

Diabetic foot assessment: a service improvement project aimed at enhancing compliance

KEY WORDS

- » Diabetic foot assessment
- » Service improvement
- » Education
- » Hospital

Diabetic foot ulcers (DFU) have a major impact on quality of life, morbidity and mortality. During hospital admission it is estimated that more than a third of patients with diabetes are 'at risk' of acquiring a DFU (Chadwick and Joule, 2015). It is recommended that all patients with diabetes admitted to hospital, should have a diabetic foot assessment (DFA) (National Institute of Health and Care Excellence [NICE], 2016). However, successive National Diabetes Inpatient Audits (NaDIA) have identified that DFA during admission is poor. **Objective:** The main aim of this study was to improve compliance with the National Institute for Health and Care Excellence (NICE) NG19 guideline 2016 with the effective implementation of a DFA tool by nursing staff on two acute hospital wards in Wales. **Method:** A service improvement approach supported by action research methodology was employed to promote a change in practice by following evidence-based methods including audit, feedback and reminders. An educational intervention using mixed methods was provided to 33 nursing staff on two wards which included completion of a DFA tool (Foot Protection Tool). A series of audits, based on NaDIA methodology, were carried out at baseline and time periods of 4, 12 and 16 weeks after the introduction of the tool to identify improvements in the number of DFA carried out. **Results:** In terms of outcome there was some improvement in the number of DFA carried out, though despite employing an evidenced-based approach, the degree of anticipated change in practice was slow. **Conclusion:** As there is limited published evidence on the implementation of DFA within the acute setting this study has reported some useful findings. This project has demonstrated that compliance with NICE NG19 guideline 2016 may be achievable with the use of a DFA tool and mixed educational methods, but only if frontline staff are engaged and take ownership of the project.

It is well documented that diabetic foot disease is costly in terms of healthcare resources and quality of life to the patient (International Best Practice Guidelines [IBPG], 2013). In the UK hospital bed occupancy for adults with Diabetes Mellitus (DM) has been reported to be as high as 20% (Hillson 2010; NHS Digital, 2016a). It is further estimated that more than one third of inpatients with DM are at risk of acquiring a foot ulcer during their admission (Chadwick and Joule, 2015). Prevention of diabetic foot ulcers (DFU) or iatrogenic foot complications such as heel

pressure ulcers should be a priority in patients with diabetes who are admitted to hospital for any reason (Wukich et al; 2013) because delays in diagnosis and management of diabetic foot disease has been directly linked to increased morbidity, mortality and can contribute to higher amputation rates (National Institute of Health and Care Excellence [NICE], 2011).

Prevention of unnecessary amputations has been high on the agenda within the UK for many years (McInnes, 2012), resulting in the publication of national guidelines and frameworks

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(Welsh Assembly Government, 2003; NICE, 2004, Diabetes UK, 2009; Diabetes UK/NHS Diabetes 2009; Diabetes UK, 2011a; Diabetes UK, 2011b; NHS Diabetes, 2011). These outline the importance of foot assessment in patients with DM (Kerr, 2012). NICE guidelines NG19 (2016) recommend that all patients with diabetes mellitus admitted to hospital should have a diabetic foot assessment (DFA) within 24 hours of admission. The National Diabetes Inpatient Audit (NaDIA) programme, established in 2009, has provided a snapshot audit of diabetes care in UK hospitals (HSCIC, 2016a). The focus of the NaDIA is to establish if diabetes management minimizes the risk of avoidable complications and any harm resulting from the inpatient stay such as if a DFU occurred during admission. Since starting these audits there has been a slight improvement in the number of DFA carried out in Wales, although the figures remain disappointingly low with only 19% of patients receiving a DFA during admission in the NaDIA 2015 audit period (NHS Digital, 2016b). The reasons for this are unclear but it has been suggested this could be because in the acute setting clinicians are often generalists and may not be aware of the importance of DFA (Evans and Chance, 2005). The lack of a DFA tool to act as both a prompt and a method for recording may also be a barrier for completion of DFA. The 2015 NaDIA report (HSCIC, 2016) identified that hospitals with a tool or system in place were more than twice as likely to complete DFA. Several studies have reported strategies to improve DFA in the acute setting using foot assessment tools (Rayman, 2011; Barker, 2015; Creagh et al, 2015; Rajendran

et al, 2015) whilst other have utilised information technology to facilitate DFA (Chadwick, 2011; Lockett et al, 2014). Although it appears from the literature that no single method or approach to improving DFA is entirely successful, but rather a multi-faceted approach may be more suitable.

AIMS

The main aim of this study was to improve compliance with the NICE NG19 (2016) guideline with the effective implementation of a DFA tool by nursing staff on two acute hospital wards in Wales. Foot assessments can be carried out by any member of the medical team, but as nurses complete risk assessments within 6 hours of admission and then continue to reassess and monitor regularly, it is appropriate for foot assessment to become a part of this.

METHODS

The study used a service improvement approach because its main aim was to promote a change in practice, improving compliance with the NICE NG19 guideline (2016) and facilitating the sustainable implementation of a diabetic foot assessment tool. This was supported by action research methodology. It was hoped that the study would support the roll out to all wards within the UHB to increase DFA within the acute setting.

The study took place on two acute hospital wards. Ward 1, a 38-bedded ward, consisted of adult patients who were admitted for rehabilitation following an acute episode of illness or due to reduced independence whereas Ward 2, a 33-bedded ward, consisted of adult patients with diabetes who were admitted for a variety of reasons including diabetic-related complications. An audit of foot assessments was taken at baseline and after an educational intervention and introduction of a foot assessment tool. The audit form used for this and subsequent audits (*Figure 1*) was based on the general foot care section of the NaDIA audit form. The use of this tool within national published audits strengthened the validity and reliability of this study. However, it could be argued that the study could contain an element of observer bias, the difference between the true situation and that recorded by the observer (Bowling, 2014), due to the project lead being involved in the implementation of the

Figure 1. Blank audit form

Diabetic foot assessment tool audit			
Cycle of audit: week 0 / 4 weeks / 12 weeks / 16 weeks			
Audit sheet number:			
	Yes	No	Unsure
Was a DFA or foot protection tool completed within 24 hrs of admission to Ward 1/Ward 2?			
Was a DFA or foot protection tool completed after 24hrs of admission on the ward?			
Was the patient admitted with active foot disease?			
Did a foot lesion arise during this admission?			

Foot protection tool
To be completed for all patients with diabetes

Patient addressograph

Name of person completing form (PRINT):

Signature: Designation:

Date:/...../..... Time: :

HIGH RISK

Does the patient have any of the following?

Previous ulcer / amputation Y/N

Known peripheral arterial disease Y/N

Immobility Y/N

Cognitive impairment Y/N

Impaired consciousness Y/N

Stroke Y/N

Renal failure / dialysis Y/N

Limb contracture Y/N

No

Perform the Ipswich Touch Test to check for loss of sensation (Neuropathy)

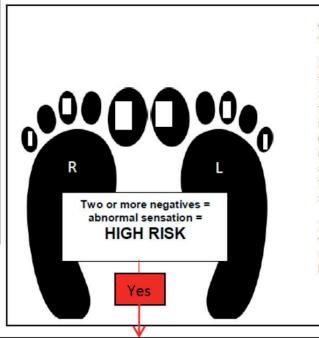
&

Palpation of foot pulses (dorsalis pedis and posterior tibial)

Ask the patient to close their eyes.

Now very lightly touch the tips of 1st / 3rd / 5th toes on both feet for 1-2 seconds in a randomised order. The touch must be as light as a feather: when you feel them they should feel you.

Record the results with Y if felt or N if not felt in each box.



Two or more negatives = abnormal sensation = **HIGH RISK**

Right foot **Left foot**

Dorsalis Pedis pulse
Y / N Y / N

Posterior tibial pulse
Y / N Y / N

If pulse(s) absent refer to medical staff for review / check with handheld Doppler.

Pulse(s) absent &/or clinical features of poor circulation = HIGH RISK

Refer all **HIGH RISK** patients, foot ulcers and unhealthy heels to the Podiatry team (see referral form on Cav web) and fax to 20335498.

Date of referral:/...../..... Initials: Date seen:/...../..... Initials:

THINK FEET!

Half of all heel ulcers acquired in hospital occur in people with diabetes

Heel status

(tick if healthy or unhealthy and please initial)

Week 1	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Date							
Healthy	Y L	Y L	Y L	Y L	Y L	Y L	Y L
Unhealthy*	Y L	Y L	Y L	Y L	Y L	Y L	Y L
Week 2	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Date							
Healthy	Y L	Y L	Y L	Y L	Y L	Y L	Y L
Unhealthy*	Y L	Y L	Y L	Y L	Y L	Y L	Y L

*Discolouration: red, mottled, black

Active foot disease should be referred immediately to the Podiatry team.

Foot ulceration, infection, gangrene, necrosis, critical ischaemia or hot swollen foot (suspected Charcot or osteomyelitis) requires immediate referral. Please contact the Podiatry 'Hot' phone 07989604413 for advice and complete the Podiatry referral form. For more information please see the Diabetic foot pathway and microguide available on Cav web.

Figure 2. Foot protection tool (the heel status section was based on Dr Gerry Rayman's FOB form)

tool and the audit. The use of blinding during the audit would have reduced bias and strengthened the internal validity of the study, although this was not possible due to time constraints. The inclusion and exclusion criteria of the study also replicated those used in the NaDIA. With the records of those patients with diabetes being reviewed only.

INSTRUMENTS

The foot assessment tool used was based on a tool devised by Rayman (2011), who reported that foot examinations increased to over 85% when the 'Foot of the Bed (FoB)' tool was employed. The FoB

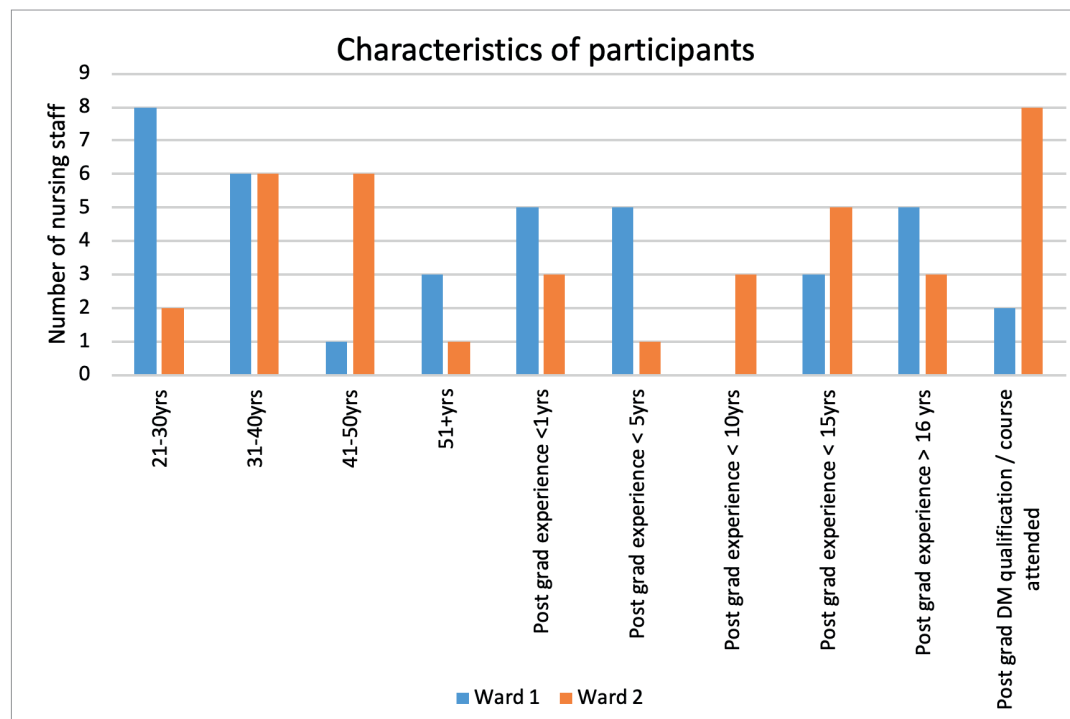
does however, omit to record the vascular status of the foot, a risk factor associated with diabetic foot disease (NICE, 2016) and an increased risk of pressure ulcer development (Coleman et al, 2013; McGinnis, 2014) so the tool was amended and renamed the Foot Protection Tool (FPT) (Figure 2). The validity of the tool was not tested in a pilot study but the inter-rater reliability was supported with a clear explanation of how to complete the tool during the educational sessions and practical demonstration at one-to-one mentoring sessions.

EDUCATIONAL INTERVENTION

Qualified nursing staff were invited to attend a ward based education intervention which outlined the causes of DFD and how to screen for it using the FPT. The education employed several different methods including a PowerPoint presentation, a practical demonstration delivered to staff in groups of three to six individuals and completion of an online e-learning diabetes foot screening training module (Foot Risk Awareness and Management Education FRAME) (Stang, 2011). This intervention was held six times during a two week period to allow as many staff as possible to attend. For the two weeks following the training the project lead provided one-to-one support and mentoring for the staff on the wards in completing the tool for all patients with diabetes. Ward 1 had 21 registered nurses, 18 of which attended the training and Ward 2 had 20 registered nurses, 15 of which attended the training.

The educational intervention was based on evidence by Ivers et al (2012) and Johnson and May (2015). In a Cochrane systematic review, Ivers et al (2012) identified that audit and feedback generally leads to improvement in professional practice, particularly if the feedback is given both in writing and verbally. This view is supported by Johnson and May (2015). In their systematic review of the effectiveness of behaviour change interventions, these authors identified that a combination of several types of education methods and the involvement of audit, feedback and reminders are more likely to be successful in professional behaviour change. Prompts such as newsletters displayed in staff areas, individual laminated pocket cards, a ward resource folder and reminders were provided to support the education

Figure 3. Characteristics of participants



package and encourage a behaviour change within the staff groups.

Four weeks after the introduction of the FPT the patient notes were audited to identify if the tool had been completed. Additional training and support was offered to the staff during the subsequent two-week period. This process was repeated at 12 and 16 week intervals after the introduction of the FPT. This was aimed at identifying if any improvements in completion of the tool were sustained during the study period and if further support to the ward staff was required. The time periods also reflected the audit period in the research by Rayman (2011) which reported an increase in foot assessments at three and four months after the introduction of the tool. The audits were conducted on one day replicating the NADIA process rather than over several days for each ward at each time period.

ETHICAL CONSIDERATIONS

Ethical approval was not required for this study as it was a service improvement project (NHS Health Research Authority, 2016). However, such a project involving NHS staff and patients is required to observe all usual ethical principles. The project was also approved and registered by the Continuous Service Improvement Team of the UHB.

RESULTS

Characteristics of participants.

A questionnaire was administered to the qualified nurses (n=18 for Ward 1 and n=15 for Ward 2) prior to the commencement of the educational intervention in order to ascertain the skill mix. The questions asked included age of participants, years of post grad experience, current banding, any post grad qualification in diabetes, experience in managing DFD, attendance of diabetes study days and confidence in completing foot assessment of the participants and their knowledge and previous experience of DFA. Nursing staff who did not attend the training as they were not rostered to work on the days of the training were able to review the training materials in a ward resource folder and were encouraged to complete the online e-learning foot screening training module. The characteristics of the participants are summarised in *Figure 3*. Overall, Ward 1 had more nurses who were younger, less experienced and with less knowledge of DM and DFA compared to Ward 2. Because of this, it was anticipated that at the baseline audit Ward 1 would carry out less DFA compared to Ward 2.

Completion of DFA

At baseline, prior to the educational intervention or

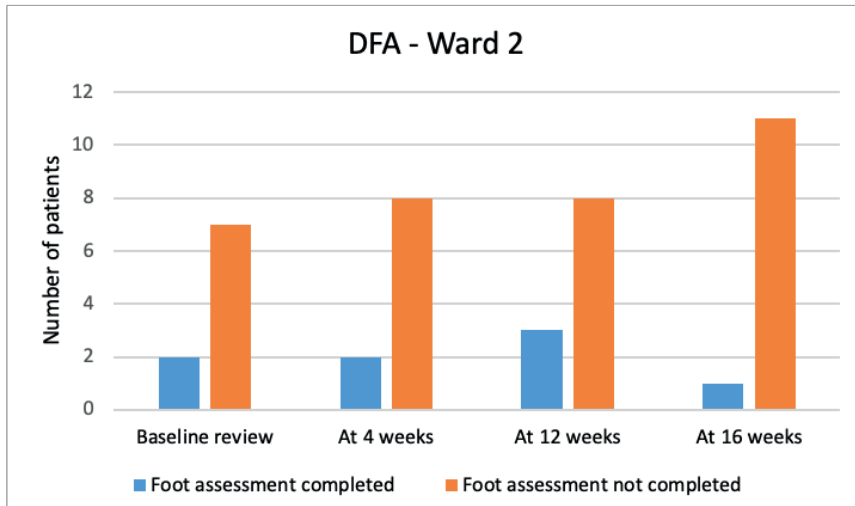


Figure 4. Diabetic foot assessment on Ward 2

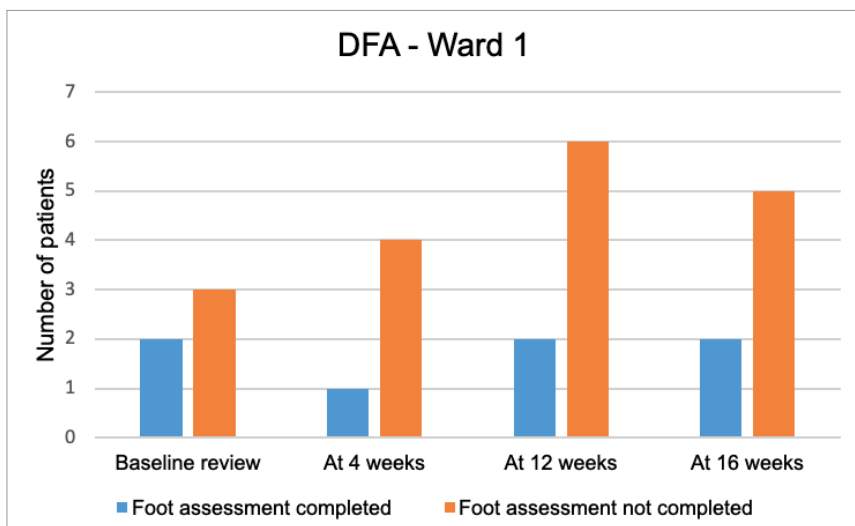


Figure 5. Diabetic foot assessment on Ward 1

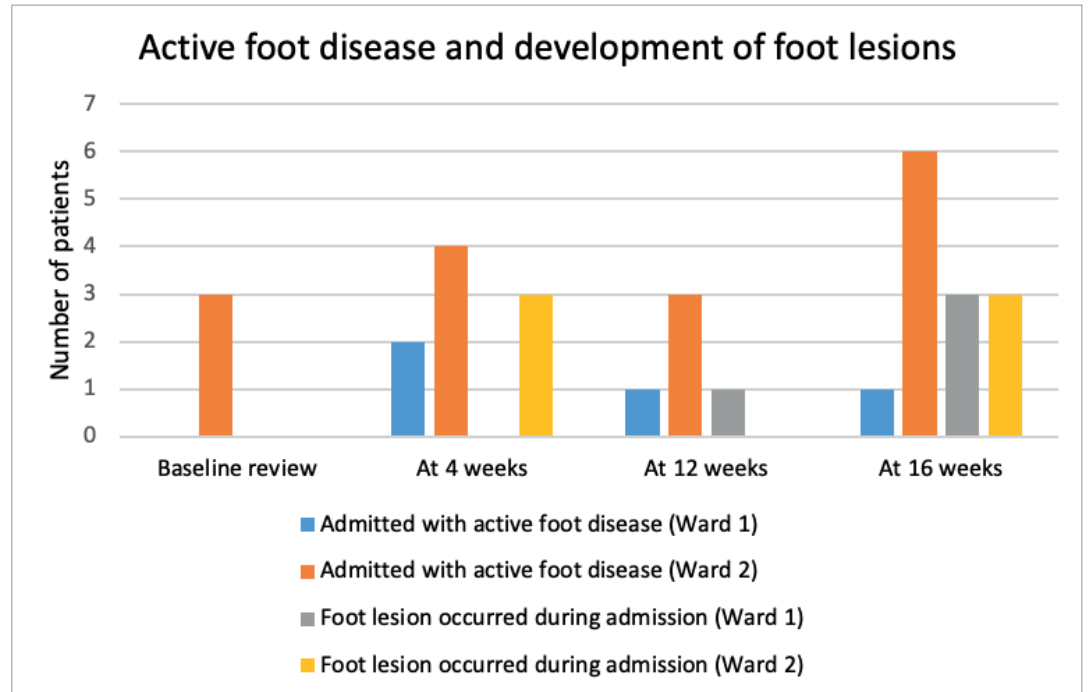
introduction of the FPT, both wards had similar results for the number of DFA carried out, two patients on each ward. *Figure 4* shows that a greater number of the nine patients on Ward 2, 77% (n=7) had receive a DFA compared with 60% (n=3) of the five patients on Ward 1 (*Figure 5*). It was expected in the absence of a tool to record the DFA there would be a higher number of patients who had not received a DFA on both wards. However, because of the knowledge and confidence expressed by the participants of Ward 2, a slightly higher number of DFA completed on Ward 2 might have been anticipated.

As there was no increase in the number of DFA completed, the results of the audit four weeks after the introduction of the FPT were disappointing

(*Figure 4*). Unfortunately, Ward 1 experienced some difficulties during the first few weeks due to an outbreak of norovirus on the ward and accompanying staff shortages. This had a direct impact on the completion of the DFA on the ward. Ward 2 demonstrated similar results with only 20% of patients (2 out of 10) receiving the assessment. Following these disappointing results verbal feedback was given to the participants on both wards. Methods to support and encourage the nursing staff to complete the FPT were discussed with the ward managers. It was decided that because all patients on both wards had their Waterlow risk score regularly reviewed and amended, a sticker would be placed adjacent to this assessment tool to remind the staff to complete the FPT for all diabetic patients. A verbal reminder about the tool was also given every morning during the safety briefing and patient handover. Further reminders were provided in the form of a newsletter that was sent to all the nursing staff on both wards. The dissemination of the initial findings of the study resulted in a keen interest in the project by the medical staff working on Ward 2. The medical team provided regular verbal encouragement to the nursing staff to complete the FPT for all patients with diabetes. This interest also enabled a dialogue throughout the UHB about DFA and facilitated discussions for the roll out of DFA across the organisation.

At 12 weeks there was a slight increase in the number of DFA carried out on both wards. On Ward 1, 2 out of 8 patients and Ward 2, 3 out of 11 patients. At 16 weeks there was no improvement in the number of DFA completed on ward 1. Only 28.6% (n=2) of patients having documented DFA. The results for Ward 2 were somewhat better with an increase in the number of FPT included within the medical records of patients, 83.3% (n=10) of patients had evidence of a DFA. However, the FPT was not fully completed with 90% (n=9) of the assessments failing to document the results of either pulse palpation or sensory testing. Without the completion of these key elements it is difficult to fully ascertain if the patient is 'at risk' of developing a DFU, although the documented improvement in the number of skin inspections carried out was encouraging.

Figure 6. Active foot disease and development of foot lesions



Active foot disease and development of foot lesions

As expected, due to the specialism of the ward, Ward 2 had a larger number of patients admitted with active foot disease. This is shown by Figure 6. The occurrence of foot lesions or DFU during admission is also presented. Both wards had patients who developed a foot wound during their admission. These were reported and referred to the Podiatry Departments as per the UHB policy. The audit did not identify whether these occurred on Wards 1 and 2 or prior to the transfer to these wards as the main purpose of this study was to increase and improve DFA. The results of this study were shared with the nursing and midwifery board and Podiatry service of the UHB.

DISCUSSION

Despite employing an evidence-based approach, using audit, feedback and reminders within a PDSA cycle allowing continuous evaluation of the change throughout the study and opportunities to resolve any problems that occurred, the degree of anticipated change in practice was slow and it could be argued there was limited change in practice. A reason for this could be due to a difference in the characteristics of the nursing staff of each ward with Ward 1 having more nurses who were younger, less experienced

and with less knowledge of DM and DFA compared to Ward 2. It could be argued that inexperience can cause an initial barrier, as newly qualified staff have many procedures and policies to grasp in their day to day work (Feng and Tsai, 2012). Although conversely newer staff members are often keen and could be eager to engage with changes to practice. The second ward, on the other hand, with a higher proportion of more experienced nurses, may have struggled to adapt to new ways of working, due to long established working practices and a feeling that they have learnt enough (Pool et al, 2013). The beliefs and attitudes of the nurses on both wards were not explored as part of the study, so no conclusions about this can be drawn.

Challenges to the completion of DFA

The results of the audits at time points 4, 12 and 16 weeks after the introduction of the FPT revealed that there was no improvement in the number of DFA completed on Ward 1. This was similar to the findings of Creagh et al (2015) who also reported that following ward-based education and the introduction of a screening tool, DFA remained low. However, absence of the full details of this study prevent any direct comparisons. It may have been the case that low numbers of DFA on Ward 1 were due to the challenges experienced on the ward with

recent changes to the ward's specialism, staff sickness and staff shortages, all of which were beyond the control of the ward staff. It is widely recognised that this is a picture seen in many hospital wards across the UK, due to the increasing demands of a growing elderly population coupled with financial constraints and nursing staff shortages (Lintern, 2013; Appleby, 2014; McKeon et al, 2014). It has been argued that these pressures have a direct effect on quality of care and the motivation of staff to change practice (Spouse, 2013).

Practical barriers such as time and resource have been identified by NICE (2007) as factors that can prevent or delay change. Ball and Pike (2009) reported in a NHS survey that 55% of nurses said that they were too busy to provide the level of care they would have liked. This may have been the case for Ward 1. Reassuringly, nurse staffing is high on the agenda in Wales with the introduction of the 'Nurse Staffing Levels (Wales Act) in 2016, an act aimed at enabling the provision of safe nursing care to patients at all times (HM Government, 2016). Future improvement projects should not be affected by time and resource to the same extent, and patient safety should be improved.

Another possible explanation for the lack of improvement in DFA is that the nursing staff may not have fully appreciated or understood their role in DFA. This may have prevented ownership of the change in practice. Dixon-Woods et al (2012) proposed that engaging staff and overcoming a perceived lack of ownership is one of the biggest challenges in improvement projects. The engagement of frontline staff is essential to win 'hearts and minds' (1000 Lives Improvement, 2014). Patient experiences or stories are often used in healthcare as a way of identifying areas of improvement by achieving a patient-centred pathway and engaging staff (Tee and Gray, 2010). This was acknowledged in the study, with the inclusion of a patient story within the educational material. The staff in the study were encouraged to view a film of the patient story as part of 'homework' or reflection. Compliance with this was not recorded, so failure to fully participate in all parts of the educational programme may have influenced motivation and a lack of engagement.

A failure to appreciate the importance of DFA could have been a contributing factor to the results

because DFA and pressure ulceration assessment are often seen as separate entities, even though diabetes is a major risk factor for heel pressure ulcers (Cook and Murphy, 2013). There is some debate as to whether an ulcer on the heel of a patient with diabetes is classed as a DFU or a pressure ulcer (Ousey et al 2011; Watret, 2013; Vowden and Vowden, 2015). Traditionally DFU management is provided by Podiatrists and pressure ulcer care by nurses, so there may be some uncertainty over whose role it is to provide the DFA (Fletcher 2006). In 2011 a national minimum skills framework was published by Diabetes UK in partnership with NHS Diabetes. This report identified the skills required for DFA and acknowledged that these were for all HCP not only podiatrists and doctors. It could be argued that this is the view held by NICE in the NG19 guidance (2016) where it does not specify whose role it is to carry out DFA. This view is shared by Fletcher (2006) and Sharp (2013). Fletcher (2006) suggested that whilst nurses are not expected to be the 'experts' of diabetic foot care, examination of the feet should be part of the routine examination of any patient with DM to ensure timely referral to the appropriate HCP. However, in clinical practice there still appears some uncertainty (Abu-Qamar, 2006).

Resistance to change may have been another factor contributing towards the lack of improvement in DFA. This can occur due to a feeling of disempowerment, particularly if the nursing staff felt changes were imposed on them, without their views being taken into consideration (Bowers, 2011). The involvement of 'change champions', often clinical or managerial personnel, can spread good practice by demonstrating a commitment to the improvement project, providing regular feedback and guidance to the staff involved (Randall, 2015). It could be argued that to some extent the medical team on Ward 2 provided this role, which may explain the increase in the number of DFA carried out at 12 and 16 weeks. Although 90% of the FPT reviewed at the 16 week audit were not fully completed, with many failing to document that the sensory testing or pulse palpation had been carried out. It may have been the case that there was an element of power struggle or misunderstanding of roles between the professions (McKay and Narasimhan, 2012), with the nursing staff perhaps believing that DFA is the role of the medical team or other HCPs such as podiatrists.

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The audit aspect of the study followed the methods of the NaDIA. While this added credibility it also presented some limitations. Data collection occurred over one day at each time point so it was not possible to track the number of patients that were admitted and discharged over this period due to the busy nature of the ward but generally all beds on these wards were occupied throughout the study. The audit also included gathering data on foot lesions. It was difficult to draw any conclusions from this as this was prevalence, rather than incidence data which may not reflect the actual number of hospital acquired foot lesions. Mohammedi et al (2013) argued that there can be a difference in the number of reported and actual foot lesions. If the study had included a foot assessment, in addition to the audit, this would have identified any differences in reported and actual DFU. This study also failed to identify if the employment of DFA led to an improvement in the number of early referrals to the Podiatry service as this data was not collected. Exploration of the barriers to change were not explored during this study due to time constraints of the project. A study exploring the attitudes and beliefs of a different HCPs

including nurses, doctors and Podiatrists could prove useful in identifying the barriers.

CONCLUSION

This study has demonstrated that using a DFA tool, evidenced-based methodology and an educational intervention involving mixed methods, some improvement in compliance with the NICE guideline can be achieved. Nevertheless, the anticipated changes to practice did not occur on Ward 1 and on Ward 2 were incomplete. The reasons for this were not clear. Time may have been a factor on Ward 1 due to circumstances beyond the control of the ward staff but lack of understanding, engagement, ownership of the project and resistance to change are probable reasons for both wards. This also has important implications in a wider context for any service improvement projects conducted within the NHS. Engaging all stakeholders from the conception of the project, particularly frontline staff and 'change' champions who will maintain enthusiasm and motivation for the project, appears fundamental for the success of any service improvement project (Dixon-Woods et al, 2012).

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