visits to wound care clinics result in faster times to close diabetic foot and venous leg ulcers. *Adv Skin Wound Care* 25(11): 494–501

Wilcox JR, Carter MJ, Covington S (2013) Frequency of debridements and time to heal: a retrospective cohort study of 312 744 wounds. *JAMA Dermatol* 149(9): 1050–8