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## Adherence to leg ulcer lifestyle advice: qualitative and quantitative outcomes associated with a nurse-led intervention

Ann Van Hecke, Maria Grypdonck, Hilde Beele, Katrien Vanderwee and Tom Defloor

**Aim and objectives.** Examining the (experienced) changes associated with a nursing intervention to enhance adherence to leg ulcer lifestyle advice.

**Background.** Few interventions to enhance adherence to leg ulcer treatment are developed and tested.

**Design.** Qualitative evaluation approach and pre–post-test design were used.

**Method.** Twenty-six patients with venous ulcers in a community care setting participated. Data were collected by means of interviews and participant observation. Frequency and duration of wearing compression, leg exercising and leg elevation, activity level, pain and ulcer size were registered at baseline, after the end of the intervention and three months later. Inductive content analysis and Wilcoxon signed-rank test were used.

**Results.** Knowledge about leg ulcer advice increased. The education contributed to more consciously following of the advice. The rationale of the advice and its association with healing or recurrence remained often unclear. More patients performed exercises after the intervention and at follow-up. Patients often looked out onto a ‘new’ perspective where enhancement of quality of life and even healing might be attainable. Some patients regained independence after learning how to apply and remove compression garments themselves. The frequency of exercising and the duration of exercises increased significantly. Step counts had not altered significantly. Patients not elevating the legs at baseline elevated the legs more and for a longer period of time after the intervention. This effect on leg elevation decreased after three months. No significant changes were reported on hours wearing compression.

**Conclusions.** The perceived changes suggest that the intervention holds a promise for current home care. Combining qualitative and quantitative research assisted to determine the possible effects of the intervention, increasing the potential for a meaningful randomised trial in the future.

**Relevance to clinical practice.** Education about leg ulcer advice should be incorporated in nursing practice. Further testing of the intervention is recommended.

**Key words:** adherence, evaluation research, leg ulcer lifestyle, leg ulcers, nursing, patient compliance

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## Introduction

A venous leg ulcer is a chronic problem that mainly occurs as a consequence of chronic venous insufficiency (Brem *et al.* 2004). Prevalence in adult populations is estimated at 0.63–1.9% in Europe, the UK, the USA and Australia (Briggs & Closs 2003). Leg ulcers are difficult to heal, frequently recur (Barwell *et al.* 2004) and are often associated with pain, restricted mobility and decreased quality of life (Persoon *et al.* 2004, Briggs & Flemming 2007, Herber *et al.* 2007). Social isolation often ensues because of restricted mobility, pain, unsightly and malodorous wounds and compression bandages (Persoon *et al.* 2004). Leg ulcers also have a psychological impact and encompass negative emotions (Ebbeskog & Ekman 2001), sleeping disorders (Persoon *et al.* 2004), depression and anxiety (Phillips *et al.* 1994, Jones *et al.* 2006).

Venous leg ulcers indicate a life-long treatment plan (Reichardt 1999) including compression therapy (Nelson *et al.* 2000, O'Meara *et al.* 2009), leg exercises and leg elevation (Heinen *et al.* 2004). Non-adherence to leg ulcer treatment frequently occurs. However, few studies report the development and testing of nursing interventions to enhance adherence to leg ulcer treatment.

## Background

Several authors report the problem of non-adherence among patients with venous leg ulcers. Jull *et al.* (2004) found that only 52% of the included patients ( $n = 129$ ) reported wearing compression stockings daily for the first six months after leg ulcer healing. About one fifth (22%) of the patients had not worn compression stockings at all. In the study of Raju *et al.* (2007), only 37% of the patients with chronic venous disease (including leg ulcers) reported full or partial adherence and 63% did not use compression stockings at all or abandoned them after a trial period in the past. Ertl (1992) reported an even higher percentage of non-adherence to compression hosiery (83%). Few studies examined non-adherence to leg exercises and leg elevation. Twenty per cent of the patients with venous leg ulcers elevated their legs when sitting and they walked for 1.7 hours per day (Johnson 1995). Heinen *et al.* (2007b) described less positive results regarding physical activity: 56% of the 150 patients was physically active less than 2.5 hours per week, 13% of the patients walked for 30 minutes at least five days of the week and 35% performed lower leg exercises.

Non-adherence is a complex phenomenon (Kyngas *et al.* 2000). Reasons for non-adherence encompass different factors, varying from patient-related, condition-related and

therapy-related factors to factors related to the healthcare team, system-related factors and socioeconomic factors (World Health Organisation 2003). Published research concerning the determinants of non-adherence to leg ulcer treatment is limited. Pain, discomfort and inadequate lifestyle advice by healthcare professionals are the main reasons for non-adherence, as reported by leg ulcer patients (Van Hecke *et al.* 2009). Additional reasons for non-adherence are difficulties in applying compression, skin problems, uncomfortable footwear, poor cosmetic appearance of compression bandages and financial restrictions (Van Hecke *et al.* 2009). Interpersonal patient-nurse relationships also influence adherence (Van Hecke *et al.* 2009). Heinen *et al.* (2007a) report that pain, co-morbidity, difficulties in finding appropriate footwear, compression bandages, incorrect health beliefs, low self-efficacy and lack of social support are linked to insufficient activity in leg ulcer patients. The fear that physical activity will cause injury and aggravate pain has also been documented as a reason for non-adherence (Walshe 1995, Chase *et al.* 1997, Hyde *et al.* 1999, Ebbeskog & Ekman 2001).

Non-adherence has a negative impact on the outcomes of venous leg ulcers. It increases the time to complete healing (Mayberry *et al.* 1991, Erickson *et al.* 1995, Moffatt *et al.* 2009). Recurrence rates also increase when patients do not wear compression stockings (Mayberry *et al.* 1991, Erickson *et al.* 1995, Harper *et al.* 1999, Finlayson *et al.* 2009, Moffatt *et al.* 2009). Non-adherence is also associated with increased costs (Korn *et al.* 2002). Therefore, adherence to leg ulcer treatment is important. The need to improve patient adherence to maximise therapeutic benefits is highlighted in the literature. However, few comprehensive programmes to optimise patient adherence to leg ulcer lifestyle advice have been initiated (Van Hecke *et al.* 2008). Educational programmes combining cognitive, behavioural and affective components have proved to be effective in enhancing adherence to leg ulcer lifestyle advice (Brooks *et al.* 2004). Patients receiving a multi-level approach, including education, active patient participation and negotiation, frequent follow-up visits, provision of support and changes in types of compression systems, seemed more adherent (Crookes 1997, Hawkins 2001, Hayward 2002, Rees 2002, Briggs 2005). Well-documented evidence for the effectiveness of healthcare system interventions such as Leg Clubs and community leg ulcer clinics to enhance adherence is limited (Thambiaya 1996, Lindsay 2001).

## The nursing intervention 'adherence to leg ulcer lifestyle advice'

The nursing intervention 'Adherence to leg ulcer lifestyle advice' intends to enhance patients' adherence to compression

therapy, leg exercises, physical activity and leg elevation. Tissue viability nurses (TVNs) carry out the intervention in individual sessions at home. The nurses received a two-day training session at the beginning of the intervention, two additional training sessions later on and on-the job training from the researcher. Information on the content of this training is outlined in Table 1. The intervention consists of three to five sessions spread over a period of three months. The decision to offer three, four or five sessions depends on the fulfillment of three specified criteria: (1) no pain or pain is acceptable to the patient, (2) patient follows lifestyle advice as prescribed and (3) perceives positive evolution by the patient. The intervention starts with listening to the patient's narrative of living with a leg ulcer to understand the patient's point of view, needs and perceptions concerning the leg ulcer. During the visits, patients are informed about leg ulcer lifestyle and are involved in goal setting and in formulating strategies to enhance adherence. The

intervention consists of educational, cognitive and behavioural components. Detailed information is provided in Table 2. The intervention was theory-based and systematically developed after analysis of the patients' needs.

## Method

The aim of this study is to examine the changes associated with the nursing intervention 'Adherence to leg ulcer lifestyle advice' (1) to identify outcomes sensitive to leg ulcer patients' experience and more specific to the nursing intervention and (2) to explore the quantitative effects of the intervention.

## Design

To document the changes associated with the intervention, a qualitative evaluation and a pre-post-test design were used.

**Table 1** Overview of the training sessions for TVNs

| Period                         | Content of the training session – teacher   | Duration |
|--------------------------------|---|----------|
| Sept 2008                      | Day 1 – researcher (first author)<br>Description and situation of the research project<br>Leg ulcer patient's needs and experienced problems<br>Content of the intervention protocol for each visit   | 7 hours  |
|                                | Day 2 – researcher (first author) and expert in motivational interviewing<br>Basic principles of motivational interviewing<br>Role playing of scenarios that are common for leg ulcer patients (e.g. less motivated patients, patients who think they are not able to adhere to prescribed lifestyle advice) – practicing various aspects of patient education and motivational interviewing<br>Practical information about registration forms, work protocol, etc.   | 7 hours  |
| Sept 2008–Dec 2008<br>Jan 2009 | Providing the intervention to four leg ulcer patients<br>Researcher (first author)  | 4 hours  |
| Jan 2009–Apr 2009<br>Apr 2009  | Experiences of leg ulcer patients with the intervention: preliminary results<br>Experiences of the TVNs with the intervention<br>Content based on self-reported data by the TVN and data collected by researcher during participant observation – points of particular interest:<br>How to provide tailored verbal information provision<br>Setting specific and realistic goals (what, when, how often, how)<br>Demonstration of adequate leg exercises, leg elevation and use of hosiery application aids.<br>Practical information about registration forms, work protocol, etc.   |          |
| Jan 2009–Apr 2009<br>Apr 2009  | Providing the intervention to 11 leg ulcer patients<br>Researcher (first author)  | 4 hours  |
| May 2009–July 2009             | Experiences of leg ulcer patients with the intervention: preliminary results<br>Experiences of the TVNs with the intervention<br>Content based on self-reported data by the TVN and data collected by researcher during participant observation – points of particular interest:<br>Balancing between wound care and leg ulcer information provision and counselling<br>Giving attention to physical activity and not only leg exercises<br>Informing the community nurse responsible for daily care<br>Attention for prespecified criteria when the TVN considers to end the intervention<br>Practical information about registration forms, work protocol, etc. |          |
| May 2009–July 2009             | Providing the intervention to 11 leg ulcer patients   |          |

TVN, tissue viability nurses.

**Table 2** Content of the nursing intervention

| Session | Content  | Materials/tools  |
|---------|--|--|
| 1       | Start with listening to 'leg ulcer narratives' to understand patient's experiences, viewpoints, needs and experienced ulcer problems;<br>Inventory of current behaviour regarding compression, leg exercises, physical activity and leg elevation;<br>Measurement of pain intensity, ulcer size;<br>Invite patients to demonstrate leg ulcer knowledge and identify knowledge deficits;<br>Provide tailored verbal information and written information (aetiology, realistic perspective, treatment, lifestyle advice);<br>Encourage patients to ask questions and verify understanding;<br>Invite patients to elaborate on own leg ulcer lifestyle and elicit willing to change statements;<br>Priority is given to pain and not sleeping in bed;<br>Inform the nurse who is responsible for daily patient care.  | Open conversation combined with a topic guide based on literature review<br>Structured assessment form<br>Verbal/numeric pain scale, wound tracing sheets<br>Brochure on leg ulcers based on study of leg ulcer patients' information needs<br>Pain assessment form and pain intervention protocol |
| 2       | Measurement of pain intensity (if necessary);<br>Involve patients in setting specific and realistic goals (what, when, how often, how) and assess self-efficacy;<br>Demonstrate leg exercises, leg elevation, application of compression as needed and invite patients to demonstrate skills;<br>Involve patients in formulating strategies for enhancing adherence to lifestyle advice;<br>Identify and use practical strategies;<br>Try to reach habit formation (e.g. performing leg exercises while watching the news)<br>Inform the nurse who is responsible for daily patient care.  | Verbal/numeric pain scale<br>Patient goal setting form<br>Using hosiery application aids, pedometers, card reminders with specific exercises, leg ulcer lifestyle advice poster  |
| 3–5     | Perform measurements (pain intensity if necessary, ulcer size);<br>Invite patients to evaluate behaviour change in the previous week – let patients express success (e.g. progress in wound healing, pain reduction);<br>Discuss and encourage positive behaviour change (what was good the previous week?);<br>Discuss barriers experienced for behaviour change (what was difficult the previous week?);<br>Adjust goals and strategies for enhancing adherence to lifestyle advice (if necessary) and assess self-efficacy;<br>Inform patients about (applicable) causes of delayed healing (if necessary);<br>Inform the nurse who is responsible for daily patient care.<br>Specific for last session:<br>Invite patients to set future specific and realistic goals and assess self-efficacy;<br>Inform the general practitioner and the nurse who is responsible for daily patient care | Verbal/numeric pain scale<br>Wound tracing sheets (to visualise progress or deterioration)<br>Nurse workbook: patient record   |

### Participants

Twenty-six patients with a venous leg ulcer participated in the study. Patients were included if they had an Ankle Brachial Pressure Index (ABPI) between 0.8–1.2 (Vowden & Vowden 2001), had a prescription of compression garments, spoke Dutch, were able to read and write, received leg ulcer care by community nurses and were non-adherent. A decision tree was used to define non-adherent patients (Fig. 1).

Patients were excluded if they had communication impediments, had a fixed ankle range of motion, were totally dependent for mobility, or had underlying pathologies like uncontrolled diabetes mellitus, pyoderma gangrenosum, myasthenia gravis and vasculitis (Davies *et al.* 2007). Patients characteristics are outlined in Table 3. The median age was 79 years. Fifteen patients were women. Most patients had a low educational level and 10 patients lived alone. The median ulcer duration was 25.5 weeks. Six patients refused to

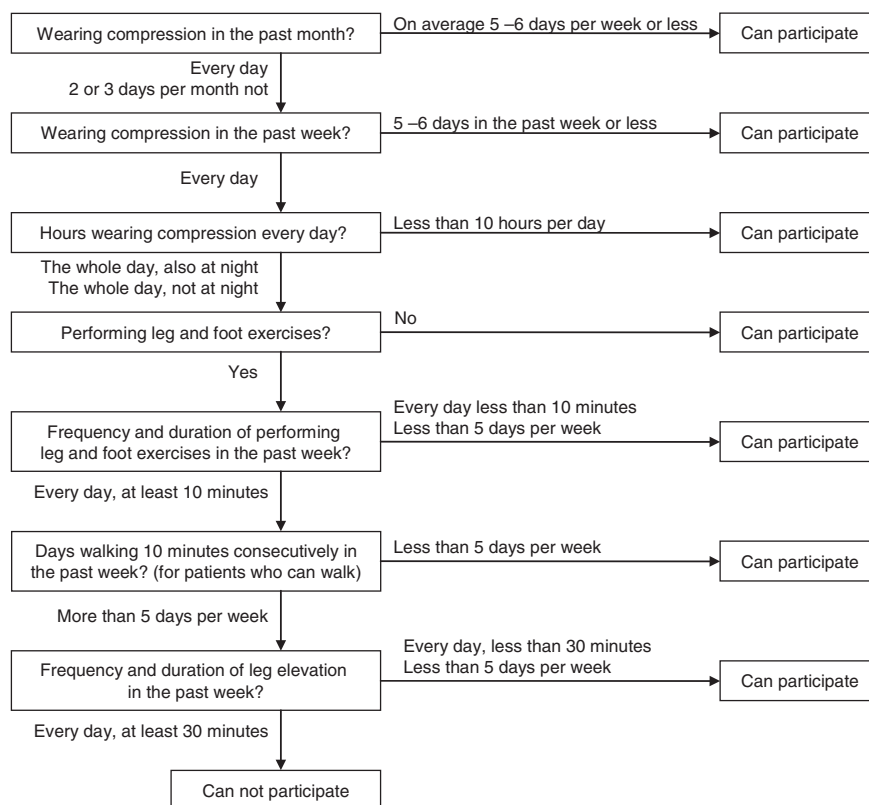


Figure 1 Decision tree for inclusion of non-adherent patients.

Table 3 General characteristics of patients

| Characteristics ( <i>n</i> = 26) | <i>n</i> | Median (IQR)     |
|----------------------------------|----------|------------------|
| Gender                           |          |                  |
| Female                           | 15       |                  |
| Age in years                     |          | 79 (76-83)       |
| Education level                  |          |                  |
| High (> 18 years)*               | 6        |                  |
| Medium (16-18 years)             | 8        |                  |
| Low (≤15 years)                  | 12       |                  |
| Living circumstances             |          |                  |
| Living alone                     | 10       |                  |
| Living with partner/others       | 16       |                  |
| Mobility status                  |          |                  |
| Using mobility aids              | 17       |                  |
| No impaired mobility             | 9        |                  |
| Ulcer duration in weeks          |          | 25.5 (8.8-123.5) |
| Ulcer size in cm <sup>2</sup>    |          |                  |
| Closed                           | 3        |                  |
| ≤5 cm <sup>2</sup>               | 13       |                  |
| 6-10 cm <sup>2</sup>             | 5        |                  |
| More than 10 cm <sup>2</sup>     | 5        |                  |
| Previous episodes of ulceration  |          |                  |
| None                             | 6        |                  |
| 1 episode                        | 4        |                  |
| 2-5 episodes                     | 7        |                  |
| More than 10 episodes            | 9        |                  |

\*Years of education.

participate, four of these patients because of 'the burden of the research'. Two patients did not complete the intervention. For one patient, the intervention did not meet his needs and expectations, the other patient found participation too cumbersome. A flowchart is given in Fig. 2. Five TVNs from a community healthcare organisation participated in the study. General characteristics of the TVNs are presented in Table 4. The nurses' median age was 41 years, and the median duration of their professional experience as TVN was six years.

### Data collection

To explore the changes associated with the nursing intervention, both qualitative and quantitative data were collected. At the end of the nursing intervention, semi-structured interviews were held with 25 patients in their home. Owing to hospital admission, one patient was not interviewed. The interviews took place within a week after the end of the intervention to maximise recall of the experience. A topic guide with open-ended questions was used. To encourage patients to tell their experiences and perceptions, the interview started with a general and open-ended question ('What was it like for you to receive the intervention?'). The topic list



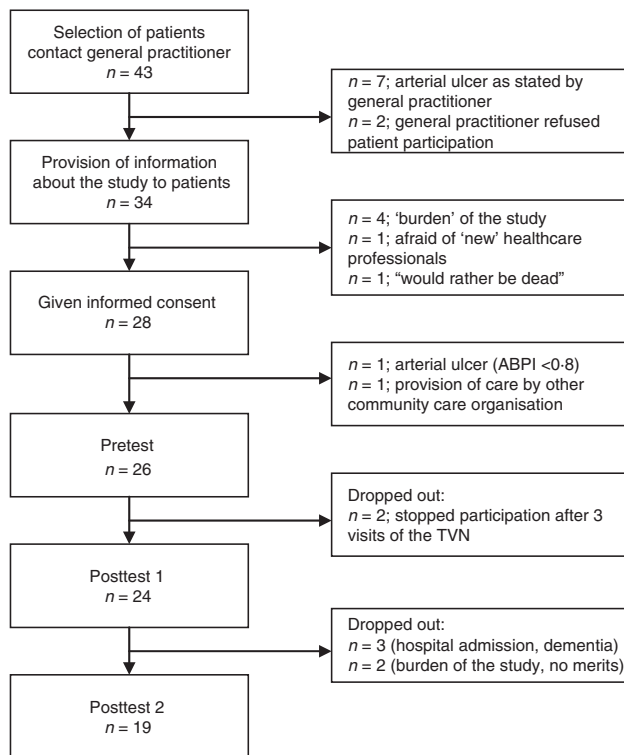


Figure 2 Flowchart of patients in the study.

Table 4 General characteristics of nurses

| Characteristics (n = 5)                                    | n | Median (IQR) |
|--|---|--------------|
| Age in years   |   | 41 (8-5)     |
| Education level  |   |              |
| Sub-degree level   | 4 |              |
| Bachelor's degree  | 1 |              |
| Professional nursing experience in years                   |   | 20 (13-0)    |
| Professional experience as tissue viability nurse in years |   | 6 (3-0)      |

was based on the themes as described in the Situation-producing Theory of Dickoff *et al.* (1968) and the questionnaire of Peters *et al.* (2003). Peters *et al.* (2003) focused on barriers and opportunities to optimise patient care. Themes like the evaluation of the intervention and experienced changes associated with the intervention were discussed. Patient interviews lasted between 18–81 minutes (mean duration: 44 minutes). The interviews were audio-taped and transcribed verbatim.

Problems with capturing the perspective of the older people are acknowledged in literature (Willits & Crider 1988). Therefore, participant observation by the researcher (AVH) was also used. The researcher observed 38 consultations of the TVN with the patient. Written field notes regarding conversations, interactions, context and observa-

tions of TVNs' activities were made. All quantitative data about wearing compression, performing leg exercises, leg elevation, physical activity, pain and ulcer size were collected three times: at baseline (at least one week before the start of the intervention), at the end of the intervention (starting within one week after the last visit) and three months later.

*Frequency and duration of wearing compression, performing leg exercises and leg elevation*

As no valid and reliable tool is available to assess the frequency and duration of wearing compression, performing leg exercises and leg elevation (Van Hecke *et al.* 2008), patients kept a diary for seven consecutive days, they recorded the number of hours wearing compression (including the time they got up and went to bed) and the frequency and duration of performing leg exercises and leg elevation. Leg exercises were defined as tiptoe exercises (standing or sitting on a chair), ankle circling and plantar and dorsiflexion ankle exercises during at least one minute. These exercises were described on cards, the patients received as part of the TVNs instructions. Only if necessary, community nurses who provided daily leg ulcer care were asked to help patients in completing the diary.

*Activity level*

Step counts were recorded with the ActiGraph accelerometer GT1M (Fort Walton Beach, FL, USA). Patients were instructed to wear the accelerometer continuously during their waking hours for a period of seven consecutive days. The accelerometer was held in place with an elastic belt and an adjustable buckle. Although no information about validity, accuracy and reliability of the ActiGraph accelerometer steps counting in the older people was available, it was used in other research to measure physical activity in older people (Oliveira *et al.* 2008, Harris *et al.* 2009). Two patients had fewer than five days of analysable data and were not included in the analysis. One patient refused to wear the accelerometer in the follow-up assessments.

*Pain*

Although visual analog pain-intensity scales are recommended for widespread use in adults, they do not work well in older people (Jones *et al.* 2007). Numeric rating scales are valid instruments to assess pain intensity and are often easier to understand (Breivik *et al.* 2008). As pain levels across numeric rating scales and verbal rating scales were highly correlated in the older people (Jones *et al.* 2007) and as the latter were often preferred by older adults (Herr & Mobily 1993, Closs *et al.* 2004), pain was measured by a researcher

with a verbal scale (no pain, mild, moderate, severe and worst pain imaginable). Pain at the moment of assessment (now) and pain in the previous 24 hours were measured.

#### *Ulcer size*

The researcher measured the healing rate by acetate tracing and computer-assisted counting of the number of squares (cm<sup>2</sup>). The acetate method is most commonly used for measuring wounds and has been demonstrated to have good inter- and intrarater reliability (Majeske 1992).

#### *Demographic and illness-related variables*

At baseline, a general questionnaire was used to obtain data about age, gender, education level, living circumstances, mobility status, leg ulcer duration and recurrence rate. Data collection took place between September 2008–July 2009.

### **Procedure**

Five TVNs who were responsible for 19 local departments of a community healthcare organisation were delegated by the management staff to participate in the study. All the venous leg ulcer patients in these local departments were listed. Different characteristics of these patients were inventoried e.g. inclusion and exclusion criteria, age, education level, recurrence rate, ulcer duration, amount of social support and presence of pain. The researcher selected patients who met the inclusion criteria. By means of purposive sampling, the researcher ensured that the intervention was tested in patients with different characteristics (age, gender, education level, duration of leg ulcer, recurrence rate, pain) and in a different context (amount of social support, living alone versus cohabiting). After selection, the researcher contacted the patient's general practitioner (and/or specialist) to inform him/her about the study, to verify the venous origin of the ulcer and to check for underlying pathologies. Once the treating physician(s) gave consent, the community nurse providing daily (leg ulcer) care or the TVN explained the purpose of the study to the patient. Written consent was obtained. The researcher performed ABPI measurements to verify if there was no arterial component. After baseline assessment, the intervention was initiated. To ensure that the nursing intervention was adequately and sufficiently used in practice, several steps were undertaken: (1) the intervention was delivered by trained TVNs as their professional background and expertise in leg ulcer care may facilitate adequate intervention delivery, (2) for each patient, one to three consultations were observed, (3) when the TVN had questions regarding the intervention, leg ulcer lifestyle or problem-solving decision-making, the first researcher was

available and gave advice, (4) the TVN and the researcher (when present) registered the actions in each visit in a work protocol and (5) in intermediate training sessions points of particular interest based on the self-reported data by the TVN and the researcher were addressed.

### **Data analysis**

Inductive content analysis was used (Elo & Kyngäs 2008). Qualitative data were entered into QSR N6 (QSR International Pty Ltd, Doncaster, Victoria, Australia). The transcripts were read through several times to become immersed in the data. The transcripts were coded, categories were created and these were grouped under higher-order headings: cognitive, behavioural, emotional and physical changes. To ensure the trustworthiness of the findings and interpretations, researcher triangulation was used. Coding and interpretations were discussed with another qualitative researcher who read most of the transcripts. Insights emerging from these discussions were checked against the data by critically rereading the transcripts and by checking these insights in new interviews. Interview transcripts and observational data were referred to during analysis, and characteristic quotes were used to support the credibility of the findings. To verify the findings against the data, two researchers not yet involved in the analytical process read a random selection of the transcripts.

Quantitative data were analysed with SPSS version 15.0 (SPSS Inc., Chicago, IL, USA). As the variables were not normally distributed, the Wilcoxon signed-rank test was used to analyse whether the baseline outcomes differed significantly from the outcomes at the end of the intervention and three months later. The Bonferroni correction was used to correct for multiple testing (Polit & Beck 2007). A value of  $p < 0.017$  (0.05/3) was considered statistically significant.

### **Ethical considerations**

The study was approved by the ethical committee of the Ghent University Hospital (B67020084230). Nurses and patients were informed and gave written consent.

### **Results**

#### **Qualitative results**

Four clusters of changes were associated with the nursing intervention: cognitive, behavioural, emotional and physical changes. The clusters included a range of statements made by one or more patients.



### *Cognitive changes*

Two cognitive changes are described: knowing what to do and knowing why to follow leg ulcer lifestyle advice:

*Knowing what to do.* Knowledge about leg ulcer lifestyle advice increased. Performing leg exercises was new for most patients. Patients with long-lasting or (several episodes of) recurrent ulcers said to have learned a few 'new things'. They had already consulted different healthcare professionals for advice and had experienced the benefits (e.g. benefits of wearing compression garments) or disadvantages (e.g. pain while exercising) of leg ulcer lifestyle advice. The information provided helped patients to cope with leg ulcer-related problems (e.g. what to do when experiencing discomfort or tiring legs). Inadequate leg ulcer lifestyle that patients had assumed to be correct was now adjusted, especially advice regarding leg elevation and maintenance of compression garments:

P: Well, I used to elevate my legs like this [showed the use of a hassock to elevate the legs], but my legs were lower. X [tissue viability nurse] said to elevate my legs in a way that I can see my toes. That's a good rule of thumb to know if I am elevating my legs correctly. But lying my legs on a hassock, that is not very effective. That is something that she has taught me.

*Knowing why.* Patient education contributed to patients more consciously following leg ulcer lifestyle advice. However, the rationale for the advice and the relationship between the advice and wound healing or recurrence often remained unclear to the patients. Some patients still doubted their own contribution to enhance leg ulcer healing, doubted the benefits of the advice (especially of performing leg exercises and being physically active) and focussed on wound care.

### *Behavioural changes*

Behavioural changes are seen in 'following and giving lifestyle advice' and 'using creative strategies and use habit formation to incorporate advice in daily life'.

*Following and giving lifestyle advice.* The qualitative findings indicated that not all patients adhered to leg ulcer lifestyle advice. Some patients apparently judge their adherence by their own standards that may differ from the recommended regimen (e.g. patients stated to adhere to compression therapy, whereas they wore it not as recommended). Patients stated that inadequate timing of professional leg ulcer care hampered the duration of wearing compression. They mainly adopted performing leg exercises that they found easy to incorporate in daily living. Walking and leg elevation were more difficult. Patients were afraid of walking as they feared falling, and leg elevation was inconvenient and often caused discomfort. Some patients

carried out leg exercises and leg elevation at fixed times and related to daily recurring activities (e.g. exercising during dish washing, when watching the news on television). Other patients performed exercises or leg elevation when it 'crossed their mind'. Patients also recommended and taught leg ulcer lifestyle advice to others confronted with (similar) problems:

P: Recently, my brother was admitted to the hospital. He is already 82 years old. I said to him – as his mobility is also bad – 'you should do some exercises of mine'. We have once done exercises together.

*Creative strategies to incorporate advice in daily life and to seek habit formation.* Patients found creative strategies to incorporate leg ulcer lifestyle advice in daily life, which enhanced adherence. For example, a patient who often watched television and initially counted the number of exercises started to exercise each time commercials came on television.

### *Emotional changes*

Hoping, feeling safe, regaining independence and enhancement of quality of life were emotional reactions/changes associated with the intervention:

*Hope and a new perspective.* During the intervention, patients often experienced 'getting out of the rut'. Participation in the study implied that they received 'other' leg ulcer care than they used to. Some patients looked out onto a 'new' perspective where healing and/or enhancement of quality of life might be attainable. Hope arose again in situations where hope had been lost. Wound measurements initiated hope, especially in patients with a positive wound progress. Hope was less apparent in patients who suffered from long-lasting leg ulcers and had tried several remedies without attaining leg ulcer healing:

P: She [tissue viability nurse] said: 'Let's measure it. The wound size is decreased. Look! It is small and the wound looks good'. That gives you a bit of hope that it will heal. Honestly, I thought that it would never heal, at my age and such a wound, because they [other nurses from the hospital] did not give me courage.

*Feeling safe.* Receiving the intervention from a TVN was reassuring for patients. It made them feel safe. They were confident that leg ulcer care was performed skilfully and that the provided information was adequate.

*Independence.* In a few patients, independence was enhanced after learning how to apply and remove compression garments themselves. As a consequence, help from healthcare professionals was no longer needed or less urgent and patients did no longer have to adjust daily activities to nurses' timing of leg ulcer care (e.g. patient had to get up

early in the morning for application of compression garments by the nurse):

P: ... but that aid [stick to remove compression garments] has made me independent. You can recommend that to other patients. (...) Probably, I would have given up on wearing compression if I did not have that stick, because I am an independent person.(...) Independence is very important to me and that is what you have given me with this aid.

*Enhancement of quality of life.* Several patients experienced an increase in quality of life, one patient even said to have 'revived' during and after the intervention. Previously, she had received inadequate or incomplete advice that had an enormous impact on her quality of life. Having received the advice to rest with legs elevated, she had refrained from social activities and got socially isolated. The TVN informed her that balancing between leg elevation and being physically active would benefit her healing process. This meant that she was legitimised to participate in social life again. The 'revival' of this patient was also attributed to a relief of severe pain after the intervention:

P: I was sure that I could be physically active, because they [other healthcare professionals] always said 'you should rest', but then you are isolated. X [tissue viability nurse] said that I was allowed to walk. That helped me a lot. (...) I did not walk anymore, because they told me to rest. For me, it was a real revival. [community nurse who provided daily leg ulcer care] said: 'You have completely changed'. I was interested in things again. Of course, when pain is relieved, things are completely different. The information about exercising was very supportive to me.

#### *Physical changes*

Patients perceived physical improvements by following the advice. They 'felt' that tiptoe exercises were beneficial: they felt that muscle strength increased, that the 'blood in the legs was flowing' and that their feet warmed up more easily.

#### **Quantitative results**

In the quantitative analysis (see Table 5), no significant changes were found in the number of hours wearing compression therapy. Significantly, more patients performed leg exercises at the end of the intervention ( $Z = -3.87$ ,  $p < 0.001$ ) and at three months thereafter ( $Z = -3.00$ ,  $p = 0.003$ ) compared to baseline measurements. The mean frequency of exercising increased from not exercising at baseline to 13 times a day after the intervention ( $Z = -3.64$ ,  $p < 0.001$ ) and 17 times a day three months after the end of the intervention ( $Z = -2.94$ ,  $p = 0.003$ ). The duration of

exercising per day also significantly increased. No significant changes were found in patients who already performed leg exercises at baseline. Walking did not increase significantly at the end of the intervention ( $Z = -1.93$ ,  $p = 0.05$ ) nor three months later ( $Z = -0.21$ ,  $p = 0.84$ ). No significant increase was seen in the number of patients adequately elevating their legs ( $Z = -2.33$ ,  $p = 0.02$ ) nor in the duration and frequency of elevating the legs.

Pain intensity for patients reporting pain at baseline significantly decreased from moderate pain before to no pain at the end of the intervention ( $Z = -2.60$ ,  $p = 0.009$ ) (Table 5). No significant reduction in ulcer size was seen at the end of the intervention ( $Z = -1.88$ ,  $p = 0.06$ ). Compared to baseline, the ulcer size three months after the end of the intervention was significantly reduced ( $Z = -3.44$ ,  $p = 0.001$ ). Only ulcer size of ulcers  $\leq 6$  months significantly decreased at the end of the intervention ( $Z = -2.55$ ,  $p = 0.011$ ). In six patients of the 24 patients, the ulcer was healed at the end of the intervention. One of these patients had a recurrent ulcer three months after the end of the intervention.

#### **Discussion**

This study sought to identify the changes associated with the nursing intervention 'Adherence to leg ulcer lifestyle advice' primarily through a qualitative evaluation approach. Cognitive, behavioural, emotional and physical changes were identified. There is sparse literature about home-based nursing interventions aiming at enhancing adherence to leg ulcer treatment to compare our results with. Studies mainly report on the effectiveness of community leg ulcer clinics (Simon *et al.* 1996, Ghauri *et al.* 2000) and Leg Clubs (Edwards *et al.* 2005, 2009). Home-based nursing interventions in patients with venous leg ulcers primarily focus on the effectiveness of therapeutic exercising programmes (Davies *et al.* 2007, Jull *et al.* 2009) and on other leg ulcer lifestyle advice (e.g. leg elevation) (Brooks *et al.* 2004). As only quantitative measures are used and the measurement of adherence level is hampered by the lack of uniformity, comparison is impeded. Patients in the study by Brooks *et al.* (2004) exposed to the lifestyle programme elevated their legs for a significantly longer period per day after 52 weeks. In our study, no significant effects on leg elevation were found. Patient characteristics were different from the participants in the study by Brooks *et al.* (2004). Our patients had more mobility restrictions and used more mobility aids. Our results suggested that the improvements regarding leg exercises were more prominent in patients who did not exercise at baseline compared to patients who

Table 5 Comparison of outcome measures T0–T1–T2\*

| Outcome  | T0<br>Median (IQR) | T1<br>Median (IQR) | T2<br>Median (IQR) | Results<br>T0–T1 |                                 | Results<br>T1–T2 |          | Results<br>T0–T2   |                 |          |
|--|--------------------|--------------------|--------------------|------------------|---------------------------------|------------------|----------|--------------------|-----------------|----------|
|  |                    |                    |                    | <i>n</i>         | ( <i>p</i> -value) <sup>†</sup> | <i>Z</i> -value  | <i>n</i> | ( <i>p</i> -value) | <i>Z</i> -value | <i>n</i> |
| Leg exercises and physical activity  |                    |                    |                    |                  |                                 |                  |          |                    |                 |          |
| Number of exercising patients  | 6/26               | 20/23              | 13/17              |                  | < 0.001 <sup>‡</sup>            | –3.87            | 0.18     | –1.34              | 0.003           | –3.00    |
| Days of exercising/week – all patients   | 0.0 (0.0–0.5)      | 6.0 (5.0–7.0)      | 7.0 (3.0–7.0)      | 23               | < 0.001                         | –3.71            | 17 0.53  | –0.63              | 17 0.002        | –3.16    |
| Days of exercising/week – exercising on T0   | 5.50 (3.5–7.0)     | 7.0 (6.0–7.0)      | 7.0 (7.0–7.0)      | 5                | 0.36                            | –0.92            | 4 1.00   | 0.00               | 4 0.11          | –1.60    |
| Days of exercising/week – not exercising on T0   | /                  | 6.0 (3.3–7.0)      | 7.0 (0.0–7.0)      | 18               | 0.001                           | –3.45            | 13 0.53  | –0.63              | 13 0.004        | –2.89    |
| Frequency of exercising/week – all patients  | 0.0 (0.0–0.5)      | 13 (6.5–28.0)      | 17.0 (0.0–20.0)    | 21               | < 0.001                         | –3.64            | 13 0.09  | –1.68              | 15 0.003        | –2.94    |
| Frequency of exercising/week – exercising on T0  | 8.5 (4.3–12.0)     | 28.0 (8.0–31.5)    | 16.0 (13.3–20.3)   | 5                | 0.14                            | –1.48            | 4 0.14   | –1.46              | 4 0.07          | –1.83    |
| Frequency of exercising/week – not exercising on T0  | /                  | 12.0 (4.5–21.8)    | 17.0 (0.0–20.0)    | 16               | 0.001                           | –3.18            | 9 0.21   | –1.24              | 11 0.02         | –2.38    |
| Minutes of exercising/day – all patients   | 0.0 (0.0–0.3)      | 13.6 (1.9–20.4)    | 12.5 (1.5–24.3)    | 21               | < 0.001                         | –3.62            | 16 0.78  | –0.28              | 16 0.003        | –2.98    |
| Minutes of exercising/day – exercising on T0   | 6.8 (1.4–17.5)     | 15.0 (8.4–27.0)    | 15.1 (7.9–22.4)    | 5                | 0.14                            | –1.48            | 4 0.47   | –0.73              | 4 0.14          | –1.46    |
| Minutes of exercising/day – not exercising on T0   | /                  | 9.07 (1.4–20.0)    | 12.5 (0.0–25.4)    | 16               | 0.001                           | –3.18            | 12 0.48  | –0.71              | 12 0.01         | –2.52    |
| Step counts/day  | 1186 (739–2012)    | 1742 (567–3184)    | 1281 (712–3125)    | 21               | 0.05                            | –1.93            | 16 0.07  | –1.82              | 16 0.84         | –0.21    |
| Leg elevation during the day   |                    |                    |                    |                  |                                 |                  |          |                    |                 |          |
| Number of patients (elevated <sup>§</sup> or horizontal)                                     | 14/25              | 16/21              | 14/18              |                  | 0.10                            |                  | 1.00     |                    | 0.05            |          |
| Number of patients (only elevated)   | 4/25               | 11/21              | 7/18               |                  | 0.02                            | –2.33            | 0.08     | –1.73              | 0.10            | –1.63    |
| Days of leg elevation/week (elevated or horizontal) – all patients                           | 3.0 (0.0–7.0)      | 7.0 (3.0–7.0)      | 7.0 (1.5–7.0)      | 20               | 0.02                            | –2.33            | 17 0.36  | –0.92              | 17 0.03         | –2.13    |
| Days of leg elevation/week (elevated or horizontal) – leg elevation on T0                    | 7.0 (5.3–7.0)      | 7.0 (7.0–7.0)      | 7.0 (6.0–7.0)      | 11               | 0.46                            | –0.74            | 9 0.66   | –0.45              | 9 0.47          | –0.73    |
| Days of leg elevation/week (elevated or horizontal) – no leg elevation on T0                 | /                  | 6.0 (0.0–7.0)      | 3.5 (0.0–7.0)      | 9                | 0.03                            | –2.12            | 7 0.34   | –1.00              | 8 0.05          | –2.00    |
| Frequency of periods of leg elevation/week (elevated or horizontal) – all patients           | 3.0 (0.0–7.0)      | 7.0 (5.3–13.8)     | 7.0 (1.0–11.5)     | 19               | 0.20                            | –1.29            | 15 0.45  | –0.76              | 15 0.15         | –1.43    |
| Frequency of periods of leg elevation/week (elevated or horizontal) – leg elevation on T0    | 7.0 (4.5–17.5)     | 9.8 (7.0–14.0)     | 7.0 (6.0–13.5)     | 10               | 0.44                            | –0.77            | 9 0.73   | –0.34              | 8 0.67          | –0.42    |
| Frequency of periods of leg elevation/week (elevated or horizontal) – no leg elevation on T0 | /                  | 7.0 (0.0–11.0)     | 0.0 (0.0–7.0)      | 9                | 0.03                            | –2.23            | 6 0.20   | –1.29              | 7 0.10          | –1.63    |
| Minutes of leg elevation/during the day (elevated <sup>§</sup> or horizontal) – all patients | 23.6 (0.0–77.4)    | 89.3 (21.4–132.9)  | 28.9 (4.3–119.3)   | 18               | 0.27                            | –1.10            | 13 0.25  | –1.16              | 14 0.61         | –0.51    |
| Minutes of leg elevation/during the day (elevated or horizontal) – leg elevation on T0       | 76.2 (45.0–210.0)  | 120.0 (55.0–270.0) | 88.6 (27.3–151.6)  | 10               | 0.68                            | –0.42            | 8 0.58   | –0.56              | 7 0.50          | –0.68    |

Table 5 (Continued)

| Outcome  | T0               | T1               | T2               | Results  |                                 |         | Results  |                    |         | Results  |                    |         |
|--|------------------|------------------|------------------|----------|---------------------------------|---------|----------|--------------------|---------|----------|--------------------|---------|
|  | Median (IQR)     | Median (IQR)     | Median (IQR)     | <i>n</i> | ( <i>p</i> -value) <sup>†</sup> | Z-value | <i>n</i> | ( <i>p</i> -value) | Z-value | <i>n</i> | ( <i>p</i> -value) | Z-value |
| Minutes of leg elevation/during the day (elevated or horizontal) – no leg elevation on T0  | /                | 77.9 (0.0–120.0) | 0.0 (0.0–60.0)   | 8        | 0.04                            | –2.03   | 5        | 0.29               | –1.07   | 7        | 0.11               | –1.60   |
| Wearing compression  |                  |                  |                  |          |                                 |         |          |                    |         |          |                    |         |
| Number of patients wearing compression   | 25/26            | 22/24            | 17/19            |          | 0.56                            |         |          | 1.00               |         |          | 0.56               |         |
| Days of wearing compression/week   | 7.0 (7.0–7.0)    | 7.0 (7.0–7.0)    | 7.0 (7.0–7.0)    | 24       | 0.68                            | –0.41   | 17       | 1.00               | 0.00    | 17       | 0.32               | –1.00   |
| Hours wearing compression/day – no change in compression system ( <i>n</i> = 19)           | 13.8 (11.7–15.5) | 13.7 (11.7–14.2) | 13.3 (11.4–16.0) | 16       | 0.64                            | –0.47   | 11       | 0.09               | –1.72   | 11       | 0.76               | –0.31   |
| Hours wearing compression/day – change to more adequate compression system ( <i>n</i> = 7) | 13.6 (12.0–24.0) | 19.4 (11.8–24.0) | 19.1 (12.6–24.0) | 6        | 0.69                            | –0.41   | 6        | 0.59               | –0.54   | 6        | 0.69               | –0.41   |
| Pain intensity <sup>‡</sup>  |                  |                  |                  |          |                                 |         |          |                    |         |          |                    |         |
| Number of patients with pain   | 11/26            | 6/24             | 5/18             |          |                                 |         |          |                    |         |          |                    |         |
| Pain intensity (now) – all patients  | 0.0 (0.0–2.0)    | 0.0 (0.0–0.8)    | 0.0 (0.0–1.3)    | 24       | 0.07                            | –1.83   | 18       | 0.41               | –0.82   | 18       | 0.25               | –1.16   |
| Pain intensity (previous 24 hours) – all patients  | 0.0 (0.0–2.0)    | 0.0 (0.0–1.0)    | 0.0 (0.0–1.3)    | 24       | 0.04                            | –2.02   | 18       | 0.48               | –0.71   | 18       | 0.20               | –1.27   |
| Pain intensity (now) – patients with pain on T0 ( <i>n</i> = 11)                           | 2.0 (1.0–2.0)    | 0.0 (0.0–2.0)    | 0.0 (0.0–2.0)    | 11       | <b>0.009<sup>‡</sup></b>        | –2.60   | 8        | 0.66               | –0.45   | 8        | 0.02               | –2.27   |
| Pain intensity (previous 24 hours) – patients with pain on T0                              | 2.0 (1.0–3.0)    | 0.0 (0.0–2.0)    | 0.0 (0.0–2.0)    | 11       | <b>0.004</b>                    | –2.89   | 8        | 0.66               | –0.45   | 8        | <b>0.02</b>        | –2.43   |
| Ulcer size (cm <sup>2</sup> )  |                  |                  |                  |          |                                 |         |          |                    |         |          |                    |         |
| Ulcer size (cm <sup>2</sup> )  | 3.7 (0.4–6.6)    | 0.3 (0.0–9.2)    | 0.1 (0.0–2.9)    | 24       | 0.06                            | –1.88   | 19       | 0.02               | –2.27   | 19       | <b>0.001</b>       | –3.44   |
| Ulcer duration ≤6 months   | 1.3 (0.2–6.0)    | 0.05 (0.0–1.6)   | 0.1 (0.0–0.4)    | 12       | <b>0.01</b>                     | –2.55   | 10       | 0.12               | –1.57   | 10       | <b>0.005</b>       | –2.80   |
| Ulcer duration >6 months   | 3.9 (0.8–19.4)   | 3.9 (0.0–19.3)   | 3.0 (0.0–13.1)   | 12       | 0.39                            | –0.87   | 9        | 0.17               | –1.36   | 9        | <b>0.011</b>       | –2.55   |

\*T0, baseline; T1, at the end of the intervention; T2, three months after the end of the intervention.

<sup>†</sup>Wilcoxon signed-rank test.

<sup>‡</sup>Significant values are bold (0.017).

<sup>§</sup>Leg elevation 10–30° above the heart level.

<sup>¶</sup>Pain intensity ranged from no pain (0), mild pain (1), moderate pain (2), severe pain (3) and worst pain imaginable (4).

already exercised at baseline. The small sample size of the latter group ( $n = 5$ ) might explain why no significant difference could be detected. These patients reached at T0 the scores that the other non-exercising patients reached at T1. Our results might also support the finding that ulcer duration  $>6$  months is associated with delayed healing (Moffatt *et al.* 2010).

The inclusion of both qualitative and quantitative methods led to a better understanding of the results. The qualitative evaluation brought to light new 'outcomes' or aspects of the efficacy of the intervention. A range of outcomes sensitive to the patient's experience, highly valued by leg ulcer patients and specific to the nursing intervention were detected. These outcomes would not have been accounted for when a single method approach would have been used. In accordance with other researchers (Hearn *et al.* 2003), we noticed that combining qualitative and quantitative research provided a more complete picture of the changes resulting from the intervention. The use of complementary methodologies to evaluate complex nursing interventions is also stressed by other authors (Bradley *et al.* 1999, Campbell *et al.* 2000, van Meijel *et al.* 2004) and is desirable to evaluate how interventions affect patients (Merkouris *et al.* 2004, Moffatt *et al.* 2006). Treating qualitative and quantitative datasets as complementary also assisted in exploring or explaining why the quantitative results occurred and why the intervention did not produce the expected outcome i.e. wearing compression garments for more hours, elevating the legs more, walking more frequently. Compared with other research on hours wearing compression (Jünger *et al.* 2004), adherence at baseline to wear compression therapy was already high for our patients. Our observational data revealed that patients wore compression therapy more adequately, but not necessary for a longer period. For example, two patients wore long-stretch bandages mainly at night and scarcely during the day, after the intervention they wore compression only during the day as recommended. Patients expressed being afraid of walking. They feared falling and some of them already fell in the past. They also refrained from leg elevation as it was inconvenient, was not easy to incorporate in daily living and interrupted the daily routine. When legs were elevated, patients also declared to be more dependent on others when they wanted to get up from the couch. Some of them experienced discomfort to muscles/knees.

As adherence is not static, frequent follow-up counselling visits as part of a multi-level approach for enhancing adherence in leg ulcer patients are recommended (Crookes 1997, Hawkins 2001, Hayward 2002, Rees 2002, Briggs 2005). Such follow-up sessions were not investigated in this

study for pragmatic reasons. The measurable effect of the intervention decreased three months after the end of the intervention which also suggests that adherence requires ongoing, long-term support to maintain adherence.

This study had several limitations. It is possible that the experienced changes are presented more favourably. The interviews indicated that being part of an 'experiment' enhanced adherence. As errors in self-report measurements generally are biased towards an overestimation of adherence (World Health Organisation 2003) and as no psychometrically tested instrument to assess frequency and duration of wearing compression, performing leg exercises and leg elevation was used, results should be cautiously interpreted. The researcher was in contact with the patients during a considerable period of time. This prolonged relationship could also contribute to the positive qualitative and quantitative findings as patients could feel an obligation to help the researcher 'succeed'. The motivation of the participants to share their experiences for the benefit of future patients enhances the reliability of the qualitative findings. Although several steps were taken that led to a greater improvement in adherence to the intervention protocol, the way the intervention was delivered by the TVNs could not be totally controlled. Leg ulcer care provision by the community nurse was not made a controlled part of the study. However, the care delivered by the community nurse might influence the successfulness of the intervention as well. Recruitment bias by only including motivated patients is particularly likely in educational interventions (Coster & Norman 2009). It is unlikely that this was the case in this study as also other motivations for participation were present (e.g. hope for leg ulcer healing, receiving new compression garments for free), and the interviews showed that not all patients were motivated to change their behaviour at the start of the study. Recruitment was hampered as some patients found participation in the study too cumbersome. Although a combined method approach enhanced and clarified the results, it also implied a greater (time) commitment for the patients. Especially the use of diaries three times during a week was a barrier. Four patients refused to participate after explaining the study, one patient dropped out of the study in the post test phase and some quantitative data were sketchy or incomplete. As only a seven-day registration was performed, no information was available in the periods between. It was also not possible to differentiate between the improvement in adherence to lifestyle advice prompted by the intervention and prompted by the diary registration/accelerometer as the latter might also be considered as an intervention increasing physical activity (De Cocker *et al.* 2007).

## Conclusions

By means of complementary methodologies, the perceived changes associated with the intervention 'Adherence to leg ulcer lifestyle advice' were depicted. Testing the effectiveness as well as the cost-effectiveness of the intervention is advocated because the results indicate that the intervention helps to acquire behavioural change and can make a difference in daily living of patients. We believe that the intervention holds a promise for current home care. A randomised controlled trial, although not easy to set up, could prove this.

## Relevance to nursing science and clinical practice

The qualitative analysis revealed the (experienced) changes with the nursing intervention i.e. cognitive, behavioural, emotional and physical changes or outcomes. These outcomes can be integrated in research evaluating adherence promoting interventions in general and the intervention 'Adherence to leg ulcer lifestyle advice' in particular. A combination of research approaches is recommended in studies evaluating complex nursing interventions. This can provide further insights into quantitative outcomes and in understanding the relevance of a wide range of patients'

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outcomes. User-friendly, valid and reliable instruments to measure adherence to leg ulcer lifestyle advice should be developed. Further research could also focus on the effectiveness of different patient education materials in improving the understanding of the underlying pathophysiology of leg ulcers and rational for the advice. It is recommended that nurses include education about leg ulcer lifestyle advice into their practice and are aware of its impact on leg ulcer patients.

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## Contributions

Study design: AVH, TD, MG, HB, KV; data collection and analysis: AVH, TD, MG and manuscript preparations: AVH, TD, MG, HB, KV.

## Conflict of interest

The authors declare that they had no conflict of interests.



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