Third Edition 2025 – Recommendations Document

Clinical guidelines for the pre and post-operative physiotherapy management of adults with lower limb amputations

BACPAR
British
Association of
Chartered
Physiotherapists in limb
Absence
Rehabilitation

Clinical guidelines for the pre and post operative physiotherapy management of adults with lower limb amputations

About BACPAR: The British Association of Chartered Physiotherapists in limb Absence Rehabilitation (BACPAR) is a professional network recognised by the Chartered Society of Physiotherapy (CSP). 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.

About this document: This document presents the updated, evidence based, clinical guidelines for the pre and post operative physiotherapy management of adults with lower limb amputations as described in the literature and expert opinion.

Please refer to the guideline Process document (available at https://www.bacpar.org/) for full details of all methodology and processes undertaken in the development of these recommendations. All appendices referred to will be found in the process document.

Citing this document:

British Association of Chartered Physiotherapists in limb Absence Rehabilitation (BACPAR) (2025) '*Clinical guidelines for the pre and post-operative physiotherapy management of adults with lower limb amputations*' 3rd Edition. Available at https://www.bacpar.org/

This document will update: Smith S, Pursey H, Jones A, Baker H, Springate G, Randell T, Moloney C, Hancock A, Newcombe L, Shaw C, Rose A, Slack H, Norman C. (2016). '*Clinical guidelines for the pre and post-operative physiotherapy management of adults with lower limb amputations'*. 2nd Edition. Available at http://bacpar.csp.org.uk/ [1]

Comments on these guidelines and the additional documents should be sent to:
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Key to the updates:
Where recommendations or good practice points have been amended or added for this update symbols are displayed next to the recommendation numbering for ease of identification.

** New recommendations

~~ Amended recommendations

CPD activities: Examples of CPD activities and evidence can be found at Health & Care Professions Council CPD webpage https://www.hcpc-uk.org/cpd/carrying-out-and-recording-cpd/what-activities-count-as-cpd/

Introduction

The first edition of this guideline was published in 2006 and then updated in 2016. This third edition seeks to integrate new scientific evidence and current best practice into the original recommendations and create additional recommendations where new evidence has emerged.

These guidelines are not mandatory and BACPAR recognises that local resources, clinician enthusiasm and effort, support from higher management, as well as the rehabilitation environment in which the practitioner works, will influence the ability to implement recommendations into clinical practice.

Guideline recommendations: The guidelines are divided into seven sections for ease of reference, and each section includes an introduction, a summary of the evidence, the relevant recommendations, good practice points (GPPs) and suggestions for local implementation:

Section 1 - The role of Physiotherapist within the Multidisciplinary team

Section 2 – Assessment

Section 3 – Patient and Carer Information

Section 4 – Pre-operative management

Section 5 – Post-operative management

Section 6 - Health and well-being

Section 7 – Developing specialist knowledge

Throughout these sections the adults with lower limb amputation may be referred to as individuals, amputees, patients or users.

Recommendations were developed and graded according to the level of evidence (*Appendix 8*). After each recommendation the letter in brackets refers to the evidence grade allocated (*Appendix 13*).

Where a number of different evidence sources were used to develop a recommendation, the grade is based on the highest level of evidence used. This grade reflects the quality of the evidence reviewed and should not be interpreted as the recommendation's clinical importance.

In the absence of other evidence, consensus opinion was sought to further inform sections.

The table of the papers utilised in developing the recommendations and their allocated level of evidence is in *Appendix 9*.

The full list of references follows the recommendations.

Section 1 - The role of the physiotherapist within the multidisciplinary team

Introduction

The Chartered Society of Physiotherapy (CSP) Core Standards[2] outline the role of the physiotherapist within a multidisciplinary team (MDT). These standards emphasise the need for physiotherapists to be aware of the roles of other members of the MDT and to have clear protocols and channels of referral and communication between members.

A specialist MDT achieves the best rehabilitation outcome[3,37,38,39,40]. To rehabilitate people who have had an amputation, the core MDT may include specialist physiotherapist, specialist occupational therapist, surgeon and specialist nurse. Additional MDT members include diabetic team, dietician, general practitioner, housing and home adaptation officer, podiatrist, counsellor, psychologist, social services team, social worker, pain management team, wheelchair services, rehabilitation consultant, prosthetist, orthotist and community services.

Evidence

Casale et al.[41] discuss that amputation is the beginning of a process that should be dealt with by the MDT team. The MDT approach to rehabilitation following amputation is internationally recognised as the rehabilitation mode of choice; however, there is little published literature to support this. To provide an effective and efficient service the team work together towards goals agreed with the patient. The physiotherapist plays a key role in coordinating patient rehabilitation.

Condie et al.[42] supported the role of the physiotherapist within the MDT and found that in a cohort of Scottish people with a lower limb amputation, the time from surgery to casting was reduced when patients received physiotherapy. However, in 2014, a national review[9] of the care received by patients who underwent major lower limb amputation due to vascular disease or diabetes, found that physiotherapists were often not involved early enough in patient pathway. The review recommended that structured involvement in the pathway should include pre-op input as well as early post-op rehab and discharge planning.

Recommendations

1.1 **The MDT should agree on its approach to rehabilitation, with specific professional roles and responsibilities identified and agreed within the MDT. **D** [41,43]

1.2 There should be an agreed procedure for communication between the physiotherapist and other members of the MDT. **D** [43]

1.3 ~~The physiotherapist should be involved in producing protocols to be followed by the MDT and subsequent audits to ensure compliance. **D** [43]

1.4 The physiotherapist should contribute to the decision on which MDT outcome measures are to be used. **D** [43]

1.5 ~~A physiotherapist experienced in amputee rehabilitation should be responsible for the management of physiotherapy care. **C** [3, 44]

1.6 **A physiotherapist experienced in amputee rehabilitation should have an overview of their service adherence and compliance to relevant published physiotherapy specific guidelines. e.g. BACPAR. **D** [43]

1.7 When it is possible to choose the level of amputation, the physiotherapist should be consulted in the decision making process regarding the most functional level of amputation for the individual. **D** [9]

1.8 ~~The physiotherapist contributes, as part of the MDT, to the prediction of prosthetic use. **C** [45,46]

1.9 The physiotherapist, as part of the MDT, should be involved in making the decision to refer the patient prosthetic rehabilitation service for assessment for provision of a prosthetic limb. **D** [43]

1.10 ~~The physiotherapist, along with other members of the MDT, should contribute to the patients/carers psychological adjustment and holistic well-being following amputation. **B** [47-52]

Good practice points

GPP 1 Patient and public involvement should underpin service delivery and development.

GPP 2 ~~ Channels of communication should be established between the MDT, stakeholders, commissioners, professional networks.

GPP 3 The physiotherapist should contribute to MDT audit, research and/or education on a regular basis, where possible.

GPP 4 Documented pathways of care should be used.

GPP 5 Contact details of the MDT should be readily available to the patient and carers.

GPP 6 Access to other stakeholder agencies should be understood and agreed to facilitate discharge planning and transfer of care e.g. Intermediate Care Teams, Social Services etc.

GPP 7 A summary of the patient's treatment and status at transfer or discharge should be documented in the patient's record, with details of future management plan e.g. details of package of care, community therapy, prosthetic referral.

GPP 8 ** Physiotherapists should be aware of referral criteria for local prosthetic services, and the mechanism of locally agreed referral pathways.

Section 2 – Assessment

Introduction
Sufficient information should be gathered from all sources including the clinical record and other members of the MDT before carrying out a full subjective and objective examination of the patient. This should consider the emotional and cognitive status and any co-morbidities e.g. cardiac and/or renal disease, diabetes, arthritis or previous stroke, which may affect the patient's motivation, exercise tolerance, skin condition or sensation. The social situation, including available support, occupation and hobbies, together with the home environment of the patient, should also be considered[2] .

Realistic goals and a rehabilitation programme should be discussed and agreed with the patient (and carers)[2]. Appropriate and validated outcome measures should be used to evaluate change in functional level as part of continual assessment and to ensure the practitioner is meeting the explicit requirements of the CSP's quality assurance standards[2].

Evidence
A prospective study by Budinski et al.[53] looked at predictive factors to successful prosthetic rehabilitation after vascular transtibial amputation (TTA). The study showed that patients without a functionally patent popliteal artery had 4 times less chance of successful prosthetic use, due to inadequate blood flow for wound healing. It was therefore recommended that patients who were in a good general condition and had a patent popliteal artery, reliably lead to clinical improvement and realisation of the full capacity of rehabilitation after TTA. They also identified that age is an independent predictor with younger patients being more successful.

In 2014, Erjavec et al.[54] completed a prospective exploratory cohort study which highlighted the importance of cardiovascular fitness for increased successful prosthetic outcome of TFAs due to PVD. The study shows that those patients who reached a level of 30 Watts or more during exercise testing on an arm ergometer at admission to rehabilitation are likely to be able to walk indoors using a prosthesis.

The National Institute for Health and Care Excellence (NICE) falls guidelines[55] state that "*Older people in contact with healthcare professionals should be asked routinely whether they have fallen in the past year and asked about the frequency, context and characteristics of the fall/s*." Given the relationship between falls and a patient's co-morbidities and their environment, this statement is also applicable to the amputee population. This can be supported by older studies by Collin et al.[56] about environmental factors determining functional outcome, and Pernot et al.[38] that suggests concurrent conditions along with increasing age are prognostic of a low level of function.

The need to examine specific pathologies during assessment, for example sensation in the intact limb, was supported by Potter et al.[57] This cohort study noted a high incidence of peripheral neuropathy in the intact limb among all patients, with or without diabetes.

The care of the contra-lateral limb guidelines evidence the importance of assessing skin condition[8], even when patients who have undergone previous amputation of the contra-lateral limb.

Vivas et al.[58] completed a retrospective cohort study and found that obesity does not seem to

confer a disadvantage with regards to validated outcome measures such as 2 minute Timed Walk Test (2TWT), L – Test or SIGAM (Special Interest Group in Amputee Medicine) Mobility grades and that it should not be a barrier to rehabilitation. However, they did find that patients who were underweight had significantly shorter distances in 2TWT than normal weight patients.

Coffey et al.[59] in a systematic literature review found that impaired cognitive skills such as memory and executive function negatively affect independence. A further paper by Hanspal[60] suggested that the results of a cognitive assessment soon after amputation can predict the level of mobility likely to be achieved. This was based on a cohort study of 32 elderly patients, but no specific results were published on level of mobility and links with cognitive status.

People experience significant emotional distress following amputation and are at risk of developing anxiety and depression[61]. Pedras et al.[62] found in a cohort study of 86 diabetic patients in Portugal that higher pre-surgery anxiety and depression predicted post-surgery anxiety and depression. Furthermore, poor pre-surgery function predicts poor adjustment but social support improved adjustment to limitations.

Recommendations

2.1 ~~ The physiotherapist is aware that level of amputation, pre-existing medical conditions and social environment will affect rehabilitation. **B** [38,43,56-58,60,63-69]

2.2 The impact of the level of amputation on rehabilitation potential is understood by the physiotherapist. **B** [24, 65, 70, 71]

2.3 ~~ The physiotherapist has an understanding of the predisposing factors to successful (and unsuccessful) rehabilitation. **B** [31,43,53,59,64,69,72-75]

2.4 There should be written evidence of a full physical examination and assessment of previous and present function. **D** [2]

2.5 ~~ The patient's social situation, falls history, psychological status, goals and expectations should be documented. **C** [55,56,60,61,76]

2.6 ~~ Relevant pathology including diabetes, previous arterial reconstruction, impaired cognition and skin condition should be noted. **B** [53,57,59,60,64]

2.7 A problem list and treatment plan, including agreed goals, should be formulated in partnership with the patient**. D** [2]

Good practice points

GPP 9 ~~ A locally agreed amputee specific physiotherapy assessment should be used.

GPP 10 ** The physiotherapist should be aware of generalised anxiety/depression scales and consider their use, and an onwards referral if indicated.

GPP 11 ~~ Where possible, a multidisciplinary assessment should be considered to improve MDT communication and reduce duplication of assessments from multiple healthcare professionals.

GPP 12 ** Names and contact details of the patient's immediate support system, i,e. next of kin/carers should be recorded to facilitate communication and discharge planning.

GPP 13 ~~ Names and team contact details of the MDT involved in the patient's care should be recorded to facilitate communication.

Section 3 – Patient and Carer Information

Due to the number of recommendations in this section it has been sub-divided into two sections for ease of use. These sub-sections are:

3.1 Patient journey
3.2 Informed goal setting

3.1 Patient journey

Introduction

There are many variables that may affect a patient's journey following a lower limb amputation. The CSP Quality Assurance Standard[2] 4.3 states that "*information is provided to enable service users to participate fully in their care*". This promotes understanding of the process and reasoning behind treatment. The rehabilitation process should have an educational element that empowers patients and carers to take an active role in their present and future management. This will assist with problem solving and awareness of when to seek professional help.

Evidence

A small study of 16 participants, undertaken in 2014, by Pedlow et al.[77], looked at patients' perspectives on information needs following vascular amputation. They recommended that an education protocol should include multiple strategies for delivery of information, to target multiple audiences, at various times throughout their surgical journey. Further to this, variability in the timing, mode, and amount of delivery would ensure all patients receive the required information while catering to their individual needs and preferences. They reiterated that one must consider age, pain levels, medication, emotional state, environment, use layman's terms and understand why the patient needs the information.

MacKay et al.[52] interviewed 35 patients in their qualitative study and findings highlighted the long-term impact of lower limb amputation (LLA) which results in a change in mobility, social activities, roles and psychological wellbeing. They emphasised the importance of social support including practical, emotional and companionship from family and friends as these can influence a patient's journey with limb loss and reduce social isolation. The study also highlights the importance of advising on home adaptations to enable activities of daily living and accessibility within the home environment. More forward planning is needed as walking with a prosthesis requires more attention and therefore there is an increased cognitive burden.

One of the key messages from Mackay et al.[52] was that patients and carers should be made aware of the available social support. Whilst in 2022, Küçük Öztürk et al.[78] spoke of the importance of providing a supportive environment to allow patients to voice both negative and positive feelings about the rehabilitation process and their adjustment to amputation.

Recommendations

3.1.1 ~~ The physiotherapist should give patients information about the expected stages and location of the rehabilitation programme suited to their individual circumstances. **C** [2,77,79,80]

3.1.2 ~~ With the patient's consent, the physiotherapist should give carers information about the expected stages and location of the rehabilitation programme suited to the patient's individual circumstances. **D** [2,77,79]

3.1.3 ** The physiotherapist should consider the impact of protected characteristics when planning their rehabilitation journey and consider reasonable adjustments, to help reduce potential social isolation. **D** [52]

3.1.4 ** The physiotherapist should provide information about the rehabilitation process to those patients not likely to be referred for a prosthesis. **D** [62]

3.1.5 The physiotherapist should provide information about the prosthetic process to those patients likely to be referred for a prosthesis. **D** [43]

3.1.6 ** Where required, all verbal information/advice given should be supplemented in an accessible form to meet patients' needs and health literacy e.g. written - font size, language, different media. **D** [2,77]

3.1.7 ~~ The physiotherapist should offer patients the opportunity to meet other adults with lower limb amputations. **D** [78,81]

3.1.8 ~~ The physiotherapist, along with other members of the MDT, should have an awareness of which professionals/organisations to signpost patients for information and to support about benefits. **D** [43]

3.1.9 ~~ The physiotherapist, along with other members of the MDT, should have an awareness of which professionals/organisations to signpost carers for support. **D** [43]

3.1.10 ~~ The physiotherapist should be able to refer the patient to other agencies/professions as necessary. **D** [43]

Good practice points

GPP 14 ** Names and team contact details of the MDT involved in the patient's care should be given to patients and carers throughout their journey.

GPP 15 ** If available, the physiotherapist should offer to show demonstration prosthetic limbs to those patients likely to be referred to for a prosthesis.

3.2 Informed goal setting

Introduction

The CSP Quality Assurance Standard[2] 8.5 states that "*goals are agreed with the service user, multi-disciplinary team including outside agencies and wider carers and family*". When goal setting following a lower limb amputation, there are various factors which should be assessed and discussed, that impact function (in particular, level of ambulation with prosthesis). This includes various co-morbidities (both cognitive and physical), and the associated increase in energy cost when ambulating with a higher level of amputation[71].

Evidence

Bowrey et al.[46] developed the Blatchford Leicester Allman Russell tool (BLARt) which predicts mobility levels and functional outcomes in LLAs, which can be used to inform goal setting, and can help guide pre-operative information and communication, including the management of expectations.

There are several studies that show patients with a transtibial amputation have a greater chance of succeeding with a prosthesis than those with a trans-femoral amputation[24,31,53,65,70]. A

prospective cohort study by Czerniecki et al.[64] report that average subjects did not regain pre-amputation levels of mobility within the first year post surgery. In addition to this, increased age and previous arterial reconstruction are factors associated with a reduced rate of ambulatory recovery. It summarised that co-morbidities (including cognitive and physical factors) will impact on levels of ambulation post-operatively. The impact of cognitive impairment, in a systematic review by Coffey et al.[59] states that memory and executive function, is predictive of functional limitations over time. These factors should be considered when undertaking the goal-setting process.

More recently, Frengopoulos et al.[82] found that Montreal Cognitive Assessment (MoCA) score less than 26 was predictive of functional mobility as in L-test among people with transtibial and transfemoral amputations in a retrospective cohort study. They also pointed out that cognitive impairment alone should not be used to exclude people from rehabilitation.

In a retrospective cohort study[83] of 206 subjects with major lower limb amputations from acute hospital to community settings, increased Body mass index (BMI) was found to be predictive of non-ambulatory status post operation.

Park et al.[67] carried out a retrospective review of 41 patients with a lower limb amputation and diabetic end stage renal disease. They found that those with a history of sepsis were more than 8 times likely to have major complications, than those without the history of sepsis. Wada et al.[74] in a retrospective cohort study found that patients with lower limb amputation undergoing haemodialysis had a lower Functional Independence Measure (FIM) score than those not receiving haemodialysis. This contradicts Czyrny and Merrill[73] who concluded that amputees on renal dialysis admitted to acute rehabilitation had similar functional outcomes and rehabilitation costs to amputees with peripheral vascular disease without renal failure. Without further details about the treatment regimens applied and given the relatively low subject numbers, it is difficult to draw a definitive conclusion to the impact haemodialysis has on the functional outcome from lower limb amputation.

Recommendations

3.2.1 ~~ Patients and carers should be made aware that concurrent pathologies, age and previous mobility affect realistic goal setting and final outcomes of rehabilitation. **B** (46,64,67,74,75,84,181)

3.2.2 ~~ Patients and carers should be made aware that the level of amputation affects the expected level of function and mobility. **C** (64,84,85)

3.2.3 ~~ Patients and carers should be made aware that they may experience lower levels of function than bipedal subjects. **C** (52,64)

3.2.4 ~~ The physiotherapist should consider the use of prediction tools, alongside appropriate validated outcome measures for the development of patient centred rehabilitation goals. **D** (2,3,46,75,82)

3.2.5 ~~ The physiotherapist should use a range of strategies to assess and consider the impact of cognitive impairment on goal setting. **C** (59,82,86)

3.2.6 ** The physiotherapist should consider the impact of protected characteristics when setting individual goals and consider reasonable adjustments. **D** (43)

Good practice points

GPP 16 Physiotherapists should be aware of the BACPAR Guidelines entitled "Risks to the contra-lateral foot of unilateral lower limb amputees"[8] and "Guidance for the multi-disciplinary team on the management of post-operative residuum oedema in lower limb amputees"[7].

Section 4 – Pre-op Management

Introduction

Early assessment and planning of rehabilitation can commence at this stage and helps to prepare the patient for rehabilitation. A pre-amputation consultation also enables the physiotherapist to give appropriate advice, information and reassurance; issues such as phantom limb sensation and avoidance of falls may be discussed[87]. However, it is acknowledged that patients who require emergency amputation may not have the opportunity for pre-amputation consultation, assessment and treatment.

Evidence

In 2013, Ostler et al.[81] found that the use of pre amputation consultations, as well as meeting established amputees should be more of a priority in cases where time is limited. They concluded that patient information and patient discussions are a vital part of the rehabilitation adjustment process. This was further supported by Columbo et al.'s 2018 study[88] which concluded that participants wanted to be an integral part of the amputation decision-making, even if there was often no alternative to amputation. Peters et al.[89] recommended that individual goal setting and shared decision making were important in not delaying the decision to amputate in view of these findings.

Premnath et al.[75] found that pre-operative walking status was significantly associated with good functional outcome at 6 and 12 months and patients who were wheelchair-bound before surgery were less likely to walk independently after amputation. The study further demonstrated that a BLARt score of less than 13 was significantly related to good functional outcomes at 6 and 12 months and patients who had a below knee amputation had better outcomes at 12 months when compared to transfemoral amputation (TFA), through knee amputation and hip disarticulation patients.

Ejavec et al.[54] highlights the importance of exercise programmes to increase fitness of TFA patients to improve chances of successful prosthetic rehab.

Dekker et al.[90] interviewed a small sample of medical professionals and researchers in LLA about utility of pre-hab programs, specifically with peripheral vascular disease (PVD) patients at risk of LLA. All participants agreed it would help improve post-operative recovery by improving mental and physical function. However, many participants did not have pre-hab experience, as patients needed to be identified earlier pre-op to be able to implement any kind of pre-hab. This could be implemented by monitoring dysvascular patients earlier on when they enter the healthcare system. A similar concept was piloted by Fulton et al.[91] with a small sample participating in a "prehabilitation-plus" program which showed that amputee prehabilitation, by providing comprehensive multidisciplinary assessment, targeted functional interventions and education before the amputation, may improve post-amputation outcomes.

Recommendations

4.1 ~~ The physiotherapist should have an understanding of the pathology leading to amputation. **C** [2,80,89,90]

4.2 The physiotherapist should have knowledge of medical investigations commonly undertaken prior to amputation and their significance. **C** [64]

4.3 ** The physiotherapist, as part of the MDT, should contribute to the use of a validated outcome predictor tool, such as BLARt. **C** [46]

4.4 ~~ The physiotherapy assessment should be commenced pre-operatively, if possible, to contribute to MDT discussions about planned care. **D** [3,9, 90,91]

4.5 ~~ Where possible rehabilitation/discharge planning should commence pre-operatively. **D** [9,77]

4.6 ~~ Where possible the physiotherapist should reinforce information given by other MDT members about the general surgical process (not technique). **D** [43, 77]

4.7 ~~ Where possible the patient and carers should be given advice, information and reassurance by the physiotherapist about rehabilitation. **D** [77,81,87,88]

4.8 Where appropriate and possible, the patient should be instructed in wheelchair use pre-operatively. **D** [43]

4.9 ** Joint range of movement (active +/- passive) and muscle strength should be assessed, and the presence of any contracture documented. **D** [43]

4.10 ~~ A structured exercise regime should be started as early as possible. **C** [54,92]

4.11 Bed mobility should be taught where possible. **D** [43]

4.12 Where appropriate and possible, transfers should be taught pre-operatively. **D** [43]

4.13 ~~ Respiratory assessment and treatment should be given if clinically indicated. **D** [43]

4.14 Pain control should be optimised prior to physiotherapy treatment pre-operatively. **D** [43]

4.15 If appropriate, and with the patient's consent, carers should be involved in pre-operative treatment and exercise programmes. **D** [43]

Good practice points

GPP 17 ** Following a pre-op assessment, the physiotherapist should identify the need and make onward referrals in a locally agreed time frame.

Section 5 – Post-op Management

Introduction
The rehabilitation process should commence as early as possible, preferably following a suitable care pathway[93]. Patients should be assessed, and a rehabilitation plan discussed and agreed. Advice and information should be given regarding bed mobility, to avoid complications such as contractures and pressure sores. Appropriate advice and assistance with transfers should be given[94].

Following assessment, a problem list should be made, with both short- and long-term goals, considering the patient's psychological, emotional and physical status, pain management and the broader issues surrounding social and home environment.

Evidence
Ostler et al.[81] concluded that patient information and patient discussions are a vital part of the rehabilitation adjustment process.

Ghazali et al.[92] report that early education to increase patients' awareness as to the implications of knee flexion contractures on their prosthetic rehabilitation, increased compliance to using splints and completing active exercises and may improve compliance with bed positioning and that those who were independent with transfers by day 21 post-op were often more suitable for prosthetic. Madsen et al.[94] found that early physio input before day 21 was the only environmental factor statistically significant when associated with independence with transferring or not.

Meikle et al.[95], in a retrospective cohort study, found that interruptions to rehabilitation due to co-morbidity are common, but do not adversely affect the outcome of rehabilitation despite lengthening the process.

For ease of description, this section has been divided into the following sub-sections:

5.1 Setting of care
5.2 Immediate post-operative care
5.3 Care of the remaining limb
5.4 Care of the residual limb and oedema management
5.5 Environment and equipment
5.6 Non-prosthetic mobility/transfers
5.7 Wheelchairs and seating
5.8 Early walking aids (EWAs)
5.9 Falls management
5.10 Prevention of contractures / maintenance of joint range of movement
5.11 Exercise programmes
5.12 Management of phantom sensation (PLS), phantom pain (PLP) and residual limb pain (RLP)

5.1 Setting of care

Introduction

It is acknowledged by the authors, that in the UK there are geographical limitations on availability of inpatient rehabilitation settings, that cover both pre-prosthetic and prosthetic rehabilitation.

Evidence

In 2000 a retrospective cross sectional study of 146 traumatic amputees by Pezzin et al.[96] found that their physical function and vitality were increased by having longer in- patient rehabilitation. Schaldach[93] found in a retrospective 'before and after' case control study of 71 trans-femoral and transtibial patients that in-patient rehabilitation is more effective in terms of cost and time when a clinical care pathway is followed. In a case control study Cutson et al.[97] observed that in-patient rehabilitation reduced the time from surgery to prosthetic ambulation among male dysvascular transtibial patients.

Batten et al.[98] studied the characteristics of those with LLA admitted to inpatient rehab and on discharge. It was found that over the 7 year period that motor function should be addressed in rehab to optimise the patient's ability to return home and to the community. There are studies that show higher level of mobility, and a home discharge is more likely if rehabilitation is carried out in an inpatient rehab facility setting[99,100]. This supported earlier studies, such as Sauter et al.[101] in 2013 who found that at 6 months, functional outcomes were better following post-acute care at an inpatient rehab facility vs skilled nursing facility and discharge directly home.

Whereas, Columbo et al.'s[88] participants described their extended period in an inpatient rehabilitation facility as a "*glass bubble*" in which there was always assistance available. They reported that "*getting home and realising how things would really be*" readjustment in their home environment afterwards was unanticipated and difficult. The study participants described recovery as when they had regained their functional independence.

Regardless of where care is provided, staff competency must be given consideration, as described by Fortington et al.[102]. It is more difficult to maintain staff competency and the care necessary, among those teams which undertake amputee care on an infrequent basis. It requires improved links with other specialist services. This was supported by Fard et al.[100] who identified that patients aged 64 and under and having a partner at home increase the chances of returning to independent living directly from the acute setting. For patients unable to go home directly following hospital admission being under the age of 75 and cared for in either inpatient rehabilitation or a specialist nursing facility is associated with higher odds of returning to independent living.

Good practice points

GPP 18 Physiotherapist should be aware of the Audit tool for personal knowledge linked to these guidelines and utilise them in reflective practice as part of their CPD.

5.2 Immediate Post-op care

Evidence

Recommendations

5.2.1 ~~ Post-operative physiotherapy assessment and rehabilitation should ideally start on day zero/one, dependent on patient condition. **D** [43]

5.2.2 ** The physiotherapist, along with other members of the MDT, should contribute to the management of pressure care. **D** [43]

5.2.3 ~~ Methods of post-operative pain relief are understood by the physiotherapist, and pain should be adequately controlled prior to every treatment. **A** [3,103-106]

5.2.4 ~~ Respiratory assessment and treatment should be given as clinically indicated. **D** [43]

5.2.5 The physiotherapist should use their assessments to inform the MDT regarding interventions and discharge planning. **D** [43]

5.3 Care of the remaining limb

Evidence

A body of work was carried out by BACPAR in 2009[8] recommending that "care of the remaining/contra-lateral limb is included in therapeutic practice. These guidelines are intended to be a practical resource for therapists working with lower limb amputees and should be used alongside other current, published guidelines."

NICE Guidelines for diabetic foot problems[107] describes the need for annual reviews, the importance of visual foot checks, to provide patient information about the risk of developing a diabetic foot problem and refer those with a moderate-high risk to the Foot Protection services. If a diabetic foot problem is identified, they should be referred to the local Foot Protection services within 24 hours.

Rerkasem et al.[108] also support the education of patients of risk factors for foot care and ensuring that the patient is under the care of appropriate MDT foot care specialists.

The BACPAR endorsed evidence based guideline 'Risks to the contra-lateral foot of unilateral lower limb amputees: A therapist's guide to identification and management'[8] may help guide the clinician as to the recommended areas a therapy assessment of the remaining foot should cover.

Recommendations

5.3.1 ~~ The risk of damage to the remaining diabetic/ neuropathic foot is understood by the physiotherapist. **C** [8,107-112]

5.3.2 ** The physiotherapist should, as part of their initial and ongoing assessments, observe and document the condition of the patients remaining limb. **D** [43,113]

5.3.3 ** The physiotherapist should actively participate in the management and care of the remaining limb including positioning, pressure relief and the utilisation of orthoses/prescribed footwear as indicated. **B** [8]

5.3.4 ~~ Vascular and diabetic patients and their carers should be made aware of the risks to their remaining foot and educated in how they can reduce them. **B** [8,107,108]

5.3.5 The patient/carer should be taught how to monitor the condition of the remaining limb. **B** [8,108]

5.3.6 ~~ Physiotherapists, along with other members of the MDT, should establish links with their local podiatry/chiropody services to ensure that information and education given to patients and carers is consistent. **C** [43,107]

5.3.7 ~~ If foot concerns are identified, physiotherapists should ensure that patients are under the care of a specialist MDT, which may include a diabetic specialist, podiatrist and foot care specialist. **B** [8,107]

5.4 Care of the residual limb and Oedema management

Evidence

Factors affecting wound healing include smoking, malnutrition, previous surgery, gangrene, level of amputation, antibiotics, diabetes, surgical technique, dressings and drains. No single factor can be considered in isolation[114]. In a review by Eneroth[114] multiple factors were found to affect wound healing in vascular patients with an amputation. Oedema control is considered essential in preventing this delay.

A systematic review by Reichmann et al.[116] described removeable rigid dressings use in post-operative management of TTA, and that the various benefits beyond oedema management. This includes reductions of trauma, reduction of knee flexion contractures, accelerated healing times and therefore a shorter time to casting. Sumpio et al.[117] found that consideration should be given to the use of rigid dressing rather than soft dressing to promote healing and earlier ambulation. This is supported by the systematic review by Churilov[118]. Furthermore, Fencel[119] who found a reduced revision rate (from 42% to 7.55%) from TTA to TFA once removeable rigid dressings were introduced.

Oedema Management

As described in the BACPAR guidelines about management of residuum post-operative oedema[7], the presence of post-operative oedema can cause the following complications to a patient's rehabilitation:

- Delayed healing time
- Pain
- Delayed mobility
- Increased time to start of prosthetic phase of rehabilitation
- Increase in length of hospital stay
- Poor stump shaping and maturation

These guidelines[7] found robust evidence to support the use of rigid dressings, pneumatic post amputation mobility (PPAM) aids, compression socks and wheelchair residual limb support boards in the management of oedema. It demonstrated that available evidence is against the use of elastic bandages due to it being unreliable and dangerous regarding pressure distribution. It was recommended that compression therapy is commenced within 10 days post-operatively.

A recent survey of Scottish Physiotherapists Amputee Research Group (SPARG) members in Scotland[120], found 100% consensus that use of compression is aimed to be applied by day 10/as soon as possible post theatre dressings/RD's /wound allows. However, due to advances in wound

management/dressings, some variations in practice have been created. This supports previous findings by Condie et al.[42] in 1998, where a survey of physiotherapists in Scotland revealed that compression socks were widely prescribed and its use in clinical practice varied greatly. Discharge data from all Scottish amputees over a three-year period showed that all forms of compression therapy resulted in quicker progression to prosthetic rehabilitation[42].

Types of Oedema management

1. Rigid dressings

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

2. PPAM aid

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

3. Compression socks/silicone liners

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

4. Wheelchair Stump boards

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

Recommendations

5.4.1 ** The physiotherapist should actively participate in the management and care of the residual limb, including wound healing, positioning, pressure relief and the use of compression therapy. **D** [43]

5.4.2 The physiotherapist understands the factors affecting the healing of residuum wounds. **C** [7,114,121]

5.4.3 ~~ The physiotherapist has an understanding of the different types of management of residual limb oedema, and the timing of their use. **A** [7,24,114,117-119,122-124]

5.4.4 ** The physiotherapist should as part of their initial and ongoing assessments, observe and document the patient's residual limb and refer on to other services as appropriate. **D** [43]

5.4.5 Advice should be given to the patient/carer on the factors affecting wound healing. **B** [114]

5.4.6 The physiotherapist should use compression therapy as appropriate. **D** [7,123]

5.4.7 ** The timing of compression therapy application should be discussed with the MDT at an early stage. **D** [7,123]

5.4.8 ~~ A compression sock/post-operative liner should be used in preference to elastic bandages for reducing limb volume. **D** [7,123]

5.4.9 ~~ Advice should be given to the patient/carer on the use of compression therapy. **D** [3,7,42]

5.4.10 Instruction should be given to the patient/carer on methods to prevent and treat adhesions of scars. **D** [43]

5.4.11 ~~ The physiotherapist should give on-going advice to the patient/carer about residual limb care. **D** [43]

Good practice points

GPP 19 ** All decisions on the application of oedema control modalities should be made jointly by the MDT, where available.

GPP 20 ** The residuum should also be regularly reassessed, and measurements documented.

5.5 Environment and equipment

Evidence

Environment and equipment should be considered in relation to the individual, the intervention and both the rehabilitation setting and discharge destination. The evidence based guidelines for occupational therapy with people who have had lower limb amputations[4] recommend the provision of residual limb support boards for all transtibial amputees.

Recommendations

5.5.1 The physiotherapist should have knowledge of the provision of equipment that can enhance the rehabilitation process and facilitate activities of daily living. **D** [43]

5.5.2 Physiotherapists should be familiar with the correct use and availability of specialist amputee equipment, e.g. slings, hoists, residual limb boards. **D** [4,125]

5.5.3 ~~ The physiotherapist, along with other members of the MDT, should be involved in access and home visits where necessary, and ensure they are undertaken in a timely fashion. **D** [43]

Good practice points

GPP 21 ** The physiotherapist should be aware of who to contact in local manual handling teams, and seek any support required for patients who may need more specialist equipment or training than they have access to.

GPP 22 ** A thorough local risk assessment for each individual should be completed and documented for any equipment considered that is not safety approved for those with limb loss (according to manufacturer's guidance) e.g. standing transfer aids. This should be passed on for review, once patient moves onto next part of pathway e.g. community therapy/prosthetic clinic.

5.6 Non-prosthetic mobility/transfers

Evidence

A longitudinal cohort study by Stineman et al.[126] found that even a small improvement in

dependency levels resulted in improved mortality rates at six months. i.e. through progression of transfers and functional ability. Madsen et al.[94] found that patients with independent transfers at day 21 post-op are more likely to progress to provision of a prosthesis.

According to Kirby et al.[127] in a qualitative study, "the seated stair handling method is a generally effective, safe and well-tolerated method for people with unilateral lower limb amputations to ascend and descend the stairs."

Recommendations

5.6.1 ** The physiotherapist should have knowledge of different transferring methods, for all levels of all amputation, single or multiple. **D** [43]
5.6.2 Ideally, bed mobility should be taught on the first day post-operatively. **D** [43]
5.6.3 Sitting balance should be re-educated if indicated. **D** [43]
5.6.4 Standing balance should be re-educated if indicated. **D** [43]
5.6.5 ~~ Safe transfers should be taught as early as possible, using appropriate equipment if required. **C** [94]
5.6.6 ~~ Mobility post-operatively should be in a wheelchair, unless there are specific documented reasons to teach a patient to use alternative mobility aids. **D** [43]
5.6.7 ~~ The physiotherapist should help the patient gain maximum mobility post-operatively, which may include the option of ascending and descending the stairs using a seated method. **C** [126,127]

Good practice points

GPP 23 ** The use of standing transfer aids, such as the Sara steady/RotaStand, are not advised for use with lower limb amputees without a prosthesis (as described by the manufacturers guidance). Where the decision to use a standing transfer aid, instead of standard amputee transfer techniques (slide board/pivot transfer) is made, an individualised risk assessment should be carried out, and the reasoning for use over other standard transfers/ transfer aids should be clearly documented in the patient's clinical record. The risks should be discussed with the patient, and this decision should be handed over to other healthcare providers when the patient moves into a different episode of care, so that they can review the ongoing risk.
GPP 24 ~~ If alternative mobility has been provided/taught e.g. with elbow crutches/knee scooters, the risks should be discussed with the patient and clearly documented in their medical notes.
GPP 25 If using a seated method to ascend and descend the stairs, consideration should be paid to how the patient gets up from the floor at the top of the stairs.

5.7 Wheelchairs and seating

Evidence

World Health Organization (WHO) wheelchair provision guidelines[128] state that access to an appropriate wheelchair is a human right, and wheelchair provision services should place people

at the centre so that it meets their individual needs.

NICE guidelines[129] recommend providing information and support at the earliest opportunity regarding equipment for use after hospital, such as wheelchairs, as it may delay discharge. In addition, the National Major Trauma Rehabilitation Group (NMTRG) guidelines[130] recommend that expectations around post-op mobility in a wheelchair should be advised pre-operatively. Post-operatively, the therapy team should provide training such as transferring from the bed into a wheelchair on day one and general wheelchair mobility practice/education. Before hospital discharge, an issue/order of a permanent wheelchair should be completed, as well as onward referrals to wheelchair services and for any required housing adaptations to allow access.

Recommendations

5.7.1 ~~ The physiotherapist should have knowledge of who prescribes wheelchairs, how they are provided, any appropriate accessories including pressure relieving seating. **D** [130]

5.7.2 ~~ Patients should routinely be provided with a suitable wheelchair with appropriate accessories to include residual limb support, footplates, anti-tippers and pressure management devices (as required). **C** [4,130]

5.7.3 Where necessary the physiotherapist should be able to assess a patient's suitability for a wheelchair or have knowledge of the referral process i.e. to local wheelchair service. **D** [130]

5.7.4 ~~ The physiotherapist, along with other members of the MDT, should be able to teach the patient and carer how to safely use the wheelchair, including all accessories and develop their wheelchair mobility skills. **C** [125,130,131]

5.7.5 ** Patients should be educated on how to participate in physical activity when using a wheelchair i.e. signposting to local initiatives/facilities. **D** [132]

Good practice points

GPP 26 The physiotherapist should discuss potential long-term usefulness of a wheelchair, even if a patient is likely to receive a prosthetic limb.

5.8 Early walking aids (EWAs)

Evidence

Use of an early walking aid to facilitate assessment and rehabilitation is well documented. [7,60,71,133-137]. Lee et al.[136,137] reported on the early and frequent use of the PPAM aid can reduce time to achieve rehabilitation milestones resulting in a reduced time to delivery of prosthesis. Pollock et al.[133] found in a randomised controlled trial that using EWA's reduced the incidence of post-operative complications and resulted in faster and more successful rehabilitation.

Schon et al.[138] demonstrated in a 'before and after' case control study that prefabricated prostheses may reduce complications, falls, revisions and time to first prosthesis. This is further supported by Van Ross[121] with the use of an EWA as part of an unhealed wound protocol.

Flint et al.[139] reported (in a combat-related LLA population), that disuse atrophy and the severity of the loss of bone mineral density was linked with a delay to amputation and subsequent weight bearing rehabilitation post-amputation. The effect of amputation on bone mineral density is also seen in studies that report on TFA prosthetic users who develop osteopenia/osteoporosis in the amputated side femur and hip[140-142].

In a 1997 pilot study of 10 patients - seven with abnormal resting electrocardiogram (ECG) with peripheral vascular disease, Bailey et al.[72] investigated ECG abnormalities during walking with a pneumatic post-amputation mobility aid. They found normal blood pressure elevation in nine patients and a group mean age-predicted maximum heart rate of less than 70%, suggesting appropriate exercise levels. However, five patients reached over 70% of age-predicted maximum heart rate. They suggest that physiotherapists need to pay close attention to patients' cardiac status during rehabilitation.

Ali et al. [182] investigated the use of an immediate postoperative prosthesis following transtibial amputation. There was a clear criteria for us of this immediate prosthesis and the protocol used. It reported similar benefits to the types of EWA's used commonly in the UK, however this method involves a rigid plaster cast around the residual limb, which is then placed inside a plastic shell which is attached to the prosthetic foot. This technique is used in many other countries but may require fabrication on site whilst patient is still in hospital, and requires weekly wound review and cast changes, so could place additional time constraints on appropriately trained staff.

Recommendations

5.8.1 ~~ The use of EWAs as an assessment and treatment tool is understood by the physiotherapist, with an awareness of the potential clinical benefits and precautions that require monitoring. **B** [7,71,121,133-137]

5.8.2 ~~ EWAs should be considered as part of the rehabilitation programme for all lower limb amputation patients as an assessment +/- treatment tool. **B** [7,42,71,121,133-138]

5.8.3 ~~ A physiotherapist experienced in amputee rehabilitation, should be responsible for the decision to start using the EWA, having liaised with other members of the MDT as necessary. **C** [136,137]

5.8.4 ~~ EWAs should be used under the supervision of therapists trained in their correct and safe application and use. **B** [3,7,71,121,133-137]

5.8.5 ** The physiotherapist should be aware of the cardiovascular impact of EWA and take patient observations as indicated. **B** [7,71,72,121,133-137]

Good practice points

GPP 27 The physiotherapist should be aware of the SPARG PPAM aid guidelines and ensure/maintain appropriate competence.

5.9 Falls management

Evidence

The National Confidential Enquiry into Patient Outcome and Death (NCEPOD)[9] recommended

that a falls risk assessment should be undertaken and put in place for every person with lower limb amputation. Three studies[143-145] have reported an increased risk of falls following lower limb amputation. Kulkarni[143] concluded that instruction on how to get up from the floor should be part of rehabilitation. Pauley[145] states that older age, greater number of co-morbidities, cognitive impairment and the use of a greater number of medications predict a greater likelihood of falling.

The current NICE Falls guidelines[55] and BACPAR guidance for the prevention of falls in lower limb amputees[6] further supports this evidence by identifying several risk factors along with appropriate assessment tools and multi-factorial falls prevention interventions.

Steinberg et al.[146] through a systematic review identified patterns of falling, categorised three different stages of the patient journey. They were post-op, during inpatient rehab and a community living return. All of these have different factors associated with them, earlier falls may be related to patient adjustment to their altered physical condition but patients with increased balance could be more at risk of falls in the community living phase due to increased likelihood of undertaking riskier behaviour compared to less physically abled patients.

Recommendations

5.9.1 ** The physiotherapist should ensure a falls risk assessment has taken place for all those with lower limb amputations. **D** [6,9]

5.9.2 ~~ The patient, carers and the MDT should be made aware that the risk of falling is increased following lower limb amputation. **C** [6,143]

5.9.3 ** All falls prevention should be tailored individual patients, with physiotherapists acknowledging that at different rehabilitation stages there may be different contributing factors. **A** [55,146]

5.9.4 ~~ Rehabilitation programmes should include improving strength and balance, as well as education on preventing falls. **C** [6,55,143,147]

5.9.5 Patients and carers should be given instructions on how to get up from the floor in the event of the patient falling. **C** [6,143,147]

5.9.6 Advice should be given in the event that the patient is unable to rise from the floor. **C** [143,147]

Good practice points

GPP 28 Within the MDT, the physiotherapist may contribute to the assessment of home hazards as part of discharge planning.

5.10 Prevention of contractures/maintenance of joint range of movement

Evidence

Early education to increase the patient's awareness as to implications of knee and hip flexion contractures on their prosthetic rehabilitation, increased their compliance to wearing knee splints and to completing active exercises[92].

Recommendations

5.10.1 ** Joint range of movement (active +/- passive) and muscle strength should be assessed and documented post-operatively. **D** [43]

5.10.2 Education of appropriate positioning should be given to reduce the risk of contractures. **D** [43]

5.10.3 ~~ Contractures should be prevented by education of active exercises and where appropriate the use of splints or above knee (removeable) rigid dressings. **A** [92,116,118]

5.10.4 ** If the patient is in a critical care environment and is unable to actively exercise, physiotherapists, along with other members of the MDT, should maintain joint range of movement through passive exercises, positioning or use of equipment. **D** [43]

5.10.5 ~~ Where contractures have formed, appropriate management strategies should be discussed with the MDT. **D** [43]

5.10.6 ** Where reduced range of movement has occurred; appropriate treatment should be. **D** [43]

5.11 Exercise programmes

Evidence

The WHO physical activity guidelines[148] for adults (18-65 years old), recommends at least 150 to 300 minutes of moderate aerobic activity per week (or the equivalent vigorous activity) for all adults. Furthermore, older adults (ages 65 years and older) should add physical activities which emphasise balance and coordination, as well as muscle strengthening, to help prevent falls and improve health[148,149].

Miller et al.[150] highlighted that there are several factors that influence physical activity after amputation such as social support, motivation and understanding the benefits of exercise. Ward and Meyers[71] in their review describe that with daily exercise, people with an amputation consume significantly less oxygen (i.e. use less energy).

Recommendations

5.11.1 ~~ The role of exercise therapy as an essential part of the rehabilitation process is understood by the physiotherapist. **C** [2,54,71,72,151-155,180]

5.11.2 ** Following on from the initial assessment, an exercise program should be provided to address the problems identified. This should be reviewed and progressed as appropriate. **D** [43]

5.11.3 ~~ An exercise regime should be given relevant to the patient's goals and reviewed on a regular basis. **D** [43]

5.11.4 ** It is important for the physiotherapist to support their patients to understand their physical condition and the effect of exercise to aid in motivation to exercise. **B** [150]

5.11.5 ** The physiotherapist should be aware of community resources that patients can access that will support them in being more physically active. **D** [43]

Several studies agree that exercise plays an important part in a functional rehabilitation programme following amputation[151-153]. They concluded that those who are fit enough can proceed straight away to prosthetic rehab, and those who aren't should be prescribed an exercise programme to complete first[152,153]. Erjavec[54] highlighted the importance of a cardiovascular exercise programme to increase fitness, as transfemoral amputees achieving 30W+ on an arm ergometer were more likely to achieve complete a 6 Minute Walk Test (6MWT) with a prosthesis.

Good practice points

GPP 29 Physiotherapists should be aware of the well-established Physiotherapy Inter Regional Prosthetic Audit Group (P.I.R.P.A.G.) exercise program [176]

GPP 30 Information on self-management/home exercise following discharge should be provided to the patient.

GPP 31 ~~ Where possible all verbal information/advice given should be supplemented in an accessible form to meet patients' needs and level of health literacy e.g. written - font size, language, different media.

GPP 32 ~~ Patients requiring ongoing outpatient/community referral should have this arranged prior to discharge.

5.12 Management of phantom sensation (PLS), phantom pain (PLP) and residual limb pain (RLP)

Evidence

In 2017, Kelle et al.[156] carried out a retrospective review and cross-sectional interview of 101 patients to determine the association between phantom limb complex and the level of lower limb amputation. They found that all patients had stump pain and PLS in the early post-op period. The incidence of PLS decreased to 80% at six months post-amputation. Patients with amputation proximal to knee disarticulation level had higher visual analogue score (VAS) scores for stump pain and PLP in the early post-op period. 90% of patients had PLP in the early post-op period. This decreased to about 45% at six months after surgery. There was no difference between the groups regarding pre-amputation pain, therefore the results demonstrate no relationship between preoperative pain and PLP. TFA and distal amputation were predictive factors for PLP.

Through a qualitative research project involving interviews, Trevelyan[157] found that PLP is a continual reminder of circumstances and noted it can affect quality of life, including sleep, fatigue, mood and relationships. They concluded that PLP should be considered clinically during therapeutic encounters, and those with limb loss should be given appropriate information on these potential associations.

The importance of addressing PLP is further supported by Polat et al.[158] who used a cross-sectional study to investigate PLP. Polat et al.[158] found that quality of life was significantly lower in the group with PLP ($p<0.05$) and therefore concluded that PLP should be treated to increase quality of life.

It is not just PLP that can affect quality of life. Gupta and Leung[66] found that post amputation pain affects 69% of patients post amputation. High-pain interference and poor self-efficacy were associated with poorer quality of life after adjusting for age, gender and cause of amputation. It

was therefore concluded that post amputation pain continues to be a major determinant of quality of life post limb loss. Pain and quality of life assessment should be integrated into routine clinical evaluation.

A range of modalities have been identified in the management of PLS, PLP and RLP. Physiotherapeutic management methods include mirror therapy[159], phantom limb exercises, progressive muscle relaxation, and mental imagery[160]. However, there is currently insufficient evidence to determine which modality to use.

Recommendations

5.12.1 The physiotherapist, along with other members of the MDT, should contribute to the management of pain as necessary. **D** [157]

5.12.2 ~~Methods of post-operative pain relief are understood by the physiotherapist. **A** [3,103-106]

5.12.3 ~~The physiotherapist is aware that pain (including RLS or PLP) may affect the quality of life of the amputee. **B** [66,156-158,161-163]

5.12.4 ~~As early as possible, patients should be made aware they may experience PLS or pain post-operatively. **B** [103,104,156,161,163]

5.12.5 Information and treatment regarding PLS and pain should be given by clinicians with appropriate knowledge and training. **B** [103,104,164]

5.12.6 Techniques for the self-management of PLP should be taught. **D** [104,165]

5.12.7 ~~Appropriate information and treatment should be given for RLP. **C** [157,158]

5.12.8 **All patients should be made aware of the increased risk of falls, due to PLS. **D** [43]

Good practice points

GPP 33 ~~Patients requiring ongoing outpatient/community treatment should have this arranged prior to discharge.

Section 6 – Health and Well-being

Introduction

Experience of loss is a universal reality, but loss experiences may differ between individuals. The importance of being allowed to express negative emotions and the development of skills to cope with these during rehabilitation, along with social support and interaction with others like themselves, was found to be very helpful[78].

Evidence

Peters et al.[89] in their prospective observational cohort study of 49 patients aged 70 and over, undergoing amputation due to critical limb ischaemia, found that quality of life and physical health scores improved after amputation, as did mental health scores, but in the longer term.

A small qualitative study by Madsen et al.[166] in 2016 used a constructivist grounded theory methodological approach to explain patients' behaviour shortly after having a leg amputated due to vascular disease. Three phases that patients go through shortly after having a leg amputated due to vascular disease was proposed: being losing control, digesting the shock, and regaining control.

Mayo[61] explored psychosocial needs after LLA and reported that many experience significant emotional distress following amputation and are at risk of developing anxiety and depression. Turner et al.[167] reported that amputees have increased rates of suicidal ideation at 12 months than the general population. Especially those with dissatisfaction with recovery or lower self-efficacy. Miller et al.[168] completed a qualitative analysis of the resilience characteristics of 18 people with unilateral transtibial amputation. Five themes of resilience were described: coping skills, cognitive flexibility, optimism, skills for facing fear, social support.

Woods et al.[51] and Ward Khan et al.[50] both investigated sexual functioning and body image, mood and anxiety after amputation. Woods[51] highlighted that the psychological challenge following limb loss are strongly associated with levels of sexual dysfunction. Ward Khan[50] highlighted that patients experience decreased sexual well-being, disrupted body image, stigmatism and resilience. Woods[51] recommended a need for psychological assessment following limb loss, to ensure appropriate and timely interventions are made available and that interventions that target the psychological factors related to sexual dysfunction (depression, anxiety and body image issues) are likely to improve overall quality of life for these individuals. Ward Khan[50] recommended compassion focused approaches in therapeutic intervention as well as the necessity for health care professionals to involve spouses in sexual rehabilitation conversations and encourage patient led peer support networks.

Recommendations

6.1 ~~ The psychosocial issues that may affect patients following amputation and the cognitive and psychomotor aspects affecting the rehabilitation potential of the amputee are understood by the physiotherapist. **C** [49,51,52,59-62,76,88,166,168,169]

6.2 The physiotherapist should have basic knowledge of the principles of counselling and should know when it is appropriate to refer a patient to a clinical psychologist/counsellor. **C** [3,49]

6.3 ** The physiotherapist should consider depression screening, including assessment for suicidal ideation, among patients - especially those dissatisfied with recovery or demonstrating low levels of self-efficacy. **C** [49,167]

6.4 ** The physiotherapist should recognise the phases of behaviour that a patient might pendulate through following an amputation, and support the patient to recognise, and understand the phases. **C** [49,61,166,170]

6.5 ** The physiotherapist should recognise the potential for resilience characteristics to influence rehabilitation outcomes following TTA in middle age, or older. A referral to the appropriate support and intervention should be made. **D** [168]

6.7 ** Where possible patients should be enabled to have contact with other amputees to encourage the adjustment process. **D** [166]

6.8 ** Patients should be encouraged to express their concerns and support given to help develop coping skills during rehab. **D** [166]

6.9 ** The physiotherapist should be aware of the increased risk of obesity following a lower limb amputation. **D** [132]

6.10 ** The physiotherapist should encourage the patient to be aware of the benefit of health and nutrition education following lower limb amputation, particularly if co-morbidities are present, and how to access this information e.g. diabetic team, dietitian. **D** [132]

Good practice points

GPP 34 The physiotherapist should be able to refer directly to a clinical psychologist/ counsellor if appropriate.

Section 7 – Developing specialist knowledge

Introduction
Working with adults following lower limb amputation, requires specialist knowledge in order to address the unique physical and psychological challenges of limb loss that go beyond general post-operative rehabilitation.

Evidence
Concurrent conditions will influence rehabilitation potential, and the physiotherapist should be aware of these[43,68,69]. In a systematic review, Sansam et al.[63] found that poorer health status can impact negatively on walking ability particularly given the increased energy requirements to walk with a prosthesis.

In a retrospective cohort of 254 lower limb amputees, Meikle et al.[95] found that interruptions to rehabilitation are common and result in longer periods of rehabilitation, but the outcome is not adversely affected.

Recommendations

7.1 ** The physiotherapist is responsible for keeping up to date with developments in amputee rehabilitation. This should include awareness of published guidance and recommendations and other learning opportunities. **D** [2,16]

7.2 ** There should be opportunities for CPD and lifelong learning, in a variety of forms. **D** [2,16]

7.3 The physiotherapist should have knowledge of surgical techniques used in amputation. **D** [43]

7.4 ~~ To provide effective rehabilitation the physiotherapist needs a good understanding of the factors that may influence the short- and long-term outcomes of rehabilitation. **B** [63,64,140,170]

7.5 ~~ The physiotherapist should be aware of the socio- economic impact of lower limb amputation. **D** [52]

7.6 ~~ Knowledge of the complications that may arise following amputation of the lower limb and how members of the MDT may deal with these complications is essential in order that the rehabilitation process may be adapted to accommodate these factors. **C** [67,69,109,114,171,172]

7.7 ~~ The physiotherapist also needs to have an understanding of prosthetic prescription principles and the prosthetic rehabilitation process to successfully plan and deliver rehabilitation. **D** [31,68]

7.8 ** The physiotherapist should be aware of a standard list of topics that should be covered before a patient's discharge. **D** [77]

7.9 ** Physiotherapists should have an awareness of post-operative nutritional demands after a lower limb amputation (especially when co-morbidities are present) and its impact on post-operative wound healing, and how to refer to specialist dietary service if indicated. **D** [173-175]

Good practice points

GPP 35 ** Patients should be treated as individuals, considering their socio-economic status, size and protected characteristics.

GPP 36 ~~ Patients requiring ongoing outpatient/community treatment should have this arranged prior to discharge.

GPP 37 A summary of the patient's treatment and status at transfer should be sent to the physiotherapist providing on-going treatment.

GPP 38 Prior to discharge, patients/carers should be provided with relevant contact details for any ongoing referrals i.e. prosthetic limb centre, community therapy, wheelchair services.

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Appendix 17
Glossary of terms
The following recognised terminology and abbreviations were used in the guideline document.

Abbreviations

2TWT – 2 minute Timed Walk Test
6MWT – 6 Minute walk test
AfC - Agenda for Change
AGREE - Appraisal of Guidelines for Research and Evaluation
BACPAR - British Association of Chartered Physiotherapists in limb Absence Rehabilitation
BLARt - Blatchford Leicester Allman Russell tool
BMI – Body mass index
CASP - Critical Appraisal Skills Programme
CPD - Continuing Professional Development
CSP – The Chartered Society of Physiotherapy
EBGs – Evidence based guidelines
ECG - Electrocardiogram
EWA - Early Walking Aid
FIM – Functional Independence Measure
GIRFT – Getting It Right First Time
GPPs – Good Practice Points
GUG – Guidelines update group
HCPC – The Health and Care Professions Council
HQIP – Healthcare Quality Improvement Partnership
LLA – Lower limb amputation
MDT – Multidisciplinary Team
MoCA - Montreal Cognitive Assessment
NCEPOD – The National Confidential Enquiry into Perioperative Death
NHS – National Health Service
NICE – National Institute for Health and Care Excellence
NMTRG - National Major Trauma Rehabilitation Group
NVR – National Vascular Registry
PAD - Peripheral Arterial Disease
P.I.R.P.A.G. - Physiotherapy Inter Regional Prosthetic Audit Group
PLP – Phantom limb pain
PLS – Phantom limb sensation
PPAM aid - Pneumatic Post Amputation Mobility Aid
RCT - Randomised Controlled Trials
RLP – Residual limb pain
SHTAC - Southampton Health Technology Assessment Centre
SIGAM - Special Interest Group in Amputee Medicine
SIGN - Scottish Intercollegiate Guideline Network
SPARG – Scottish Physiotherapists Amputee Research Group
TTA – Transtibial amputation
TFA – Transfemoral amputation
VAS – Visual analogue scale
VSGBI - The Vascular Society of Great Britain and Ireland

Appendix 18

Professional organisations:

British Association of Chartered Physiotherapists in limb Absence Rehabilitation (BACPAR)
https://www.bacpar.org/

The British Association of Prosthetics and Orthotics (BAPO)
2nd Floor, Clyde Offices, 48 West George Street, Glasgow, G2 1BP
https://www.bapo.com/

The Chartered Society of Physiotherapy (CSP)
3rd Floor South, Chancery Exchange, 10 Furnival Street, London, EC4A 1AB.
https://www.csp.org.uk/

International Society for Prosthetics & Orthotics UK (ISPO UK)
ISPO UK MS, PO Box 7225, Pitlochry PH16 9AH
https://www.ispo.org.uk/

Royal College of Occupational Therapy (RCOT)
https://www.rcot.co.uk/

Scottish Physiotherapists Amputee Research Group (SPARG)
c/o Joanne Hebenton (Chairperson)
WestMARC, Southern General Hospital, 1345 Govan Road, Glasgow, G51 4TF.
https://www.bacpar.org/resources/sparg-resources/

Amputee Medicine Special Interest Group for the British Society of Physical and Rehabilitation Medicine (AMSIG of BSPRM)
c/o Royal College of Physicians 11, St Andrews Place, London, NW1 4LE
https://www.bsprm.org.uk/sigam-special-interest-group/

The Society of Vascular Nurses
https://svn.org.uk/

The Vascular Society of Great Britain and Ireland
https://www.vascularsociety.org.uk/

Useful organisations:

Limb loss & limb difference UK
(alliance between **Amputation Foundation, BLESMA, Finding Your Feet, Steel Bones, LimbPower, Reach**)
https://www.limblosslimbdifference.co.uk/who weare

Amputation Foundation
https://amputationfoundation.org/

British Limbless Ex-Servicemen's Association (BLESMA)
https://blesma.org/

The Circulation Foundation
https://www.circulationfoundation.org.uk/

Day One Trauma
https://dayonetrauma.org/

Disabled Motoring UK
https://www.disabledmotoring.org/

Everybody Moves
https://everybodymoves.org.uk/

Finding Your Feet
https://findingyourfeet.net/

iC2a
https://www.ic2a.eu/

Limbcare
https://www.limbcare.org/

Limbless Association
https://limbless-association.org/

LimbPower
https://www.limbpower.com/

Steel Bones
https://steelbone.co.uk/