

# Nurse-led patient education for persons suffering from a venous leg ulcer in outpatient's clinics and homecare settings: A scoping review

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## ABSTRACT

**Aim of this study:** To provide an overview of the available nurse-led individualized educational interventions, for persons with Venous Leg Ulcer (VLUs) in an outpatient or homecare settings.

**Materials and methods:** For this scoping review, a search was performed between December 2019 and January 2020. To identify sources of evidence a systematic search was conducted in PubMed, CINAHL, Embase, PsychINFO, Web of Science and LiSSa as well as in clinical trial registers to identify sources of evidence. All types of evidence associated with a nurse led-intervention were included.

**Results:** Fifteen sources of evidence met the inclusion criteria. Educational sessions varied in modality, content and duration. Education sessions were face to face and supported by written material. The content focused on compression therapy and exercises. The duration and numbers of sessions varied. The most reported health related outcomes was wound healing.

**Conclusion:** This scoping review provides a broad overview of the available evidence and ongoing research for individualized nurse-led education persons with VLUs. Variability in the literature was found, which suggests that more intervention studies are needed to test and evaluate efficacy of nurse-led patient education.

## 1. Introduction

Leg ulcers (LUs) are commonly defined as a loss of skin on the lower leg or foot with a healing time above 6 weeks [1]. LUs have various aetiologies and are generally the result of venous, arterial or mixed insufficiencies. Venous leg ulcers (VLUs) are predominant and account for 70% of all LUs [2]. Ulceration is associated with venous hypertension and is the highest grade of chronic venous insufficiency [3]. Further, VLUs are often seen as the result of an unhealed trauma on the leg [4].

In Europe, incidence increased from 0.5 new VLUs per 1000 people per year in 2010 to 1 new VLU per 1000 people per year in 2014 [5]. The yearly prevalence of VLUs is estimated to be between 0.8 and 2.2 VLU patients per 1000 people [5,6], and prevalence increases with age. These numbers are possibly underestimated as LU persons frequently self-treat their own wounds [7,8].

VLUs are slow-healing wounds. Berenguer Perez et al. demonstrated in their retrospective study with 139 VLU patients that 27% of patients require about three months, whereas 46% require around six months to

heal [5]. Once healed, 22% of people develop a recurrence after 3 months, 57% after one year and up to 78% at three years [9]. Compared to persons without recurrences of VLUs, persons with a history of multiple LUs are 4.4 times more at risk for a recurrence [9].

The costs related to VLU care are estimated at £941 million/year in the United Kingdom (UK) [10], and the management of unhealed VLUs is 4.5 times more expensive than healed VLUs [11], which results in a financial burden for health services.

Patients with VLUs frequently observe a deterioration in their quality of life [12], as VLUs can be associated with pain, insomnia, mobility restriction, leg swelling, exudation and odour [13,14].

Treatment is multifaceted, and there is no type of wound dressing that results in a clear benefit for VLU healing [15–17]. This explains why interventions acting on cofactors of wound healing are a focus for the management of patients with VLUs. Recommendations for best practice suggest the use of compression therapy as the gold standard for the treatment and prevention of VLU recurrence [18–20].

In addition to compression, clinical studies have shown that exercise

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has a positive impact on the calf muscle pump, which can in turn improve blood flow [21]. Nevertheless, there is no solid evidence of an improvement in healing rates through exercise interventions [22]. Nutrition and micronutrients may have a beneficial impact on VLU healing [23]. According to Barber et al. [23], decreasing malnutrition and obesity and increasing overall diet quality could result in improved healing rates, thus rationalizing why a specific focus on nutritional aspects during treatment can be beneficial.

Overall, there is a lack of evidence for adjuvant treatment such as pharmaceutical agents, surgical interventions, topical agents, specific devices or physiotherapy to promote VLU healing [24]. Due to a lack of clear evidence, following the guidelines for VLU management is recommended for clinical practice.

Evidence demonstrates that VLU patients seem to have insufficient knowledge about the underlying causes of VLUs, the rationale for wearing compression stockings to prevent an ulcer recurrence or the impact of activity diminution to the development of the first VLU [7,25]. Misunderstanding of the underlying cause of VLUs may make it improbable for patients to promote self-management strategies [26].

Clinical recommendations highlight that patient outcomes can be improved by personalized patient education [27,28]. Community nurses perform most wound-care interventions for persons with VLUs [10,11]. It is therefore important to report individualized nurse-led patient-education interventions that promote healing, improve health-related outcomes and prevent recurrence for people with VLUs.

In a systematic review, Weller et al. [29] described interventions that promote adherence to compression therapy but that do not focus on the type of intervention. Since this publication, further evidence has been generated. However, no other systematic review is ongoing as the last study protocol was withdrawn from publication [30]. Therefore, we conducted a scoping review to provide an overview of the available nurse-led individualized educational interventions for persons with VLUs in outpatient or homecare settings.

### 1.1. Scoping review question

What types/kinds of individualized nurse-led patient education have been reported in outpatient clinics or homecare settings for persons with an existing VLU?

- What are the modalities and the content of the education provided?
- What outcomes are reported with patient education?

## 2. Methods

No review protocol was registered or published prior to this scoping review.

### 2.1. Eligibility criteria

#### 2.1.1. Population

According to the prevalence of VLUs, this review considered adult study participants (aged 18 and over), male or female, who were treated for VLUs or LUs treated as VLUs. There was no geographical limitation. According to the literature, the ankle-brachial index must be interpreted with caution and was not used as an inclusion criterion [31]. Linked to the concept of patient education, we did not include in this review people with advanced dementia, Alzheimer's or other mental illnesses.

#### 2.1.2. Concept

This scoping review aims to explore the educational interventions performed by nurses. This includes any intervention or action that can increase participants' knowledge, skills or self-management. Taking into consideration the concept of health literacy, actions or interventions should be individualized to the patient.

#### 2.1.3. Context

According to healthcare economic analysis, nurse-led interventions take place in outpatient clinics or homecare settings. To broaden the scope of the available interventions, the context was not a criterion for study selection.

## 2.2. Type of design

We included all types of studies linked to an intervention or reviews of interventional studies in this scoping review.

### 2.2.1. Information sources and search strategies

We used the Population-Concept-Context (PCC) method [32] to identify relevant items for our search strategies. Firstly, we performed an exploratory search through MEDLINE via PubMed and CINAHL, Joanna Briggs Institute (JBI) and Cochrane Library to identify keywords in the title abstract and MeSH terms or subheadings. Secondly, all identified keywords were combined to provide a complete search strategy for PubMed, CINAHL, Embase, PsychINFO, Web of Science and LiSSa. These databases provide an overview of published documents on interventional studies. Table 1 presents the keywords and adaptation for each concept and database. Thirdly, when possible, we used the same keywords for search strategies on [clinicaltrials.gov](http://clinicaltrials.gov), World Health Organization (WHO) international clinical trials registry platform, European Union (EU) Clinical Trials Register, Centerwatch and Cochrane Central Register of Controlled Trials. If possible, we replaced the study protocols by the completed study. Table 2 provides an overview of the complete searches.

### 2.2.2. Selection of sources of evidence

We uploaded all outcomes from databases uploaded in RAYYAN. PB removed duplicates. PB and SP blindly selected articles evaluating the title and abstract. Additionally, PB and SP reviewed all outcomes of the clinical trial registers. We then discussed divergences. A third reviewer was not needed.

## 3. Results

Database search strategies permit the identification of 229 sources of evidence and 132 after removing the duplicates. We removed 118 (89.4%) on title and/or abstract. Then, we removed four (3%) articles on the full text. We replaced one study protocol (O'Brien et al., 2014) [33] with the published study (O'Brien et al., 2017) [34].

From the 492 records on clinical trial registers, we included four study protocols and identified two published articles [35,36]. The PRISMA flowchart (Fig. 1) illustrates the process and reasons for exclusion.

### 3.1. Data extraction

We extracted data into a table including author names, year of publication, population, description of intervention, measured outcomes, significant outcomes and recommendations. Then, we included study protocols or outputs of clinical trial registers in the same table, but outcomes or recommendations are not applicable (N/A). PB and SP completed data extraction. PL reviewed the entire process.

### 3.2. Characteristics of studies and sources of evidence

For this scoping review, we included two systematic reviews [29,37], one literature review [38], four randomized controlled trials [34,36,39,40], three pre-post designs [41–43], one descriptive study [44] and four study protocols or registered trials [35,45–47].

Of all the included studies, one study did not present an intervention [44] because the researchers used secondary data based on Heinen et al.'s [39] study.

**Table 1**  
Key words and adaptation for each database.

Concept	Key words	MeSH (PubMed)	CINAHL Headings (Cinahl Complete)	Emtree (Embase)	PsycINFO
Venous leg ulcer	venous leg ulcer* OR venous ulcer* OR varicose ulcer* OR hypertension venous ulcer OR stasis ulcer* OR venous stasis ulcer* OR venous ulceration OR crural ulcer* OR ulcus cruris	"Varicose Ulcer"[Mesh]	MH "Venous Ulcer"	'leg ulcer'/de	–
Patient education	therapeutic education OR education intervention OR health education OR patient education OR education program OR therapeutic education program OR therapeutic patient education OR self management education programs OR educational intervention OR therapeutic play OR psychoeducational intervention OR psychoeducation OR patient education handout Cinahl: patient N3 education OR patient N3 information OR education N2 program	"Patient Education as Topic"[Mesh] "Models, Educational"[Mesh] "Counselling"[Mesh]	MH "Patient Education+" MH "Counselling+"  MH "Nursing Care+" MH "Nursing Role" MH "Nursing Interventions"	'education program'/de 'psychoeducation'/de 'patient education'/de 'counselling'/exp	exp Client Education/ exp Counselling/
Nursing	nursing intervention* OR nursing or nurse*	"Nursing Care"[Mesh] "Nurse's Role"[Mesh] "Nursing"[Mesh] "Nursing, Team"[Mesh]	MH "Research by Type and Subject+" MH "Experimental studies+" MH "Quasi-experimental studies+"	'nursing'/exp 'nursing role'/de 'nursing care'/exp 'nurse attitude'/de 'experimental study'/de 'methodology'/exp	exp Nursing/ exp Nurses/
Intervention	clinical trial OR randomized controlled trial OR controlled clinical trial OR comparative study OR intervention study OR intervention trial OR action research OR mixed methods	"Research Design"[Mesh] "Epidemiologic Research Design"[Mesh] "Health Services Research"[Mesh]	MH "Research by Type and Subject+" MH "Experimental studies+" MH "Quasi-experimental studies+"	'experimental study'/de 'methodology'/exp	Experimental design/

Table 3 provides characteristics of the sources of evidence and relevant results.

### 3.3. Study participants

All of the studies included persons with venous aetiologies. However, three studies included additional persons with a mixed or mild LU aetiology [38,39,44]. Van Hecke et al. [42] included non-adherent LU persons, and Gonzalez [43] included persons diagnosed with a first-time VLU. To reinforce the intervention and the behaviour change, two studies included informal caregivers or family members [36,39].

### 3.4. Nurse-led patient-education programmes and their modalities

All educational interventions were carried out by trained (tissue viability) nurses [39,41,42] or their own study investigator [34,36,40, 43].

The educational process of the included studies used various strategies to individualize the sessions. These included a quiz to assess patient knowledge about VLUs (Kane [1998], cited by Van Hecke et al. [38]), starting the education with patients' narratives about how they live with a LU [42] or a lifestyle assessment [39]. O'Brien et al. [34] started their education with a demonstration of exercise, including individualized feedback about their technique. All studies reported that their first educational session was a face-to-face meeting either at home [41,43, 48] or at the outpatient clinic [34,39,40].

Follow-up sessions were provided by telephone [34], at home [41, 48], through clinic visits and/or in the outpatient clinic [39,40]. Gonzalez [43] did not plan any follow-up sessions, whereas others offered up to 6 sessions over a timeframe of 6 months [39,41]. The educational sessions lasted in general between 20 and 60 min [39,41,43]. Heinen et al. [39] proposed a first session of 45–60 min with following sessions between 20 and 30 min.

The number of educational sessions carried out by van Hecke et al. [42] were adapted from three to five visits depending on participants' pain and ability to follow lifestyle advice as well as their perception. Heinen et al. [39] adapted the frequency and time frame of their sessions depending on participants' needs and the content of the goals.

The educational process was reinforced by educational material such as brochures, leaflets, written information or a diary [39–43]. Kapp et al. [41] combined modern communication using a multimedia presentation with written documents for support. In all studies except two [36,45], all

of the nurse-led interventions were combined with educational material.

Compression therapy [35,39–42,46,47] and exercise [34,35,39–42, 46,47] were the most frequent content of the interventions. Ning et al. [36] proposed a holistic health education, and Gonzalez [43] covered pertinent aspects of disease development and provided an overview of self-care activities that promote healing and reduce recurrence. Rieger [45] referred the content as a referral to clinical practice guidelines. Table 4 provides an overview of the content.

## 4. Reported outcomes and their measures

The reported outcomes of the included sources varied according to the aim and content of the proposed education.

All included sources of evidence, except two [41,44], reported wound healing as a primary or secondary outcome. Wound healing included either wound-size reduction or complete healing. Wound characteristics were described with clinical tools like TIME (Tissue debridement, Infection or Inflammation, Moisture Balance and Edge) [46] or PUSH (Pressure Ulcer Scale for Healing) [34,40]. Wound measures were using imaging devices [34,35,45–47], plastic foil [39] or the height and width of the wound [40]. In one study, participants self-reported wound healing [43]. The costs associated with the dressing changes and healing were assessed by Ning et al. [36] or planned to be evaluated by Rieger [45].

Outcomes associated with behaviour change, self-care or quality of life were measured with self-reported questionnaires and a diary [42], combined with an accelerometer [35,39,46], or by self-reporting through telephone [43]. Kapp et al., 2010 [41] developed their own evaluation tools, whereas others used validated tools [34,35,40,46].

Only one study [48] explored patients' experiences of the educational intervention through semi-structured interviews. Van de Glind et al. [44] focused on the nature of goals set during the counselling sessions of Heinen et al. [39].

All sources measured their outcomes using a different timeframe. It ranged from immediately after the intervention [41] to repeated measures during 18 months [39]. Table 3 provides a detailed overview of the measured outcomes.

## 5. Discussion

With this scoping review, we aimed to report individualized nurse-led patient-education modalities, their content and their associated

**Table 2**  
Search strategies.

Full search strategies MEDLINE via PubMed	
(((((((epidemiologic research design[MeSH Terms]) OR health services research [MeSH Terms]) OR research design[MeSH Terms])) OR (clinical trial OR randomized controlled trial OR controlled clinical trial OR comparative study OR intervention study OR intervention trial OR action research OR mixed methods))) AND (((((nursing care[MeSH Terms]) OR nurse's role[MeSH Terms]) OR nursing [MeSH Terms]) OR nursing, team[MeSH Terms])) OR (nursing intervention* OR nursing or nurse*)) AND (((((model, educational[MeSH Terms]) OR patient education as topic[MeSH Terms]) OR counselling[MeSH Terms])) OR (therapeutic education OR education intervention OR health education OR patient education OR education program OR therapeutic education program OR therapeutic patient education OR self management education programs OR educational intervention OR therapeutic play OR psychoeducational intervention OR psychoeducation OR patient education handout))) AND ((varicose ulcer[MeSH Terms]) OR (venous leg ulcer* OR venous ulcer* OR varicose ulcer* OR hypertension venous ulcer OR stasis ulcer* OR venous stasis ulcer* OR venous ulceration OR crural ulcer* OR ulcus cruris))	
<b>Filters: none</b>	<b>Number of articles: 61</b>
<b>Date: December 19, 2019</b>	
<b>Full search strategies CINAHL</b>	
(((MH "Nursing Care+") OR (MH "Nursing Role") OR (MH "Nursing Interventions") OR (nursing intervention* OR nursing or nurse*)) AND (((MH "Patient Education+") OR (MH "Counselling+") OR (therapeutic education OR education intervention OR health education OR patient education OR education program OR therapeutic education program OR therapeutic patient education OR self management education programs OR educational intervention OR therapeutic play OR psychoeducational intervention OR psychoeducation OR patient education handout OR patient N3 education OR patient N3 information OR education N2 program)) AND ((MH "Venous Ulcer") OR (venous leg ulcer* OR venous ulcer* OR varicose ulcer* OR hypertension venous ulcer OR stasis ulcer* OR venous stasis ulcer* OR venous ulceration OR crural ulcer* OR ulcus cruris)) AND (((MH "Research by Type and Subject+") OR (MH "Experimental Studies+") OR (MH "Quasi-Experimental Studies+") OR (clinical trial OR randomized controlled trial OR controlled clinical trial OR comparative study OR intervention study OR intervention trial OR action research OR mixed methods)))	
<b>Filters: none</b>	<b>Number of articles: 55</b>
<b>Date: December 19, 2019</b>	
<b>Full search strategies Embase</b>	
('nursing'/exp OR 'nursing care'/exp OR 'nurse attitude'/de OR (nursing AND intervention*) OR nursing OR nurse*) AND ('education program'/de OR 'psychoeducation'/de OR 'patient education'/de OR (((((((((((therapeutic AND education OR education) AND intervention OR health) AND education OR patient) AND education OR education) AND program OR therapeutic) AND education AND education AND program OR therapeutic) AND patient AND education OR self) AND management AND education AND programs OR educational) AND intervention OR therapeutic) AND play OR psychoeducational) AND intervention OR psychoeducation OR patient) AND education AND handout) OR (patient NEAR/3 education) OR (patient NEAR/3 information) OR (education NEAR/3 program) OR 'counselling'/exp) AND ('leg ulcer'/de OR (((((((((((venous AND leg AND ulcer* OR venous) AND ulcer* OR varicose) AND ulcer* OR hypertension) AND venous AND ulcer OR stasis) AND ulcer* OR venous) AND stasis AND ulcer* OR leg) AND ulcer* OR venous) AND ulceration OR leg) AND ulceration OR crural) AND ulcer* OR ulcus) AND cruris)) AND ('experimental study'/de OR 'methodology'/exp OR (((((((clinical AND trial OR randomized) AND controlled AND trial OR controlled) AND clinical AND trial OR comparative) AND study OR intervention) AND study OR intervention) AND trial OR action) AND research OR mixed) AND methods))	
<b>Filters: none</b>	<b>Number of articles: 68</b>
<b>Date: December 19, 2019</b>	
<b>Full search strategies PsycINFO</b>	
(exp Nurses/OR exp Nursing/OR Nursing intervention* OR nursing or nurse*) AND (exp Counseling/OR exp Client Education/OR therapeutic education or education intervention or health education or patient education or education program or therapeutic education program or therapeutic patient education or self management education programs or educational intervention or therapeutic play or psychoeducational intervention or psychoeducation or patient education handout) AND (venous leg ulcer* or venous ulcer* or varicose ulcer* or hypertension venous ulcer or stasis ulcer* or venous stasis ulcer* or venous ulceration or crural ulcer* or ulcus cruris) AND (exp Experimental design OR clinical trial or randomized controlled trial or controlled clinical trial or comparative study or intervention study or intervention trial or action research or mixed methods))	
<b>Filters: none</b>	<b>Number of articles: 21</b>
<b>Date: December 19, 2019</b>	
<b>Full search strategies Web of Science</b>	

**Table 2 (continued)**

Full search strategies MEDLINE via PubMed	
((venous leg ulcer* OR venous ulcer* OR varicose ulcer* OR hypertension venous ulcer OR stasis ulcer* OR venous stasis ulcer* OR venous ulceration OR crural ulcer* OR ulcus cruris) AND (therapeutic education OR education intervention OR health education OR patient education OR education program OR therapeutic education program OR therapeutic patient education OR self management education programs OR educational intervention OR therapeutic play OR psychoeducational intervention OR psychoeducation OR patient education handout) AND (nursing intervention* OR nursing or nurse*)) AND (clinical trial OR randomized controlled trial OR controlled clinical trial OR comparative study OR intervention study OR intervention trial OR action research OR mixed methods))	
<b>Filters: none</b>	<b>Number of articles: 18</b>
<b>Date: December 19, 2019</b>	
<b>Full search strategies LiSSa</b>	
(éducation du patient comme sujet OU éducation thérapeutique OU éducation du patient) ET (ulcère variqueux OU ulcère veineux)	
<b>Filters: none</b>	<b>Number of articles: 6</b>
<b>Date: December 18, 2019</b>	
Cochrane Library - Research done in two steps due to number of keywords	
1) (venous leg ulcer* OR venous ulcer* OR varicose ulcer* OR hypertension venous ulcer OR stasis ulcer* OR venous stasis ulcer* OR venous ulceration OR crural ulcer* OR ulcus cruris) AND (therapeutic education OR education intervention OR health education OR patient education OR education program OR therapeutic education program OR therapeutic patient education OR self management education programs OR educational intervention OR therapeutic play OR psychoeducational intervention OR Psychoeducation OR patient education handout)	
<b>AFilters: none</b>	<b>Number of articles: Search 1 : 155 (50 trials) Search 2 : 28 (14 trials)</b>
<b>Date: January 15, 2020</b>	
ClinicalTrials.gov - Research done in two steps due to number of keywords	
1) Disease: venous leg ulcer* OR venous ulcer* OR varicose ulcer* OR hypertension venous ulcer OR stasis ulcer* OR venous stasis ulcer* OR venous ulceration OR crural ulcer* OR ulcus cruris	
Other terms: therapeutic education OR education intervention OR health education OR patient education OR education program OR therapeutic education program OR therapeutic patient education OR self management education programs OR educational intervention	
2) Disease: venous leg ulcer* OR venous ulcer* OR varicose ulcer* OR hypertension venous ulcer OR stasis ulcer* OR venous stasis ulcer* OR venous ulceration OR crural ulcer* OR ulcus cruris	
Other terms: therapeutic play OR psychoeducational intervention OR psychoeducation OR patient education handout	
<b>Filters: none</b>	<b>Sources of evidence: Search 1 : 68 Search 2 : 5</b>
<b>Date: January 13, 2020</b>	
WHO International clinical trials registry platform - Research done in two steps due to number of keywords	
1) leg ulcer AND education	
2) leg ulcer	
<b>Filters: none</b>	<b>Sources of evidence: Search 1 : 1 Search 2 : 133 notices (102 trials)</b>
<b>Date: January 15, 2020</b>	
EU Clinical Trials Register - Research done in two steps due to number of keywords	
1) leg ulcer AND education	
2) eg ulcer	
<b>Filters: none</b>	<b>Sources of evidence: Search 1 : 0 Search 2 : 60</b>
<b>Date: January 15, 2020</b>	
Centerwatch	
venous leg ulcers	
<b>Filters: none</b>	<b>Sources of evidence: Search: 43</b>
<b>Date: January 15, 2020</b>	

reported outcomes.

**5.1. Study characteristics**

The design of the included studies varied from descriptive to experimental, including RCTs. Some studies were parts of a doctoral thesis project with a limited timeframe. This rationalizes variation in sample size and follow-up duration. Study protocols included in this scoping review are promising as they have experimental designs with an

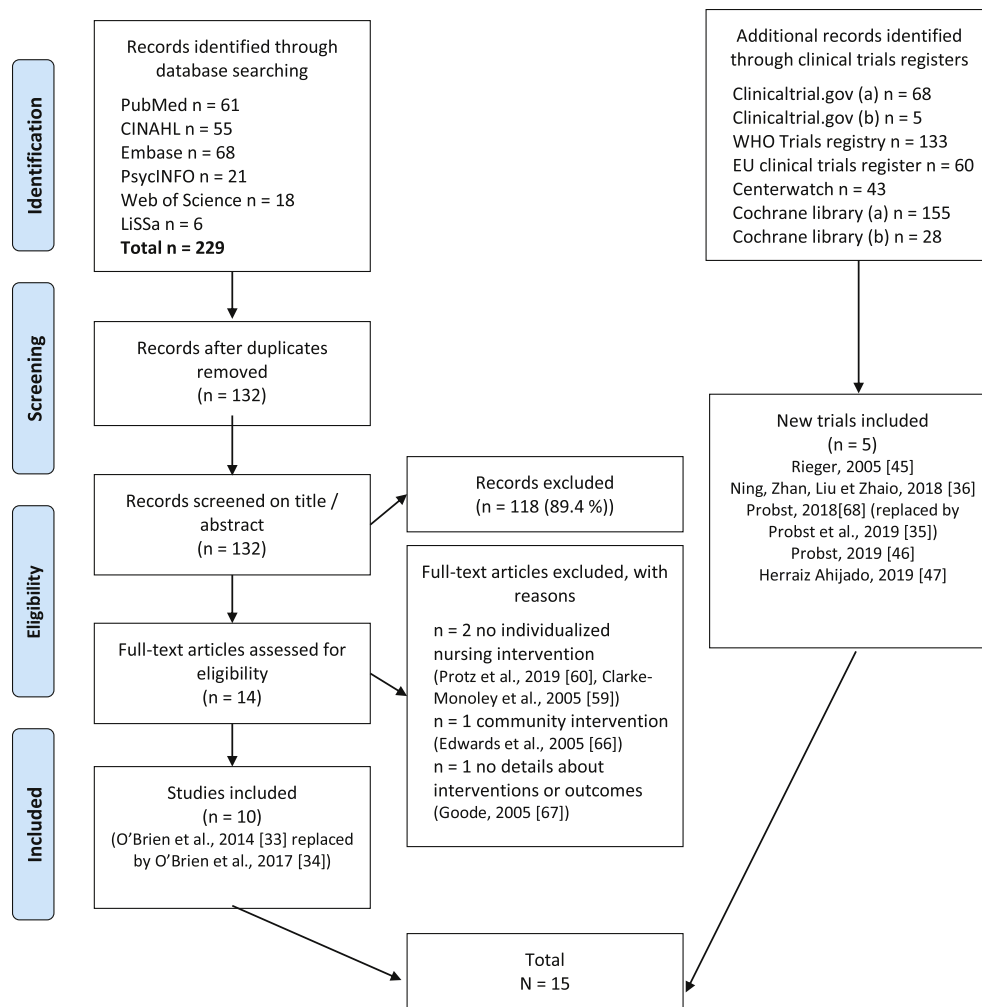


Fig. 1. Prisma flow diagram [66–68].

increased sample size ( $n = 224$  [47]) or are multicentric ( $n = 248$ ;  $n = 124$  Switzerland and  $n = 124$  Australia [46]). Conclusions from the literature review [38] and systematic reviews [29,37] demonstrate that evidence from study results remains low due to methodological limitations, and it was not possible to recommend or discourage patient education with regards to adherence to compression. The systematic review of Shanley et al. [49] described the same limitations.

## 5.2. Nurse-led patient-education programmes and their modalities

This scoping review demonstrates a variety of approaches as to how patient education was provided. This is a frequent [50,51] and long-standing [52] challenge for educating patients with a chronic condition.

In our review, all approaches address patients' needs. Evidence shows that patient needs in the management of LUs include being confident in the given therapy [53,54]. Therefore, it is utmost important that VLU patients have the opportunity to develop relationships with healthcare professionals to enhance adherence to therapy [55]. To individualize patient-education sessions and follow-up, nurses use the goal-setting technique [39]. This process has been described and used in various nurse frameworks such as King's Theory of Goal Attainment [56]. Nurse–patient interaction was rarely described in the clinical trials and could have an impact on clinical outcomes.

Education on compression therapy and exercises were the most reported content within programmes. Compression therapy is the only unambiguously defined therapy for treating VLUs and preventing recurrence [18,20]. Other content of the educational session varied

widely. Some interventions focused on specific leg exercises, diet or walking. These are challenging, as the evidence of these intervention on their one are actually not clearly defined [22–24]. Other evidence, such as the Leg Ulcer Prevention Programme [41] or a study protocol from Probst [35,46], proposes an intervention covering a broader aspect or an interdisciplinary approach of VLUs. In a systematic review, Tan et al. [57] also described the various contents of the provided educational sessions, and they evaluated the quality of VLU clinical practice guidelines to assist healthcare professionals. Care bundles, defined as a structured set of evidence-based interventions to improve patient outcomes [58], may be a solution to provide VLU best practice.

The most used written educational materials were brochures or leaflets. Both were combined with an individualized nurse-led education. Results of an intervention study with 20 participants [59] indicate there is limited value in using written material for their individualized patient education. However, the results of Protz's et al.'s [60] quasi-experimental study with 136 participants demonstrate that only the overdistribution of written material may have an impact on patients' knowledge. Additional evidence shows that written material is useful in keeping the content "fresh in mind" [61] and supporting patients to ask healthcare professionals specific questions [62]. To support patients in their learning process, nurses have to point out specific content and enhance patients' self-care [7].

Detailed description of the intervention for content and modality is an important fact for clinical practice. Due to the source of evidence (e. g., abstract), some interventions [36,45] were insufficiently described and could not be translated into clinical practice. Others [39,41,42]

**Table 3**  
Results.

Author's	Country	Design, Population and sample size	Aims	Type of educational intervention Delivery mode, duration and content	measured outcomes and timeframe	Significant outcome /Level of significant/Clinical Study status	Recommendations
Under this line are reviews							
Van Hecke et al., 2007 [38]	N/A	<b>Literature review</b> MEDLINE, Embase, Cinhal, reference lists, specific journals and conference abstracts were searched 20 studies were included VLU or MLU patients	To examine existing compliance-enhancing interventions and the effectiveness of these interventions on VLU patients	20 studies where included. Two studies described educational interventions (Brooks et al., 2004; Kane et al., 1998) Kane (1998) used a standardized method for educating patients. A quiz was used to encourage discussion and assess patient's understanding of their situation. This study also focus on providing single information (oral and written information to improve understanding). Brooks et al. (2004) was a nurse led education for healed VLU. It was excluded from our review	Two studies described educational outcomes (Brooks et al., 2004; Kane et al., 1998), Kane (1998), described knowledge (84% patients could name their type of LU) 75% could describe appropriate care, 60% could identify specific risk factor and 91% were compliant).	Both studies concluded that educational intervention enhance compliance. But studies present methodological limitations or differences in baseline populations characteristics.	The evidence of the two studies supporting compliance enhancing effects of educational intervention is inconclusive due to methodological limitations of the reviewed studies.
Weller et al., 2013 [37]	N/A	<b>Systematic review</b> of RCTs or Cluster- RCTs Cochrane database, Medline, Embase, CINAHL & bibliographies of all studies 2 studies	To assess the benefits and harms of interventions designed to help people adhere to VLU compression therapy and improve healing of VLU and prevent recurrence	Two RCTs where included in this review (Edwards et al., 2009, Heinen et al., 2012). Edwards et al., 2009 presented a leg club intervention and was excluded from our review. Heinen et al., 2012 presented the lively legs program. This study is included, for details see above.	For Heinen et al., 2012 see Heinen et al., 2012.	Evidence level of included studies was low.	For practice It is not possible to recommend or discourage nurse-led clinic care interventions over standard care with regards to adherence to compression therapy
Weller et al., 2016 [29]	N/A	<b>Systematic review</b> Update of Weller et al., 2013 3 RCTs (1 new RCT, and one ongoing study)	To assess the benefits and harms of interventions designed to help people adhere to VLU compression therapy and improve healing of VLU and prevent recurrence	Three RCTs where included in this review (Edwards et al., 2009, Heinen et al., 2012, Baquerizo Nole et al., 2015) and one ongoing study (O'Brien et al., 2014) Edwards et al., 2009 presented a leg club intervention and was excluded from our review Heinen et al., 2012 presented the lively legs program. This study is included, for details see above. Ongoing study from O'Brien et al., 2014 is included in our review, and replaced by O'Brien et al., 2016 Baquerizo Nole et al., 2015 design an interventional study to improve patient	For Heinen et al., 2012, and O'Brien et al., 2016 see their own linea.	Evidence of studies remains low.	It is not possible to recommend or discourage educational interventions or nurse-led clinic care interventions over usual care with regards to adherence to compression

(continued on next page)

Table 3 (continued)

Author's	Country	Design, Population and sample size	Aims	Type of educational intervention Delivery mode, duration and content	measured outcomes and timeframe	Significant outcome /Level of significant/Clinical Study status	Recommendations
Under this line are interventional designs or studies measuring an intervention				knowledge about VLU disease and management. The IG receive a video delivered educational program. The CG receive the same information on a paper pamphlet. This study was excluded from our review, as the intervention was not individualized.			
Kapp et al., 2010 [41]	Australia	<b>Pre-post design</b> N = 156 completed	To evaluate the effectiveness of a multimedia client education package for people with venous leg ulcers	6 individualized sessions from 20 to 60 min delivered to the client each week, at usual home wound-care visits by a trained nurse The global time for the E learning and related activities is estimated at 3 h) composed of A multimedia presentation, A written version for the participant A summary sheet and relevant activities. The content presents compression therapy and its role, activity, healthy eating, skin observation and compression stockings and keeping the ulcer healed	Measure where done before and after the 6 sessions Knowledge Behaviour change Adherence to recommendations	Global knowledge improved after intervention Nutrition did not change in pre-post test Activities and exercises behaviour changes including leg elevation Impact on compression is unclear Skin care change in behaviour for participant Leg Ulcer Prevention Programme where helpful for participants (95.4%) The use of the nurse's computer to provide the education was excellent (96.7%) It was valuable to have the nurse available (100.0%).	Leg Ulcer Prevention Programme is an evidence-based resource for providing effective client education to improve client knowledge and behaviours and, in turn, promote better health and wellbeing. The nurse was available during this intervention.
Van Hecke et al., 2011 [42]	Belgium	<b>Pre-post design</b> With qualitative and quantitative outcomes Non adherent LU patients N = 26	To examine the changes associated with the nursing intervention "adherence to leg ulcer lifestyle advice". To identify sensitive outcomes and explore quantitative effects of the intervention	3 to 5 individual sessions spread over 3 months by a trained Tissue Viability Nurse (TVN) at participants home. The number of sessions depends on patient's pain, patient ability to follow life style advices and patient positive perception of the evolution. Start with patient's narrative of living with LU, needs and perceptions. After, the TVN provide information about lifestyle advice and participants are involved in goal setting. The intervention focus on educational, cognitive and behavioural components. The content focuses	Qualitative data were collected via Semi structured interviews 1 week after the end of the intervention. Quantitative data were collected at baseline, the end of the intervention and 3 months later Pain (verbal scale) Wearing compression Leg exercises and leg elevation (frequency and duration) Activity level (Step counts using ActiGraph) Wound area (Acetate tracing and computer assisted counting)	<b>Qualitative results</b> Cognitive change: knowing what and knowing why Behaviour change: following and giving lifestyle advice, creative strategies to implement Emotional changes: hope and new perspectives, feeling safe and independence. Physical improvements <b>Quantitative results</b> No statistical differences in time wearing compression, walking or adequate elevating legs were reported. More participants follow leg exercise in time and frequency at the end	An educational intervention can make a difference in behavioural change and clinical outcomes. This intervention was undertaken by non-adherent LU patients

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Table 3 (continued)

Author's	Country	Design, Population and sample size	Aims	Type of educational intervention Delivery mode, duration and content	measured outcomes and timeframe	Significant outcome /Level of significant/Clinical Study status	Recommendations
Heinen et al., 2012 [39]	Netherlands	<b>RCT</b> N = 184 (IG = 92 CG = 92) LU, predominantly VLU or MLU	To evaluate the effectiveness of lively legs program for promoting adherence with compression therapy, physical exercise and recurrence	2 to 6 session from a trained nurse led self-management counselling program on physical activities and adherence to compression. Counselling session from 45 to 60 min first time to 20–30 min for session 2 to 5. When possible the partner or informal caregiver were included in the session. Sessions includes: Assessment, demonstration, use of educational material, goal setting ... ) Second visit or phone follow-up after a period of 2–4 weeks and the last visit after 6 months. The timeframe was adapted to the patients needs and nature of goals. The last session was ideally planned at the end of the 6 months. Usual care was defined as according to the guidelines for LU patients and wound care.	Measure where done at baseline, 6, 12 and 18 months. Adherence with compression, Walking and Leg exercise where measured by interview with categorized answers. Wound size (plastic foil with a raster of square centimetre cells.	of the intervention (p = 0.001) and pain for patients reporting pain at baseline decrease (P = 0.009) At 3 months, significant LU size reduction was observed (P = 0.001) No differences on adherence or partial adherence to compression (P = 0.77; P = 0.46) 10 min walks improved by 16% in intervention group (IG: 39% to 51%, p < 0.01, CG: 33% to 34%) but not for 30 min walks (IG: 24%–29%, P = 0.24 CG: 17%–25%) Leg exercises also improved by 32% in IG (35%–59%, P = 0.01 versus CG : 33%–40%)	Individual nurse counselling can promote behaviour change Authors recommend the implementation of the Lively Legs program as part of integrated care for LU patients.
Van de Glind et al., 2015 [44]	Netherlands	<b>Exploratory design using secondary data of an RCT</b> VLU and MLU patients included in the intervention group N = 71	To describe goals set during individual nurse-led lifestyle counselling sessions for LU patients. To explore patient and goals characteristics in relation to health behaviour change	This article focused on goal setting during a counselling session from "lively leg programme". <b>For a global overview of the intervention, see Heinen et al., 2012.</b>	Data were extracted from nursing records during 2–6 sessions. Number of goals Topic of the Goals Quality of the goals Adherence to compression therapy Physical activity Leg exercises	89% of goals were set in the first 3 counselling sessions 227 goals were formulated, 96 for walking, 69 for leg exercise and 32 for increasing adherence with compression therapy 26 goals where set for problem solving Patients who change behaviour were significantly younger (M 63, SD12. VS mean 71 SD9.9, P = 0009)	Goal setting could be improved to provide health promotion. Younger patients change their behaviour more frequently after goal setting in a nurse led counselling programme. Nurses should be aware of the importance of « SMART » goal setting during counselling sessions
Gonzalez, 2014 [43]	USA	<b>Single group Pre- post</b> Patient diagnosed with a first time VLU	To evaluate patients knowledge of CVI, VLU occurrence and recurrence and self-care after an	Education at participant's home. One session from 45 min including a brochure and	Measures were done at baseline, 2 and 9 weeks post-intervention Patients knowledge	Knowledge improved directly after a one to one education session and was maintained	One to one educational intervention could be useful for increasing knowledge and reduce recurrence

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Table 3 (continued)

Author's	Country	Design, Population and sample size	Aims	Type of educational intervention Delivery mode, duration and content	measured outcomes and timeframe	Significant outcome /Level of significant/Clinical Study status	Recommendations
		Outpatient clinic N = 30	educational intervention	handout. Contents give an overview of the disease progression and an overview of self-care activities. All education was done by the principal investigator	about disease process Self-care activities wound healing recurrence were measured by phone follow-up	during the 9 weeks. pre: 4.33 Post:12.3 (P = 0.002) 2 weeks 11.9 (P = 0.003) 9 weeks 11.1 (P = 0.003)	
O'Brien et al., 2017 [34]	Australia	RCT patients with VLU from an outpatient wound clinics IG = 31 (29 analyzed) CG = 32 (30 analyzed)	To evaluate the impact of a home-based exercise program assisted by phone management was effective in promoting healing rates, improve physical activity, functional ability and quality of life	<u>Intervention group</u> received a demonstration of calf muscle exercises by a trained nurse and a feedback on participant's technique of exercise for a 12 weeks supervised programme. A specific leaflet was provided, and a focus was done on stretching before and after exercise. Follow-up and goal setting was done during 6 phone calls during 12 weeks. Duration of the first session and follow-up was not described. <u>Control group:</u> As supplement to usual care, the control group received a bag with a generic information brochure 'Taking care of your legs', a pedometer and 'Keep it up' worksheets to diarise their step count. CG received 6 phone calls at the same time points for data collection.	Measures were done every 2 or 4 weeks during 12 weeks. Healing rates (yes/no) (photographs (portable digital planimetry device), PUSH & ulcer characteristics and level of compression) Physical activity (Yale Physical activity survey, adherence to exercise program) Functional ability (Tinetti Gait and Balance Test, Ankle range of motion) Quality of life (SF-8) Likert scale for adherence to leg exercise and walking	77% in intervention group healed VS 53% in CG but was not significant (P = 0.09) YPAS: no interaction effect between group and time. BUT: comparison IG vers CG was significant (F1, 45 = 4.26, P = 0.04), AND a main effect for time, Wilks $\lambda = 0.84$ (F1, 45 = 8.31, P = 0.01). ROAM improved significantly over time (P = 0.05) Tinetti Gait and Balance, PCS and MCS didn't evolve significantly This study present significant risks of bias with a small sample size	Participants who adhere to the program are more likely to heal. Improving adherence in this population should be investigated
Domingues et al., 2018 [40]	Brazil	RCT VLU patients N = 102 IG (incl 49 analyzed 35) CG (incl 53 analyzed 26)	To evaluate the effect of an orientation programme on lifestyle of VLU patients and on wound healing	The intervention group received nursing guidelines regarding the lifestyle with regards to the physiopathology of VLU, compression, specific physical exercise (repetitive movements of the calves and feet) and rest. 4 face to face interviews of 40 min with an informative brochure where held every 4 weeks by the lead researcher at the outpatient clinic telephone interviews where used to maintain contact between face-to-face meetings	Wound size reduction in square cm & PUSH Tool& ulcer status was measured every 30 days NRS Pain, Freiburg Quality of life assessment for Wounds (short version) were measured at baseline and after wound healing or the study end	Improvement of wound size reduction at days 30, 60 and 90 (P < 0.05) satisfaction domain of QoL (P = 0.0300) no statistical differences between groups considering the self-referred variables (pain, health, wound, treatment, and QoL) Globally, the study has a drop -out rate of 30 participants and a small sample size.	Compression and lifestyle counselling is effective in wound healing for patients with VLU. The in-person orientations and phone reinforcements may have promote adherence to the guidelines and wound healing

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Table 3 (continued)

Author's	Country	Design, Population and sample size	Aims	Type of educational intervention Delivery mode, duration and content	measured outcomes and timeframe	Significant outcome /Level of significant/Clinical Study status	Recommendations
Ning, Zhan, Liu et Zhao, 2018 [36]	China	RCT VLU patients N = 37 RG(routine group) = 19 CG = 18	To study the effect of holistic health education in dressing change for patients with venous ulcer of lower extremities	12 week follow up Usual care was defined as following the usual routine guidelines and returned every 15 days to the clinic. The RG received a training on moist wound healing therapy and pressure treatment in dressing change. The CG received the same training and a holistic health education in patients and their family members by the research team. No more details were provided	Timeframe is not described. Wounds healing Days of dressing change Costs	15 patients of RG were healed VS 17 in CG Days of dressing change was 83.22+-9.8 in RG and 67.16 +-7.4 in IG Costs were 6756.32 CNY in RG and 4696.56 CNY in CG	Quality of this abstract is poor. Intervention is unclear.
Under this line are study protocols							
Rieger, 2006 [45]	Germany	Study protocol for RCT VLU patients N = 400	The aim of this study is to evaluate the impact of an education program for VLU patients and support for general practitioners (GP)	In the intervention group, nurses offer an education based on evidence based self-care activity catalogue derive from national and international clinical guidelines to patients who receive care from their General Practitioner(GP). In addition, a nurse specialist offer support to GP. The control group will receive usual care from their GP and no nurse led education program,	Depending on outcomes, measures will be done at 6, 12, 24 and 52 weeks. Wounds healing Wounds reduction FLQA Self-care competencies Health economic evaluation Patient and GP satisfaction	N/A	Study recruitment failed to obtain the target of participants (Herber, Schnepf & Rieger, 2009 [65]) Study intervention is poorly described.
Probst et al., 2019 [35]	Switzerland	Study protocol for RCT Outpatient wound care clinic IG CG	To present a study protocol that will Describe an interdisciplinary educational intervention Evaluate the feasibility of implementing the intervention for VLU patients and compare adherence to therapy	A nurse led educational session about physiopathology of LU, wearing and putting on compression, isometric exercises in the lower leg, physical activity, leg elevation, skin care and high protein and vitamin rich diet. Specific timeframe and duration of the intervention is not described The nurse will be a trained wound expert. Usual care was defined as visit to the outpatient wound-care center, directed by the physician, and performed by a wound care specialist.	Data collection is planned forT1, T2 and T3 over 3 months Duration of compression (hours) Frequency and time of leg elevation about heart level (minutes per day) Amount of physical activity (FitBit®) Number of foot exercises performed (Days per week) Nutrition (Food intake assessment and nutritional status) Self-care Recurrence Wound characteristics Wound dressings & compression used	N/A	N/A
Probst, 2019 [46]	Switzerland & Australian	Study protocol for multicentre RCT VLU patients N = 248	To evaluate the effectiveness of nurse-led intervention for high-	Nurse led education of care bundle focusing on use of compression	Data collection will be done over one year Wound size reduction (Woundworks) &	Recruitment did not start.	N/A

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Table 3 (continued)

Author's	Country	Design, Population and sample size	Aims	Type of educational intervention Delivery mode, duration and content	measured outcomes and timeframe	Significant outcome /Level of significant/Clinical Study status	Recommendations
		(Swiss 124, Australia 124)	risk patients with VLU	bandages, wearing and putting on compression stockings, physical activity, ankle exercises, leg elevation and a high protein diet. An educational brochure will be given to participants and the intervention will be provided by a trained wound care expert. Specific timeframe and duration of the intervention is not described Usual care was defined as prescribed by a physician. Wound care and measures will be done by the institute nurse.	characteristics (TIME) Self-care (VeLUSET) Activity (Geneactiv device) Therapy adherence (short health questionnaire) Nutritional status (MNA®) and protein intake (FFQ)		
Herraiz Ahijado, 2019 [47]	Spain	Study protocol for RCT VLU patients N = 224 IG = 112 CG = 112	To evaluate the effectiveness of a structured educational intervention in physical exercise as adjuvant treatment to improve the healing of chronic VLU.	Structured nurse-led educational intervention. The content is oriented on "active legs" and include 4 lower limb exercise that must performed at home 5 times a week and a twice daily walking. Specific timeframe and duration of the intervention is not described Usual care is defined as wound care and compression therapy according to the recommendation of the region of Madrid	Data collection will be done depending on outcome at 3 months and up to 6 months follow-up Healing rate at 6 months and days to complete healing Degree of healing Ulcer area (digital photography) HRQoL (CCUQ-e) Perceived pain (Visual analogical scale) Number of steps (Pedometer) Self-reported adherence to intervention, compression, Minnesota free time physical activity questionnaire	Recruitment did not start	N/A

Table 4  
Content of education sessions.

Authors	Compression therapy	Leg elevation	Exercise	walking	Skincare	nutrition	Specific content
Kapp et al., 2010 [41]	√(4 layers and stockings)	✓	✓	✓	✓	✓	
Van Hecke et al., 2011 [42]	✓	✓	✓				Aetiology, treatment and Lifestyle advice
Heinen et al., 2012 [39]	✓		✓				Lifestyle advice Physical activity
O'Brien et al., 2017 [34]			✓				Stretching before and after exercise
Domingues et al., 2018 [40]	✓		✓				Importance of rest
Probst et al., 2019 [35]	✓	✓	✓	✓		✓	
Probst, 2019 [46]	✓	✓	✓	✓		✓	
Herraiz Ahijado, 2019 [47]	(✓)		✓	✓			

provided a precise description of their interventions and supported clinical implementation.

5.3. Reported outcomes

Wound healing was a frequently reported outcome of this scoping review. The method to measure wound-size reduction varied from a

manual measurement of height and width to a computer-assisted method. Wound-size reduction could be used as an interesting substitute when the study's time frame did not allow complete healing [63]. However, the validity of the measures could be discussed if they are not computer assisted [64] and did not allow reproducible and independent assessment [63]. Some interventions developed their own associated outcomes, whereas other study protocols suggested the use of validated clinical tools.

#### 5.4. Strengths and limitations

We used a scoping review to include a wide range of sources of evidence, including ongoing studies via trial registers, and provided a large overview of actual nurse contribution to VLU patient education. One limitation is that we did not carry out a systematic assessment of the included studies' methodological quality. We included various sources and different levels of evidence. Studies on individualized VLU patient education are often studies with a higher evidence level. As we did not assess the methodological quality, no recommendations can be made.

#### 6. Conclusions

This scoping review provided an overview of individualized nurse-led patient-education modalities, their content and their associated reported outcomes for nurse-led patient education that may improve knowledge, behaviour change and healing. These results could suggest a move towards care bundles for VLU persons, but they must be supported by additional research. Nurses have a specific contribution to VLU management and must use and adapt evidence-based interventions targeted to each person.

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#### Authors' contribution

All authors were responsible and accountable to all part of works related to the review. More specifically, PB designed the review. SP contributed to the conception, supervised the review and acquired the funding. PB and MP developed the search strategies. PB and SP selected the studies and did the data extraction. PL reviewed the entire process. PB, PL and SP contributed in writing the manuscript. All authors revised the manuscript and gave the approval to the final version to be published.

#### Declaration of competing interest

The authors have no competing interests.

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