Decision-making on the use of compression hosiery and compression bandaging: a systematic review.

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ABSTRACT

This systematic literature review was carried out by a final-year nursing student in response to clinical experience, and to understand the rationale and evidence around managing venous ulcers. In the student's clinical experience, the two most commonly used treatment methods were forms of compression hosiery and compression bandaging. The CINAHL, Science Direct, Cochrane Library, Internurse and MEDLINE databases were searched for literature published over the period 2003–2023. From the resulting five papers, five key themes were identified: types of compression systems used and the rationale for decision-making; clinical effectiveness; the impact on patient experience and quality of life; pain levels following application of compression systems; and cost effectiveness. Management and prevention of venous ulceration is complex. The decisions should be made in partnership with the patient and will be influenced by context. Overall, compression hosiery was identified as the more favourable system.

Keywords: Compression therapy; Lower limb venous ulceration; Evidence-based clinical practice; Nurse education; Mixed-methods systematic review

Key points

- There is some evidence to suggest that compression hosiery is the favourable system of compression in the treatment of lower leg venous ulceration
- Nurses should strive to provide evidence-based and person-centred practice, with an emphasis on the safe and effective use of compression therapy as appropriate for patients with lower leg venous ulceration
- A greater emphasis on venous ulcer care is required in undergraduate nursing education with more focus on the safe prescribing of compression systems
- Research into the impact of compression systems on mental wellbeing and their costs is required.

Introduction

As an undergraduate student nurse in a Community Nursing Team, the author was involved in the provision of nursing care for patients who presented with venous ulceration (VU). The use of compression hosiery (CH) or compression bandaging (CB) in the management of VU varied between community and inpatient settings, with the rationale for the treatment choice often difficult to understand.

The NMC (2018) state that to practise effectively, registered nurses must make all clinical decisions using the best available evidence. In the experience of the student nurse, these evidence-based clinical decisions were often made using local formulary. Unfortunately, due to a lack of available data nationally, local formularies often lack concise guidance on compression therapy selection, sparking an interest into the evidence-based decision making process behind compression therapy selection for the student nurse (Bjork and Ehmann 2019). The student nurse, now as a registered nurse working in the community setting, has felt inspired to share their knowledge further with other healthcare practitioners and hopes that through successful publication, they will encourage future student nurses to consider sharing their knowledge through academic publication.

Background

The Scottish Intercollegiate Guidelines Network (SIGN 2010 p. 1) states that a “chronic venous leg ulcer is defined as an open lesion between the knee and the ankle joint that remains unhealed for at least four weeks and occurs in the presence of venous disease”. VU is the most common type of leg ulceration and affects around 1.5% of adults in the UK annually (Porter 2018). The rising number of cases has seen an increase in public spending on treatment, costing the UK taxpayer over £100,000,000 annually (Urwin et al. 2022). There are many methods of managing and preventing VU, for example intermittent pneumatic, stockings, multi-layer, two-layer short stretch bandages and unna boots (Dolibog et al. 2014). Guidance from SIGN (2010) states that CB should be used to promote healing when managing new lower leg VU and CH should only be used after healing to promote venous return within the limb and reduce the likelihood of venous ulcer reoccurrence. However, more recently authors such as Hampton (2018) states that CH can be used as either a treatment method or a preventative method in cases of lower leg VU, suggesting that some practitioners view CH and CB as being equally effective in the management of lower leg VU.

Review Question and Aim

Question: “Is the use of CH or CB more effective in enhancing the patient experience and reducing wound healing time in adults with venous lower leg ulceration?”

Aim: To explore the evidence for the use of CH and CB and the impact this has on healing times and patient experience.

Objectives:

1. Identify types of compression systems used and the rationale for decision making.
2. Identify the impact of CH and CB on reducing wound healing times.
3. Identify the impact of CH and CB on patient experience.
4. Identify the impact of CH and CB on patient pain levels.
5. Identify the cost effectiveness of CH compared to CB.

Review Protocol

Both quantitative and qualitative research were included. The data search was restricted to a 20 year period of publication (Aromataris and Riitano 2014), from 2003-2023, to include the relevant guidelines from SIGN (2010). Furthermore, the author excluded articles not published in the English language. No exclusion criteria were applied to the place of publication, as a worldwide perspective was appropriate to the review question.

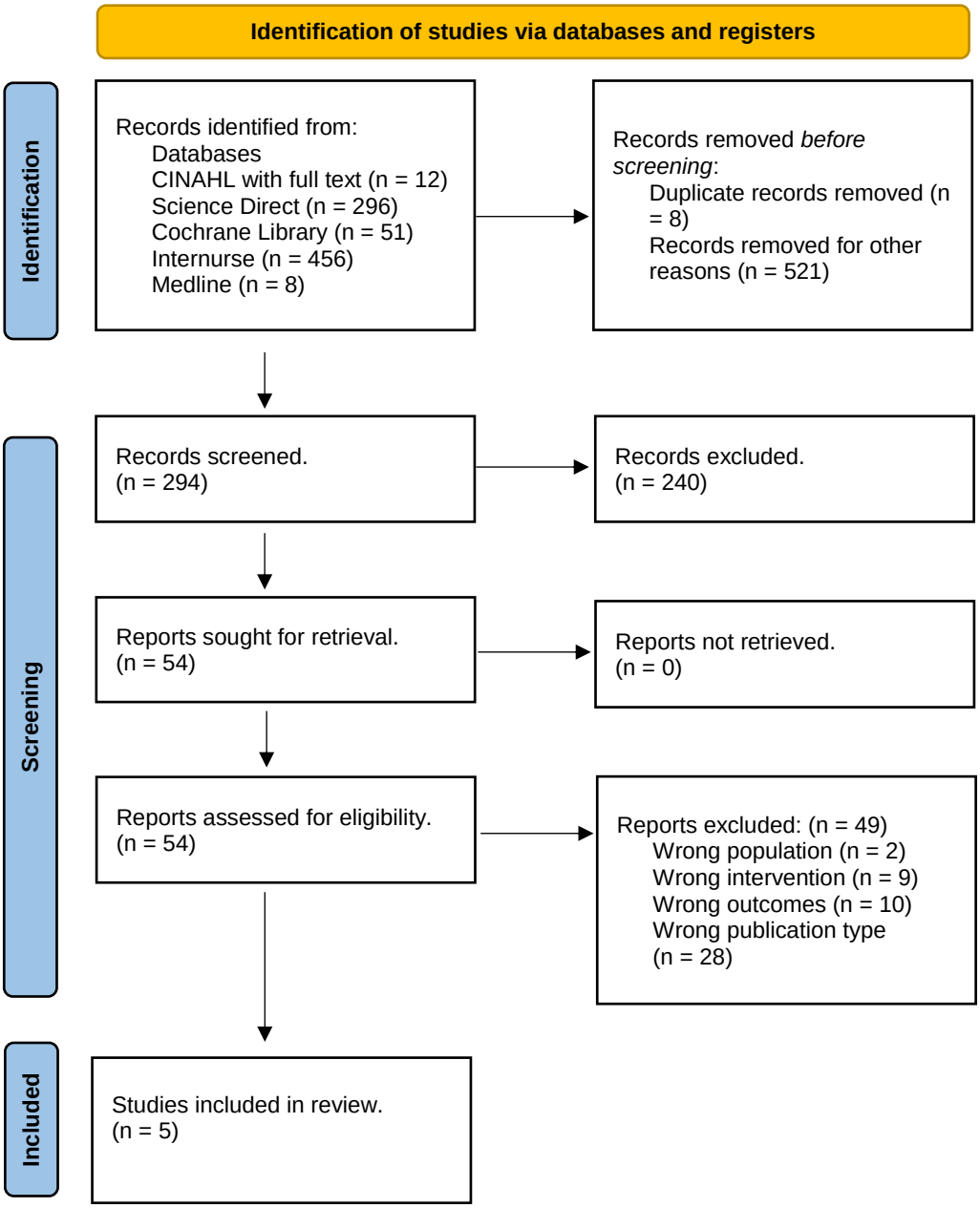
Upon identification of the keywords: adult or individual; venous ulcer or lower leg venous ulcer; compression hosiery or compression stockings; compression bandage; compression bandaging; thoughts; feelings; opinions; perspectives; views; healing time; healing rate, the Boolean operators “AND” and “OR” were inserted between search terms to direct databases to search for these terms (Aromataris and Riitano 2014). Additionally, the truncation symbol “*” was placed at the end of each search term to account for variations in

spelling and terminology, ensuring the inclusion of all appropriate studies within database searches (Aromataris and Riitano 2014).

Database searches were conducted in MEDLINE and Cochrane, two highly regarded nursing databases of literature (Larson et al. 2019); CINAHL and Science Direct to ensure the inclusion of wider literature relevant to the scientific aspect of nursing (Aromataris and Riitano 2014). Finally, Internurse due to its focus on primary care nursing was searched (Mark Allen Group 2023).

The titles and abstracts of the search results were reviewed (294) based on the relevance to the overall review question and search criteria (Parahoo 2014). The studies that remained (54), were then further reviewed to allow for the determination of relevance to the inclusion criteria (Parahoo 2014) and those which did not meet the inclusion criterion, such as those exploring other types of compression therapy, were excluded (see Figure 1).

Figure 1: PRISMA Diagram (Adapted from Page et al. 2021)



Each of the five studies were critically appraised using the Critical Appraisal Skills Programme (CASP) Qualitative Studies Checklist (2018a) to critically appraise the qualitative research and the CASP Randomised Control Trial Checklist (2018b) to appraise quantitative studies.

All studies had sought ethical approval and therefore, the participants' ethical rights were upheld.

Figure 2: Description of Included Studies

Study Details
Study 0 Oates and Adderley (2019), United Kingdom Mixed-Methods study • Three main compression systems used (four-layer CB, two-layer CB and two-layer CH). • CH most used system of compression. • Patient preference towards the use of CH as a treatment option due to its less bulky appearance when compared with CB.
Study 1 Ashby et al. (2014), United Kingdom Quantitative Study • Time of venous ulcer healing equal in both control groups. • Mental wellbeing of participants similar in both control groups. • Prevalence of ulcer reoccurrence higher in participants treated with CB. • CH treatment significantly more cost effective. • Participants trialling CH noted significantly less instances of pain.
Study 2 Dolibog et al. (2014), Poland Quantitative Study • Participants trialling CB healed marginally quicker than those trialling CH. • CH was more cost effective than CB due to its reusable nature and decreased application time.
Study 3 Taradaj et al. (2009), Poland Quantitative Study • A larger proportion of individuals in the compression stocking group experienced steady and efficient healing compared to those in the CB group.
Study 4 Brizzio et al. (2010), Switzerland Quantitative Study • Ulcer size reduced significantly quicker in those trialling compression stocking. • Individuals within the CH group were noted to experience less pain. • Quality of life was similar for participants trialling both systems of compression.

Findings

Finding 1 Types of Compression Systems Used and The Rationale For Decision Making

Oats and Adderley (2019) compared the proportion and rate of healing, pain, and quality of life of low-strength CH with CB and concluded that two-layer CH was the first choice of compression system being used by 37.6% of participants compared with 16.8% of participants using CB as a first choice treatment option. Similarly, Taradaj et al. (2009) in their randomised controlled trial of CB compared to two-layer CH they concluded that CH was more effective at healing lower leg VU and that faster healing leads to reduced costs, influencing clinicians' decisions around choice of compression therapy systems. Brizzio et al. (2010) agrees and proffers that practitioners consider several aspects of the treatment; cost was a recurrent theme.

Ashby et al. (2014) concluded that two-layer CH and CB compression bandaging could both be regarded as first-line choice for VU treatment. However, considerations such as cost influenced the ultimate nursing decision on choice of compression system.

Dolibog et al. (2014) sought to quantitatively compare five types of compression therapy. In this instance, CB appeared marginally more effective than CH in healing VU, influencing treatment method.

Overall, the rationale for choice remains complex and multi-factorial nevertheless, cost was a clear consideration.

Finding 2 Clinical Effectiveness of Different Compression Systems

Oats and Adderley (2019) favoured CH, identifying that healing was positively influenced by increased concordance due to patient satisfaction of having less bulky compression. Again, the findings of Oats and Adderley (2019) were supported by Taradaj et al. (2009) with participants in the CH group noted to have more significant and steady healing with 20%

more participants in the CH group healing within the trial period of two months. Brizzio et al. (2010) in their 6-month study concurs that CH was more effective in reducing ulcer size over the 6-month period of the trial.

Ashby et al. (2014) again, states there is no evidence of a difference in healing times between CH and CB and both types of compression were equally manageable for patients. However, in this study it was identified that there was a notable difference in re-occurrence of venous leg ulcers in patients trialled with CB, leading them to conclude that overall CB was less clinically effective than CH.

Dolibog et al. (2014) proffered that CB appeared marginally more effective than CH in healing lower leg VU, the comparable healing rates were as follows: 56.6% CH to 58.6% CB.

Finding 3 The Impact of Different Compression Systems on Patient Experience and Quality of Life

Oats and Adderley (2019) report that patients declined bandaging as a treatment due to the increased 'bulk' on their leg, impact on clothing and footwear choice. Conversely again, Ashby et al. 2014 reported no evidence of variation in mental wellbeing between CH and CB between participants in their trial. However, Oats and Adderley (2019) noted the decision not to have CB came before application, whereas Ashby et al. (2014) evaluated after the CB and CH were in place.

Dolibog et al. (2014) proposed that because healing with CB was accelerated, the result was an improvement in the quality of life for patients. The findings of Taradaj et al. (2009) reported that CH was overall more effective at healing, improving the participant quality of life. The rationale for the conclusions was the same, but for different treatments.

Brizzio et al. (2010) suggest that CB reduces pain, proposing that the consequence was improved patient experience. However, in their study there was no significant difference in

terms of quality of life noted between participants in either trial group. Both CB and CH promoted similar patient experience and quality of life reports.

Finding 4 Pain Levels Following Application of Compression Systems

Two studies reported on pain levels. Ashby et al. (2014) reported that participants in CH group noted significantly less pain than those in the CB group, despite identical pain management. Conversely, Brizzio et al. (2010) identified that individuals in the CB group were noted to suffer a 10% reduction in pain levels compared with those in the CH group.

Finding 5 Cost Effectiveness of Different Types of Compression Systems

Four of the five authors discussed cost effectiveness and agreed that CH is more cost effective. Oats and Adderley (2019) concluded that re-usable compression systems such as CH were more cost effective than single use bandaging. Ashby et al. (2014) agreed, noting that participant treatment costs approximately £300 less in the CH group than in the CB group due to CH being re-usable and requiring less nursing input. Ulcer recurrence was also noted as being reduced and therefore reducing costs. Taradaj et al. (2009) agreed that CH was overall more effective at healing ulceration, leading to reduced costs.

Dolibog et al. (2014) provided a comprehensive picture and concluded that because CB appeared marginally more effective than CH in healing lower leg VU, CB saved money reducing the need for further contact with healthcare professionals as well as reducing overall expenditure on wound care products. However, they also agreed that CH was significantly less expensive because it could be re-used compared to CB as a single use treatment, which is extremely costly both in the purchasing of the bandaging kits and the professional time required in its application.

Discussion

SIGN (2010) state that over 80% of VU take over six months to heal, with around 70% re-occurring within a year. The management and prevention of VU occurs with the successful reversal of the effects of sustained venous hypertension and addressing the pathophysiological mechanisms of venous insufficiency (Kirsner and MargolisIt 2014). The choice of management should adhere to best practice evidence, be person-centred, cost effective and offer optimum comfort and effectiveness (Anderson 2015). To practise effectively, registered nurses must make decisions using best evidence (NMC 2018). Muldoon et al. (2020) identify that the use of CB requires the practitioner to have a high degree of competence to ensure effectiveness and emphasise that when CB is applied incorrectly, service users may not receive the correct level of compression required, delaying ulcer healing, and causing discomfort. Therefore, the conclusion here is that CH requires less of a degree of practitioner competence than bandaging when CH is measured accurately and the correct level of compression is chosen (Attaran and Chaar 2016).

In relation to patient wellbeing and concordance, Powell et al. (2015) identify that patients who are less satisfied with their treatment typically have longer healing times. Dissatisfaction could be for numerous reasons, one example being the negative appearance of CB (Day 2015; Oats and Adderley 2019; Jones 2019). However, in relation to concordance, Bar et al. (2021) remind us that CH is easier for patients to remove, compared with CB, which would be a consideration for practitioners. As such, increased time during consultations and further research into the true impact of VU and the associated treatments is required to ascertain the extent of the condition on individuals' mental health and well-being (Rook et al. 2023).

Overall, ulcer size in participants with CH reduces more efficiently than with CB (Taradaj et al. 2009; Brizzio et al. 2010). The use of CH, in comparison to bandages is more effective in promoting venous ulcer healing due to its consistent compressive effects (Attaran and Chaar 2016). Despite the reported clinicians' preference towards CH, Cook (2011) emphasises that in the initial stages of treatment, venous ulcers are often highly exudating and challenging to manage with CH. Practitioners need to be mindful that CH is not suitable for all individuals (Gong et al. 2020) with many experiencing peri-wound tissue breakdown following application. Jones (2019) also recognises that CH is not suitable for everyone for a variety of reasons, including unusual limb sizes and skin fragility. Therefore, knowledge of the strengths and weaknesses of differing compression system suitability is essential to enable staff to prescribe the most appropriate clinically effective treatment, considering factors beyond ulcer healing and reoccurrence rates (Gong et al. 2020).

Prevention and ongoing care is advocated by using CH. Milic et al. (2018) emphasise that when utilised from day one of treatment, CH is more effective than bandaging in preventing ulcer reoccurrence and patients are more likely to continue wearing it beyond healing. Ashby et al. (2014) observe that participants in the CB group experience higher levels of ulcer reoccurrence.

Pain management is a key theme. Ashby et al. (2014) and Brizzio et al. (2010) suggest that the CH group experienced significantly lower pain levels and an increased ability to undertake day-to-day tasks in comparison to participants trialling CB (Brizzio et al. 2010). Barnes (2023) supports this, stating that patients often experience increased levels of pain when using CB. While it is difficult to explain the aetiology of increased pain levels, Amsler et al. (2009) acknowledge that it is a significant consideration and has a profound influence on concordance, wellbeing, and healing. Atkin and Martin (2020) state that some

compression systems are associated with less pain and practitioners need to manage pain levels in individuals with lower VU in whatever method is being used (Atkin and Martin 2020).

The quality of life of the patient has been a recurrent theme and one in which the five studies led to no conclusion. Bjork and Ehmann (2019) assert that both systems of compression would improve patients' quality of life, due to enhanced healing. However, Green et al. (2015) suggest that while treatment may benefit patients' quality of life on a physical level, inadequate attention is given to the impact of this long-term condition on patients' mental health. As such, an increased time during consultations and further research into the true impact of VU and the associated treatments is required to ascertain the extent of the condition on individuals' mental health and well-being (Rook et al. 2023).

A recurrent theme in the literature for choice of treatment was cost effectiveness, discussed by four out of the five studies and in which there was agreement that management with CH costs the NHS less than CB and the participants had slightly more quality-adjusted life-years than those in the bandage group (Taradaj et al. 2009; Ashby et al. 2014; Dolibog et al. 2014; Oats and Adderley 2019). Re-usable CH was economical over single use bandaging (Oats and Adderley 2019; Ashby et al. 2014; Dolibog et al. 2014). Balcombe et al. (2017) states that the use of CH could reduce total spending on venous ulcer care, if utilised as a first line treatment option, as opposed to CB due to its significantly shorter application time. Taradaj et al. (2009) agreed that CH was overall more effective at healing ulceration, leading to reduced costs disputed by Dolibog et al. (2014) who concluded that CB was marginally more effective reducing the need for further contact with practitioners and reducing the expenditure on wound care products.

Both treatment and prevention were included in all five studies. CH, when well fitted, was associated with a reduced chance of ulcer recurrence after healing (Taradaj et al. 2009; Ashby et al. 2014; Dolibog et al. 2014; Oats and Adderley 2019). Brown (2020) supports this, stating that CH which has been measured and fitted appropriately can be re-used, delivering consistent compressive effects from the initial application onwards. However, it is important for clinicians to be aware that while most manufacturers recommend a maximum wear time before replenishment, many patients continue to wear the same CH out with the recommended time, rendering the compressive effects of the hosiery ineffective and increasing the risk of delayed healing and recurrence (Robertson et al. 2014). Again, CH is not suited to every individual experiencing a venous ulcer and therefore, in some instances, CB will remain the best treatment option (Jones 2019).

Conclusion

It can be concluded that an evidence-based and a person-centred approach is important when nurses are making a treatment choice, but success of the treatment is complex and includes concordance, comfort, cost, evidence, and the skill of the practitioner, not to mention clinical guidance (SIGN 2010) and local policy (Bjork and Ehmann 2019). CH is not suited to every patient and in some instances, CB will remain the best treatment option (Jones 2019Choice of compression therapy must be made through several nurse consultations, the patient's ability to self-manage, whether they require a home visit and the number of dressing changes required.

This systematic review explored the evidence base behind the decision making to use CH or CB. CH was favoured over CB in the treatment of VU. As a Student Nurse, the author recommended an increased focus on VU care in undergraduate nurse education, with

emphasis on the safe prescribing of compression systems. Finally, to enhance understanding on the topic, the author also recommends further research into the impact of compression therapy on mental well-being and the impact of this long-term condition on patients' mental health.

Keywords

- Compression Therapy
- Lower Limb Venous Ulceration
- Evidence-Based Clinical Practice
- Nurse Education
- Mixed Methods Systematic Review

Key Points

- There is some evidence to suggest that CH is the favourable system of compression in the treatment of lower leg venous ulceration.
- Registered nurses should strive to be evidence-based and person-centred in their practice when caring for patients experiencing lower leg venous ulceration.
- A greater emphasis on venous ulcer care is required in undergraduate nursing education with an enhanced focus on the safe prescribing of compression systems.
- Further research is required into the impact of compression systems on mental well-being and finance.

CPD Reflective Questions

- What compression systems are in use in your area of practice and what factors are considered when undertaking compression system selection for patient care?
- Does your area of practice have their own local guidance on compression system selection? Is this followed in your clinical area?
- What key points can be taken from this article to enhance your own day-to-day clinical nursing practice?

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