

Impact of therapeutic house shoes on footwear behaviour

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Article points

1. Therapeutic footwear is recommended for use by people with diabetes who are at increased risk of foot complications to prevent foot injury or skin breakdown that may lead to ulceration.
2. Since 2005, the author's orthotic department has provided therapeutic house shoes for people with at-risk diabetic feet and a questionnaire was developed to assess footwear behaviour in this group.
4. The results suggest that the provision of house shoes has improved the wearing of therapeutic footwear indoors in this population.
5. No data on reulceration rates in the study population were available, thus it was not possible to determine whether those who wore regularly house shoes with greater or lesser frequency than those who did not.

Key words:

- Footwear
- House shoe
- Therapeutic shoe

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House shoes are provided to people at risk of diabetic foot disease to protect their feet from damage that may precipitate ulceration. The effectiveness and acceptability of house shoes supplied to people at risk of diabetic foot disease was assessed by written questionnaire. Eighty-seven people took part in the survey, with the majority reporting that they wear the provided house shoes for at least a couple of hours every day and are satisfied with the shoes' level of comfort and appearance.

People with diabetes at increased risk of foot complications may be prescribed therapeutic footwear to prevent foot injury or skin breakdown that can precipitate ulceration – and, ultimately, lead to amputation (Mueller, 1997). Buying well-fitting shoes on the high street is difficult when the accommodation of deformity, achieving offloading and protecting neuropathic feet from trauma must be considered. Therapeutic footwear that is wide, deep, soft, seamless and incorporates bespoke moulded insoles are more successful in protecting the at-risk diabetic foot than high street shoes (Edmonds et al, 1986).

For therapeutic footwear to be most effective, it must be worn at least 60% of the time (Macfarlane and Jensen, 2003). Thus, the types of therapeutic shoes provided to people at risk of diabetic foot complications needs to be considered in the light of where people are most active and what type of shoes are most appropriate for that setting. Armstrong et al (2001) found that people at risk of diabetic foot complications took more steps per day inside their homes than

they did outside, and that although 85% of the participants in that study indicated they wore their therapeutic shoes most or all of the time while outside the home, only 15% continued wearing them in the home. Focusing multidisciplinary team attention on the protection of the foot while in the home, therefore, may reduce the incidence of injury or skin breakdown leading to ulceration.

Background

Prior to 2005 at the author's institution (Northern General Hospital, Sheffield), outdoor shoes were provided by the orthotic department to people at risk of diabetic foot complications following referral from their podiatrist or diabetologist. These people were advised to wear therapeutic outdoor shoes in the home, and not to wear slippers as they did not protect their feet.

The clinicians' expectation that people should wear their therapeutic footwear at all times did not take into account the range of footwear traditionally used in day-to-day life. Anecdotally, people with at-risk diabetic feet reported having injured their feet while

walking barefoot indoors because they refused to wear outdoor shoes in the home and had been advised against slippers. It was felt that the provision of house shoes for indoor wear might encourage the continued use of therapeutic footwear.

The author's institution provides a pair of outdoor shoes for people with at-risk diabetic feet. Following a review appointment, a second pair of outdoor shoes are provided and, since 2005, a pair of house shoes have also been ordered at the review appointment. Approximately 3–5 weeks after the review appointment, the house shoes are provided.

A range of house shoes (County Orthopaedic Footwear, Kettering; *Figure 1*) are prescribed by the author's institution for people at risk of diabetic foot complications. All of the styles were designed:

- As a comfortable alternative to outdoor shoes that look like slippers while retaining the properties of therapeutic footwear. Suede uppers, sheepskin or plush lining was used to give the shoes a softer, slipper-like appearance.
- With a sturdy but lightweight micro sole unit to reduce pressure and friction, and to protect the foot from sharp objects on the floor (Dahmen et al, 2001).
- To fasten firmly to avoid friction or shear forces that may precipitate skin breakdown. Achieved by easy to undo Velcro (Middlewich) straps.
- Where necessary, to accommodate orthotic insoles. All styles contain shock-absorbing polyurethane foam and sheepskin insoles that can be removed and replaced with bespoke insoles to offload specific pressure areas or accommodate plantar deformity.
- With ample toe space and depth to accommodate deformities.
- With heel stiffener to prevent lateral sliding and friction forces, avoiding distortion and creasing of the uppers.

Aims

The aims of conducting this survey were to evaluate whether: (i) the supplied house shoes

Figure 1. Five of the house shoe styles (County Orthopaedic Footwear, Kettering) provided by the Orthotic Department at the Northern General Hospital. All of the house shoes are designed to look like slippers, while protecting the foot from sharp objects and friction and shear forces.



were being worn as a replacement for high street slippers or bare feet; and (ii) people supplied with the house shoes found them comfortable and liked the shoes' appearance. Data were also collected on people's perceptions of their foot problems since the provision of house shoes.

Methods

A patient questionnaire was developed with the assistance of the Clinical Effectiveness Unit at the Northern General Hospital to assess footwear behaviour in those supplied with house shoes. It was based on a similar questionnaire used in 2001 to investigate the views on footwear held by people provided with therapeutic outdoor shoes. A return rate of 59% (133/225) was achieved with that survey (unpublished data).

Page points

1. Since 2005, in addition to two pairs of outdoor shoes, house shoes have been ordered at the review appointment and provided shortly after.
2. All house shoe styles used were designed to be comfortable alternatives to outdoor shoes that look like slippers while retaining the properties of therapeutic footwear.
3. One aim of conducting the questionnaire was to evaluate whether the supplied house shoes were being worn as a replacement for high street slippers or bare feet.
4. A patient questionnaire was developed with the assistance of the Clinical Effectiveness Unit at the Northern General Hospital to assess footwear behaviour in those supplied with house shoes.

Page points

1. The questionnaire comprised 36 questions, with both tick-box and free-response items.
2. The return rate was 51% and was considered high enough to be valid.
3. Fifty-nine percent of participants reported wearing their house shoes all day. A further 20% wore them for a couple of hours every day.
4. The majority of participants reported that they liked the appearance of the house shoes.
5. More than half of the participants reported that they had not had any new podiatric problems since the supply of their house shoes.
6. The free-responses suggested that participants believed that their diabetes, the associated poor circulation and neuropathy, were the cause of foot complications.

On 1 November 2007 the house shoe questionnaire was distributed to all those provided with house shoes between September 2005 and September 2007 (excluding those known to have died subsequent to the provision of house shoes) for the protection of at-risk diabetic feet ($n=87$); house shoes only having been provided since 2005, this was the largest sample possible.

The questionnaire comprised 36 questions, with both tick-box and free-response items (*Appendix I*). Participants were posted a copy of the questionnaire with an explanatory covering letter and a reply-paid envelope in which to return the completed questionnaire. All questionnaires were anonymous. The results were collated by the Clinical Effectiveness Unit.

Results

Forty-five questionnaires were returned. One was rejected due to pages being missing. The return rate was 51% (44/87) and was considered high enough to be valid.

Therapeutic house shoe use

Fifty-nine percent (26/44) of participants reported wearing their house shoes all day. A further 20% (9/44) wore them for a couple of hours every day. Four participants (9%) did not wear them, and the remaining five participants (12%) did not answer this item.

When asked if the house shoes had replaced their high-street slippers, 73% (32/44) said yes, while the rest reported still wearing high-street slippers. Two reasons, given in the participants' own words, for still wearing high-street slippers were:

- "The house shoes were difficult to get on."
- "They [the house shoes] felt too big."

Eleven participants elaborated on why they were wearing the house shoes as advised, rather than high-street slippers. Six of those responses are as follows:

- "The house shoes offered [me] more support."
- "The hospital had advised against it [wearing high-street slippers]."

- "I have neuropathy and have to have proper fitting slippers."
- "I find the house shoes more comfortable and supportive."
- "I know they [the house shoes] are expensive, so wear them when in the house."
- "They [the house shoes] are meant to protect my feet more than slippers."

Two respondents with neuropathy and loss of proprioception commented that they preferred to wear their shoes tight so they are aware of them being on. They felt that all slippers, including the house shoes, were unsuitable for them and thus wore therapeutic outdoor shoes at all times.

Appearance

The majority of participants (84%, 37/44) reported that they liked the appearance of the house shoes. Six participants (14%) did not like the house shoes' appearance and one (2%) did not answer this item. Reasons given for not liking the appearance were:

- "Too bulky."
- "Old fashioned."
- "Too wide, big and heavy."

Recurrence of foot problems

More than half (55%, 24/44) of the participants reported that they had not had any new podiatric problems since the supply of their house shoes. One respondent stated that they now need less podiatry care.

Some 43% (19/44) of participants reported a new foot problem since the supply of house shoes. Four people who reported a new foot problem specifically reported having developed an ulcer. None of the participants blamed their therapeutic footwear for subsequent foot problems. Free-responses suggested that participants believed that their diabetes, the associated poor circulation and neuropathy, were the cause of foot complications.

One participant stated that a new ulcer had been caused because they had failed to wear their house shoes one night. This may be speculation, or they may have sustained

an injury that went on to ulcerate and would not have occurred had they been wearing their house shoes.

Limitations

The non-response rate was high, with 48% (42/87) of those invited and eligible to participate not responding. Thus, the results may not reflect the opinions and experience of all those provided with house shoes at the author's institution.

Valuable information would have been obtained if the questionnaire had asked participants for demographic data (e.g. age, sex), information on their diabetes (e.g. duration of diabetes) and details on the nature of their foot complications (e.g. frequency of professional diabetic foot care, number of episodes of previous ulceration, previous partial foot amputation). Such data would have made it possible to analyse

differences in footwear behaviours for various groups within the cohort.

Discussion

Concordance and compliance

The results of the questionnaire suggest that the provision of house shoes has improved the wearing of therapeutic footwear indoors in this population, with 59% of participants reporting that they wear their house shoes all day, and a further 20% wearing them for a couple of hours every day.

The rate of compliance in the present population is higher than that reported by Macfarlane and Jensen (2003), who found that only 30% of participants with diabetes and at-risk feet provided with outdoor therapeutic shoes wore them for >60% of the time while at home. Yet, the rate of concordance was high in that

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1. The non-response rate was high and the results may not reflect the opinions and experience of all those provided with house shoes.
2. Valuable information would have been obtained if the questionnaire had asked participants for demographic data, information on their diabetes and details on the nature of their foot complications.
3. The results suggest that the provision of house shoes has improved the wearing of therapeutic footwear indoors in this population.

Page points

1. To improve therapeutic footwear concordance and compliance, their provision must be coupled with patient education that motivates behaviour change.
2. It is not possible to change the sole unit of therapeutic shoes to a less bulky style without losing some or all of the protection it offers.
3. Appearance and patient choice in terms of colour and material is an important part of encouraging footwear concordance and compliance.
4. It cannot be said from the results that the provision of house shoes has reduced diabetic foot problems in this population.

cohort, with 90% of participants agreeing that wearing therapeutic footwear was important or very important.

Comments by participants in the present study suggested a high level of concordance with the wearing of house shoes – 73% having ceased to wear high-street slippers and adopting the house shoes, 59% doing so all day. This suggests that the advice provided by members of the multidisciplinary diabetic foot team is listened to and understood.

Emery and Borthwick (2002) suggest that diabetes education is most effective when delivered by a multidisciplinary team as an interactive, collaborative and ongoing process involving the person with diabetes. That study also reported that 83.5% of participants wore shoes supplied by the multidisciplinary diabetic foot team at all times, and only 3.8% had never worn them. Orthotists should make sure that people with diabetes referred to the orthotic department for therapeutic footwear straight from an outpatient appointment – rather than from a multidisciplinary diabetic foot clinic – be given extra advice on why footwear has been prescribed for them.

The present study found that some participants (27%) continued to wear high street slippers. To improve therapeutic footwear concordance and compliance – with the goal of protecting at-risk diabetic feet – the provision of therapeutic footwear must be coupled with patient education that motivates behaviour change. When educating people with diabetes who have high-risk feet on the importance of therapeutic footwear, patient attitudes and lifestyles must be considered (Macfarlane and Jensen 2003), and a range of therapeutic footwear should be available to suit the needs of the person with diabetes.

Appearance

Therapeutic house shoes have to incorporate a range of features to protect the at-risk foot. To achieve this, the shoes must, to some degree, differ in appearance to high-street footwear. In the present study, 14%

of participants reported that they did not like the appearance of the therapeutic house shoes provided.

Macfarlane and Jensen (2003) reported that, among those who disliked the therapeutic shoes provided to them, appearance (24%) was the equal most-cited reason, along with discomfort. Likewise, Knowles and Boulton (1996) reported that 18% of people with diabetes and at-risk feet surveyed disliked the therapeutic shoes provided because they were not cosmetically acceptable.

It is not possible to change the sole unit of therapeutic shoes to a less bulky style without losing some or all of the protection it offers. The width and depth needed to accommodate an at-risk foot are generally contra to most fashionable footwear styles and highlight to the wearer that their feet are not as small or elegant as they might once have been (Churchman, 2008). However, without losing the therapeutic effect, appearance and patient choice in terms of colour and material is an important part of encouraging footwear concordance and compliance (Churchman, 2008).

Incidence of podiatric complications

Edmonds et al (1986) reported that only 26% of participants reulcerated when they wore “special shoes”, while 83% reulcerated wearing their own high-street shoes. Faglia et al (2001) found incidence of new ulceration was low, and ulcer-free periods were longer among those who received slippers with a rigid sole and thermoformable lining.

No published data on reulceration rates are available for the population reported here. As such, it was not possible to determine whether those who wore the house shoe in the present study with regularity reulcerated with greater or lesser frequency than those who did not. It cannot be said from the results that the provision of house shoes has reduced diabetic foot problems. However, participants were questioned on whether the house shoes had improved their foot problems and 77% perceived that they

had. Yet, 43% reported having a podiatric problem since the supply of the house shoes.

Conclusions

This study has provided some positive results on the wearing pattern of house shoes supplied to people with at-risk diabetic feet. Patient perceptions of the appearance and comfort of the house shoes were mostly favourable.

Future research should look at whether the supply of other styles of therapeutic footwear, such as trainers and boots, would further improve compliance with therapeutic footwear. A range of therapeutic styles would allow the shoes to match the lifestyle of the person wearing them.

House shoes will continue to be provided at Northern General Hospital to people with diabetes and at-risk feet. In so doing, these people will have an alternative to therapeutic outdoor shoes while in the home, without compromising the protection of their feet. ■

Armstrong DG, Abu-Rumman PL, Nixon BP, Boulton AJ (2001) Continuous activity monitoring in persons at high risk for diabetes-related lower-extremity amputation. *J Am Podiatr Med Assoc* 91: 451–5

Churchman N (2008) A retrospective audit of footwear use by high-risk individuals in North Derbyshire. *The Diabetic Foot Journal* 11: 10–21

Dahmen R, Haspels R, Koomen B, Hoeksma AF (2001) Therapeutic footwear for the neuropathic foot: an algorithm. *Diabetes Care* 24: 705–9

Edmonds ME, Blundell MP, Morris ME et al (1986) Improved survival of the diabetic foot: the role of a specialized foot clinic. *Q J Med* 60: 763–71

Emery M, Borthwick A (2002) The orthopaedic footwear service: a survey of effectiveness. *The Diabetic Foot* 5: 45–50

Faglia E, Favales F, Morabito A (2001) New ulceration, new major amputation, and survival rates in diabetic subjects hospitalized for foot ulceration from 1990 to 1993: a 6.5-year follow-up. *Diabetes Care* 24: 78–83

Knowles EA, Boulton AJ (1996) Do people with diabetes wear their prescribed footwear? *Diabet Med* 13: 1064–8

Macfarlane DJ, Jensen JL (2003) Factors in diabetic footwear compliance. *J Am Podiatr Med Assoc* 93: 485–91

Mueller MJ (1997) Therapeutic footwear helps protect the diabetic foot. *J Am Podiatr Med Assoc* 87: 360–4

Appendix I. Therapeutic house shoe patient questionnaire.

1. In which year were you first supplied with hospital footwear?
 Before 2003 2003 2004
 2005 2006 2007
 Don't know
 2. Do you still wear the footwear supplied?
 Yes No
 If no, please state why ____
 3. Approximately how many pairs have you had?
 1 2 3 4 5+
 4. How many pairs have you got at the moment that you can wear?
 0 1 2
 3 4+
 5. How many pairs would you like?
 0 1 2
 3 4+
 6. Do you need more pairs than you have now?
 Yes No
 7. If yes, why do you need more pairs?
 Sport Work
 For indoor wear
 For summer
 Other, please list ____
 8. How often do you wear your house shoes?
 Never All day
 A couple of hours every day
 Other, please list ____
 9. Do you like the appearance of the house shoes?
 Yes No
 If no, please state why ____
 10. Do you find your house shoes comfortable?
 Yes No
 If no, please state why ____
 11. Which insoles do you wear in them?
 Sheepskin White moulded
 Grey rubber Beige moulded
 Don't know
 12. Do you still wear slippers bought from the shop?
 Yes No
 If no, please state why ____
 13. Have you had an ulcer or other foot problem since you were supplied with the house shoes?
 Yes No
 If yes, what do you think caused it? ____
 14. Do you think the house shoes have helped your foot problems?
 Yes No
 Please feel free to comment ____
 15. Do you know why you were issued with hospital footwear?
 Yes No
 If yes, please state why ____
 16. Please tick any of the following problems you have.
 Loss of sensation/neuropathy
 Corns Misshapen feet
 Hard skin Deformed toes
 Other, please list ____
 17. Do you get pain in your feet?
 Yes No
 18. If yes, what sort of pain is it?
 Tightness Numbness
 Pins and needles
 Pressure from tight shoes
 Feels like walking on pebbles/marbles
 Pain from ulcer Pain from arthritis
 Others, please list ____
 19. Does your hospital footwear lessen the pain?
 Yes No
 20. How satisfied are you with the fit of the footwear?
 Very satisfied Satisfied
 Dissatisfied Very dissatisfied
 21. How satisfied are you with the comfort of the footwear?
 Very satisfied Satisfied
 Dissatisfied Very dissatisfied
 22. Do you wear any other footwear apart from the hospital footwear?
 Yes No (go to question 27)
 23. If yes, what sort of footwear do you wear?
 Trainers Sandals Shoes
 Boots Slippers
 Others, please list ____
 24. Are they comfortable?
 Yes No
 25. Which are most comfortable:
 Footwear from a shop, or
 Footwear from the hospital
 26. Why do you wear them instead of hospital footwear?
 More comfortable
 Better appearance
 Hospital shoes not suitable for a specific activity
 Do not have enough hospital footwear
 Other, please list ____
 27. Have you had any new problems with your feet since you had your hospital footwear?
 Yes No
 Same problems as before
 28. If yes, what was the problem?
 Ulcer Callous Corns
 More pain More numbness
 Charcot Other, please list ____
 29. What do you think caused the new problems? ____
 30. How much help is the footwear to you?
 A lot of help Some help
 No help Made things worse
 31. Do you like your hospital footwear?
 Yes No
 32. If not, why not?
 Too small Too big
 Uncomfortable
 Poor appearance
 Too heavy Other, please list ____
 33. Do you feel that the orthotists who saw you in the clinic understood your needs regarding footwear?
 Yes No
 34. Were you given instructions regarding the use and care of your footwear?
 Yes No
 35. Were you given enough information about what to do when your footwear starts to wear out?
 Yes No
 36. Overall, how would you rate the service you received from the Orthotics Department?
 Very good Good Acceptable
 Poor Very poor
- Please feel free to make any suggestions on how you think the Orthotics Department could improve your footwear ____
- Please feel free to make any further comments ____