

# **Guidance for the multi disciplinary team on the management of post-operative residuum oedema in lower limb amputees.**



BRITISH  
ASSOCIATION OF  
CHARTERED  
PHYSIOTHERAPISTS IN  
AMPUTEE  
REHABILITATION



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# Introduction

## ***Guidance development***

This guidance is designed for use by the multi-disciplinary team, working with lower limb amputees. It provides recommendations based on evidence gained from the literature to aid decision making regarding non-pharmacological oedema management post operatively and to inform best practice.

It has been developed from work originally completed as part of a Post graduate certificate from Bradford University and has been endorsed by the British Association of Chartered Physiotherapists in Amputee Rehabilitation (BACPAR) to support and enhance the other evidence based guidance produced by this professional network (Appendix 3); BACPAR is a professional network and a Chartered Society of Physiotherapy (CSP) affiliated organisation. BACPAR aims to promote best practice in the field of amputee and prosthetic rehabilitation, through evidence and education, for the benefit of patients and the profession. It is committed to research and education, providing a network for the dissemination of best practice in pursuit of excellence and equity whilst maintaining cost effectiveness.

This document has been produced by practising physiotherapists and occupational therapists who are members of the Chartered Society of Physiotherapy and British Association of Occupational Therapists and who hold registration with the Health and Care Professions Council (HCPC). No sponsorship or funding was received during the development of this guideline and no conflicts of interest have been declared by the authors.

All decisions on the application of oedema control modalities should be made jointly by the multidisciplinary team. The residuum should also be regularly reassessed and measurements documented in order to ascertain the clinical effectiveness of the chosen oedema control modality.

Within the current literature there are various methods of oedema control described, with wide variation in their application and a lack of clarity on the timing of such applications. The guidance presents current evidence and is intended as a resource to guide application of best practice and to assist decision making. It should be used to support clinical judgement. Further research is needed to substantiate the guideline with regards to the timing and application of modalities.

## ***Background***

Oedema control methods should ideally be safe, easy to apply, remain secure, prevent skin breakdown, provide limb shrinkage and shaping, be painless and cost effective.<sup>6,7</sup>

Oedema occurs post operatively following lower limb amputation surgery due to the trauma and handling of tissues during surgery.<sup>12,20,29</sup> In normal tissues, volume is controlled by the complex interplay of fluid transfer across capillary membranes and lymphatic re-absorption. Usually equilibrium is maintained unless pathology or trauma<sup>20</sup>,

such as amputation, occurs. This swelling remains due to post amputation inactivity<sup>29</sup> and a lack of muscle tone in the residuum.<sup>29</sup>

The presence of post-operative oedema can cause the following complications to patient's rehabilitation;

- Delayed healing time<sup>12,18</sup>
- Pain<sup>1,20</sup>
- Delayed mobility<sup>1,3</sup>
- Increased time to start of prosthetic phase of rehabilitation<sup>15,16,18</sup>
- Increase in length of hospital stay<sup>16</sup>
- Poor stump shaping and maturation<sup>10</sup>

## ***Literature Review***

Evidence was gathered from a thorough review of available literature in November 2010 using a search of multiple databases: AMED, BNI (British Nursing Index), CINAHL, Cochrane, EMBASE, Medline, NHS EVIDENCE, OT Seeker, PEDro, Pubmed and hand searches of relevant literature reference lists. Limits were applied to exclude minor amputation, upper limb amputations, hip disarticulations and hemi pelvectomy, children and non-human studies. The inclusion criteria included major lower limb amputations, human adults and papers written in the English language.

A list of all methods of oedema control was compiled by the guidance development group (GDG) all working in the field of vascular surgery and amputee rehabilitation.

Search terms generated from this list were; Elevat\*, Swelling, Stump AND Board, Shrinker, Sili\* AND/OR Sleeve, Heal\*, Femurett\*, Exercise, Juzo, Tubi, Flowtron \*, Wound, Elastic AND/OR band\*, Compres\*, PPAM, EWA, Sock, Volume, POP, Plaster of Paris, Rigid AND dressing.

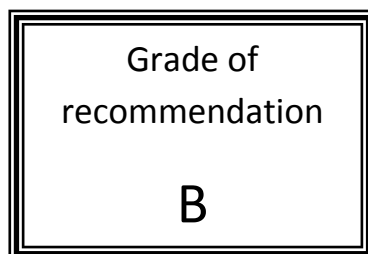
117 articles were identified by the literature search, 73 were excluded by abstract. Of the remaining 44 articles, 39 were appraised using the Scottish Intercollegiate Guidelines Network (SIGN) methodology checklists<sup>28</sup>, by two GDG members, as recommended by the National Institute of Health and Clinical Excellence (NICE)<sup>26</sup> and assigned a level of evidence (Appendix 1). This appraisal tool was selected as the GDG were familiar with its use from previously published guidelines relating to lower limb amputees<sup>21</sup>. The remaining five articles could not be appraised as their methodological design did not have an appropriate corresponding checklist; these include OrthoEurope<sup>27</sup> & manufacturers guidance<sup>24</sup>. These articles were included in the guideline's additional reference list, as they provide a depth of explanation to the guideline recommendations. The evidence base for each modality was assigned an overall grade of recommendation based on the quality of research available. (Appendix 2)

Robust evidence was found to support the use of Rigid dressings, Pneumatic Post Amputation Mobility Aid (PPAM aid), compression socks, wheelchair stump boards and to discourage the use of elastic bandage wrapping.

## Methods of Oedema Control

### **Rigid Dressings**

***A rigid or semi rigid dressing applied to a trans-tibial residuum to contain and further prevent formation of post-operative oedema.***



### **Types available**

- Rigid removable (extending above the knee or remaining below knee, eg fibreglass sock)
- Vacuum formed manufactured by Ossur
- Rigid non removable (eg Plaster of Paris)
- Semi rigid (extending above the knee or remaining below knee).

These techniques require specialist skills and materials. Costs vary depending on design and supplier.

### **Application**

#### *When*

- Immediate post-operative/theatre<sup>4,8,9,12,14,15,18,19</sup>
- 0-3 days post-operative<sup>5</sup>

#### *Who*

- Multi-disciplinary team members need to have documented training prior to application of rigid dressings<sup>11,23</sup>
- Surgeon<sup>8,9</sup>

#### *Duration*

- The literature is unclear on the duration of use of rigid dressings but the GDG suggest use until fitting of a prosthesis or until stump volumes have stabilised.
- Rigid Dressings
  - Kept on for 7 days, checked and reapplied for further 14 days<sup>19</sup>
  - Dressing changed every 7 days<sup>15</sup>
  - 5-7 days then replaced with compression therapy<sup>9</sup>
- Rigid Removable Dressings
  - Continuous (to be removed for wound inspection)<sup>7,8,11</sup>
  - 5-7 days then swapped to standardised compression therapy<sup>8</sup>

## Benefits

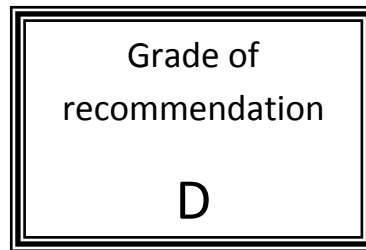
- Reduction in oedema<sup>1,7,8,11,12,14,15,18</sup>
- Reduced healing time<sup>4,12,15,18</sup>
- Reduced time to prosthetic casting<sup>3,7,8,9,12,15,19</sup>
- Reduced incidence of fixed flexion deformities at the knee<sup>15</sup>
- Physically protects the stump from external trauma<sup>4</sup>
- Removable rigid dressings permits regular residuum inspection<sup>7,8</sup>
- Able to apply earlier than other modalities such as stump shrinkers<sup>7</sup>

## Further Considerations

- Further reduction in oedema with addition of polymer gel sock<sup>5</sup> or compression sock under rigid dressing
- Various designs are available, however there is no consensus as to which is best.<sup>1,12,14</sup>
- Multi-disciplinary team members need to have documented training prior to application of rigid dressings<sup>23</sup>
- This technique requires specialist materials and cost varies.

## ***Pneumatic Post Amputation Mobility Aid (PPAM aid)***

***An early walking aid consisting of a pneumatic sleeve extending from groin to below amputation residuum enclosed by a frame cage.***



### **Types available**

Ortho Europe - trans-tibial and trans-femoral bags available with 3 heights and 2 circumferences of frames available.

### **Application**

#### *When*

- Can be used from 5 days post-operative pending a satisfactory wound inspection<sup>27</sup>
- From 6 days post-operative<sup>13</sup>
- If used prior to 10 days post-operative, time to casting is significantly reduced<sup>3</sup>

#### *Who*

- Used by therapist trained in the correct and safe application<sup>2</sup>

#### *Duration*

- Inflation time is increased from 5 minutes to up to 2 hours twice a day<sup>27</sup>

#### *Frequency*

- Everyday<sup>25,27</sup>
- The GDG suggest use of the PPAM aid until fitting of a prosthesis or until stump volumes have stabilised.

### **Benefits**

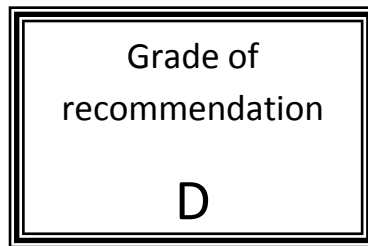
- Reduction of oedema<sup>3,13,25</sup>
- Improves limb shaping<sup>13</sup>
- Can be used as an assessment tool for prosthetic limb potential<sup>2,25</sup>
- Allows commencement of early walking preventing deterioration of postural muscles<sup>13</sup>

### **Further Considerations**

- Can be used for trans-femoral, through-knee and trans-tibial amputations<sup>25</sup>
- Can cause delayed healing if used incorrectly<sup>25</sup>
- Only to be used partially weight bearing and not bilaterally<sup>25</sup>

## **Compression Socks**

***A conical, graduated, sock like compression garment for residual limbs.***



### **Types available**

Manufactured by Juzo and Otto Bock. Available for trans-tibial and trans-femoral amputations in a variety of lengths and circumferences.

### **Application**

#### *When*

- Within 10 days post-operative<sup>3</sup>

#### *Who*

- No evidence is documented in the literature to suggest who should measure and fit a compression sock.

#### *Duration*

- A regime for wearing a compression sock is not documented in current literature or manufacturer's instructions.

### **Benefits**

- Reduction in oedema<sup>1,2,10</sup>
- Reduced time to prosthetic casting<sup>3</sup>
- Easy donning and doffing<sup>10</sup>
- Helps to shape into cylindrical shape for casting<sup>10</sup>

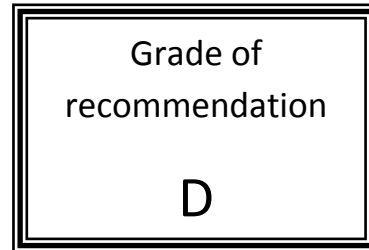
### **Further Considerations**

- Compression socks should be used in preference to elastic bandage wrapping<sup>2</sup>
- Trans-femoral and trans-tibial socks available<sup>24</sup>
- Compression sock size selection as per manufactures' guideline<sup>24</sup>
- Bespoke compression socks can be ordered from the manufacturers
- Frequent donning and doffing of socks in the early post op stages can create excessive distraction pressure over the distal end therefore the GDG suggest the use of a bandage applicator for ease of application and to reduce this effect.
- Manufactures' guidance does not say when compression socks can be initially applied.



## **Wheelchair Stump Boards**

***A detachable wheelchair accessory to allow elevation of the residuum when seated in the wheelchair.***



### **Types**

- Kings Mark II
- Different types available from different wheelchair manufacturers

### **Application**

#### *When*

- Within a week post-operative<sup>17</sup>

#### *Who*

- No literature documents who should provide the stump boards but it is suggested by the GDG that this is done by the professional responsible for providing and organising a loan/permanent wheelchair.

#### *Duration*

- Literature does not state how long a stump board should be used for but the GDG group suggest their use whenever the patient is in the wheelchair without a prosthesis.

### **Benefits**

- Reduces formation of dependent oedema<sup>17</sup>
- Reduced formation of fixed flexion deformities at the knee<sup>17</sup>
- Increased patient comfort<sup>17</sup>
- Protection of the residuum against injury<sup>17</sup>

### **Further Considerations**

- Primarily used with trans-tibial amputations, but may be appropriate in trans-femoral or through-knee amputations where the residuum length exceeds the seat depth<sup>17</sup>

## ***Elastic Bandage Wrapping***

***Figure of eight elastic bandaging technique, consisting of oblique turns that alternately ascend and descend after encircling the lower limb. The greatest pressure is applied at the distal end and allows several degrees of compression of the residual limb to control oedema.***<sup>10</sup>

The evidence available<sup>6</sup> is **against** the use of elastic bandages therefore information regarding types available and their application is not included in this guideline.

Elastic bandage wrapping has been used as the control group in comparison with rigid dressings and was demonstrated to be less effective in oedema reduction<sup>1,11,15,18</sup>

Elastic bandaging is unreliable and dangerous in terms of pressure and pressure distribution<sup>6</sup>

## **Conclusion**

Based on the best current available evidence rigid/semi rigid dressings should be used when expertise, time and resources allow; the benefits are well documented in the literature. The PPAM aid, compression socks and stump boards have been shown to have some evidence base for oedema control and may be used in addition or in the absence of rigid dressings dependant on clinical judgement. However, these modalities are not necessarily primarily intended for use for oedema control. Their advantages include preparation for prosthetic rehabilitation, reduction in flexion deformities and maintenance/improvement in muscle tone and are important components of amputee rehabilitation. Compression socks and the PPAM aid are the only tools available for trans-femoral amputees.

Although compression socks are widely used<sup>3</sup> as a form of oedema control there is very limited evidence on aspects such as timing of application, who should assess appropriateness and the frequency it should be worn for. It is suggested that further research is required in order to offer more clarity for clinicians in these areas.

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## Appendix 1

### Levels of evidence

- 1++** High quality meta-analyses, systematic reviews of Randomised Controlled Trials (RCTs), or RCTs with a very low risk of bias.
- 1+** Well-conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias.
- 1-** Meta-analyses, systematic reviews, or RCTs with a high risk of bias
- 2++** High quality systematic reviews of case control or cohort or studies. High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
- 2+** Well-conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
- 2-** Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
- 3** Non-analytic studies, e.g. case reports, case series
- 4** Expert opinion

## Appendix 2

### Grades of Recommendations

- A** At least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population; *or* A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results.
- B** A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; *or* Extrapolated evidence from studies rated as 1++ or 1+
- C** A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; *or* Extrapolated evidence from studies rated as 2++
- D** Evidence level 3 or 4; *or* Extrapolated evidence from studies rated as 2+

## Appendix 3

### BACPAR evidence based guidance

- Evidence based clinical guidelines for the physiotherapy management of adults with lower limb prostheses.  
<http://bacpar.csp.org.uk/publications/evidence-based-clinical-guidelines-physiotherapy-management-adults-lower-limb-p>
- Clinical guidelines for the pre and post operative physiotherapy management of adults with lower limb amputation.  
[http://www.csp.org.uk/sites/files/csp/secure/BACPAR\\_guidelines\\_lower\\_limb\\_amputation\\_2006.pdf](http://www.csp.org.uk/sites/files/csp/secure/BACPAR_guidelines_lower_limb_amputation_2006.pdf)
- Guidance for falls prevention in lower limb amputees.  
[http://www.csp.org.uk/sites/files/csp/secure/falls\\_prevention\\_lowerlimb\\_amputees.pdf](http://www.csp.org.uk/sites/files/csp/secure/falls_prevention_lowerlimb_amputees.pdf)
- Risks to the contra-lateral foot of unilateral lower limb amputees – guideline.  
[http://www.csp.org.uk/sites/files/csp/secure/ka-final\\_contra\\_foot\\_guideline.pdf](http://www.csp.org.uk/sites/files/csp/secure/ka-final_contra_foot_guideline.pdf)

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## Appendix 4

### Guideline Development Group (GDG)

**Elizabeth Bouch** is a Senior Specialist Physiotherapist working in amputee rehabilitation at Central Manchester Foundation Trust. Elizabeth qualified as a physiotherapist in 2004 and completed her junior rotations at Central Manchester Foundation Trust. In 2007 she obtained a static senior post working with amputees and commenced the senior specialist role in 2009. Elizabeth specialises in Intermittent Claudication, acute amputee rehabilitation and early prosthetic rehabilitation both in an outpatient and community setting. In 2011 Elizabeth completed a post graduate certificate in amputee rehabilitation at The University of Bradford and is currently working to complete a masters in amputee rehabilitation at The University of Bradford.

**Katie Burns** is an Expert Practitioner Occupational Therapist working in vascular and amputee rehabilitation at The James Cook University Hospital in Middlesbrough. Katie qualified as an Occupational Therapist in 2004 at Teesside University. Following a graduate rotation Katie secured a senior position in vascular and amputee rehabilitation in 2007 and commenced the expert practitioner role in 2008. In 2011 Katie completed a post graduate certificate in amputee rehabilitation at The University of Bradford. Katie is now working towards a masters in evidence based practice at Teesside University.

**Matthew Fuller** is a highly specialised physiotherapist in vascular surgery and amputee rehabilitation working at Guys and St Thomas' NHS Foundation Trust. Matthew qualified as a physiotherapist in 2000 from the University of East London. Matthew has worked within vascular and acute amputee rehabilitation since 2006. Firstly he held senior physiotherapist posts within a regional prosthetic centre working with pre-prosthetic, prosthetic rehabilitation and established amputees before moving to the vascular surgery department at St Thomas' Hospital in 2010. In 2011 Matthew completed a post graduate certificate in amputee rehabilitation at The University of Bradford and has held the post of Public Relations Officer on the executive committee of The British Association of Physiotherapists in Amputee rehabilitation (BACPAR) for the last 3 years.

**Lizzie Geer** is a senior vascular physiotherapist working in vascular and amputee rehabilitation at The Heart of England NHS Foundation Trust. Lizzie qualified as a physiotherapist in 2006 from Birmingham University. She has worked in vascular and amputee rehabilitation since 2008 and specialises in pre and immediate post operative amputee care. In 2011 Lizzie completed a post graduate certificate in amputee rehabilitation from The University of Bradford and is currently working towards obtaining a masters in professional development at Salford University.

**Anna Rose** is a senior physiotherapist leading vascular, amputee and renal therapy at The Royal London Hospital within the North East London Vascular network. Anna graduated in 2001 from Oxford Brookes University. After completing Band 5 rotations and in-patient Band 6 rotations at large teaching hospitals, Anna specialised in vascular and amputee management in 2008. In 2011 Anna completed a post graduate certificate in amputee rehabilitation at The University of Bradford.