Third Edition 2025 – Process Document

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

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 this document: This document describes the evidence based clinical recommendations for the pre and post operative physiotherapy management of adults with lower limb amputations.

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]

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3rd edition Guideline update group:
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Acknowledgements: Thanks are due to the following groups:
The Guidelines Update Group (*Appendix 1a*)
Working Group from previous Editions of Guideline (*Appendix 1b*)
Professional Advisers (*Appendix 2a*)
Literature appraisers (*Appendix 6*)
Delphi Panel (*Appendix 9*)
External, Peer and Patient Reviewers (*Appendix 15a*)
British Association of Chartered Physiotherapists in limb Absence Rehabilitation (BACPAR)
The Chartered Society of Physiotherapists (CSP)
Southampton Health Technology Assessments Centre (SHTAC) – Lois Woods

These clinical guidelines present the best available evidence in the view of the authors. This follows careful consideration of all the evidence available. Healthcare professionals are expected to take it fully into account when exercising their clinical judgement. However, these clinical guidelines do not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or their guardian or carer. Implementation of this guidance is the responsibility of local commissioners and/or providers.
National Institute for Health and Care Excellence (NICE) recommends there is an ongoing literature search and regular updates over 5 years.

Comments on these guidelines and the additional documents should be sent to:
BACPAR Guidelines Co-ordinator.
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Contenjordts

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

Preface

The British Association of Chartered Physiotherapists in limb Absence Rehabilitation (BACPAR) is a professional network that is recognised by the Chartered Society of Physiotherapy (CSP). BACPAR encourages its members to use the biopsychosocial model of care. It aims to promote best practice in the field of limb absence, amputation 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.

The previous editions of these guidelines were published in 2016[1] and 2006. This third edition seeks to integrate new scientific evidence and current best practice into the original recommendations following similar methodology. The Delphi consensus method was replicated to ensure that recommendations based upon expert opinion capture and continue to reflect current thinking and best clinical practice. Further amendments and additions have been made to Good Practice Points (GPPs) from the previous edition.

The impact of the new evidence and the 2024 Delphi consensus are detailed at the beginning of each recommendation section; all new recommendations are marked (**) after the recommendation numbering and amended recommendations are marked (~~) for ease of identification.

This update of the guidelines remains split into 3 documents:

1. the Process document
2. the Recommendations document
3. the Audit and Implementation Guide.

There was a consensus from the BACPAR membership who attended the 2023 National Conference, that the following supplementary documents were not utilised due to having their own Trust's information. These have therefore been removed from publication:

- The public information leaflet ("*Information for the public about physiotherapy following amputation of a lower limb*")
- A poster for use in the clinical environment, that signposts to the public information leaflet.

Both previous editions, and this third edition, have been produced by members of the CSP who hold state registration with the Health and Care Professions Council (HCPC). At the time of production all members of the guidelines update group (GUG) were practicing physiotherapists and BACPAR members.

Aims of the guidelines

These guidelines have been produced to:

- Facilitate best practice for the physiotherapy management of amputees during the pre-operative and immediate post-operative phase of care.
- Support and inform all physiotherapists working in this field regardless of their level of experience.
- Identify and incorporate new published evidence into the guidelines recommendations.
- Assist clinical decision-making based on the best available evidence.
- Provide evidence for physiotherapists to inform service providers of best practice to promote quality and equity.
- Inform service providers to promote quality and equity.
- Reduce variation in the physiotherapy management of adults undergoing amputation.
- Facilitate audit and research.
- Reduce unproven and ineffective practice.

Objectives of the guidelines

These guidelines have been developed to:

- Provide a comprehensive process document outlining how the guidelines are produced and a recommendations document which will inform physiotherapists in the pre and post operative management of adults with lower limb amputation.
- Rigorously appraise the current relevant literature since 2016.
- Make recommendations for best practice based on the published evidence and expert consensus opinion.
- Facilitate the dissemination of information to relevant parties.
- Facilitate a tool for audit and benchmarking of local service provision against national best practice recommendations.

Throughout the update of these guidelines, the views of clinicians, individual service users, and service user focus groups recognised as being stakeholders/ interested parties, were sought *(Appendices 1b and 2)*. Their comments and suggestions informed the guidelines.

These guidelines do not constitute a legally binding document. They are based on the best evidence currently available and are intended as a resource to guide application of best practice. BACPAR recommends that these guidelines should always be

utilised in conjunction with the CSP Quality Assurance Standards[2].

If this document is being used for the purpose of service planning it should be read alongside other amputee-specific guidelines and documents developed by other healthcare professions, including groups representing service user views and pertinent government publications whose findings can be extrapolated to the lower limb amputee population[3-8]. The National Confidential Enquiry into Patient Outcomes and Deaths[9] (NCEPOD) is one such example.

These guidelines are intended for those adults who have undergone a lower limb amputation. However, it should also be acknowledged that not all lower limb absence have undergone an amputation, for example those with congenital limb deficiencies.

Throughout this document adults with lower limb amputation may be referred to as individuals, amputees, adults with limb loss or absence, patients, or service users.

Conflict of Interest

In accordance with National Institute for Health and Care Excellence (NICE) recommendations[10], a conflict-of-interest policy exists for BACPAR guideline updates. The conflict-of-interest policy is available from the Guideline co-ordinator.

A signed declaration of interest was provided by the BACPAR Chairperson, the BACPAR Treasurer, the GUG, the patient representatives (service users) and the reviewers. Only one potential conflict of interest was declared by the authors as working for a prosthetics manufacturer. This was discussed within the BAPCAR Executive committee and the GUG and was deemed not to be a conflict of interest, as these guidelines do not recommend specific prosthetic products.

Those physiotherapists who participated in the Delphi process and peer review were volunteers. The GUG and BACPAR considered volunteer physiotherapists to be part of this process and posed no conflict of interest.

The authors successfully applied for funding from the CSP Professional Network fund to support the development of these guidelines (see funding section for more details). No sponsorship was received during the development of these guidelines.

Introduction

The need to drive up clinical standards and the quality of clinical services so that meaningful improvements for the patient are seen, whilst maintaining cost effectiveness, is a central theme found in all recent government publications pertaining to the National Health Service (NHS).

Physiotherapists need to prove that they are providing clinically effective interventions and demonstrate their ongoing commitment to Continuing Professional Development (CPD) to maintain state registration.

In accordance with NICE guidance[10], BACPAR is updating the guidelines to support and facilitate the ongoing hard work of its membership striving to achieve best clinical outcomes and to secure the optimal local service provisions for patients who have undergone lower limb amputation.

Clinicians working within amputee rehabilitation have reported using the previous guideline editions in many ways:

- as a reference tool to guide best recognised clinical practice.
- to aid in the identification of personal and team learning needs specific to physiotherapy treatment of adults with lower limb prostheses.
- to benchmark local services against national, evidence-based recommendations and use the findings as drivers in the development of local service provision and local protocols.

Definition of clinical guidelines

Evidence based guidelines (EBGs) are '*systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific circumstances*'[11].

The practice of evidence based medicine means integrating individual clinical expertise with the best available external evidence from systematic research.

Figure 1[12] highlights the key stages undertaken by the authors of all editions of these guidelines. The filtering and refining of research information to create a 'knowledge product' with clear, concise and explicit recommendations and aims, follows the knowledge translation model proposed by Graham et al [13]. Guidelines seek to guide the clinician/stakeholder through steps of knowledge acquisition to transfer and facilitate instrumental use of this new knowledge by actioning changes in clinical behaviour.

Clinical governance and professional responsibility

Clinical governance is a central theme promoted

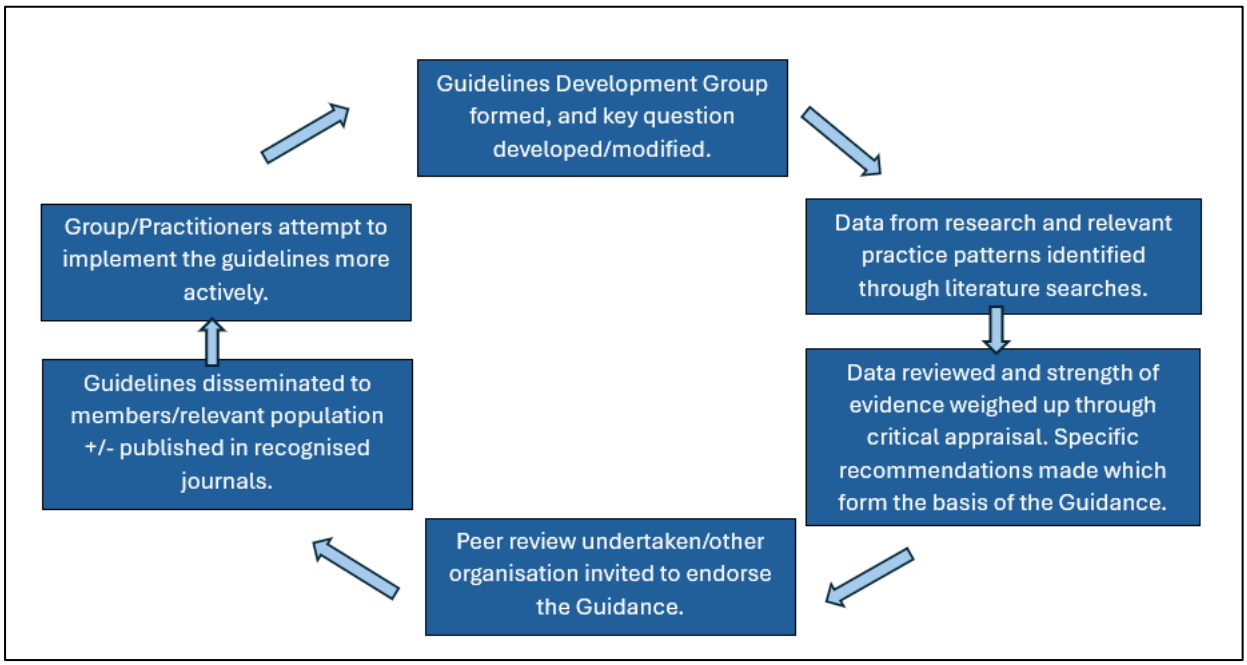

Figure 1: Key stages of the Guideline Development Process

within the NHS. Evidence based practice is recognised as a statutory duty for health organisations to examine the quality of healthcare provided[14,15,16].

Although there continues to be political and policy changes, the elements of clinical governance continue to drive many changes within the physiotherapy profession. Successive Governments have recognised the need for health care professionals to be informed of change and improvements within clinical practice and to remain in touch with current research findings that affect clinical decision-making[15, 16].

The HCPC have made CPD a regulatory requirement for physiotherapists and, through commitment to lifelong learning, physiotherapists are required to be reflective practitioners and base clinical judgements on the most appropriate information available[16].

Resource implications

Since the previous edition of these guidelines, there have been many changes and challenges to the NHS, and there has been significant impact on services treating amputees[17,18].

Major lower limb amputation has a profound effect on quality of life with high levels of morbidity and mortality[19-23]. The cost of prosthetics service to the NHS requires an enormous commitment in terms of finances, equipment and resources and warrants maximum clinical effectiveness to ensure a cost-efficient service.

Most recent figures from NHS England are estimated that the number of people with an amputation or limb difference in England is between 55,000-60,000 [17]. In the latest Scottish Physiotherapy Amputee Research Group (SPARG) report, data for amputations in Scotland for 2021 showed 698 new major lower limb amputees, with 45% went on to have a prosthesis fitted[24].

Multidisciplinary rehabilitation of this patient group consumes significant resources. Learning to use a prosthesis to minimise the disability caused by the loss of a limb demands highly skilled, specialised therapeutic input, as well as the provision of costly prosthetic componentry/ specialised equipment.

The London Paralympic Games in 2012, in addition to the Invictus Games in 2014, showcased disability and have shaped both the public and service users expectations of amputation and prosthetic limbs.

The dissemination of well-researched clinical guidelines enables patients and all grades of clinician to base decisions on the best available evidence. They also assist in the delivery of an efficient and cost-effective service.

Identifying the need for guidelines specific to physiotherapy treatment of adults with lower limb amputation

In the field of amputee rehabilitation, strategic thinking is needed to address the long-term needs of the patient. This involves teamwork and consultation, which should include the patient and their carers. There is a wide variation nationally in the quality, type of service and care offered by physiotherapists to

adults with lower limb amputation[10, 24,25].

These guidelines will provide best practice recommendations to allow benchmarking and audit of local service provision.

Commonly, within the current healthcare environment a patient will not necessarily be treated by a physiotherapist with 'specialist' knowledge of the pre and post operative management of the lower limb amputee. In the past 'senior colleagues' have been the most relied upon source to inform and develop clinicians[26]. However, specialist senior staff are becoming fewer in number due to re-banding and re-configuration of services. It is, however, also recognised that a high number of these senior colleagues specialising in amputee and prosthetic rehabilitation are lone practitioners[27] and that specific CPD opportunities for more experienced clinicians may be limited. It is therefore important to ensure that professional expertise is integrated with scientific evidence to promote truly 'evidence-based practice'[28]. In these instances, guidelines may be helpful in assisting the clinician to access the research base, eliminate unacceptable local/national practice variations and improve the quality of clinical decisions by promoting reflection on therapeutic strategies currently utilised.

Past evidence suggests there can be some resistance amongst some practitioners towards adopting of evidence-based guidelines as there is a fear that diminished personal autonomy, restriction of clinical freedom and resource limitations may lead to 'average' clinical practice being widely promoted rather than clinical excellence [11, 29].

A clinical guideline is not a mandate for practice – it can only assist the clinician with the decision-making process about a particular intervention. Consideration of the strength of the evidence on which the guidelines recommendations are made is important; however, it is the responsibility of the individual clinician to interpret their application for each individual patient encounter. Guidelines do not negate the need for physiotherapists to use their clinical reasoning skills or have discussions with patients about their management. This will include taking account of patient preferences as well as local circumstances; patient consent should always be gained prior to any treatment[2].

BACPAR recognise that local resources, clinician prioritisation, as well as the rehabilitation environment in which the practitioner works, will influence the implementation of the guidelines. It is, however, encouraging that senior clinicians currently practising in the field of amputee rehabilitation do report using previous editions of these guidelines in a number of ways as identified in the introduction.

Method

Process of updating the guidelines

The NICE Guideline manual[30] suggests that: "*Any decision to update a guideline must balance the need to reflect changes in the evidence against the need for stability*."

In 2022, the BACPAR Executive committee agreed to a third review of the guidelines due to potential changes in physiotherapy management over time and the availability of new evidence. Priority was given to this update to ensure the work remained relevant and valid.

The guideline update group (GUG)

A working party of BACPAR members was formed. Volunteers were requested via the professional network and were sought predominantly from the acute sector reflecting the necessary experience and skills needed to compile these clinical guidelines (*Appendix 1a*). All members understood the use of guidelines in assisting and informing clinical practice, with some members having post graduate experience of guideline development. The BACPAR Guideline co-ordinator led the working party and conflict of interests were declared (see *Preface* for more details).

Details of the previous working parties involved in the development and writing of the previous editions are detailed in *Appendix 1c*.

No physiotherapy-specific literature/information regarding the update of clinical guidelines was identified. The methods utilised during the updating process have therefore been drawn from those outlined within '*The Guideline Manual*' developed by NICE[30] (**Figure 2**).

Service user involvement

Throughout the updating of these guidelines, the views of clinicians, individual service users, service user focus groups and professional advisers recognised as being stakeholders/ interested parties were sought – see *Appendices 2b, 3d and 15b*. Their comments and suggestions informed the guidelines.

Preparation for updating

Before updating could begin, the GUG undertook a survey of clinicians using the previous edition to identify how the current guidelines were being used

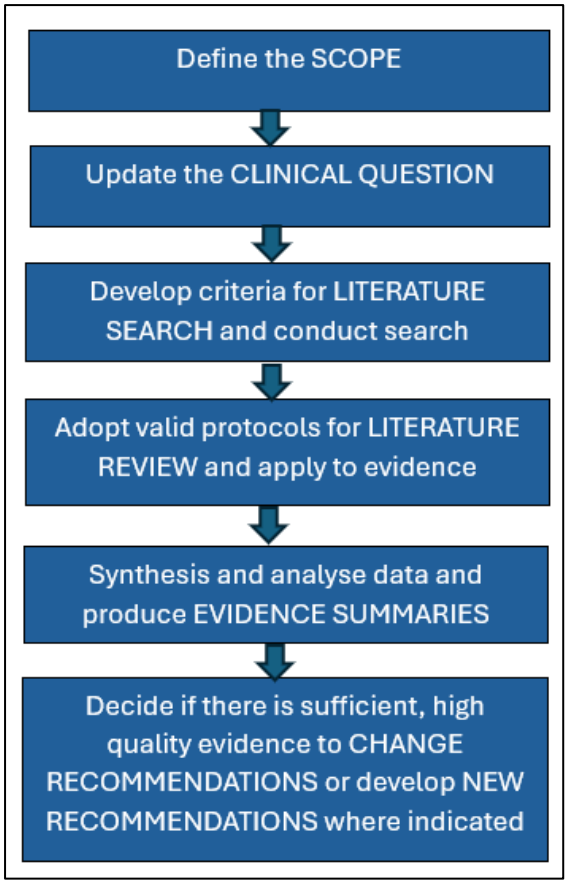

Figure 2: Summary of the six basic steps identified in the updating of a Guideline

and what changes may be useful. Clinicians completed a Survey Monkey questionnaire posted on iCSP and the BACPAR members Facebook page. Clinicians were asked to comment on the relevance of the guidelines; the content; current format, presentation, and language. See *Appendix 3a* for the questionnaire and *Appendix 3b* for a summary of the main comments.

Previously, clinicians working within amputee rehabilitation reported using the first edition in different ways:

- as a reference tool to guide best recognised clinical practice.
- to aid in the identification of personal and team learning needs specific to physiotherapy treatment of adults with lower limb amputation; and
- to benchmark local services against national evidence-based recommendations and use the findings as drivers in the development of local service provision and local protocols.

These uses remain accurate according to the latest survey.

The update group also asked patients for their comments on the previous edition of the guidelines and public information leaflet and flyer. This was collated using feedback questionnaires to individual patients and to patient user groups. The focus of this questionnaire was to identify if patients were aware of the guidelines and, if they were, if they were useful in informing patients of what physiotherapy they should expect to receive following amputation. See *Appendices 3c and 3d* for the questionnaire and summary of the main comments.

The feedback from these surveys was used to inform the production of the 3rd edition of the guidelines and the cessation of the public information document.

Following the results of these surveys BACPAR confirmed its decision to update this guideline to support and facilitate its members striving to achieve best clinical outcomes and secure the optimal local service provisions for patients who have undergone lower limb amputation.

Funding

BACPAR, as a professional network is funded by its members' subscriptions and these funds support the development of any guideline produced by BACPAR. This funding is not conditional on editorial input. The members of the GUG are all BACPAR members and carry out the update within their own work time. Members of the GUG claim their travel expenses to get to GUG meetings from BACPAR.

During the update process, the authors successfully applied for funding from the CSP Professional Network fund to support the Literature search completion of the guidelines. The funding was awarded to BACPAR and will fund the literature search being carried out by Southampton Health Technology Assessment Centre (SHTAC) at the University of Southampton, for both the two main BACPAR produced guidelines (prosthetics and pre-post operative guidelines).

All the guideline documents will be available electronically via the BACPAR website.

Scope of the guidelines

The scope of these guidelines is purposely broad. It was not BACPAR's intention to include details of specific areas of physiotherapy management as these would detract from the broader overview that these guidelines present. They are intended to be a framework for best practice that all physiotherapists should aspire to achieve
as part of their professional responsibilities.

These guidelines address the pre and post operative physiotherapy management of adults with lower

limb amputation. They are applicable to all major levels of amputation, including bilateral amputation, and all causes and pathologies.

The levels of amputation **covered** by the guidelines are:

- Trans-pelvic
- Hip disarticulation
- Trans-femoral
- Knee disarticulation
- Trans-tibial
- Ankle disarticulation (Symes).

The guidelines commence when the decision is taken to amputate and continue until the receipt of the first prosthesis or until completion of rehabilitation as a non-prosthetic user. The physiotherapy management of the patient once a prosthesis is delivered is addressed in '*Evidence based clinical guidelines for the physiotherapy management of adults with lower limb prostheses*' [31].

The guidelines **do not** cover:

- Specific types of equipment such as walking aids, wheelchairs and prosthetic componentry
- Upper limb prosthetic management
- Prosthetic care of the amputee
- Care provided by members of the MDT who are not physiotherapists
- Children
- Digital and partial foot amputations
- Cost effectiveness.

The clinical question

The clinical question is unchanged from the previous editions of these guidelines:

> "***What physiotherapy management constitutes best practice for adults requiring lower limb amputation, from the pre-amputation phase until receipt of the first prosthesis or completion of rehabilitation as a non-prosthetic user***?"

The GUG sought to assess whether new evidence and/or clinical developments have changed what is considered to be best physiotherapy practice.

Literature search

Aims of search:
To identify literature relating to the pre and post operative management of adults with lower limb amputation from **November 2010 – February 2023.**

The literature search was limited by:
Inclusion criteria

Articles were included if they were:

- Published from November 2010
- Published in English (for practical reasons)
- Relevant to lower limb amputees
- Relevant to adults, 18 years of age and over
- Relevant to all pathologies/causes of amputation
- Relevant to all major levels of lower limb amputation i.e. trans-pelvic, hip disarticulation, trans-femoral, knee disarticulation, transtibial and ankle disarticulation (Symes).

Exclusion criteria
Articles were excluded if they were related to:

- Prosthetic care of the amputee
- Surgical management of the amputee
- Upper limb amputees
- Paediatric amputees
- Minor levels of amputation e.g. partial foot.

Method of literature search

Literature searches were conducted in February 2023 by a SHTAC information specialist, who based the search protocol and key words developed in the first edition of the guidelines,

The search terms were expanded to include more specific terms utilised in the Oedema management guidelines that were developed as part of an MSc Amputee Rehabilitation group project at Bradford University in 2012, as these will not be updated separately, but still provide useful evidence and knowledge to physiotherapists managing amputees.

The following databases were searched:
AMED, Cinahl, Cochrane Library, DARE, Embase, Medline, PEDRO.

Key words

To make the search as sensitive as possible MeSH terms were used in conjunction with keywords and free text.

The MeSH terms used were amputation, physiotherapy, physical therapy, post operative care, pre operative care, exercise therapy, and rehabilitation.

The key words and free text used were physical therap*, physiotherap*, exercise therap*, therapeutic exercise*, rehab*, amp*, manag*, care*, lower limb* and lower extremit*.

Selection of relevant articles

The results from each database search were assessed and all duplicates removed. The GUG undertook the appraisal by dividing into pairs and then the abstracts were distributed equally. The abstracts were then

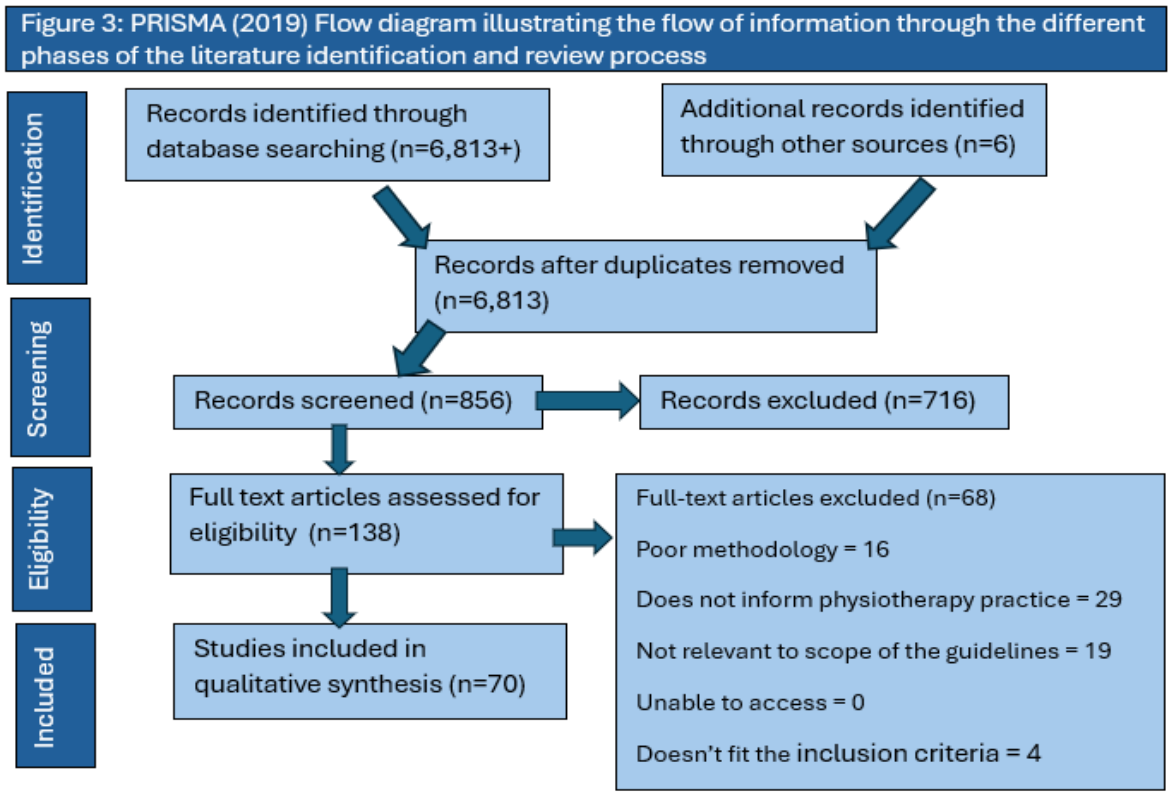

Figure 3: PRISMA flow diagram

reviewed to ensure the article met the inclusion criteria.

From the abstracts, the articles were excluded if both appraisers felt the study was:

- not relevant to the guidelines
- contained inconclusive evidence and
- purely descriptive.

All articles deemed relevant were obtained in full to be critically appraised. Details of the articles excluded after full review are displayed in *Appendix 7*.

Figure 3 details a completed PRISMA flow diagram illustrating the flow of information through the different phases of literature identification and review.

The appraisal process

The GUG undertook the literature appraisal (*Appendix 6*). The Critical Appraisal Skills Programme (CASP) tools[32], specifically developed to help evidence-based analysis in health and social care settings, were selected to guide article appraisal. There are separate tools devised to help appraise different types of research methodology, each has simple applicability. All appraisers practised using one of the tools to compare their results and ensure consistency.

Classification of included articles

Each pair agreed on the relevant CASP tool and carried out separate reviews on full text articles prior to discussing it to minimise potential bias. For each article the pairs completed an 'evidence table' detailing the study design, characteristics, subject of study/intervention, comments, potential use in guidelines and level of evidence. The level of evidence of each article was classified using the SIGN grading tool[33] (*Appendix 13*).

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 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

65 articles were identified as providing new evidence. Completed evidence tables were reviewed by the GUG and, where ambiguous or contradictory comments were found, the full text article was revisited and further detail added.

The evidence tables for all articles utilised in the previous and current edition of these guidelines are found in *Appendix 9*.

The consensus process

It was recognised in the previous editions[1] that, in some clinical areas, the literature did not provide sufficient evidence to develop recommendations; the authors therefore chose the Delphi technique to obtain consensus opinion where the literature was lacking.

Given the length of time that had elapsed since publication it was felt by the GUG that it was important that the expert opinion (from which 'D' graded recommendations had been developed) be scrutinised to ensure they continue to be a true reflection of current ideas and clinical practice.

The Delphi technique

The Delphi technique involves a series of questions to 'obtain the most reliable consensus of opinion of a group of experts… by a series of intensive questionnaires interspersed with controlled opinion feedback'[34].

It is a widely utilised methodology within health care for gathering expert opinion and turning it into group consensus[35] and, although more time consuming and labour intensive than a conference, the Delphi Technique ensures that:

- all contributors have an equal voice
- geographical barriers do not prevent participation
- there is consideration of all possible options for treatment and
- practising clinicians have the opportunity to contribute to and develop the guidelines.

The Delphi process

In the original process three rounds of postal questionnaires were sent out before recommendations were written. It was decided that those recommendations that currently had level D grading would be the statements that needed to be tested by the Delphi process and would be the basis for the questionnaire for the subsequent editions. The current guidelines Delphi questionnaire can be found in *Appendix 11*.

No literature could identify a universally acceptable percentage at which it could be determined that consensus agreement had been reached. Previously, it was decided that if 75% or more of the respondents scored more than 75% agreement with a statement, consensus would be reached. If consensus was 75% or below, the statement would not have the agreement of the panel, and the question would be refined for a second round. If consensus could not be reached after all the rounds of questionnaires, then no recommendation would be written.

The consensus panel

No specific panel size has been identified as being optimal for the Delphi process; representation should be assessed by 'qualities of the expert panel rather than its numbers' [35].

The consensus panel utilised in the updating process consisted entirely of physiotherapists because the Delphi questions were directly related to physiotherapy practice.

The panel inclusion criteria remain unchanged - Physiotherapists who:

- were working as a senior physiotherapist or clinical specialist
- had worked mainly with amputees (pre and post-surgery) for a minimum of two years and
- had postgraduate training in the field of amputation rehabilitation.

Invitations to participate were sent out by an appeal on the amputee network on the iCSP website, and the BACPAR members only Facebook group by the BACPAR guidelines co-ordinator. Thirty-three clinicians were recruited *(Appendix 10).*

For round one a return rate of 75% was achieved with twenty five out of the eligible thirty-three 'experts' returning a completed Delphi questionnaire.

No literature reviewed could identify an acceptable return rate for the Delphi technique; as subject numbers closely reflect those gained in the previous editions, any bias introduced by a difference in response rate is unlikely to be significant.

Round one Delphi results

Four statements did not have consensus of more than 75%; therefore, a further round was indicated.
Using the feedback from the consensus panel, four statements were reworded and were resent to those in the original panel who returned their responses to Round 1 (25 participants).

Round two Delphi results

20 responses were received giving an 80% response rate. Consensus of over 75% agreement was indicated by 15 responders, giving a level of agreement of 85% for all reworded statements. A further round was therefore not indicated.

- *Appendix 12a* displays the results of the online questionnaire.
- *Appendix 12b* outlines the impact and changes made to the guidelines following the comments from round one of the Delphi process.
- *Appendix 12c* outlines the comments received from the 2nd round of Delphi.

Drafting the updated guideline:

A considered judgement of all new evidence identified was made by the GUG (*Appendix 1a*) and reviewed considering the section headings utilised in the guidelines previous editions.

Section headings:

The original authors (*Appendix 1b*) had decided upon section headings for the recommendations using:

- CSP Core Standards (now replaced by CSP Quality Assurance Standards [2])
- Knowledge and expertise of the working party

It was agreed that five of the original six section headings utilised in the guidelines previous editions remained clinically relevant and representative of the evidence. With new evidence considered, there was an additional heading and an adjustment to the Knowledge heading title, to represent the need to develop specialist knowledge in this area.

Updating the guideline and incorporating new evidence

The introduction was reviewed and updated to reflect changes within NHS and professional policy; additions and changes to the methodology utilised were made.

Following appraisal of the new evidence each section of the previous guideline was re-examined by the GUG; consensus was gained within the group as to whether the new evidence strengthened previous recommendations or supported a new recommendation being developed. Once the new literature was amalgamated, levels of evidence for each recommendation were allocated (*Appendix 8*) reflecting the strength of the supporting evidence from which they were formulated.

The recommendation grading system utilised gives guideline users information about the quality of evidence upon which each recommendation is based; it does not rank recommendations in the authors perceived level of importance. It is acknowledged that it is sometimes not appropriate to use a RCT to answer therapy research questions,[28,29,33] hence there are very few 'A' graded recommendations.

The authors continue to find that there are large areas of pre and post operative physiotherapy input with lower limb amputees where no supporting published evidence exists; in these instances, expert opinion has been revisited using the Delphi process and recommendations derived from this can only receive a 'D' grading.

Good Practice Points (GPPs):

The previous edition[1] replaced existing 'Local Implementation Points' with GPPs. These GPPs by definition[33] reflect a 'common sense' approach to intervention and achieved consensus through the Delphi process.

Having updated the 7 sections of guideline recommendations, it was these that were sent out for considerations using the Delphi process previously described. In parallel, these 7 sections of updated guideline recommendations were sent to lay/patient representatives for their feedback.

See *appendices 12a, 12b, 12c* for the Delphi questionnaires and feedback comments.

Guideline audit tool

It is recognised by validated guideline appraisal tools (i.e. the AGREE II tool[36]) that a guideline should present key review criteria that individual practitioners could utilise in the monitoring and auditing of their own service/practice.

Updating the Audit tool

The previously developed audit tool was reviewed as part of the updating process and changes made in line with new evidence and GPPs.

The audit tool remains split into three distinct tools:

- service evaluation
- personal achievement of GPPs
- patient notes audit form

It is hoped that these standalone audit tools will decrease some of the time burden on the auditor/ clinician as they can be completed at separate times and could be utilised as evidence of continued professional development – e.g. completion of audit tool 2: Personal achievements of GPPs.

The audit tool is available as a standalone document and can be found on the BACPAR website:

Public Information document

The previous guidelines edition[1] developed a public information document, which was updated during the subsequent Prosthetic guidelines update. However, following feedback from the attendees (mostly BACPAR members) at the BACPAR Annual National Conference 2023, it was determined that each hospital Trust has their own guidance that is provided to patients/service users, and the information in this document is more in depth and localised, compared to the document developed alongside the guidelines. The decision was made to withdraw the BACPAR public information document for this update.

Review of the drafted guideline update:

Seeking feedback from Stakeholders/interested parties

As recommended by NICE, the AGREE II guideline appraisal tool was used as a tool to assist the reviewers to deliver a quality judgement about these guideline's usefulness and validity; see *Appendix 15* for the specific domains examined [30,36]. Once a full draft of the process document, the Guideline recommendations and the audit and implementation tool were completed, these were sent with the AGREE II tool to:

Peer reviewers

- non specialist Physiotherapy staff with or without experience of the pre and post operative management of the lower limb amputees were invited to comment upon the draft guideline. A mixture of staff grades, clinical specialities and geographical location was sought to maximise the strength of the peer feedback.

This was initially carried out by inviting interested Band 5 and Band 6 physiotherapists who responded to an invitation published on the iCSP amputee network and the BACPAR members Facebook group (*Appendix 15a*). However, due to the poor completion rate, this was extended to higher banded levels of physiotherapists.

External reviewers

These stakeholders were approached to be part of the review process as they had advised on the previous editions and, as they are considered to represent all the multidisciplinary aspects of amputee rehabilitation, their expert opinion is highly valued. (*Appendix 15a*)

- **BAPO** – The British Association of Prosthetics and Orthotics is the recognised professional body representing the prosthetic and orthotic workforce across the United Kingdom.
- **BSPRM** - The British Society of Physical Rehabilitation Medicine a medical Society dedicated to rehabilitation with a special interest group "Amputee Medicine Special Interest Group (AM SIG)" for those interested/working in the field of amputee medicine.
- **ISPO UK** - International Society for Prosthetic and Orthotics UK is an interdisciplinary society for professionals working in the fields of Prosthetics and Orthotics and in the associated areas of Rehabilitation.
- **PARs OT** – Prosthetic Amputee Rehabilitation Occupational Therapists special interest group provides a forum for occupational therapists and occupational therapy staff that have an interest in upper and lower limb prosthetics and rehabilitation.
- **SPARG** - Scottish Physiotherapy Amputee Research Group are the equivalent of BACPAR in Scotland and are involved in guideline development themselves.
- **The Society of Vascular Nurses -** is a professional organisation for vascular nurses throughout the UK and Ireland.
- **VSGBI** - The Vascular Society of Great Britain and Ireland is the pre-eminent organisation in the country promoting vascular health by supporting and furthering excellence in education, training and scientific research. The Society represents & provides professional support for over 600 members, including vascular surgeons, vascular radiologists & others involved in independent vascular practices in Great Britain and Ireland. The Society focuses on non-cardiac vascular disease, including diseases of peripheral arteries, veins & lymphatic. Vascular specialists are trained in the diagnosis and management of conditions affecting all parts of the vascular system.

Service Users

Service users were asked to comment on the guidelines (A*ppendix 15a*), including representatives from:

- **The Limbless Association (LA)**
- **LimbPower**
- **Steel Bones**

The recommendations and comments from all the reviewers were considered by the GUG. In addition, some of the peer reviewers included members of their MDT e.g. Occupational Therapists, Prosthetists. They

were collated and themed and where appropriate the document was amended to produce the final documents. See *Appendix 15b* for their comments and suggestions and actions taken.

Review and further updates of the work

The GUG acknowledges the length of time that has elapsed from when the initial literature search and CASP appraisals were carried out, to the update publication of the updated guidelines. However, during this process members of the GUG were involved in various conferences, CPD events and liaised closely with the research officer. These regular events provide opportunity for any new developments that could impact on the guidelines to be highlighted. BACPAR executive meetings also have the guidelines as a standing item on the agenda with a detailed report and newly published evidence can be disseminated via '*Article Corner*', in the biannual BACPAR journal.

The role of the guideline co-ordinator will be important in the continual review and updating of all the guidelines produced by BACPAR. The guidelines for Care of the contra- lateral limb[8] and the Falls guidelines[6] are due for review. It was recognised that during the literature search for the pre and post-operative guidelines, articles were sourced that would support the Care of the contra-lateral limb and the oedema management guidelines[7], and therefore it is proposed that the literature searches used for these two updates will incorporate the search criteria for the pre and post op guidelines, and if articles are identified as supporting the pre and post op guidelines they be appraised and added to the body of evidence.

Therefore, the GUG continues with the plan that going forward the following processes will be adopted to improve the updating process:

- The guideline co-ordinator, liaising with BACPAR's Research officers, will undertake an annual literature review and appraise any relevant articles.
- Any new evidence that is appraised as adding to the body of evidence will be added to the recommendations document and information about this new evidence will be disseminated in the same way through regional networks, iCSP, BACPAR conference and the journal.
- The guideline co-ordinator will update the BACPAR Executive committee of any new evidence in their report at the March executive meeting.
- The guideline co-ordinator liaises with the MSc Amputation and Prosthetic Rehabilitation (University of Southampton) course lead and BACPAR Education officers to consider the opportunity for participating students to identify areas lacking in evidence with the potential for supporting course assignments and/ or research dissertations.

BACPAR will then continue to assess the need to undertake a major review and update of the guidelines after a period of 5 years. The new processes outlined, and the knowledge that the amount of new evidence for physiotherapy within amputee management being published is small, will impact on the update process.

With the information gathered on an annual basis, BACPAR's executive committee will have assessed the amount of new evidence available. They will discuss whether there is sufficient new evidence, or if there has been a change in clinical practice by either healthcare professions and/or patient and carer organisations, that would warrant a major review and update. A decision will then be made either to update the guideline or produce a statement detailing the reasons why it will be postponed.

Health benefits, side effects and identified risks

The recommendations within the guidelines are evidence based and support best practice. Further details of the health benefits of each recommendation are detailed under the relevant guideline section. No side effects or risks were identified from the literature, professional advisers, reviewers or consensus panel.

Implementation and dissemination of the updated guideline

Publication and Presentation:

The guideline is accessible from the BACPAR website. It is good practice that all guidelines be free to all who wish to access them as established by the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities (http:// oa.mpg.de/openaccess-berlin/berlindeclaration).

The regional networks of BACPAR membership will support the implementation and promotion of this guideline update at a local level by supporting various CPD opportunities.

The GUG will also seek to present at relevant national and international conferences to disseminate to multi professional audiences.

The GUG will seek to use the stakeholders already involved to facilitate dissemination of the updated guidelines through their own networks and communications links.

Dissemination of the guideline can be further enhanced using social media networks. This will be supported by the Public Relations Officer in the BACPAR executive committee.

Barriers to implementation

To adopt the recommendations in this guideline several factors should be considered which may act as barriers to their implementation. Although implementation of these guidelines may have cost implications, a cost benefit analysis could not be undertaken as the data required to enable an economic evaluation is not available.

Implementing these guidelines may involve further training of staff. The co-operation of other members of the MDT is required for full implementation of these guidelines.

It is unfortunately outside the scope of this work to directly address the varying local resources identified through the Delphi consensus exercise; the authors suggest that the evidence-based recommendations could assist in presenting a 'case of need' to healthcare managers in areas where non- compliance can be demonstrated.

Implementation outside of the UK

These guidelines were developed within the context of the UK healthcare system, encompassing both the NHS and private healthcare sectors. However, there is evidence that BACPAR guidelines have been adopted and applied internationally [179]. It is therefore important to acknowledge that these, and all BACPAR guidelines, should be appropriately contextualised to the specific country and healthcare system in which they are implemented. Variations in available resources, including staffing levels, professional expertise, and access to equipment, are likely to exist and should be taken into consideration.

Limitations to this guideline update

As documented throughout this Process document, the guideline update group sought to maintain and enhance the methodological robustness of these guidelines, with the aim of providing up-to-date, evidence-based recommendations. Nevertheless, a number of limitations were identified during the update process.

The guideline update was undertaken by contributors working on a voluntary basis alongside their routine professional roles. Dedicated funding was required to support the literature search and review conducted by SHTAC, and a substantial interval had elapsed since the previous update. As a result, the update process was lengthy. At the point of publication, the literature search had been completed approximately two years earlier, and it is therefore possible that more recent evidence has since emerged that could influence the recommendations. Adoption of a *living guideline* approach may help to address this issue in future updates; however, it requires continuous evidence surveillance, expert review, and updating and may lead to issues with quality of the methodology.

The evidence identified through the literature review remains limited in both volume and quality. This reflects, in part, the stage of the amputation pathway addressed by the guidelines, for which high-quality research evidence is limited.

A number of older publications remain cited within the guidelines and have been clearly identified in the reference list. These have been retained due to the limited availability of more recent evidence and because they continue to underpin key principles of evidence-based physiotherapy management for people with lower limb amputation.

External stakeholder engagement, including patient and public involvement, was also challenging. Given the length and complexity of the guideline documents and the review tool, participation required a substantial time commitment, which limited the extent of feedback received.

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Appendix

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

Appendix 1a
Guideline Update Group – 3rd edition

Rachel Humpherson – Guideline co-ordinator, Lead author
Rachel developed a special interest in amputee rehabilitation after graduating in 2011 from Manchester Metropolitan University. She gained experience with more complex cases whilst working in a regional prosthetic rehab centre for 3 years, treating a mixed caseload of NHS patients and military veterans, providing experience of treating patients with a wide variety of Microprocessor Knees and treating both upper and lower limb patients. Rachel has been working at Össur since 2017 as a Clinical Specialist Physiotherapist, providing clinical support and training to physiotherapists using Össur products for both upper and lower limb patients. Rachel has delivered seminars both in the UK and internationally. Additional, Rachel has held the role of BACPAR guidelines co-ordinator since 2016, during which the Prosthetics guidelines update was completed in 2020.

Kate Lancaster – Guideline co-ordinator
Kate specialised in amputee rehabilitation at Queen Mary's Hospital, Roehampton for 16 years, specialising in phantom limb pain management and falls prevention.

Karen Clark - Guideline co-ordinator
Karen has worked as the lead physiotherapist at Derby's Amputee Rehabilitation Centre since 2006. Her role covers the assessment and treatment of adult, lower limb amputees both within the outpatient and community setting. Prior to this she gained experience in acute amputee care and discharge planning whilst working within large NHS teaching hospitals based in London and Leicester. She has been involved in BACPAR since 2007 and has held roles in the Executive Committee of Diversity Officer and Guideline Co-Ordinator. Karen has completed a Post Graduate Certificate in Amputee Rehabilitation from Bradford University and was co-author of the BACPAR adopted guidelines 'Risks to the contra-lateral foot of unilateral lower limb amputees: A therapists guide to identification and management' and 'Post-operative Physiotherapy Management of Adults with Lower Limb Prostheses' (2nd edition) which she presented nationally. Recently she has been instrumental in developing the MPK service within the Derby prosthetic centre to ensure that her patients are benefitting from the specific funding available from NHS England. Karen also works as a Clinical Educator undertaking teaching to final year medical students studying at Nottingham University and is co-author of a publication discussing the teaching of rehabilitation skills to medical students. She is involved in the support and training of therapists within the Southern Derbyshire region and is a peer reviewer for 'Disability and Rehabilitation' journal.

Katharine Atkin

Katharine qualified in 1996 with a BSc Honours degree in Physiotherapy from the University of Brighton, and she obtained an MSc in Rehabilitation Studies with Distinction from the University of Strathclyde in 2010. She started working in amputee rehabilitation in 2001 and has worked in several prosthetic centres since then. Katharine is currently working as the Lead Amputee Physiotherapist at a local community hospital and works in the private sector as an independent physiotherapist, offering amputee rehabilitation in local clinics, or in a client's own home. Katharine also works as an Expert Witness and is a member of the Expert Witness Institute. Katharine has been a member of BACPAR for many years and has previously held the Executive roles of Journal Editor and Treasurer. Katharine led a working party of BACPAR members to produce the Toolbox of Outcome Measures (version 1) in 2010.

Jordana Davarian-Cross
Jordie works at North Bristol Trust as Clinical Lead for Vascular, Surgery and Renal Physiotherapy.

She first began working with prosthetic amputees in 2019 which then progressed into her current role in acute amputee rehabilitation. Jordie is passionate about optimising the care received by amputees in the region, working within the hospital and with community partners to support local therapists. She is a keen member of BACPAR, though this is Jordie's first experience of working in the guideline update group. She aspires to undertake an MSc in amputee rehabilitation in the near future.

Trudi Dunn
Trudi leads the amputee service at an acute district general hospital in Suffolk. She has over 25 years' experience working with amputees and has developed strong links with the local limb fitting centre to ensure patients get the best possible joined up care. She is also an accredited health coaching trainer and utilises these skills in her everyday work to support patients in making decisions about their health.

Julia Earle
Julia has worked with amputees for the last 30 years, 10 on acute vascular wards and the last 20 within the regional prosthetic centre in Gillingham, Kent. This role includes assessing and treating those with limb absence of all levels, ages and diagnosis for prosthetic fitting as well as supporting and training therapists from all over Kent. She completed the Rehabilitation of the Amputee, the Physiotherapists Role in 2001 with the University of Greenwich and has been a member of BACPAR for 30 years. She has presented papers at several national and international conferences and been part of the NCEPOD working group in 2014, supporting previous BACPAR guidelines editions and currently represents BACPAR on the Vascular Society Open Council. Julia has been active on the executive committee in many roles including regional representative, membership secretary, PRO, Chair and currently Vice Chair.

Fiona Gillow
Fiona developed a passion for limb absence rehabilitation as a student physiotherapist and went on to work in the field for 18 years. Her role involved pre-operative assessment and acute care through to out-patient prosthetic rehabilitation. She further developed her knowledge and skills through completion of a PGCert in Amputee Rehabilitation at the University of Bradford in 2009 and an MSc in Advanced and Specialist Healthcare at the University of Kent in 2022. Fiona's drive to educate the physiotherapy workforce of the future led her to her current role as a Lecturer in Physiotherapy at the University of Greenwich. As part of this role in 2024 Fiona completed a PGCert in Higher Education. Fiona has previously been a BACPAR South Thames Representative and is now the BACPAR Journal Editor.

Megan Haynes
Megan qualified as a physiotherapist from Coventry University in 2014. She has worked for North West Anglia NHS Foundation trust since 2020 and currently works in the Outpatients department, treating patients with limb absence. This clinic is a satellite centre of Addenbrookes prosthetics service. In this role, Megan works closely with vascular nurses, a rehabilitation consultant and prosthetists, as well as working with inpatient therapists to help create a smooth and efficient transition from inpatient care to outpatient services.

Suzanne Howie
Suzanne graduated from QMUC Edinburgh with a BSc (Hons) in Physiotherapy in 2003. She currently works in a regional prosthetics centre where she treats amputees across the pathway from the acute setting up to and including the Scottish Specialist Prosthetic Service. Prior to this she worked in an acute hospital focusing on pre-prosthetic rehabilitation.

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

Tim Randell

Tim has worked as a physiotherapist specialising in amputation rehabilitation at the Dorset Prosthetic Centre at Royal Bournemouth Hospital for the last 22 years. He treats patients as outpatients or in the community and co-ordinates their treatment in the region. He has successfully completed a Masters in Amputation and Prosthetic Rehabilitation at the University of Southampton. He is an active member of the British Association of Chartered Physiotherapists in limb absence Rehabilitation (BACPAR) and has been involved in the development of several of their previous guidelines. He completes teaching of professionals throughout the region and guest lectures at the Health Sciences University. He has been principal investigator in several research projects in the field of amputation rehabilitation.

Robert A. Shepherd (Shep)

Robert was a former Merchant Navy Officer prior to graduating as a physiotherapist in 1984. He worked at Leeds Limb Fitting Centre from 1989-2002, prior to moving to Otto Bock as a business manager between 2002-2007 and in 2007 he was the owner and lead clinician at Rehab Prosthetics Ltd until 2016. During this time, he has been an active member of the BACPAR executive committee and has co-authored to the BACPAR publications *Physiotherapy management for undergraduate Physiotherapists in the treatment of Lower Limb Amputees* (1991) and *Evidence Based Physiotherapy in the treatment of Adults with Lower Limb Amputation* (2006). Robert was also a classifier for British Athletics and the International Paralympics Committee from 1996 until 2016.

Gemma Springate,

Gemma qualified as a Physiotherapist from the University of Hertfordshire in 2004, she has worked for North West Anglia NHS Foundation Trust based in Peterborough since 2007 most recently as Clinical Specialist within Surgery and Critical Care providing specialist care to with lower limb amputee patients within the inpatient setting. Within this role Gemma worked closely with the rehabilitation consultants and colleagues from Addenbrookes. As the specialist Gemma ensured that patient's received gold standard care and that evidence based practice was maintained and has updated amputee patient information within the Trust, moulding the service to ensure a seamless transition for patients between in and outpatient rehabilitation. Since April 2025, Gemma has moved away from Amputee Rehabilitation and now works as an Enhanced Practitioner within Colorectal Surgery. Although no longer working directly with Limb loss patients Gemma continues to provide supervision, support and guidance for therapy colleagues on the management of this patient group.

Hannah Witherow

Hannah qualified as a Physiotherapist in 2003 and subsequently completed a Master's degree in Rehabilitation Science in 2017. Since 2005, she has worked in specialist roles within Amputee Rehabilitation, developing expertise across the continuum of care, including pre-amputation management, acute pre-prosthetic rehabilitation, and outpatient prosthetic rehabilitation.
Her clinical experience extends to the management of patients with complex comorbidities, including diabetes, advanced vascular disease, and end-stage renal failure. Hannah's professional interests include optimising rehabilitation outcomes for individuals with limb loss and promoting evidence-based practice in complex rehabilitation settings. Hannah currently divides her time between an NHS outpatient amputee rehabilitation service and clinical practice within the private sector.

Lauren Young

Lauren qualified as a physiotherapist in 2008 from the University of East Anglia and immediately commenced her junior physiotherapy rotations at Broomfield Hospital, Chelmsford. It was her experience working with acute amputee patients both on the vascular wards and within prosthetic

rehabilitation services that inspired Lauren to carve out a career in limb loss rehabilitation, starting at Frimley Park Hospital in 2010. Lauren completed an MSc in Amputation Rehabilitation at the University of Brighton and developed a keen interest in the management of phantom limb pain, creating a pain rehabilitation service within her current role. In 2021, Lauren moved to the private sector to her current role as a clinical specialist physiotherapist working in prosthetic rehabilitation services at the Dorset Orthopaedic Egham Clinic.
Lauren has been a member of the working party for several of the BACPAR Guidelines Update Groups and is currently one of the research officers on the BACPAR Executive Committee. Lauren has a keen interest in upper limb loss rehabilitation and upper limb osseointegration surgery and has presented at various conferences about these topics including at ISPO and BACPAR. Lauren also undertakes instructions as an expert witness in amputation rehabilitation via Somek and Associates and remains involved in research projects.

Geoffrey Yu
Geoffrey completed BSc Physiotherapy in University College Dublin in 2005. He gained extensive experience in respiratory, neurology (stroke, traumatic brain injury and spinal injuries), musculoskeletal / orthopaedic in both UK and Republic of Ireland. He became a senior physiotherapist in musculoskeletal rehabilitation in both public and private sectors on completion of Master in Manipulative Therapy in Curtin University of Technology in Perth in 2010. He became a senior / specialist physiotherapist in rehabilitation of people with limb absence in National Rehabilitation University Hospital in Dublin and West Midland Rehabilitation Centre in Birmingham since 2014. He also completed his postgraduate diploma of Rehabilitation studies in University of Strathclyde. He has specialist interest in frailty, pain management and musculoskeletal issues experienced by people with amputation.

Appendix 1b
Working group from previous editions of guidelines:
1st edition: Penny Broomhead, Diana Dawes, Amanda Hancock.

2nd edition: Sara Smith, Heather Pursey, Amy Jones, Heidi Baker, Gemma Springate, Tim Randell, Clare Moloney, Amanda Hancock, Lauren Newcombe, Carla Shaw, Anna Rose, Hannah Slack, Claire Norman.

Appendix 2a
Professional Advisors
CSP
Vascular Surgeons of GB and Ireland
BAPO
ISPO UK
Vascular Society of Nurses

Appendix 2b
Patient representatives
- Mitch Singleton
- Poli Patterson

Appendix 3a
Survey monkey questionnaire to clinicians
Dear Colleague,
In 2016 the British Association of Chartered Physiotherapists in limb Absence Rehabilitation (BACPAR - formally known as the British Association of Chartered Physiotherapists in Amputee

Rehabilitation) updated the 1st edition of the ***Clinical guidelines for the pre and post operative physiotherapy management of adults with lower limb amputation*** to help physiotherapists provide evidence-based management for adult lower limb amputees following their amputation.

These guidelines are to being reviewed and updated, by a guidelines update group, which has been formed to do this piece of work. The group is seeking feedback on the updated guidelines as part of the review process and would like to seek clinician feedback regarding this.

1. Were you aware of the existence of the guidelines documents and have access to them? Yes /No

2. If yes, were they useful Yes / No. If No, please provide details.

3. Is the Recommendation document user friendly? If not, how could it be improved?

4. Each of the 6 sections in the Recommendations document has good practice points at the end of them. Are these useful and clear? If not, how can it be improved?

5. Some sections are large and broken into smaller sections. Does this facilitate their use?

6. For each section are the recommendations clear and what you would expect a physiotherapists role to include. Any specific comments on what should/shouldn't be included?

7. In section 4 "information for patients and carers", are the recommendations comprehensive and do they incorporate all the areas that need to be covered? If not, what do you feel is missing?

8. Have you utilised/shared the Public information leaflet/poster with patients and carers etc?

9. Have you used the Audit tool guide to carry out an audit?

10. Any general comments?

Appendix 3b

Comments from clinicians used to inform the production of the 3rd Edition of the guideline

1	Yes
2	Yes - especially for teaching - we use them (and regularly reference them) to underpin our therapy work on the ward, and pathway documentation. Also use them to evidence need for improvements on ward to increase adherence - however they lack detail for those new to working with amputees
3	Yes - User friendly - It could be formatted in a better way - Good introduction and sections provide appropriate segments of information No

	- For quick reference hard to find a specific detail
4	Yes - useful and clear - The formatting could distinguish different sections better, the points are useful though. - Could there be bullet points of the most important features - Could link to specific resources/BACPAR create separate info e.g. Phantom limb pains, what specific information should we be providing for our patients
5	Yes, definitely. - It helps slightly - Easier to follow as divided into smaller sections - Can refer to appropriate section as needed
6	- Fine for the "usual role" of the Physio - If anything, more detail required - I think it does however it mentions this such as cognitive status, wheelchair prescription that are more pertinent to other professionals. I think they should be included but maybe not put the expectation on physio to deliver that care, maybe more to recognize and facilitate.
7	- Nothing missing - Links with charities e.g LA and Limbpower - Comprehensive recommendations. Used (with other BACPAR guidelines) to create the care plan that we use for patient care - Would be nice if had a document that could be printed out for patients
8	50/50 split on who had seen/utilised the document. Yes - available to pts in the centre - On our notice board in waiting room, patients like the level of information that it provides. No - Not the specific BACPAR one, but we have a local one which consists of much the same information for Physios, but also broader to include information about other members of the MDT
9	50/50 split on who had seen/utilised the document Yes - It could be less wordy and have better guidance to standardise its application. - Helping to develop service in the areas needed and prove to line manager the level of knowledge/aspects of care needed as an amputee physio - very helpful for audit structure No, but I want to/not yet
10	They are an excellent resource - useful for setting standards. This is a very useful and professional resource to have for physiotherapists, patients, the wider MDT and for staff to reference with managers re service improvement. I have been asked by my Moving and Handling coordinator if Lower limb amputees can use a Return/Samhall Turner. Could this information be added? I used this document when i was new to amputee management of patients a few years ago. It was a really key document to developing my knowledge and ensuring that i was completing patient care appropriately. Comprehensive references also assisted in learning. Generally, would be good to develop further resources within BACPAR website that the guidelines can reference for therapists new to amputee care. E.g Surgical technique for amputations/some of the other aspects in section 2

	I think the guidelines should be aimed at people who need guidance, they should provide more specific and clear recommendations, even if based on expert consensus. For example, timeline to shrinker application, advise around managing patient who want to hop with crutches etc.

Appendix 3c
Questionnaire to patients and user groups

In 2016 the British Association of Chartered Physiotherapists in limb Absence Rehabilitation (BACPAR - formally known as the British Association of Chartered Physiotherapists in Amputee Rehabilitation) updated the 1st edition of the ***Clinical guidelines for the pre and post operative physiotherapy management of adults with lower limb amputation*** *to help physiotherapists provide evidence-based management for adult lower limb amputees following their amputation. These guidelines are to being reviewed and updated, by the guidelines update group, which has been formed to do this piece of work. The group is seeking feedback on the updated guidelines as part of the review process and would like to seek patient feedback regarding this.*

1. Are you aware that there is an information leaflet available from BACPAR for patients/family/carers following amputation of a lower limb? Yes/no

2. If yes, have you accessed this leaflet, and how did you access it? (e.g. via physiotherapist, poster, google search etc)

3. Does the information contained in this leaflet answer questions you had after your amputation?

4. If no, is there any information that you would want included in this leaflet?

5. Is the leaflet and information within it easy to read?

6. Are you aware that there are guidelines for the pre and post operative physiotherapy management of adults with lower limb amputation?

Appendix 3d
Comments from patients used to inform the production of the 3rd Edition of the guideline

1	2/3 aware of poster, 1 replied no
2	Passed information by physio, enablement centre or accessed via google
3	1 yes, 1 not seen it, 1 only accessed it due to the survey but was not told any of the information in the leaflet when had amputation
4	Amputation is not just physical, the greater task to overcome is the mental health affects, so a more complete emphasis on mental health
5	2 x yes
6	2x no

Actions taken from patients comments:

- Ask wider BACPAR membership at conference 2023 about use of the Information leaflet and poster for the public, and decide whether or not to continue using this.

- Discuss with membership regarding information provided to patients, is it standardised for Trusts, and signposting onto organisations/charities, who's information we can contribute to.

Appendix 4
Literature search

Database	Date searched	Number of results
Ovid MEDLINE(R) ALL 1946 to February 14, 2023	15/02/2023	4550
Embase Classic+Embase 1947 to 2023 February 15	16/02/2023	2037
CINAHL Plus with Full Text (EBSCO)	15/02/2023	2263
AMED (EBSCO) – The Allied and Complementary Medicine Database	15/02/2023	410
Cochrane Library (Wiley platform)	15/02/2023	746 (45 Reviews; 2 Protocols; 699 Trials)
DARE (CRD website)	15/02/2023	20
PEDro (https://pedro.org.au/)	16/02/2023	56
OTseeker (http://www.otseeker.com/)	16/02/2023	0
REHABDATA (https://www.naric.com/?q=en/SearchRehabdata)	16/02/2023	2
Total number of records	-	10084
Total number of records after duplicates removed	-	6813

PubMed, NHS Evidence and the British Nursing Index (BNI) were additional databases searched for the previous update of the oedema management guideline. They were not searched this time for the following reasons:

- PubMed – covered by searching the MEDLINE 'All' segment on Ovid
- NHS Evidence – NICE have closed the evidence search service
- BNI – not accessible to SHTAC

Duplicate records were removed using EndNote's deduplication functionality.

Grey literature

Table 3 Summary of grey literature results

Other sources	Date searched	Number of results
Trip (Free) https://www.tripdatabase.com/ Guidelines only	23/02/2023	2 (not already retrieved by main database searches)
The Vascular Society for Great Britain and Ireland (website) https://www.vascularsociety.org.uk	23/02/2023	1
British Society of Physical and Rehabilitation Medicine (website) https://www.bsrm.org.uk	23/02/2023	1 (duplicate of result in Trip database search above)
Google	23/02/2023	3
Total additional records identified through other sources	-	6

#	Searches
1	Amputation/
2	Disarticulation/
3	Amputation Stumps/
4	Amputation, Traumatic/
5	Amputees/
6	amput*.tw.
7	disarticulat*.tw.
8	"limb absence".tw.
9	"limb loss".tw.
10	("residual limb*" or residuum or "stump*").tw.
11	Phantom Limb/
12	((phantom adj2 (pain or pains or sensation*)) or pseudomelia*).tw.
13	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12
14	lower extremity/ or hip/ or knee/ or leg/ or thigh/
15	("lower extremit*" or "lower limb*" or hip or hips or knee* or leg* or thigh*).tw.
16	((above or below or through) adj3 (knee* or leg* or thigh*)).tw.
17	(above-knee or below-knee).tw.
18	(transtibial or trans-tibial).tw.
19	(transfemoral or trans-femoral).tw.
20	14 or 15 or 16 or 17 or 18 or 19
21	13 and 20
22	exp Physical Therapy Modalities/
23	exp Rehabilitation/
24	("physical therap*" or physiotherap* or "therapeutic exercise*" or "exercise therap*" or rehab* or manag* or care*).tw.
25	Preoperative Care/
26	exp Perioperative Care/

27	((pre?operative or peri?operative or post?operative) adj1 (care or manag* or therap* or rehab*)).tw.
28	((pre?amputation or post?amputation) adj1 (care or manag* or therap* or rehab*)).tw.
29	Accidental Falls/
30	(fall or falls).tw.
31	22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30
32	Edema/pc, rh, th [Prevention & Control, Rehabilitation, Therapy]
33	(oedema or edema).tw.
34	(swell* or swollen).tw.
35	volume.tw.
36	exp Wound Healing/
37	heal*.tw.
38	BANDAGES/ or COMPRESSION BANDAGES/ or STOCKINGS, COMPRESSION/ or INTERMITTENT PNEUMATIC COMPRESSION DEVICES/ or NEGATIVE-PRESSURE WOUND THERAPY/ or MASSAGE/ or BED REST/
39	(PPAM or "pneumatic post amputation mobility").tw.
40	bandag*.tw.
41	compress*.tw.
42	shrinker*.tw.
43	((sili* or rigid) adj2 (sleeve* or dressing*)).tw.
44	(sock or socks or stocking*).tw.
45	(elastic* adj2 band*).tw.
46	elevat*.tw.
47	((stump or "residual limb") adj1 board*).tw.
48	femurett*.tw.
49	juzo.tw.
50	tubi.tw.
51	flowtron*.tw.
52	(POP or "plaster of paris").tw.
53	(EWA or (earl* adj3 walk* adj3 aid*)).tw.
54	32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53
55	21 and 31
56	limit 55 to dt=20121101-20230131
57	21 and 54
58	limit 57 to dt=20101101-20230131
59	56 or 58
60	exp animals/ not humans.sh.
61	59 not 60
62	adolescent/ or exp child/ or exp infant/
63	(paediatric or pediatric or child* or teenage* or adolescent* or baby or babies or newborn* or infant*).tw.
64	62 or 63
65	61 not 64
66	limit 65 to english language

Appendix 5
Example of CASP tool
These tools can be accessed via www.caspinternational.org.
There are seven different appraisal tools available on the website; which one is selected depends upon the methodology utilised within the appraised piece of literature. Below is an example of the tool that was utilised by the Literature Reviewers for new literature identified which applied cohort study methodology.

CASP tool example: Appraising cohort studies.
Critical Appraisal Skills Programme: making sense of evidence
12 questions to help you make sense of a cohort study
General comments

- Three broad issues need to be considered when appraising a cohort study.
    1. Are the results of the study valid?
    2. What are the results?
    3. Will the results help locally?

The 12 questions on the following pages are designed to help you think about these issues systematically.

- The first two questions are screening questions and can be answered quickly. If the answer to those two is "yes", it is worth proceeding with the remaining questions.
- There is a fair degree of overlap between several of the questions.
- You are asked to record a "yes", "no" or "can't tell" to most of the questions.
- A number of italicised hints are given after each question. These are designed to remind you why the question is important.

Appendix 6
Literature appraisers:

- Rachel Humpherson
- Kate Lancaster,
- Katherine Atkin,
- Karen Clark,
- Jordana Davarian-Cross,
- Trudi Dunn,
- Julia Earle,
- Jennifer Fulton,
- Fiona Gillow,
- Megan Haynes,
- Suzanne Howie,
- Tim Randell,
- Robert A. Shepherd,
- Gemma Springate,
- Hannah Witherow,
- Lauren Young,
- Geoffrey Yu

Appendix 7

Articles excluded after review of full text by the Literature Appraisal Groups

Reference	Study design	Comments	Reason for exclusion
Ali S. Psychological Adjustment To Amputation: Variations On The Bases Of Sex, Age And Cause Of Limb Loss. J Ayub Med Coll Abbottabad JAMC. 2017;29(2):303-307	Cross sectional cohort	No clear hypothesis to be tested. The only outcome measure, Psychological Adjustment scale used in this study has not been published and was originally designed for used for university students. Hence, the validity and robustness of this study is questionable.	Methodological concern
Alves Costa MS, Pereira MG. Predictors and moderators of quality of life in caregivers of amputee patients by type 2 diabetes. Scand J Caring Sci. 2018 Jun;32(2):933-942. doi:10.1111/scs.12528. Epub 2017 Sep 22. PMID: 28940618.	Cross sectional design	If carers are more physically active, then there is lower burden on the family / caregiver.	Not relevant to scope of the guidelines
Bergman BP, Mackay DF, Pell JP. Postservice lower limb amputation in Scottish military veterans. *BMJ Mil Heal*.2022;168(1):25-28. FT	Cohort Retrospective	Not those vets who lost limbs in conflict, but those to disease/trauma etc in Scotland. Long term follow up (37 years) but also includes more recent conflicts. Discussion re: long term healthcare burden of vets with LLA (not due to recent conflict), as ageing.	Does not inform clinical practice - Not applicable to general amputee population
Butler K, Bowen C, Hughes AM, Torah R, Ayala I, Tudor J, Metcalf CD. A systematic review of the key factors affecting tissue viability and rehabilitation outcomes of the residual limb in lower extremity traumatic amputees. J Tissue Viability. 2014 Aug;23(3):81-93. doi: 10.1016/j.jtv.2014.08.002. Epub 2014 Aug 23. PMID: 25193657.	Systematic review	Looks at importance of prosthetic fit in relation to stump breakdown and effects then on QoL Articles reviewed from pre 2014.	Not relevant to scope of the guidelines
Camacho VM, Carlson AN, Bondoc S. Addressing phantom pain through	Qualitative phenomenological	Looks at role of an occupational therapist. Theme 'Education to promote self-management of phantom limb	Not relevant to scope of the guidelines.

occupational participation: A qualitative study of support group participants. OTJR Occup Particip Heal. 2021;41(2):116-123.		pain' emerged from the study. All patients were at least 1 year, one was 10 years post amputation.	
Chislett M, Ploughman M, McCarthy J. Factors Associated With Prolonged Length of Stay and Failed Lower Limb Prosthetic Fitting During Inpatient Rehabilitation. *Arch Rehabil Res Clin Transl*. 2020;2(4):100084	Cohort - retrospective	Use of OM – in particular the LLAMs to retrospectively look at LOS and if can predict successful prosthetic fitting. Canadian so 80% of centres offer inpatient rehab. Their results were different to others. Can't generalise to UK centres as we have limited In-Pt rehab opportunities. Doesn't show significance, but maybe when used with other outcome measures.	Methodological concern – contradictory conclusion
Columbo JA, Nolan BW, Stucke RS, et al. Below-Knee Amputation Failure and Poor Functional Outcomes Are Higher Than Predicted in Contemporary Practice. *Vasc Endovasc Surg*. 2016;50(8):554-558.	Retrospective cohort study	Review of medical records followed by telephone interviews to obtain postop ambulation data. All patients undergoing TTA over 6-year period for PAD. 130 amputations in 120 patients. 75% of participants healed primarily, 7% healed after refashioning, 18% revised to TFA. Transcutaneous oximetry of <40mmHg was significantly associated with conversion to TFA. Transcutaneous oximetry of ≥40mmHg were significantly associated with successful one year amputation healing.	Does not inform clinical practice - Unable to replicate in most clinic settings.
Deans S, Kirk A, McGarry A, Rowe D. Physical activity guidelines and promotion: An online survey of United Kingdom's prosthetic rehabilitation healthcare professionals. Prosthetics Orthot Int. 2020;44(4):192-201. doi:10.1177/0309364620920109	Retrospective survey		Not relevant to the scope of this guideline.
Dillon MP, Anderson SP, Duke EJ, Ozturk HE,	Narrative inquiry	Lived experience of 10 participants following Partial foot amputation.	Not relevant to the scope of this

Stuckey R. The lived experience of sequential partial foot and transtibial amputation. *Disabil Rehabil*. 2020;42(15):2106-2114.	approach	Useful insight as patient report complications following partial foot amputation and feel that TTA improves their quality of life	guideline.
Dillon MP, Fatone S, Quigley M. Describe the outcomes of dysvascular partial foot amputation and how these compare to transtibial amputation: a systematic review protocol for the development of shared decision-making resources. Syst Rev. 2015;4:173.	Study proposal.	No data presented within this article - there will be a full article with results available and captured elsewhere in literature search.	Doesn't fit inclusion criteria - Study proposal, no results to analyse.
Esfandiari E, Miller WC, Berardi A, King S, Ashe MC. The Effect of Telehealth Interventions on Mobility for Individuals with Lower Limb Loss: A Systematic Review and Meta-Analysis. Prosthet Orthot Int. 2021;45(6 Suppl:65.	Systematic review and meta analysis	Systematic review	Does not inform clinical practice
Fajardo-Martos I, Roda O, Zambudio-Periago R, Bueno-Cavanillas A, Hita-Contreras F, Sánchez-Montesinos I. Predicting successful prosthetic rehabilitation in major lower-limb amputation patients: a 15-year retrospective cohort study. Brazilian J Phys Ther. 2018;22(3):205-214.doi:10.1016/j.bjpt.2017.08.002	Retrospective cohort study	Observational cohort study of 169 patients in Brazil.	Does not inform clinical practice
Fard B, Persoon S, Jutte PC, et al. Amputation and prosthetics of the lower extremity: The 2020 Dutch evidence-based multidisciplinary	Qualitative	Describes the process of updating the guidelines. Authors advise caution in applying their guidelines to other countries.	Does not inform clinical practice

guideline. Prosthetics Orthot Int. 2022;15:15.			
Finco MG, Kim S, Ngo W, Menegaz RA. A review of musculoskeletal adaptations in individuals following major lower-limb amputation. J Musculoskelet Neuronal Interact. 2022;22(2):269-283.	Literature review	Described on a neuronal level - would need to draw lots of inferences to apply to clinical practice.	Does not inform clinical practice
Fortington LV, Dijkstra PU et al. Change in health related QoL in first 18/12 after LLA 2013	Prospective longitudinal study	OMs considered well after initial post op phase.	Does not inform clinical practice
Frengopoulos C, Payne MW, Viana R, Hunter SW. MoCA Domain Score Analysis and Relation to Mobility Outcomes in Dysvascular Lower Extremity Amputees. Arch Phys Med Rehabil. 2018;99(2):314-320.	Retrospective cohort study	R square in the multivariate regression analysis was not reported. There seemed to be typo in the presentation of the result of delayed recall, which was significant as part of the analysis. The possibility of error in statistically significant result associated with certain score only within the domains in MOCA could not be ruled out.	Methodological concern
Frengopoulos C, Fuller K, Payne MWC, Viana R, Hunter SW. Rehabilitation outcomes after major lower limb amputation in the oldest old: a systematic review. Prosthet Orthot Int. 2021 Dec 1;45(6):446-456. doi: 10.1097/PXR.0000000000000038. PMID: 34693938.	Systematic review	Systematic review – included 10x articles dated between 1963 – 2014. 2014 article was a single case study of a 95yo TTA	Does not fit inclusion criteria – articles outside of date range
Gozaydinoglu S, Hosbay Z, Durmaz H. Body image perception, compliance with a prosthesis and cognitive performance in transfemoral amputees. *Acta Orthop Traumatol Turc*. 2019;53(3):221-	Questionnaires	Only included 45 patients who were mobile and unilateral transfemoral amputees following trauma. They had to have had 6 months of prosthetic use and the ability to walk independently.	Not within the scope of these guidelines.

225.			
Graham L, Doherty M, Wilson C, Wilson C, Currie M. The multidisciplinary rehabilitation of patients after lower-limb amputation. Diabet Foot J. 2019;22(3):32-37.	Qualitative overview/essay style	No clear aim – a good article as an overview	Does not inform clinical practice
Griffin SC, Curran S, Chan AWY, et al. Trajectory of phantom limb pain relief using mirror therapy: Retrospective analysis of two studies. Scand J Pain. 2017;15:98-103.	Cohort study – retrospective	4 weeks of mirror therapy (5 days a week). Outcome measures included visual analogue scale and short-form McGill pain questionnaire. Mean time since amputation was 1.8 years.	Not within the scope of this guideline.
Grzebień A, Chabowski M, Malinowski M, Uchmanowicz I, Milan M, Janczak D. Analysis of selected factors determining quality of life in patients after lower limb amputation-a review article. Pol Przegl Chir. 2017 Apr 30;89(2):57-61. doi: 10.5604/01.3001.0009.8980. PMID: 28537564.	Review article. No applicable CASP tool.	A review article of available literature regarding factors that affect quality of life following LLA. There is an aim, but it is broad and vague, there is no explanation for how methodology, inclusion/ exclusion criteria, critical analysis of the included papers. Closing statement is also very vague.	Methodological concern
Hanafil MH,IbrahimAH, Kassim NK, Chung Tze Y. Rehabilitation Medicine Management of a Bilateral Lower Limbs Amputee with Hemiparesis. *Int Med J*. 2019;26(6):533-534.	Case report	This case report discussed the clinical reasoning and rehabilitation process of an established patient with diabetes with left transtibial amputation, who suffered from left hemiplegia and subsequently right transfemoral amputation. It was concluded that patient with hemiparesis could use wheelchair for mobility due to its efficiency.	Does not inform clinical practice
Harriss A, ed. Return to work after an amputation due to peripheral vascular disease. 2018;70:24-27.	Single case study	Descriptive of case study; limited evidence synthesised into report.	Not within the scope of this guideline.
Hebert JS, Payne MW, Wolfe DL, Deathe AB, Devlin M. Comorbidities in amputation: a systematic review of	Systematic review	Systematic review	Does not fit inclusion criteria - systematic review of literature

hemiplegia and lower limb amputation. Disabil Rehabil. 2012;34(23):1943-9. doi: 10.3109/09638288.2012.665131. Epub 2012 Mar 19. PMID: 22424496.			outside of date range
Hershkovitz A, Dudkiewicz I, Brill S. Rehabilitation outcome of post-acute lower limb geriatric amputees. *Disabil Rehabil*. 2013;35(3):221-227. doi:10.3109/09638288.2012.690818	Cohort	Study carried out in Israel which has a very different population and healthcare system. Results added nothing new to what is widely accepted practice in UK: pre admission functional level is best predictor of for prosthetic success following LLA	Does not inform clinical practice
Hijmans JM, Dekker R, Geertzen JHB. Pre-operative rehabilitation in lower-limb amputation patients and its effect on post-operative outcomes. *Med Hypotheses*. 2020;143:N.PAG-N.PAG. doi:10.1016/j.mehy.2020.110134	Literature review	Only 2 studies reviewed looking at Pre-operative rehab (pre-hab). There was no support or rejection of the hypothesis of pre-hab being beneficial to patient outcomes post LLA. Lacked specific information on pre-hab program components. ➔ Dekker 2018 – younger dysvasc pts said it was feasible ➔ Turney 2001 – poor methodology and int not specified. ?risk of bias, did they pick pts with less severe co-morbidities who were likely to have improved mobility. Had daily inpt rehab prior to outpatient -> discharge Highlights the scarcity of research, what is involved in the existing pre-hab protocols – poor methodology of studies.	Does not inform clinical practice
Hunter SW, Batchelor F, Hill KD, Hill AM, Mackintosh S, Payne M. Risk Factors for Falls in People With a Lower Limb Amputation: A Systematic Review. PM R J Inj Funct Rehabil. 2017;9(2):170-180.e1.	Systematic review	This systematic review investigated the risk factors for fall. There was a discrepancy in the number of articles included. Despite part of the inclusion criteria being "risk factor evaluated against outcome of fall", only 4 studies were accounted for in the risk factors analysis despite 12 studies being included for meeting the inclusion criteria. In addition, there was lack of consistent conclusion of risk	Methodological concern

		factors according to the authors of this systematic review. No data pooling was feasible due to the heterogeneity of studies identified.	
Isaacs-Itua A, Sedki I. Management of lower limb amputations. Br J Hosp Med. 2018;79(4):205-210. doi:10.12968/hmed.2018.79.4.205	Review	A general overall summary of the management of lower limb amputations. This could be a good, quick read for anyone unfamiliar with lower limb amputations.	Does not inform clinical practice
Jayakaran P, Perry M, Kondov M, McPherson T, Sutherland L, Wypych A. Attitudes and beliefs towards physical activity participation in individuals with below-knee amputation. N Z J Physiother. 2019;47(2):118-128.	Qualitative	Small sample n=7 trans tibial's only. Participants recruited through people who had completed a survey about physical activity therefore the responses may be biased	Does not inform clinical practice
Kizilkurt, Kizilkurt T, Gulec MY, et al. Quality of life after lower extremity amputation due to diabetic foot ulcer: the role of prosthesis-related factors, body image, self-esteem, and coping styles. Dusunen Adam J Psychiatry Neurol Sci. 2020;33(2):109-119.	Qualitative	Purpose of study was to identify clinical and psychosocial factors that predict an individual's subjective quality of life after having a lower limb amputation due to diabetic foot ulcer. The study population was Turkey.	Methodological concern
Knezevic A, Petkovic M, Mikov A, et al. Factors that predict walking ability with a prosthesis in lower limb amputees. *Srp Arh Celok Lek*. 2016;144(9-10):507-513.	Retrospective cohort study	Large cohort 263. Complex study using support vector machines making it difficult to understand or reproduce. Study concluded that age, level of amputation FCI and mobility pre amputation were predictors of walking ability with prosthesis.	Does not inform clinical practice
Kwah LK, Webb MT, Goh L, Harvey LA. Rigid dressings versus soft dressings for transtibial amputations. Cochrane Database Syst Rev. 2019;(6).	Systematic review	No definitive clinical recommendations could be made by the authors.	Does not inform clinical practice
Lee LS, Hitzig SL, Mayo A, Devlin M, Dilkas S,	Qualitative	Study based in Canada which has a very different healthcare system	Does not inform clinical practice

MacKay C. Factors influencing physical activity among individuals with lower limb amputations: a qualitative study. *Disabil Rehabil*. Published online 2022:1-10		and funding. N=33 patients and 18 HCP's. Patients recruited from one city	- Unable able to extrapolate to population of these guidelines
Matalon R, Freund JE, Vallabhajosula S. Functional rehabilitation of a person with transfemoral amputation through guided motor imagery: a case study. Physiother Theory Pract. 2021;37(1):224-233.	Case report	Despite the aim of investigating the impact of mental imagery to treat phantom limb pain, gait and balance dysfunction, phantom limb pain was not measured using standardised tool. There was also concern about the use of walking aid during the short form berg balance test	Methodological concern
Mayo AL, Viana R, Dilkas S, et al. Self-reported health condition severity and ambulation status postmajor dysvascular limb loss. Prosthetics Orthot Int. 2022;46(3):239-245.		Survey undertaken over phone and in person. N=231 Data collected when patient was, on average 3.4 years post amputation - so ?relevance to the scope of pre and post op guidelines. Developed own scale based on expert opinion with no validation work undertaken so reliability / repeatability unknown	Does not inform clinical practice
McGill G, Wilson G, Caddick N, Forster N, Kiernan MD. Rehabilitation and transition in military veterans after limb-loss. Disabil Rehabil. 2021;43(23):3315-3322. doi:10.1080/09638288.2020.1734875	Qualitative	Purpose to explore the physical, psychological and social well-being of veterans who have experienced limb-loss.	Does not inform clinical practice
Mundy LR, Klassen A, Grier AJ, et al. Identifying Factors Most Important to Lower Extremity Trauma Patients: Key Concepts from the Development of a Patient-Reported Outcome Instrument for Lower Extremity Trauma, The LIMB-Q.	Qualitative	Aim was to define concepts of interest that are most important to lower limb trauma patients (limb salvage, reconstruction or amputation), via semi-structured interviews. Used to inform development of the LIMB-Q. The paper was more a description of how they gathered the information to develop the LIMB-	Does not inform clinical practice

Plast Reconstr Surg. 2020;145(5):1292-1301.		Q. Participants were American, so their healthcare system is very different, therefore the 'finance' concept, which informed the 'financial impact' of the LIMB-Q would not necessarily be applicable in the UK.	
Nielsen AØ, Topp UM, Holmehave-Brandt J, Petterson CF, Kristensen MT, Gebuhr P. Development and psychometric properties of the Basic Amputee Mobility Score for use in patients with a major lower extremity amputation. *Geriatr Gerontol Int*. 2018;18(1):138-145. doi:10.1111/ggi.13156		Article describing the development of the BAMS tool, and the testing of it's psychometric properties	Does not inform clinical practice
O'Banion LA, Qumsiyeh Y, Dirks R, Rome C, Prentice A. The Lower Extremity Amputation Protocol: A Pathway To Successful Ambulation. J Vasc Surg. 2021;74(4):e404-e405.	Expert opinion / protocol development	Initial report of the development of a Lower Extremity Protocol. Mainly medical driven - brief mentions of OT and PT being part of the MDT. No specific details of the rehabilitation expected from AHP's as part of the protocol MDT.	Does not inform clinical practice
Ol HS, Van Heng Y, Danielsson L, Husum H. Mirror therapy for phantom limb and stump pain: a randomized controlled clinical trial in landmine amputees in Cambodia. Scand J pain. 2018;18(4):603-610. doi:10.1515/sjpain-2018-0042	Randomised Controlled Trial	Compared 3 different treatment options – mirror therapy, tactile therapy and combined mirror and tactile therapy. 45 participants Landmine victims with TTA in Cambodia. All participants had their amputation at least 12 months prior to the study commencing.	Not relevant to the scope of the guidelines
Palmer J, Pymer S, Smith GE, Harwood AE, Ingle L, Huang C, Chetter IC. Presurgery exercise-based conditioning interventions (prehabilitation) in adults undergoing lower	Systematic literature review (Cochrane review)	Considered all published and unpublished RCTs comparing pre-surgery interventions with usual care. No RCTs met the inclusion criteria. Outcomes considered postoperative complications, mortality and readmission. Does not contribute to body of knowledge regarding amputee	Not relevant to the scope of the guidelines

limb surgery for peripheral arterial disease. Cochrane Database Syst Rev. 2020 Sep 21;9(9):CD013407. doi: 10.1002/14651858.CD013407.pub2. PMID: 32964423; PMCID: PMC8078675.		physiotherapy management.	
Pedras S, Meira-Machado L, Couto de Carvalho A, Carvalho R, Pereira MG. Anxiety and/or depression: which symptoms contribute to adverse clinical outcomes after amputation? J Ment Heal. 2022;31(6):792-800. doi:10.1080/09638237.2020.1836554	Prospective cohort	Majority of the participants had minor lower limb amputation at 1 month/ 6 months/ and 10 months interval. There was lack of reasonable explanation of the result or adequate consideration of other confounding analysis which could affect wound healing.	Methodological concern
Peters CML, de Vries J, Lodder P, et al. Quality of Life and not Health Status Improves After Major Amputation in the Elderly Critical Limb Ischaemia Patient. Eur J Vasc Endovasc Surg. 2019;57(4):547-553	Prospective cohort	There was lack of clarification how the questionnaires of WHO-QOL (for QOL measurement) and SF-12 (for health status measurement) were administered. Significant loss to follow up from baseline to 1 year post measurement was reported. Reason reported was due to cognitive impairment despite one of the exclusion criteria being lack of cognitive impairment. In addition, the outcome of this study is not relevant to this guideline	Not relevant to the scope of this guideline
Porras-Rangel S, Aguilar-Valencia AB, Dau-IÑIguez SE, et al. Biofeedback system enhances the time of balance and decreases the duration of pre-prosthetic training. *Rev Mex Endocrinol Metab y Nutr*. 2016;3(1):7-11.	Single blind RCT	Does not state how they randomised; does not state what bioifeedback balance machine was used so unable to reproduce; long numbers of appointments required to see the changes noted	Methodological concern
Price B, Moffatt B, Crofts D. Managing patients following a lower limb	Discussion	Many patients benefit from physiotherapy and early walking aids prior to prosthetic fitting. Hopping with frames is	Does not inform clinical practice

amputation... [with commentary by Mike Ellis]. J Community Nurs. 2015;29(3):26-33.		discouraged as this can contribute to falls and trauma to the contralateral limb. PPAM aids can be used following amputation these facilitate early walking and prevent deterioration of muscle tone and reduction in residual limb oedema.	
Richardson LJ, Molyneaux V, Murray CD. Being a peer support mentor for individuals who have had a lower limb amputation: an interpretative phenomenological analysis. Disabil Rehabil. 2020;42(26):3850-3857.	Non analytical study	Describes the setting up/ training process of peer support mentors rather than analysing the impact of such a service.	Does not inform clinical practice
de Boer RG, Paping MA, Kap B, Geertzen JH. Residual limb claudication after vascular transfemoral amputation. Prosthet Orthot Int. 2017 Dec;41(6):601-604. doi: 10.1177/0309364617706747. Epub 2017 May 4. PMID: 28470108.	Case Report. Qualitative CASP.	Report based on a single patients experience following dysvascular amputation. Does not consider objective or statistical analysis of any data, does not contribute meaningfully to body of evidence. Indicates more investigation may be pertinent but does not provide us with meaningful data to advise	Methodological concern
Roepke AM, Williams RM, Turner AP, et al. A Longitudinal Study of Social Participation After Dysvascular Lower Extremity Amputation. Am J Phys Med Rehabil.	Prospective cohort study. Cohort CASP.	Measurements used in the study were modified versions of validated measures, no psychometric study of measure was undertaken and therefore not fully validated. The sample consisted of majority white male veterans in the US. Based on their exclusion criteria the cohort could be considered the 'healthiest veterans' meaning the conclusions drawn are not applicable to general dysvascular amputee population. Doesn't consider confounding variables in a highly specific population.	Does not inform clinical practice - Not applicable to broad amputee population
Rothgangel A, Braun S, Winkens B, Beurskens A, Smeets R. Traditional and augmented reality mirror therapy for	Randomised Controlled Trial	Comparison of effects of mirror therapy, a patient-centred teletreatment and sensomotor exercises without a mirror on phantom limb pain. Participants	Not relevant to the scope of these guidelines

patients with chronic phantom limb pain (PACT study): results of a three-group, multicentre single-blind randomized controlled trial. Clin Rehabil. 2018;32(12):1591-1608. doi:10.1177/0269215518785948		were an average of 3 years post amputation, therefore not appropriate for the guideline under consideration.	
Sadowski PK, Battista S, Leuzzi G, et al. Low Back Pain in People With Lower Limb Amputation: A Cross-Sectional Study. Spine (03622436). 2022;47(22):1599-1606. doi:10.1097/BRS.0000000000004422	Cross sectional study	Online questionnaire with 239 participants to investigate prevalence of low back pain in lower limb amputees. Participants were at least 12 months post amputation and had been using a prosthesis for greater than 6 months to meet the inclusion criteria, therefore not appropriate for guideline under consideration.	Not relevant to scope of the guidelines
Sarkar A, Fencel R, Dunlap E, Fitzpatrick S, Nagarsheth K. Utility of Removable Rigid Dressings in Decreasing Discharge Narcotic Use and Improving Ambulation Following Below-Knee Amputation. *Ann Vasc Surg*. 2022;05:5.	Retrospective Cohort study	There was not enough information/detail or raw data to be able to extrapolate results	Methodological concern
Schober TL, Abrahamsen C. Patient perspectives on major lower limb amputation - A qualitative systematic review. *Int J Orthop Trauma Nurs*. 2022;46:100958.	Qualitative systematic review		Doesn't fit inclusion criteria - Systematic review therefore all references screened individually
Senra H. How depressive levels are related to the adults' experiences of lower-limb amputation: a mixed methods pilot study. Int J Rehabil Res. 2013;36(1):13-20. doi:10.1097/MRR.0b013e328356429d	Qualitative	Pilot study that aimed to explore the relationship between the experience of lower limb amputation and depression in a convenience sample of 42 adult amputees.	Does not inform clinical practice
Sions JM, Beisheim EH,	Retrospective	Cohort from Washington State	Methodological

Hoggarth MA, et al. Trunk Muscle Characteristics: Differences Between Sedentary Adults With and Without Unilateral Lower Limb Amputation. Arch Phys Med Rehabil. 2021;102(7):1331-1339.	cohort study	USA; assumptions were made about comorbidities no new emerging trends identified	concern
Stern JR, Wong CK, Yerovinkina M, et al. A Meta-analysis of Long-term Mortality and Associated Risk Factors following Lower Extremity Amputation. Ann Vasc Surg. 2017;42:322-327	Systematic review	21 articles were included in the study; all were cohort studies. Cumulative mortality over 5 years was 70.1%. Clinical risk factors associated with increased mortality were identified as being diabetes, PAD, coronary artery disease, cerebrovascular disease, ESRD and dialysis dependence, anaesthesiology class ≥4, dementia, non-ambulatory status. Surgical risk factors were higher level amputation, need for staged surgery with initial guillotine amputation. It is unclear how risk factors were determined. The data was from worldwide studies, so caution needs to be taken to apply results to the UK population.	Not relevant to the scope of the guidelines
Suckow BD, Goodney PP, Nolan BW, Veeraswamy RK, Gallagher P, Cronenwett JL, Kraiss LW. Domains that Determine Quality of Life in Vascular Amputees. Ann Vasc Surg. 2015;29(4):722-30. doi: 10.1016/j.avsg.2014.12.005. Epub 2015 Feb 26. PMID: 25725279; PMCID: PMC5292265.	Focus group.	26 patients completed focus groups in US. The study identified QOL themes in the vascular amputee population though couldn't make recommendations about existing QOL OM. It did state that patients would like more information around the cost benefit of increased pain versus pain relief with amputation at the expense of mobility.	Not relevant to the scope of the guidelines
Sugawara AT, Simis M, Fregni F, Battistella LR. Characterisation of Phantom Limb Pain in Traumatic Lower-Limb Amputees. Pain Res Manag. Published online 2021:1-7.	Cross-sectional Study	Part of the recruitment phase of a larger RCT in Brazil on phantom limb pain. Participants were traumatic lower limb amputees. Participants were at least 3 months post amputation therefore not appropriate for the guideline under consideration.	Not relevant to the scope of the guidelines

doi:10.1155/2021/2706731			
Talbot LA, Brede E, Metter EJ. Effects of Adding Neuromuscular Electrical Stimulation to Traditional Military Amputee Rehabilitation. Mil Med. 2017;182(1):e1528-e1535.	RCT	There was no explanation of components of the traditional military amputee rehabilitation programme (especially the pre-prosthetic part), which was the control group. It was unclear that if the assessor were blinded after the baseline measurement, which subjected the study to potential assessment bias. The quadriceps strength in the residuum of the intervention group using the neuromuscular stimulation was found to be significantly different from the control group (p=0.04) at week 3 only (before the prosthesis fitting). There was no statistically significant difference in muscle strength, pain and functional mobility between intervention and control groups across other timeline at 6, 9 and 12 week during the programme.	Does not inform clinical practice
Topuz S, Ulger O, Bakar Y, Sener G. Comparison of the effects of complex decongestive physiotherapy and conventional bandaging on edema of geriatric amputees: A pilot study. *Top Geriatr Rehabil*. 2012;28(4):275-280.	RCT	Participants not truly randomised Also conventional bandaging is no longer widely used in the UK	Methodological concern
Trimble J, Jessamine J, Sernik J, et al. Peer-mentorship Following Lower-limb Loss in Small Communities: Implications for Occupational Therapists. *Arch Phys Med Rehabil*. 2022;103(3).	qualitative	Cohort recruited from small communities only – does not state from which country There was insufficient information included in the study for example the questions included in the interview	Methodological concern
Van Helm S, Krops LA, Dekker R, Vrieling AH. Effectiveness of (Active) Lifestyle Interventions in People With a Lower Limb Amputation: A	Systematic review	Thirteen articles were deemed to be eligible in the studies. However, majority of the studies assessed in this systematic review did not meet inclusion criteria of this guideline. Three studies found to be	Not relevant to the scope of the guidelines

Systematic Review. Arch Rehabil Res Clin Transl. 2022;4(4):100207		appropriate for this guideline post screening of titles and abstracts were Littman et al (2019), Godlwana et al (2020), Imeni et al (2018). Further full texts were sought for review in the guideline.	
Verschuren JE, Enzlin P, Geertzen JH, Dijkstra PU, Dekker R. Sexuality in people with a lower limb amputation: a topic too hot to handle? *Disabil Rehabil*. 2013;35(20):1698-1704.	Qualitative study	Recall bias inherrent in methodology. Only identifies the need for further education/training to support professionals talking to patients about intimacy	Methodological concern
Verschuren JEA, Zhdanova MA, Geertzen JHB, Enzlin P, Dijkstra PU, Dekker R. Let's talk about sex: lower limb amputation, sexual functioning and sexual well-being: a qualitative study of the partner's perspective. J Clin Nurs (John Wiley Sons, Inc). 2013;22(23-24):3557-3567.	Qualitative	Semi-structured interviews with the partners of amputees who were attending Rehab Centres in the Netherlands or Belgium. The majority of partners indicated that they did not feel the need to discuss sexuality with professional caregivers. Partners were interviewed. There are cultural differences between the Netherlands, Belgium and the UK.	Does not inform clinical practice
Vu K, Payne MWC, Hunter SW, Viana R. Risk Factors for Falls in Individuals With Lower Extremity Amputations During the Pre-Prosthetic Phase: A Retrospective Cohort Study. PM R J Inj Funct Rehabil. 2019;11(8):828-833.	Cohort	There was error in the statistics presented within the text of result section. No analysis of other important cofounding factors/ covariates which were commonly considered to contribute to fall eg medication use, history of fall prior to amputation, cognition etc	Methodological concern
Westerkamp EA, Strike SC, Patterson M. Dietary intakes and prevalence of overweight/obesity in male non-dysvascular lower limb amputees. Prosthetics Orthot Int. 2019;43(3):284-292. doi:10.1177/0309364618823118	Cross sectional study/cohort	Cohort recruited only from Limb power and LA males and may not be a fair representation of the target population group	Does not inform clinical practice
Williams RM, Turner AP, Green M, et al. Relationship between cognition and functional	Prospective cohort study	Participants were all USA veterans	Does not inform clinical practice - Could not extrapolate

outcomes after dysvascular lower extremity amputation: a prospective study. *Am J Phys Med Rehabil*. 2015;94(9):707-717.			results to local population.
Zaheer A, Malik AN, Masood T, Fatima S. Effects of phantom exercises on pain, mobility, and quality of life among lower limb amputees; a randomised controlled trial. BMC Neurol. 2021;21(1):1-8. doi:10.1186/s12883-021-02441-z	Randomised Controlled Trial	Phantom exercises, mirror therapy and routine physical therapy compared to mirror therapy and routine physical therapy. All patients underwent amputation within 2 years of the study therefore not appropriate for the current guideline under consideration.	Not relevant to the scope of the guidelines
Zhu X, Lee M, Chew EA, Goh LJ, Dong L, Bartlam B. "When nothing happens, nobody is afraid!" beliefs and perceptions around self-care and health-seeking behaviours: Voices of patients living with diabetic lower extremity amputation in primary care. *Int Wound J*. 2021;18(6):850-861.	Qualitative	9 interviewees, investigating patients with recent (less than 12 months) amputations as a result of a DFU, for their beliefs and perceptions around their illness, self-care and health seeking behaviours. Not many participants, Singapore based – highest rate of DLEA in the world. The themes that arose are things usually covered in Diabetic clinic in UK, in Singapore they reported from another study that only 16% attended annual footcare screening for DFUs. Tried to use data to develop a framework for how to improve self-care and health seeking behaviours for those with diabetes and DFUs.	Not relevant to the scope of the guidelines

Appendix 8

Definitions of the Scottish Intercollegiate Guideline Network (SIGN) Levels of Evidence

These levels of evidence were assigned by subgroups of the GUG after review of the individual pieces of literature. Any contentious issues between these subgroups which meant that a level of evidence could not be decided upon was resolved by getting the whole GUG to review the article and gaining consensus from this additional input.

Quality rating of the Subsections:

++, + or – are allocated by the reviewers according to whether all, some or few of the criteria specified in the validated SIGN checklists have been fulfilled and whether the methodology has been adequately described and is sound enough to control/ eliminate bias in the findings of the literature.

Levels of Evidence

1++ High quality meta-analyses, systematic reviews of 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 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 9

Table of papers referenced within the updated guideline

These tables list the evidence appraised and used to inform the recommendations. The references are in alphabetical order. The reference number in brackets refers to the first time they are found in the document. Each entry gives a brief description of the design, the sample studied, the subject of the study or intervention (if one was employed), and a conclusion or comment. Evidence appraised for the first edition of the guideline is in black text; evidence appraised for the second edition is in blue text. Readers are recommended to read the original article if they want more detail.

Citation	Study Design	Population	Subject/ Intervention	Comments	Level of Evidence
Ali M (182)	Retrospective cohort	72 TTA's, vascular amputations	37 ipop users (rigid plaster cast, inside a plastic shell attached to foot) Vs 35 soft dressings. Weekly wound review and cast change	More need for revisions in non ipop group. The use of IPOP allows for early ambulation (PWB) and rehabilitation, which may be of psychological benefit and may decrease the sequelae of prolonged immobilization. Gave criteria for inclusion of the IPOP group and the protocol used. Definitive limb at 4/12. Limited – tried matching case controls, didn't look at traumatic amps.	2+
Anaforoglu K (159)	Randomised Trial	Mirror therapy or phantom limb exercises. No control group with no intervention at all	Mirror therapy using mirror box for 4 weeks.	Significant reduction in pain and depression scores (p=0.05) Significant improvement in SF-36 score (p=0.05) Improvements found straight after treatment finished, at 3 months	1-

				and at 6 months. Mirror therapy reduced pain intensity more than the Phantom Exercises group (p=0.004) Researchers/participants not blinded to intervention/treatment groups therefore open to bias. Limited by small sample size (still reaches statistical significance) and only includes traumatic amputees. No control without intervention – either mirror therapy or exercises .	
Batten H (98)	Longitudinal study		No intervention. Recorded characteristics at admission to and discharge from sub-acute rehabilitation post amputation.	Data for study fairly old, from 2005-2011. Prosthetic prescription rates decreased over time period. Admission cognition increased over time (measured with Mini Mental State Examination). Motor function worsened over time (measured with functional independence measure motor subscale). Motor function should be addressed as part of rehabilitation to optimise patient's ability to return home	2+
Bowrey S (46)	Retrospective review	8 year collection of 338 amputee data in NHS setting used to devise an assessment tool and tested on 199 patients with planned amputation	Functional outcome prediction tool	Development of a new outcome measure to help predict functional outcome post amputation. Thorough validation of tool and suggest that BLARt is highly sensitive to predicting subsequent level of walking function help guide pre op info, communication, management of expectations. Requires ongoing validation work across more NHS centres.	2+
Brunelli S	Randomised		Progressive	The experimental group showed a significant	1+

(160)	Controlled Trial		muscle relaxation, mental imagery and phantom exercises 2x week for 4 weeks Control group, standard physiotherapy	decrease over time in all the Prosthesis Evaluation Questionnaire domains (in terms of both PLS and PLP; *P*<.04 for both) and the Brief Pain Inventory (*P*<.03).	
Budinski S (53)	Prospective cohort study	61 patients. TTA vascular.	Patients monitored for 12 months to determine success of prosthetic rehabilitation. Outcomes judged by clinical characteristics (mobility status).	78.6% of patients achieved successful prosthetic use within 12 months. Age, functional patency of popliteal artery, wound healing complications and phantom limb pain presence were significantly different between those who were successful and those who were not. Variables considered in the model are outlined clearly, with the modal achieving statistical significance (p<0.05). The paper is only observational of characteristics affecting successful limb use, it doesn't really bring new information to light but could be utilised in the education of prospective amputees and to inform clinical decision making from a surgical and rehab perspective.	2+
Casale R (41)	Expert Opinion article	Expert opinion	Article	Discusses role of MDT within amputee rehab and discusses the importance of sensory components alongside motor skills	4
Chang B (172)	Retrospective study	TTA with posterior skin flap performed by a single plastic surgeon and included traction neurectomy. Between Jan 2013-Dec 2018	Diagnosis of symptomatic neuroma made by: Clinical examination Neuropathic pain in a defined neural anatomical distribution Positive Tinel sign Tenderness at the site of suspected	Residual limb pain seen in 57.1% of patients. 14.6% had incidence of symptomatic neuromas (89.7% of neuromas were superficial peroneal nerve. 48.4% were saphenous nerve. 17.2% were tibial and sural nerves.) Higher body mass index and diabetes were	2+

			nerve involved Measured at clinic appointment but not specific exactly how long after surgery.	protective against symptomatic neuroma formation p<0.01 Cause of amputation similar to UK statistics Demonstrates need for management of phantom limb pain/neuroma pain in practice Recorded at least 3 months post-op to prevent capturing post-op pain.	
Charlton K (131)	Mixed methods pilot study	two phased mixed methods nested design. Delivered in a mix of group, individual and mixed settings. The Wheelchair Skills Test Questionnaire-Version 5.0, FIM, GAS and qualitative data was collected before and after input.	11 people with LLA engaged in a minimum of two 45-min wheelchair skills sessions using the Wheelchair Skills Training Program. Australian study.	Post intervention mean Wheelchair Skills Test Questionnaire score increased in performance (42.3 ± 13.4), confidence (33.9 ± 20.7) and frequency (33.9 ± 27.3). GAS was achieved or exceeded by 91% for all participants. Pilot study and small sample size. Realistic intervention for most centres that could be applied in a group setting.	2++
Chin T (123)	Retrospective cohort	Results of prosthetic rehabilitation on managing transtibial vascular amputation with silicone liner after wound closure.	Silicone liner post-op - was fitted after wound closure and wearing time gradually progressed from 1 hour per day to 8 hours per day.	A standardised silicone liner programme reduced the duration of rehabilitation (silicone liner group 77.3 days +/- 13.4 days compared with the soft dressings group 125.4 +/- 66.4 p less than 0.05) and could be a valuable replacement for soft dressing based stump management.	2+
Chopra A (83)	Retrospective cohort	206 patients (from 2005-2016) with major lower limb amputations. Demographics, comorbidities, discharge outcome were compared between ambulatory and non-ambulatory	To identify factors predictive of ambulatory status post op.	There was difference between ambulatory and non-ambulatory groups using inferential statistics alone (BMI, social support, marriage status, wound/ischaemia/foot infection score, dialysis status, dementia, hypertension, alcohol abuse, illicit drug use, need for higher	2+

		subjects.		amputation, home as discharge destination and 30 day mortality, p< 0.05).	
Churilov I (118)	Systematic review	Six papers assessed, 2 RCTs and 4 cross sectional studies.	RD vs Soft dressing	Well written article. Poor quality of paper assessed. Variety of type of RD. Good analysis of papers. Study demonstrates use of RD reduces time from amputation to prosthetic casting.	2+
Ciufo D (69)	Retrospective cohort study	Multivariate logistic regression modelling on TTA from a national USA surgical database.	Assess for predictors of reoperation, readmission and complications	4631 patients identified. Ongoing smokers, bleeding disorder, pre-op ventilator use or transfer from another facility were at highest risk of reoperation. Re-op: 9.6%, unplanned re-admission: 8.75%, major complications: 12.8%, minor: 8.7% 30 day mortality: 5.14%	2++
Coffey L (47)	Prospective/ descriptive cohort study	64 patients with lower limb amputation	On admission to rehab they underwent life goal characteristic assessment and goal adjustment capacities were analysed. Re-assessed 6 months post discharge to identify predictors of psychosocial outcomes.	Goal importance, disturbance and re-engagement on admission significantly predicted general adjustment to amputation. Goal importance and disengagement on admission significantly predicted depressive symptoms 6 months after discharge. Highlights the importance of considering psychological adjustment to limb loss. Some suggestions that participants automatically engaged in self-protective goal disengagement (around sexual functioning).	2++
Coffey L (48)	Prospective cohort study	64 persons with major lower limb amputation (MLLA) completed questionnaires regarding quality of life, disability in	N/A	Greater goal pursuit at initial questioning was predictive for higher physical and psychological quality of life at final questionnaire. Stronger	2++

		activity and participation (of ICF) and goal pursuit / adjustment across three time points. Sociodemographic data and clinical data was also collected: 84% men, 48.4% BKA, 43.8% AKA, 7.8% bilateral.		goal pursuits and adjustment indicated lower disability / higher quality of life after discharge. Good discussion about factors which could influence results (rehab timelines, adaptations to environment). Interestingly women presented with higher scores in physical, psychological and environmental quality of life, contrasting other similar studies where men tend to perform better.	
Coffey L (49)	COHORT prospective	Irish study Adults, MMSE undertaken Questionnaires completed at 4 time points (t1: on admission; t2: 6wk post discharge; t3: 6mo post discharge; t4: 15mo post discharge).	To explore patterns of change in positive affect, general adjustment to lower-limb amputation, and self-reported disability from rehabilitation admission to 15 months post discharge, and to examine whether goal pursuit and goal adjustment tendencies predict either initial status or rates of change in these outcomes, controlling for sociodemographic and clinical covariates.	indicate the importance of fostering appropriate use of goal management strategies early in rehabilitation to promote favourable long-term outcomes.	2+
Columbo J (88)	Qualitative	Unilat, bilat, TTA (14) and TFA (6) patients with arterial vascular disease, recruited from one vascular clinic in the USA. 17 male, 3 female, age 45-88. Time from amputation was 4-51 months.	Maximum variation sampling strategy. Structured interviews with 20 participants, followed by a focus group of 5 participants to explore the findings from the structured interviews.	Most participants described an adjustment and recovery period following amputation, lasting for approximately six months. Participants defined recovery as when they had regained their functional independence.	3

			Results were categorised into longitudinal recovery, coping strategies and unmet needs.	Participants wanted to be an integral part of the amputation decision-making. The rehabilitation facility was described as being in a "glass-bubble". It was found that obtaining and successfully using a prosthesis was closely tied to the perception of a successful functional recovery by participants. Highlights the need for written pre-op information.	
Czerniecki J (99)	Prospective cohort study	72 dysvascular amputees 53% TTA 38% TMTA 9% TFA Age 54-74 veterans	Mobility outcomes following rehab in comprehensive rehabilitation unit	Compared volume of rehabilitation between different environments of care and whether better mobility outcomes were achieved in a comprehensive rehabilitation unit (CRIU). Showed that improved outcomes re mobility were achieved in a CRIU, and not just volume of rehab sessions. These were not related to differences in baseline function.	2+
Dekker R (90)	Qualitative study	Two explorative focus groups, with thematic analysis.	16 Medical profs (Drs, PTs, OT) and researchers in LLA with use of pre-hab in general, and in particular with PVD pts. Examines their opinions on need for and feasibility of pre-hab program for dysvascular pts at risk for LLA.	All agreed on if pts had improved mental and physical function pre-op would improve post op recovery. But only a few had experience with any kind of pre-op. Need to identify suitable patients earlier pre-op to implement pre-hab.	3
Dunne S (170)	Primary qualitative study	30 patients 18 months post amputation	Completed semi structured interview. Specific data analysis re: goal accommodation and assimilation.	Patients adopt key assimilative/accommodative strategies that may be useful post amputation. Being aware of the processes involved in adjusting	3

				goals in response to challenges is useful for understanding adjustment to limb loss. Long time post-amp, 60% were limb wearing.	
Erjavec T (54)	Prospective exploratory cohort study	101 TFA patients recruited.	Completed ex test using UL ergometer + ECG at post op and then completed 6TWT 3/7 prior to d/c post prosthetic rehab.	Pts achieving 30W+ in ex test using arm ergometer are likely to be able to complete 6TWT using a prosthesis. Therefore, simple ergometry may be useful for screening before prosthetic fitting. Those who are fit enough can proceed straight away to prosthetic rehab, those who aren't should be prescribed an ex programme to complete at home first.	2+
Fard B (100)	Retrospective cohort study	Study based in Netherlands. Review of 382 patients notes who had undergone LLA for dysvascularity	Return home following lower limb amputation	Care in either a rehab setting or Specialist nursing facility is associated with higher odds of returning home. Results suggest that high intensity rehab for younger people and low intensity geriatric rehab for elderly persons (OVER 65) may be effective in optimising the odds of return to independent living after LLA	2+
Fencel R (119)	Retrospective cohort	Retrospective chart review over two years of 42 pts who had BKA's.	RRD post-op	Concluded that using a RRD can improve wound healing, protect the residual limb and help prevent conversions to AKA in a 2-year period post op. RRD should be considered first line therapy in the post operative management of BKA patients. Prior to change in practice to use of RRD 42% underwent conversion to AKA in first 4 weeks; after change to use of RRD	2++

				the rate dropped to 7.55%	
Flint J (139)	Retrospective case control comparison	Combat-related LLAs. 156 patients with 182 amputations. Age 19-43, 98% male. Inclusion criteria was patients with unilateral or bilateral amputations who had a DEXA scan post-injury to investigate bone mineral density (BMD) loss.	Review of medical records.	The severity of BMD loss is predominantly related to disuse atrophy. Prevention of low BMD should focus on early and aggressive weight bearing rehab.	2+
Fortington L (102)	Qualitative - Semi structured interviews	19 Clinicians from 34 skilled nursing centres questioned about aspects of amputee care, including Physiotherapists and Elderly Care Physicians	Rehab in Specialist in-patient setting in Netherlands	Raises issues with maintenance of staff competencies across MDT's in environments where only a small number of lower limb absence patients are seen. Highlights need for guidelines of care and wider collaboration with specialised team members. Suggest decreased locations for rehab to increase specialisation in a few, and improved links with other specialist services. Annual training for PT's needed and partnerships with larger rehab centres. Dutch in patient setting different to UK so possibility of transferability issues re direct applicability	3
Frengopoulos C (82)	Retrospective cohort study	Medical charts of 176 patients, who had transtibial /transfemoral amputations in inpatient rehabilitation setting were reviewed.	Correlation and association between MOCA and walking tests (2 min walk test and L-test) were investigated. MOCA was broken down into 4 quartiles for analysis	Small correlation of MOCA to the 2 min walk test (0.29, $p<0.01$), and L-test (-0.24, $P < 0.01$) was observed in Pearson correlation analysis. In multivariance regression analysis, R square is 0.30. Only Q3 and Q4 ie MOCA lower than 26/30, has been	2+

				found to be statistically significant to predict the time of 2 min walk test (P<0.5) with adjusted beta being 0.16 (CI 0.01-0.31).	
Fulton S (91)	Cohort - Retrospective	Pilot study – intervention group vs control	Implementation of "prehabilitation-plus" for elective LLA's. MDT approach; nutrition, home assessment, education and exercise over 1-4 weeks	OM LOS and discharge destination. Provided more details of the programme content, eligibility criteria. Small sample size (n=7 in each group). Despite not being statistically significant, it did show a reduction in acute hospital and Total LOS (6 vs37 days) vs control group. The PP group still had ongoing home based and outpatient rehab after discharge, so shifted burden of that elsewhere, rather than acute. Lacked patient centred outcomes, more service based.	2-
Furtado S (80)	Prospective cross-sectional survey	100 participants Major amputations but also 2 toe amputations.	Questionnaires: Physical function, pain and quality of life (QOL) outcomes to evaluate the survivorship experience and inform service provision. TESS, QoL and self reported pain.	Questionnaires sent to 250 patients, 105 responded. 100 were progressed to analysis, 4 were excluded as children responded and 1 was incomplete. Mean age 53.6 years, 72 months post op. A variety of tumour types were included. Results 'helpful in managing the expectations of patients about treatment and addressing their complex needs.	2+
Ghazali M (92)	Cohort study	50 unilateral transtibial amputees were randomly selected from three prosthetic and orthotic supplier companies. Participants needed	Questionnaires included questions on demographic data, physical data, clinical data and participant opinions. The degree of stump contracture was measured by	Although the sample size was small and measure subjective/ not validated, the paper gave some good insight into preferred contracture management techniques form	3

		to be unilateral TTAs and be able to communicate effectively.	researchers and classified as no contracture, stump contracture or significant contracture.	patients and indicates at risk populations who may need additional support. A link between diabetic related amputation and being more elderly indicated increased incidence of contracture formation. The paper offers support to education and delivery of contracture management strategies.	
Godlwana L (180)	RCT	South African Vascular amputees	Home exercise programme	Supported use of home exercise programme Potentially poor transferability to UK from SA.	1+/-
Gupta N (66)	Cross-sectional study	101 amputees	Brief pain inventory, pain self-efficacy, EURO QOL scale	Post amputation pain common (69%). Only 13% were using pain medications. Post amputation pain continues to be a major determinant of QOL in lower limb amputees. High-pain interference and poor self-efficacy were associated with poorer QOL after adjusting for age, gender and cause of amputation. Pain and QOL assessment should be integrated into routine clinical evaluation of adult amputees.	2+
Hidayati E (124)	RCT	23 patients randomised post-op. Assessed for volume reduction and pain. Diabetic patients only.	Rigid vs elastic bandage	Reapplied every 4 hours, RRD every 7 days. Follow up for 8 weeks. Significantly increased reduction in swelling in RRD.	2-
Hingorani A (2016)	Systematic review	-	Clinical practice guideline	Identify Clinical Practice Guidelines and synthesise recommendations from CPG's of high quality	1+
Jensen P (173)	Primary qualitative study	Over 50 years of age.	17 semi structured interviews carried out at inpatient discharge at Danish Hospital. Semi purposive sampling.	Unclear sample. Patients are motivated to improve dietary intake but have limited resources. Dietary counselling is very important post	2-

				amputation and should be performed in conjunction with patient.	
Kelle B (156)	Retrospective review and cross-sectional interview	101 patients with LLA, divided into 3 groups according to amputation level. Time since amputation was 6 months to 3 years prior to interview.	Patients were evaluated in the early post-op period via review of records, and 6 months after surgery via face to face interviews.	All patients had stump pain and PLS in the early post-op period. The incidence of PLS decreased to 80% at 6 months post-amp. Group 1 (KD, HD, TFA) had higher 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% 6 months after surgery. No difference between the groups with regard to preamp pain, therefore the results demonstrate no relationship between preop pain and PLP. TFA and distal amp were predictive factors for PLP.	2-
Küçük Öztürk G (78)	Qualitative – semi structured interviews and content analysis performed	13 subjects in Turkey 5 female 8 male Within first 12 months post amputation	Experiences of individuals undergoing amputation. Kucuk et al through semi structured interviews with amputees within their first year post amputation.	Various themes identified by interviewing amputees on their experience of amputation and suggested areas that be addressed during their care. Pts identified importance of including coping skills, social support, communication with other amputees and beliefs in the adjustment process. Unclear how subjects were chosen. Cultural differences may affect the applicability of the findings.	3
Kwah L (179)	Systematic Review		Clinical Practice Guidelines	Identify Clinical Practice Guidelines and synthesise recommendations from CPG's of high quality	1+/-
Lee J (137)	Observational	Case notes of	N/A	Use of PPAM aid during	2-

	retrospective case note analysis.	unilateral TTA analysed from one Scottish NHS centre who attended inpatient rehab and were prosthetic limb fitted.		inpatient setting was associated with the days to reach referral, casting, delivery of prosthetic limb, and inpatient discharge dates ($p<0.05$). Frequency of PPAM aid use was associated with the time to reach casting ($P < 0.05$) and delivery ($P < 0.05$).	
Lombard-Vance R (86)	Cross sectional study	87 participants included	Demographic and clinical data was collected, distress was assessed using HADS. A selection of standardised neuropsychological assessments were completed. Relationships between clinical and demographic variables and neuropsychological assessments were statistically investigated.	Dysvascular amputees were significantly older than the non-vascular group, otherwise demographic data did not significantly differ. Compared to the normative population, a significantly higher proportion of the group had borderline/ impaired scores on cognitive functioning spectrum. Overall the results support the hypothesis that dysvascular amputees are more suspectable to cognitive impairment. The paper suggests that cognitive assessments for dysvascular amputees would be appropriate to identify deficits and guide rehab. Difficult to read due to layout of paper.	2+
MacKay C (52)	Qualitative study	35 individuals with dysvascular LEAs Recruited from three rehab hospitals in Canada.	Participated in semi-structured interviews. The research sat within an interpretive research paradigm, aiming to understand personal experience, interpretations and perception. Clear exclusion criteria, ethics approved and COREQ guidelines followed	Participants discussed the impacts including altered mobility status, health and non-health factors. The overall outcome concluded that the impact varies, identifying those who are likely to struggle will mitigate the negative impacts but that more research is necessary to address the ongoing needs. This study highlights the overall concerns of	3

			to report data.	people who undergo dysvascular amputation.	
Madsen U (94)	Prospective cohort study.	Sample of 105 patients undergoing major LLA, 51 participated in the day 21 follow up.	Structured interviews and Barthel index 100 completed from patient reports of one month prior to amputation and 21 days post amputation. Clinical, demographic, body function and environmental data was analysed as factors potentially affecting patients functional outcome.	Functional level decreased significantly in all 10 ADLs measured by the Barthel index. Around 60% of participants were independently transferring by day 21. Factors deemed to be of statistical significance when predicting functional independence included age (P<0.001), ASA score (P<0.030) and being deemed suitable for a prosthesis prior to discharge (P<0.087). Some issues with study design, differing clinicians undertook baseline and follow up measures which could lead to disparity in results. There is also a risk of recall bias in participants as they were asked to think about their function one month prior to the date of the amputation, though there is no feasible way around this given the nature of dysvascular amputee presentation.	2+
Madsen U (166)	A constructivist grounded theory approach was used	11 participants – 8 men, 3 women Recruited within 3 days of unilateral amputation due to vascular disease. Age 45-84.	Data collected on 5 occasions (4 while in-patient, 1 two weeks post-discharge) to explore patient's behaviour and concerns post-amputation. In-depth interviews were completed at home.	Appropriate constructivist grounded theory methodology. A three-phase pendulating process that patients go through shortly after having a leg amputated due to vascular disease was proposed. The three phases being losing control, digesting the shock, and regaining control. The authors relate their findings to chronically ill populations.	3
Mayo A (61)	Qualitative	10 Semi-structured	N/A	Main themes identified:	3

	study	qualitative interviews completed on in and outpatients with LEA at a rehab hospital in Canada. Self referral, younger average age, mainly BK. Unclear of how long post amp. ?selection bias, little discussion of data analysis		fixating on the past, worry about the future, unmet mental health needs, barriers to mental health support, importance of peer support, tailoring iCBT. People experience sig. emotional distress following amputation and are at risk of developing anxiety and depression	
Miller M (150)	Qualitative meta synthesis		Factors affecting physical activity post amputation	3 factors identified that may influence physical activity after lower limb amputation -Education and motivation -Support and self efficacy -Special concerns after amputation (equipment, environment, prosthetics) Addressing self efficacy, social support, motivation and understanding may improve patient participation.	2++
Miller M (168)	Qualitative analysis using inductive and deductive approaches	Unilateral TTAs, of traumatic or dysvascular aetiology, at least one year post-amputation, walking with a prosthesis. 18 participants – 15 men, 3 women, aged 60 +/- 7 years. Time since amputation 60 +/- 38 months	The Connor-Davidson Resilience Scale (CD-RISC) was completed via telephone. Face to face semi-structured interviews with a directed content-analysis approach.	Five themes of resilience were described – coping skills, cognitive flexibility, optimism, skills for facing fear, social support. *low resilience factors	3
Ostler C (81)	Qualitative Study	8 patients at 2 hospital sites interviewed following MLL amputation secondary to dysvascularity	Semi structured interviews	Participants expect established amputees to be their key informants. Within amputee rehab the use of pre amputation consultations and meeting established amputees should be	3

				more of a priority in cases where time is limited. Patient information and patient discussions are a vital part of the rehabilitation and adjustment process.	
Park Y (67)	Retrospective cohort	41 patient s with 46 amputations. 10 x TFA, 36 x TTA. Mean age 62.9 years. 25 male, 21 female.	Review of medical records with consideration of predictors of post-op complications following amputation with diabetic end-stage renal disease (ESRD).	There was a significant association between TFA, symptom duration over 30 days prior to amputation, and history of sepsis in patients with major complications. History of sepsis was a significant predictor of complications for this population with ESRD – Patients with diabetic ESRD with a history of sepsis had 8.16 times increased odds ratio of having major complications than did those without a history of sepsis.	2+
Pedlow H (77)	Qualitative	16 participants aged 29-82 (av age 64). Five in acute care, 9 were between discharge and one year post-amputation, 2 were between 1-2 years post-amputation.	Face-to-face or telephone interviews using an interview guide.	An education protocol should include multiple strategies for delivery of information, to target multiple audiences, at various times throughout their surgical journey. Having a standard list of topics that must be covered before a patient's discharge, but 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. Must consider age, pain levels, medication, emotional state, environment, use Layman's terms and understand why the patient needs the information.	3
Pedras S (62)	Longitudinal	86 diabetic patients	Assessed pre -op	High levels of minor	3

	cohort study.	indicated for amputation based in 6 hospitals in northern Portugal	and at 1, 6, 10 months post-op to examine influence of various factors on psychosocial adjustment to lower limb amputation. Measures used were: Barthel, HADS, IES-R, SSSS, WOC and TAPES -R	amps (81%). Good attempts at recruitment. Sufficient analysis including multiple regression. Higher pre surgery A&D predicted post surgery A&D and social adjustment. Traumatic stress at 1 month post associated with poor adjustment at 10month. Poor pre surgery function predicts poor adjustment. Social support improved adjustment to limitations	
Peters C (89)	Prospective observational cohort study	49 elderly patients with critical limb ischaemia undergoing amputation	Quality of life and health scores post amputation	Acknowledges the high mortality rate in this cohort but results show that major amputation in elderly patients can show an acceptable QoL which is, in some instances, comparable to their peers. Thought to be attributed to decreased ischaemic rest pain. QoL and depression improved post amputation compared to their baseline. Suggested there should be shared decision process with MDT, pt and family that shouldn't delay the timing of the decision to amputate.	2+
Pickwell K (112)	Prospective data analysis	Assessed 575 patients in 15 clinics in 10 European countries		Sufficient and comprehensive follow up. Good analysis. Mainly patients with more severe disease. Found association between deep ulcers, increased exudate, peri wound and pretibial oedema, fever and elevated CRP levels and amputation.	2++
Polat C (158)	Cross-sectional	104 patients.	It does not say how patients with	Only 8 patients in the PLP group used	2-

	study	Patients with phantom limb pain and patients without phantom limb pain Participants were mainly traumatic amputees with a very small amount vascular (2.8%) No transtibial amputees, mainly transfemoral (59.6%)	PLP were identified (criteria for being diagnosed with PLP) and where patients were sought from, Quality of Life measured with Nottingham extended activities of daily living index	medications! Phantom limb pain was associated with sleep disorder and marital status. Quality of life was significantly lower in the group with phantom limb pain. ($p<0.05$). Phantom limb pain should be treated to increase quality of life. Unclear how sleep disorder assessed.	
Premnath S (75)	Retrospective study	71 patients who underwent MLL amputation over 1 year.	-pre op factors that influence functional rehab after MLL -validation of the BLARt score. Blart assessment tool was used pre-amputation and was calculated at 6 and 12 months and recorded using SIGAM grading	Preoperative walking status was found to be significantly associated with good functional outcomes. Patients who were wheelchair bound were less likely to walk. Blart score was found to serve its role in risk stratification.	2+
Reichmann J (116)	Systematic Review	Assessed literature for benefits of RRD.	15 articles found, 5 RCT, 6 retrospective matched controlled trials and 4 case reports.	Poor assessment of articles and analysis of results. Outcomes described clearly. Benefits of RRD universally recognised – reductions of trauma, reduction of knee flexion contractures, swelling, healing and time to cast and pain.	1-
Sansam K (68)	Qualitative study	23 UK experienced clinicians based at 4 amputee centres	1:1 semi structured interview.	Study was based around clinicians being able to predict prosthetic prescription	3
Sauter C (101)	Cohort – prospective	3 groups for destination from acute hospital – Inpatient rehab facility, skilled nursing facility and home.	Use of SF-36 and Katz ADL disability, as well as other characteristics to determine outcomes in each destination.	R/v at 6/12 showed IRF had better physical outcomes, general health and ADL disability, likely due to the integrated team approach towards rehabilitation. Backs up other research for inpatient rehab care settings. USA study, no criteria given of how selected for IRF. However, couldn't RCT as	2+

				unethical. Otherwise, was adjusted for bias, and noted limitations.	
Sen P (111)	Meta analysis.	1873 patients with DFI who went onto amputation.	Literature reporting risk factors for amputations in patients with DFI. 25 articles (majority retrospective) included and examined Multiple risk factors found.	Predictors of amputation in patients with DFI were: IWGDF grades 3 and 4 ($p<0.001$), Wagner grades 4 and 5, male gender, hx of amp, PAD, osteomyelitis, retinopathy, ESR, length of hospitalisation.	2++
Steinberg N (146)	Systematic review		Falls	Identified 3 stages of falling -Post op -During in patient rehab -Community living return All of these have different factors associated with them and patients with increased balance could be at more risk of falls in the community living phase due to increased likelihood of undertaking risky behaviour compared to less physically able patients.	1+
Sumpio B (117)	Retrospective analysis	151 patients who underwent BKA over 2 years in the US. Compared rigid vs soft dressings and time was measured between amputation and initial casting for prosthesis	Rigid vs soft dressing	Significantly decreased time to cast for rigid (and therefore healing time). Consideration should be given to the use of rigid dressing rather than soft dressing to promote healing and earlier ambulation. BKA fitted with a rigid dressing have accelerated healing times and therefore a shorter time to casting	2+
Torbjörnsson E (79)	Qualitative	13 semi structured interviews conducted on patients of various levels.		Interviews assessed with content analysis. Patients felt abandoned in the surgical phase but did not regret decision to amputate. Vascular patients need better information on lower limb amputation,	3

				and its consequences so as to be better prepared for the whole process.	
Trevelyan E (157)	Qualitative		No intervention	Numerous painful 'real' qualities are experienced with PLP, and descriptions depict suffering. This should be considered clinically during therapeutic encounters, and amputees should be given appropriate information on these potential associations. Study part of a larger investigation into acupuncture for PLP therefore could the drive for this have influenced the conclusions?	3
Turner A (167)	Cohort survey	70 patients undergoing first LEA as a result of diabetes or PVD. 90% TTA and 93% male Age 47-83 veterans	Suicidal ideation	Amputees have increased rates of suicidal ideation at 12 months than the general population. Especially those with dissatisfaction with recovery or lower self-efficacy. Assessed at 12 months post amputation. Population skewed re level and sex. Physiotherapists should consider depression, screening including assessment for suicidal ideation. Patients perceptions may have an equal or greater influence on outcome than of objective function.	2+
Uysal S (109)	Prospective data analysis	Assessed 379 diabetic patients at one Turkish centre.	Followed up to assess for amputation.	Well described analysis. Osteomyelitis, arterial stenosis, history of DFI, wound duration over 60 days, wound depth over 15mm and fungal infection were risk factors for major amputation.	2+
van den Akker L (132)	Qualitative study	Dutch study. Thematic study.	Focus groups of SCI and LLA's who are	Motivational interviewing could be	3

			wheelchair users (no mention of prosthetic use), and separate groups for HCPs.	useful.	
van Schaik L (84)	Observational cohort study. Cohort CASP.	125 persons with lower limb amputation (LLA) and 44 healthcare professionals Dutch study. 86% men, average age 61.4 years, 114 unilateral, 11 bilateral amputations. LLA aetiology trauma (50%), Vascular / diabetes (30%), oncological (15%), congenital (4%), infection (13%), other (10%).	completed a questionnaire regarding the importance of tasks people with LLA should be able to complete independently.	Healthcare professionals (HCPs) rated four activities as significantly more important compared to those with LLA: toileting, bed transfers, indoor and outdoor walking. Those with LLA rated five activities significantly higher than HCPs: driving, cycling, stairs, heavy exercise, and meal prep. Points out the disparity between important ADLs for HCPs versus those with LLA. Population not wholly representative of UK amputees, participants of study were predominantly traumatic amputations, younger in age and higher functioning. Does highlight the importance of shared decision making during goal setting.	2+
Vivas L (58)	Retrospective design.	282 individuals admitted to a Canadian Regional Amputee Rehabilitation Programme	Compared underweight / normal / obese.	Overall, this paper concluded that obesity is prevalent in general and amputee populations, it does not affect functional outcomes on completion of inpatient rehabilitation. As there is no significant difference in the 2MWT, L-test or SIGAM score for obese individuals. However they did not disclose factors such as rehab minutes, staffing, LOS from amputation to ambulation with prosthesis. They also did not discuss the impact of BMI on	2+

				prosthetic component options.	
Wada Y (74)	Retrospective cohort study. Cohort CASP.	28 patients were recruited from a single rehabilitation centre in Japan following lower limb amputation.	Primary outcome was effectiveness of FIM, they also considered clinical demographic, characterises and functional outcomes. Outcomes compared the haemodialysis and non haemodialysis groups.	11 of the 28 patients included were undergoing haemodialysis. Both groups had same baseline and received the same amount of rehab. FIM effectiveness and FIM effectiveness for motor items was significantly higher in the no HD group. The secondary outcomes were not significantly different between groups. Reasons considered for the difference in outcomes; intensity of rehab, decreased physical activity outside of physio, HD being catabolic, and other factors which could influence the outcome. Could be useful in informing practice to adapt therapy to aim for appropriate goal according to known barriers for HD patients.	2+
Ward Khan Y (50)	Qualitative study	9 female amputees	Semi structured interviews	3 themes emerged from interviews 1. Change in relationship with self 2. Threatened relationships 3. Societal roles Highlights importance of compassion, open conversations, understanding of impact of body image on not only sexuality but also on depression, and relationships with others and self.	3
Woods L (51)	Cross sectional design. Cohort CASP	65 individuals (49 male, 16 female) with LLAs. In Ireland.	Completed a battery of self-report questionnaires regarding their current	Around half of those who responded were not sexually active, 60% reported they would like to have sex more often. Almost half of	2+

			psychological wellbeing and their current sexual activity.	participants reported sexual functioning difficulties since their amputation and nearly 40% this had impacted their sex life. 1/3 reported the amputation had affected their body image impacting on their sex life. Highlights the need for psychological/ psychosexual assessment post amputation.	
Zaza S (181)	Cohort Retrospective study	Used large national database to review data on 90+ aged LLA	Mortality and long term living disposition following LLA in nonagenarians and under the age of 90.	Good data set, however missing data for long term outcomes in both groups. Not had study on this scale, poses good questions on how to decide on MLEA for nonagenarians – discussion preop re living situation, mortality and QOL expectations post-amp. How relate to UK? Less nursing homes, more care homes? Still economic aspect, physios involved in D/C planning. Interestingly removed KD from data set.	2+/-

Appendix 10
The Delphi Panel
List of Delphi volunteers:

- Jack Cawood
- Laura Boak
- Wendy Leonard
- Amanda Tredgett
- Matt Fuller
- Emma Valums
- Peter Robinson
- Sharon Wright
- Sophie Racz
- Saskia Boxall
- Karen Duncan
- Sally Smith
- Katy Bryce
- Louise Tisdale
- Jo Burton
- Liz Bouch
- Jude Douch
- Jennifer Fulton
- Ed Morrison
- Sarah Verity
- Laura Wootley
- Gail Murray
- Lyndsey Herkes
- Emma Buckwell
- Coral McNaughton

Appendix 11
The Delphi Questionnaire

Clinical guidelines for the pre and post operative physiotherapy management of adults with lower limb amputations
Delphi Questionnaire (Round 1)

Thank you for agreeing to participate in the Delphi questionnaire for the pre and post-op guidelines 2025 update. Please ensure you have completed this form by **1st April 2025**.

If you need more time or have any comments/questions, please get in touch with us at **bacpar.guidelines@gmail.com**

There have been a lot of articles included in the guidelines, so there has been a big reshuffle in the structure of the Recommendations document. You will see new Recommendations, Good Practice Points and sections compared to the 2016 version. Remember the points included here for agreement are only the ones without sufficient evidence to support them, so we seek consensus opinion from clinicians working within this timeframe of amputee rehabilitation.

Thank you again for your contributions to the Delphi. Rachel and Karen.

Mark only one oval.

	1	2	3	4	5	
Stongly agree	○	○	○	○	○	Strongly disagree

1. Email

2. What is your job banding, job title and current area of work?

3. What is your experience of working with adults with lower limb amputations? (years, acute/prosthetic limb centre/ outpatient/community)

Section 1- **The role of Physiotherapist within the Multidisciplinary team**

4. The MDT should agree on its approach to rehabilitation, with specific professional roles and responsibilities identified and agreed within the MDT.

5. There should be an agreed procedure for communication between the physiotherapist and other members of the MDT.

6. The physiotherapist should be involved in producing protocols to be followed by the MDT and subsequent audits to ensure compliance.

7. The physiotherapist should contribute to the decision on which MDT outcome measures are to be used.

8. 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.

9. The physiotherapist, as part of the MDT, should be involved in making the decision to refer the patient for a prosthetic limb.

10. Good Practice Point: Patient and public involvement should underpin service delivery and development.

11. Good Practice Point: Channels of communication should be established between: the MDT, stakeholders, commissioners, professional networks.

12. Good Practice Point: Education, audit and research should be undertaken on a regular basis by the MDT.

13. Good Practice Point: Documented pathways of care should be used.

14. Good Practice Point: Contact details of MDT members should be readily available to the patient and carers.

15. Good Practice Point: 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.

16. Good Practice Point: 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.

17. Good Practice Point: Physiotherapists should be aware of referral criteria for local prosthetic services, and the mechanism of locally agreed referral pathways.

18. Any comments on the above statements?

Section 2 - **Assessment**

19. Good Practice Point: A locally agreed amputee specific physiotherapy assessment tool should be used

20. Good Practice Point: The physiotherapist should be aware of generalised anxiety/depression scales and consider their use.

21. Good Practice Point: The principles of the Single Assessment Process (SAP) should be considered to improve MDT communication

22. Good Practice Point: Names and contact details of the patients immediate support system, i, e. next of kin/carers should be recorded to facilitate communication and discharge planning.

23. Good Practice Point: Names and contact details of the MDT members involved in the patient's care should be recorded to facilitate communication

24. Any comments on the above statements?

Section 3 - **Patient and Carer Information**

- **Patient journey**

- **Informed goal setting**

25. The physiotherapist should provide information about the prosthetic process to those patients likely to be referred for a prosthesis.

26. The physiotherapist should know where to refer patients for information about benefits.

27. The physiotherapist should know where to get advice on arrangements available to support carers.

28. The physiotherapist should be able to refer the patient to other agencies/professions as necessary

29. The physiotherapist should consider the impact of protected characteristics when setting individual goals and consider reasonable adjustments.

30. Good Practice Point: Names and contact details of the MDT members involved in the patient's care should be given to patients and carers

31. Good Practice Point: The physiotherapist should offer to show demonstration limbs to those patients likely to be referred for a prosthesis.

32. Good Practice Point: Physiotherapists should be aware of the BACPAR Guidelines entitled "Risks to the contra-lateral foot of unilateral lower limb amputees" and "Guidance for the multi-disciplinary team on the management
of post-operative residuum oedema in lower limb amputees".

33. Any comments on the above statements?

Section 4 - **Pre-op management**

34. Where possible the physiotherapist should reinforce information given by other MDT members about the general surgical process (not technique).

35. Where appropriate and possible, the patient should be instructed in wheelchair use pre-operatively.

36. Joint range of movement (active +/- passive) and muscle strength should be assessed, and the presence of any contracture documented.

37. Bed mobility should be taught where possible.

38. Where appropriate and possible, transfers should be taught pre-operatively

39. Respiratory assessment and treatment should be given if clinically indicated

40. Pain control should be optimised prior to physiotherapy treatment pre-operatively

41. If appropriate, and with the patient's consent, carers should be involved in pre-operative treatment and exercise programmes.

42. Good Practice Point: Following a pre-op assessment, the physiotherapist should identify the need and make onward referrals in a locally agreed time frame.

43. Any comments on the above statements?

Section 5 - **Post-op management - setting of care**

44. Good Practice Point: Physiotherapist should be aware of the Audit tool for personal achievement knowledge linked to these guidelines and utilise them in reflective practice as part of their CPD.

Section 5 - **Post-op management - Immediate post-op care**

45. Post-operatively physiotherapy assessment and rehabilitation should ideally start on day zero/one, dependent on patient condition.

46. The physiotherapist, along with other professionals should contribute to the management of pressure care

47. Respiratory assessment and treatment should be given as clinically indicated.

48. The physiotherapist should use their assessments to inform the MDT regarding interventions and discharge planning.

Section 5 - **Post-op management - Care of the remaining limb**

49. The physiotherapist should as part of their initial and ongoing assessments, observe and document the condition of the patients remaining limb.

50. Physiotherapists should establish links with their local podiatry/chiropody services to ensure that information and education given to patients and carers is consistent.

51. Any comments on the above statements?

Section 5 - **Post-op management - Care of the residual limb and oedema management**

52. 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

53. 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

54. Instruction should be given to the patient/carer on methods to prevent and treat adhesions of scars

55. The physiotherapist should give on-going advice to the patient/carer about residual limb care

56. Good Practice Point: All decisions on the application of oedema control modalities should be made jointly by the MDT, where available

57. Good Practice Point: The residuum should also be regularly reassessed, and measurements documented in order.

58. Any comments on the above statements?

_____

Section 5 - **Post-op management - Environment and equipment**

59. The physiotherapist should have knowledge of the provision of equipment that can enhance the rehabilitation process and facilitate activities of daily living.

60. As part of the MDT, the physiotherapist should be involved in access and home visits where necessary, and ensure they are undertaken in a timely fashion

61. Good Practice Point: 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.

62. Good Practice Point: A thorough local risk assessment for each individual should be completed for any equipment considered that is not safety approved for those with limb loss e.g. transfer aids.

63. Any comments on the above statements?

_____

Section 5 - **Post-op management - Non-prosthetic mobility/transfers**

64. The physiotherapist should have knowledge of different transferring methods, for all levels of all amputation, single or multiple.

65. Ideally, bed mobility should be taught on the first day post-operatively

66. Sitting balance should be re-educated if indicated

67. Standing balance should be re-educated if indicated

68. Mobility post-operatively should be in a wheelchair, unless there are specific documented reasons to teach a patient to use alternative mobility aids

69. Good Practice Point: The use of standing transfer aids such as the Sara stedy/RotaStand are not advised for use without a prosthesis, as described by the manufacturers guidance

70. Good Practice Point: If alternative mobility has been provided/taught e.g. with elbow crutches, the risks should be discussed with the patient, and clearly documented in their medical notes.

71. Good Practice Point: 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

72. Any comments on the above statements?

_____

Section 5 - **Post-op management - Wheelchairs and seating**

73. The physiotherapist should have knowledge of who prescribes wheelchairs, how they are provided, any appropriate accessories including pressure relieving seating.

74. Where necessary the physiotherapist should be able to assess a patient's suitability for a wheelchair or have knowledge of the referral process

75. Good Practice Point: The physiotherapist should discuss potential long-term usefulness of a wheelchair, even if a patient is likely to receive a prosthetic limb

76. Any comments on the above statements? *

_____

Section 5 - **Post-op management - Early Walking Aids**

77. Good Practice Point: The physiotherapist should be aware of the SPARG PPAM aid guidelines and ensure/maintain appropriate competency.

78. Any comments on the above statements?

_____

Section 5 - **Post-op management - Falls management**

79. Good Practice Point: Within the MDT, the physiotherapist may contribute to assessments of home hazards as part of discharge planning.

80. Any comments on the above statements?

_____

Section 5 - **Post-op management - Prevention of contractures/maintenance of joint range of movement**

81. Joint range of movement (active +/- passive) and muscle strength should be assessed and documented post-operatively.

82. Contractures should be prevented by education of appropriate positioning

83. If the patient is in a critical care environment and is unable to actively exercise, physiotherapists should maintain joint range of movement through passive exercises or use of equipment

84. Where contractures have formed, appropriate management strategies should be discussed with the MDT

85. Where reduced range of movement has occurred, appropriate treatment should be given

86. Any comments on the above statements?

Section 5 - **Post-op management - Exercise programmes**

87. 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

88. An exercise regime should be given relevant to the patient's goals and reviewed on a regular basis

89. The physiotherapist should be aware of community resources that patients can access that will support them in being more physically active

90. Good Practice Point: Physiotherapists should be aware of the well-established PIRPAG exercise program

91. Good Practice Point: Information on self-management/home exercise following discharge should be provided to the patient

92. Good Practice Point: Where possible all verbal information/advice given should be supplemented in an accessible form to meet the patients' needs e.g. written - font size, language, different media

93. Good Practice Point: Patients requiring ongoing outpatient/community referral should have this arranged prior to discharge

94. Any comments on the above statements?

Section 5 - **Post-op management - Management of phantom sensation, phantom pain and residual limb pain**

95. All patients should be made aware of the increased risk of falls, due to phantom limb sensation

96. Good Practice Point: Patients requiring ongoing outpatient/community treatment should have this arranged prior to discharge

97. Any comments on the above statements?

Section 6 - **Health and well-being** (New section added)

98. 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

99. Good Practice Point: The physiotherapist should be able to refer directly to a clinical psychologist/counsellor if appropriate.

100. Any comments on the above statements?

Section 7 - **Developing specialist knowledge (**New section added)

101. The physiotherapist should have knowledge of surgical techniques used in amputation

102. Good Practice Point: Patients should be treated as an individual considering their socio-economic status, size and protected characteristics

103. Good Practice Point: Patients requiring ongoing outpatient/community treatment should have this arranged prior to discharge

104. Good Practice Point: A summary of the patient's treatment and status at sent to the physiotherapist providing on-going treatment

105:Good Practice Point: Contact names, telephone numbers and addresses of numbers should be supplied to patients prior to discharge

106:Any comments on the above statements?

Delphi Questionnaire (Round 2)

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

Thank you for agreeing to participate in the Delphi questionnaire for the pre and post-op guidelines 2025 update. Please ensure you have completed this form by **13th June 2025.**
There are only 4 statements to review. The wording has been altered in respect of the comments provided in Round 1.
Remember the points included here for agreement are only the ones without sufficient evidence to support them, so we seek consensus opinion from clinicians working within this time frame of amputee rehabilitation. There is an amended list of professional stakeholders and useful organisations in the Process document that can be referred to.

If you need more time or have any comments/questions, please get in touch with us at bacpar.guidelines@gmail.com
Thank you again for your contributions to the Delphi.
Rachel

Section 2 - **Assessment**

1. Good Practice Point: Where possible, a multidisciplinary assessment should be considered to improve MDT communication and reduce duplication of assessments from multiple healthcare professionals.

Section 3 - **Patient and Carer Information**

2. The physiotherapist should know which professionals/organisations to signpost patients for information and support about benefits.

3. The physiotherapist should know which professionals/organisations to signpost carers to for support.

Section 5 – **Post-op management – Non-prosthetic mobility/transfers**

4. Good Practice Point: The use of standing transfer aids such as the Sara stedy/RotaStand are not advised for use without a prosthesis, (as described by the manufacturers guidance). If the decision has been made to use a standing transfer aid, the risks should be discussed with the patient and clearly documented in their medical notes.

Appendix 12a
Results from the Delphi questionnaire – Round 1
Some consensus questions that were posed by the previous GUG have been excluded from this list as there is new evidence that supports the recommendation, and expert opinion is therefore not required.

Questionnaire results (n= 25)				
Section	**Recommendation**	**% Agreement**	**GPP**	**% Agreement**
Section 1	1.1	100%	1	96%
	1.2	96%	2	92%
	1.3	88%	3	100%
	1.4	100%	4	96%
	1.6	96%	5	88%
	1.9	100%	6	100%
			7	100%
			8	100%
Section 2			9	92%
			10	88%
			11	68%
			12	100%

			13	88%
Section 3	3.1.5	100%	14	84%
	3.1.8	74%	15	84%
	3.1.9	68%	16	100%
	3.1.10	100%		
	3.2.6	92%		
Section 4	4.6	76%	17	100%
	4.8	92%		
	4.9	100%		
	4.11	100%		
	4.12	92%		
	4.13	100%		
	4.14	100%		
	4.15	96%		
Section 5	5.1.1	100%	18	84%
	5.1.2	100%	19	92%
	5.1.4	100%	20	96%
	5.1.5	100%	21	96%
	5.2.2	100%	22	84%
	5.2.6	92%	23	76%
	5.3.1	100%	24	100%
	5.3.4	100%	25	96%
	5.3.10	92%	26	100%
	5.3.11	96%	27	100%
	5.4.1	100%	28	92%
	5.4.3	84%	29	100%
	5.5.1	100%	30	100%
	5.5.2	96%	31	96%
	5.5.3	100%	32	100%
	5.5.4	100%	33	100%
	5.5.6	96%		
	5.6.1	100%		
	5.6.3	96%		
	5.9.1	100%		
	5.9.2	100%		
	5.9.4	92%		
	5.9.5	100%		
	5.9.6	100%		
	5.10.2	100%		
	5.10.3	96%		
	5.10.5	100%		
	5.11.8	100%		
Section 6	6.2	100%	34	96%
Section 7	7.3	92%	35	100%
			36	100%
			37	100%
			38	84%

Results from the Delphi questionnaire – Round 2

Round 2 Questionnaire results (n= 20)				
Section	**Recommendation**	**% Agreement**	**GPP**	**% Agreement**
Section 2			11	85%
Section 3	3.1.8	85%		
	3.1.9	85%		
Section 5			23	85%

Appendix 12b
Comments from the Delphi Round one and their impact of the guidelines update

Related Guidelines Section Number	**Common theme identified**	**Action taken by GUG**
1	Current statement makes it seem that all patients will be provided with a prosthesis	Reworded to clarify statement
2	-Mixed knowledge about the SAP principles, some were for sharing documentation, some found that full MDT assessments are too much/time consuming. -MDT contact details	-Simplified and reworded statement for Round 2, and minor adjustments following Round 2 comments. -Slightly rephrased in each section
3	Availability of demonstration prosthetic limbs in more acute settings.	Additional wording added
	Whose role it is to provide information about benefits/carer support etc	Adjusted to signpost to these services as it will differ between localities what support is available/who's role it is and their experiences.
4	Standing transfer aids – split consensus about their use	Reworded statement for round 2 to make it more applicable to various environments.
5	Physio role vs MDT role	Minor change to add "along with other professionals"
	Equipment	Minor alteration regarding ongoing risk review and utilising local MH teams. Reworded for Round 2.
6		
7	Onwards referrals contact points	Reworded for more generic rather than individual names

General comments:

- *Due to the lack of notice given pre-operatively there needs to be a degree of flexibility with the roles especially if not all members of the team can see the patient in a timely fashion.*
- *Prosthetic teams should visit local services to enhance MDT working.*
- *Reliant on two way communication and agreement around discharge planning and onwards care. This is not easy and often there is push back from community rehab services in our area.*

- *contact details but names can change particularly with rotational staff so even if the name was recorded this may not facilitate communication*
- *Amputee assessment tool - Assessments labelled as tools usually are focused in the Prosthetic part of the patient journey and the Toolkit is full of these*
- *If pre-op review mandatory (unless an emergency procedure) it will give better support to inpatient wards in regard to staffing mixes and numbers. Currently as it is only advised, this makes pre-op reviews very challenging due to the demands of other service groups, and NHS Trusts less willing to invest in staffing as not a mandatory pathway.*
- *Pre-op: not all hospitals/teams do this, general feeling it would be useful, often don't have time to complete all recommendations, but still restricted with some onward referrals as patient needs to be deemed 'medically fit'.*
- *Lots of agreement that access to Podiatry service is vital, especially useful to do joint appointments e.g. foot is dressed while in for physio treatment too.*
- *There seems to be an issue with managing these points within the community setting, our patients see non-amputee-specific therapists until they are assessed at the local prosthetic centre - this can be a 12-week wait.*
- *Standing transfer aids being used – training of staff needed, some find it useful to progress rehab and reduce sheared forces. Others worried about high risk of falls, risk to contralateral limb etc.*
- *Minimal psychological support in all settings – variable across localities and depends on funding how accessible this is. If mandated to have inpatient counselling/psychological services, this will allow business cases for specialist input and be a huge benefit to patients and reduce demand on therapists.*
- *More information is needed in the acute sector, and on where to signpost patients.*

Appendix 12c
Comments from the Delphi Round two and their impact of the guidelines update

Related Guidelines Section Number	Common theme identified	Action taken by GUG
Section 2	MDT Assessment – general agreement that it reduces time for clinicians, increases efficiency of the team, improves patient experience (as not repeating themselves). Comments about Therapy/AHP and nursing shared assessment or to include medical/surgical too, maybe daunting if multiple clinicians are together for assessment vs 1-1, what should it include e.g. objective measures.	No changes made
Section 3	All agree this should happen however mixed opinions about who's role it should be, not knowing which organisations to refer to locally/nationally as information changes often – however good comments about linking with prosthetic service and local Trust teams that provide this information. Written and verbal information should be provided to allow patient to access once reduced overwhelm. Some difficulty if services covers a large or multiple area geographically as different systems are in place.	No changes made
Section 5	Large number of comments about how community teams/ nursing staff in settings often not used to amputee transfer techniques will use/request advice	No changes made

	about using these, so it's good to have some clarity on what to advise. Difference in opinion re: TTA vs TFA use, with or without a prosthesis. Documentation of why not chosen usual amputee transfer techniques and handover those details to other services.	

Appendix 13
Definitions of SIGN's 'Grades of Recommendations'

Grade of Recommendation	Level of Evidence Found	Definition
A	1++ or 1+	Must have at least 1 meta analysis, RCT or systematic review rated 1++ that is directly applicable to the Guideline population Or A body of evidence rated as 1+ directly related to Guideline population with consistency in the results presented.
B	2++ or Extrapolated from 1++ or 1+ studies.	Must have a body of evidence rated as 2++ directly related to Guideline population with consistency in the results presented. Or Results extrapolated from 1++ or 1+ studies.
C	2+ or Extrapolated from 2++ studies.	Must have a body of evidence rated as 2+ directly related to Guideline population with consistency in the results presented. Or Results extrapolated from 2++ studies.
D	3or4	Evidence is gained from literature rated as 3 or 4 Or Results extrapolated from 2+ studies.

These grades are allocated by the GUG to the recommendations of the completed Guideline and based on the strength of the supporting evidence from which they were formulated.

The aim of these grades is to give the Guideline user important information about the quality of evidence upon which each recommendation is based; it is not ranking the recommendations in the authors perceived level of importance to clinical practice.

Appendix 14
Domains of the appraisal of guidelines, research and evaluation (AGREE 11)
This international, validated tool is designed to assess the overall quality of a Guideline. The tool contains 23 items and is split into six theoretical quality domains.

AGREE II scoring system
Each of the AGREE II items and the two global rating items are rated on a 7-point scale (1– strongly disagree to 7– strongly agree).

A quality score is calculated for each of the six AGREE II domains. The six domain scores are independent and should not be aggregated into a single quality score.
Domain scores are calculated by summing up all the scores of the individual items in a domain and by scaling the total as a percentage of the maximum possible score for that domain.

The scaled domain score will be:
Obtained score – Minimum possible score ÷ Maximum possible score – Minimum possible score
(Maximum possible score = 7 (strongly agree) x No of items in domain x No of appraisers
Minimum possible score = 1 (strongly disagree) x No of items in domain x No of appraisers)
The percentage allocated to each of the six quality domains help to form the overall quality rating of the guideline.

Domain	Definition
Scope and Purpose	Clarity is needed about the overall objectives of the Guideline being developed and the potential impact on society & patient populations. There should be a clear description of the patient population to which the guideline is applicable to.
Stakeholder Involvement	Description of all of the authors involvement needed (including those just used for consultation or expert advice). A range of authors from differing professional backgrounds is thought to be essential to control potential biases. Stakeholders should have appropriate clinical skills and/or experience and/or technical expertise to justify their involvement in the formulation +/- implementation of the Guideline (patients views should be included in this process). Target user are unambiguously identified and the Guideline piloted amongst this group.
Rigour of Development	Systematic review and rigorous appraisal of the available evidence should be demonstrated. The methods used for formulating the recommendations are clearly described. External review of the Guideline has been undertaken by appropriate group of individuals.
Clarity and Presentation	Recommendations should be clear & unambiguous. Key recommendations are easy to identify and support material for application is included (i.e. – patient information, quick reference guide etc)
Applicability	Potential organisational barriers to implementation of the Guideline have been discussed with cost implications identified. Guideline also suggests identifies audit criteria so that the Guidelines use and effect in clinical practice may be measured by the Practitioner.
Editorial Independence	Is there independence from the Editorial group from any Funding committee & any conflicts of interest have been declared.

Appendix 15a
External, patient and peer reviewers

- Peer Reviewers who completed AGREE II tool:

Peer Reviewer	Employing NHS Trust/Organisation	Clinical Specialty	Job Title
Jess Withpetersen	North West Anglia NHS Foundation Trust	Physiotherapy	Highly specialist Physiotherapist
Amelia Reynolds	The Royal Wolverhampton NHS Trust	Physiotherapy	B6 Physiotherapist
Louise Tisdale	The Royal Wolverhampton NHS Trust	Physiotherapy	B7 Physiotherapist
Eleanor Bacon	NEL Prosthetic Service Mayflower Community Hospital, Billericay	Physiotherapy	Lead Therapist Prosthetics Service
Daniel Long	Southampton General Hospital, University Hospital Southampton	Physiotherapy	Vascular and Amputee Physiotherapist
Milutin Radotic	Specialized Hospital for Rehabilitation and Orthopedic Prosthetics, Belgrade, SERBIA	Physiotherapy	Team lead Physiotherapist
Jenni Palser	Queens Hospital, Romford	Physiotherapy	Clinical Lead Physiotherapist
Arturas Kalinauskas	Queens Hospital, Romford	Physiotherapy	B7 Physiotherapist
Sarah Drury	STEPS Prosthetics	Physiotherapy	Specialist Physiotherapist
Melanie McNicholas	Barnsley Hospital NHS Foundation Trust	Physiotherapy	Specialist MSK physiotherapist

- External stakeholders who completed AGREE II tool:

External Reviewer	Organisation	Clinical Specialty	Job Title
Tanja Scherrer	BAPO	Orthotist	Principal Orthotist
Jenny Brown	Southampton General Hospital, University Hospital Southampton	Occupational therapy	Occupational therapist
Megan Arendorf	Queens Hospital, Romford	Occupational Therapy	B8 Clinical Specialist Occupational Therapist
Hazel Anderson	Glasgow	Prosthetics	Senior Prosthetist

- External stakeholders who returned comments:

PARs OT (RCOT)
Vascular Surgeons of GB and Ireland

Appendix 15b
Impact of comments from the reviewers using the AGREE II tool and the impact on the updated guidelines

- Domain 1: Scope and purpose = 89.4%
- Domain 2: Stakeholder involvement = 76.1%
- Domain 3: Rigour of development = 71.8%
- Domain 4: Clarity of presentation = 87.2%
- Domain 5: Applicability = 78.7%
- Domain 6: Editorial independence = 62.5%

Relevant Agree II question/ domain	Comments received	Action taken by GUG
General	Consistency of abbreviations use and glossary	All have been checked and included. These were initially only included in the Process document, but they have now been added into back of the Recommendations document too, as it may be used as a standalone document.
1	-	-
2	Further information about members of the GDG not included. Referencing the prosthetist as 'additional MDT members' seems to be inferior to the part that they play in rehabilitation for people who have had an amputation. Recommendation 1.7 & 1.8 & 1.9 We would suggest making amendments as follows: along with other professionals (that would allow the	This information is included in the process document. Whilst valuable members of the MDT, generally prosthetists and orthotists are not involved in this stage of the amputee's journey as standard. The prosthetic guidelines continue on the amputee's journey to the prosthetic centre and also covers the pre-prosthetic timeframe, where

	inclusion of prosthetist who would be equally important on what is possible with regards to prosthetic design, function and use). Recommendation 3.1.5 – We would recommend that physiotherapy liaise with the local prosthetic service for protocols and guidance and advice if needed. The prosthetist should be involved in the decision making for prosthetic provision. Recommendation 5.3.6 & 5.3.7 – And orthotists	prosthetists and orthotists will be significant members of the MDT in the patients care. Wording has been altered to include MDT and orthotist.
3	9. Early reports of use of strongest evidence used but no obvious demonstration of critical appraisal within this document 13. Review by experts not documented currently, but aware it is going through the process 14. Clear description of historic review and updating given but a timescale for future development would provide rigour.	Early reviewers of the recommendation document had a version without the references included and could not access the methodology in the Process document. This is all now in place. Unable to document results of the review until the final version of guidelines is completed. This is unlikely to change – due to the nature of the volunteer work required to update the guidelines, but also the nature and pressures of working in healthcare environment. As documented, a 5 year review will remain, though earlier reviews would be ideal.
4	Some mention of barriers and good use of local implementation. Recommendations, good practice points and local implementation are clearly written are presented in a summarized box at the end of each section making them easy to find.	The Recommendations document layout had been changed prior to the review, changes have been kept due to comments.
5	No clear signposting to audit tool, possibly included in process documentation.	This is mentioned in the Process document, and the reader is now directed to both the Process document and the Audit tool at the beginning of the Recommendations document.
1-6	Unable to review / find process document therefore unable to assess some sections.	Process document was sent out delayed after initial email to reviewers, so some completed the review without it, hence a lower score by some reviewers for various domains, particularly Domain 6. There is a specific section in the Process document regarding funding and conflict of interest.

Other Comments from reviewers outside of the AGREE II tool framework:

Comments received	Action taken by GUG
Are GPPs were always *practical* rather than knowledge based, although some knowledge based ones are in there.	GPPs were previously local implementation points.
These guidelines are clearly UK based, however it is inevitable they will be reviewed and potentially used internationally. Can you narrate how you see these guidelines impacting non-UK countries, or maybe give some advice on how they should be received there?	Additional section added to the process document. The focus of these guidelines is for Physiotherapy management within the UK healthcare system, so may not be fully applicable, or resemble best practice outside of the UK. For example, EWA's often aren't used in many other countries.
A number of recommendations and GPPs are repeated in forms in different sections.	The updated layout of the document meant that each section could stand alone in isolation. This has meant there is some repetition, however, some of these could be reviewed at the next update with feedback from physiotherapists who are using the guidelines in this format.
I wonder if it is worth marking the 'knowledge' recommendations separately. There is section on specialist knowledge - why not bring all such recommendations there?	The Knowledge section was revamped, and a lot of the existing knowledge points were added into the specific sections, and all physiotherapists (at whatever experience level) would need to know about when accessing the guidelines. The additional 'developing specialist knowledge' section was created to focus on the more general knowledge points that more experienced/specialist staff would need to know to grow within the specialism.
A lot of references are given to support a recommendation, without text about the study appearing in the preceding text. Is that intended?	The evidence sections have been updated to retain the most important pieces of information from the relevant articles, but also the most updated pieces of evidence. The evidence supports the recommendations, and the process document contains the inclusion table with comments with more information if required. Some evidence sections are quite short, simply because there is not a significant amount of evidence relating to that section, or it has been commented on elsewhere deemed more important.

Appendix 16: Definition of a specialist physiotherapist in amputee rehabilitation

Since the first inclusion this definition was included in the BACPAR guidelines, there have been significant changes in roles and scope of practice, with the introduction of Advanced/Enhanced practice roles, especially for allied healthcare professionals.

The CSP Career Framework [177] latest update in 2024, replaced a previous publication that described a definition of a specialist physiotherapist, which was previously included in BACPAR's guidelines. The CSP Physiotherapy Framework should support an understanding of the knowledge and skills required of physiotherapists working across all levels of practice. Agenda for Change, (the NHS pay structure) was introduced to all NHS staff in 2004. However, there is no automatic read-across from Agenda for Change bands to the CSP Physiotherapy Framework levels.

More recently, the NHS Employers National job profile for Physiotherapists [178] has been updated and lists *Specialist Physiotherapist* role as a band 7 level. Within amputee rehabilitation, the descriptors for both *Physiotherapist Principal* (band 8a) and *Physiotherapist Consultant* (band 8a-b) would also be applicable within services specialising in amputee rehabilitation. This would be further supported by BSRM guidelines[3] recommend a minimum of specialist band 7 level physiotherapist. The guideline further describes the roles/skills a physiotherapist within referring hospitals and Prosthetic and Amputee Rehabilitation Centres.

Previous BACPAR guidelines[1,2] described the following description, formed by clinicians and managers involved in amputee rehabilitation. Specialised physiotherapists in amputee rehabilitation should:

- Be experienced in amputee management, including lower limb prosthetic training
- Have a good understanding of prosthetics
- Be able to look after amputees with complex problems
- Be conversant with evidence-based clinical guidelines produced by BACPAR
- Ideally have a relevant post-graduate accredited qualification
- Be a resource in terms of education, training, and development of senior physiotherapists and other professional staff.
- Carry responsibility for developing and utilising research evidence, current national guidelines and recommendations and integrating this into service delivery to ensure that practice is evidence based.

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

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

Terminology

Audit	In healthcare is a process used by health professionals to assess, evaluate and improve care of patients in a systematic way. Audit measures current practice against a defined (desired) standard. It forms part of clinical governance, which aims to safeguard a high quality of clinical care for patients.
Benchmarking	A systematic process in which current practice and care are compared to, and amended to attain, best practice and care.
Bio psychosocial	The biopsychosocial model states that health and illness are determined by a dynamic interaction between biological, psychological, and social factors.
Causal	The presence of cause, or ideas about the nature of the relations of cause and effect.
Clinical Effectiveness	"The extent to which specific clinical interventions do what they are intended to do" (98)
Clinical Governance	"the system through which NHS organisations are accountable for continuously improving the quality of their services and safeguarding high standards of care" (99)
Cohort	A group of individuals who share a characteristic at some specific time.
Discharge Summary	summary of the episode of care
Evaluation	review and assessment of the quality of the care for the purpose of identifying opportunities for improvement
Goal setting	Re-establishing the desired end points of care.
Hemi pelvectomy	Amputation of the whole leg plus the pelvis on that side; also known as a 'hindquarter' amputation.
Hip disarticulation	Amputation involving disarticulation of the femur from the acetabulum.
Knee disarticulation	Amputation by disarticulation of the tibia from the femur
Meta-analysis	A quantitative, formal, epidemiological study design used to systematically assess previous research studies to derive conclusions about that body of research.
MeSH	Medical Subject Heading: specified subject headings are used so that all databases are uniform in cataloguing their articles.
Multidisciplinary team	a group of people (e.g. healthcare staff, patients and others) who share a common purpose.
Morbidity	Is another term for illness.
Neuropathy/Neuropathic	Having to do with a damage to a nerve
Oedema	Swelling
Outcome measures	A 'test or scale administered and interpreted by physical therapists that has been shown to measure accurately a particular attribute of interest to patients and therapists and is expected to be influenced by intervention' (98)
Patient Record	Refers to any record containing patient details. Can be separate physiotherapy record or within multidisciplinary case notes.
Peer review	assessment of performance undertaken by a person with similar experiences and knowledge.
Prosthesis	artificial replacement of a body part

Residual limb/Residuum	remaining part of the leg on the amputated side
Service user	Anyone who is a patient or other user of health and/or social services
Service provider	A legal entity, or a sub-set of a legal entity, which may provide health care under NHS Service Agreements; it may operate on one or more sites within and outside hospitals.
Stakeholder	Are people or groups, each with a unique perspective, who have an interest in health care decisions.
Symes	amputation by disarticulation of the ankle with removal of the medial malleolus and resection of the tibia
Trans femoral Amputation	amputation through the femur
Transfer of care	the process of transferring the responsibility for care from one service to another. It includes secondary referrals and discharges.
Trans pelvic	an amputation when approximately half the pelvis is removed
Trans tibial Amputation	amputation through the tibia

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/whoweare

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/