

Third Edition 2020 – Process Document

Evidence based clinical guidelines for the physiotherapy management of adults with lower limb prostheses

British Association of Chartered
Physiotherapists in Amputee Rehabilitation



Evidence based clinical guidelines for the physiotherapy management of adults with lower limb prostheses

About this document: This document describes the evidence based clinical recommendations for best physiotherapy management of adults with lower limb prostheses as described in the literature and expert opinion.

This document will update: Broomhead P, Clark K, Dawes D, Hale C, Lambert A, Quinlivan D, Randell T, Shepherd R, Withpetersen J. (2012) *Evidence Based Clinical Guidelines for the Managements of Adults with Lower Limb Prostheses*, 2nd Edition. Chartered Society of Physiotherapy: London.

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The Guidelines Update Group (Appendix 1a),

The previous Working Parties (Appendix 1c),

Professional Advisers (Appendix 2),

Literature Appraisers (Appendix 4),

External Reviewers (Appendix 13a),

Peer Reviewers (Appendix 13a)

Delphi Panel

Users of the 'Amputee Rehabilitation' forum on the interactiveCSP (iCSP) website (www.iCSP.org),

British Association of Physiotherapists in Amputee Rehabilitation (BACPAR),

Scottish Physiotherapy Amputee Research Group (SPARG),

National Institute for Health and Care Excellence (NICE)

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.

“NICE accreditation allows clinical guidelines to be developed using critically evaluated high quality processes. In the long term it has also led to improvements in the quality of information produced for health and social care decision-makers.” NICE recommends there is an ongoing literature search and regular updates over 5 years.

Comments on these guidelines should be sent to:

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Preface

The British Association of Chartered Physiotherapists in Amputee Rehabilitation (BACPAR) encourages its members to use the biopsychosocial model of care. It aims to promote best practice in the field of amputee and prosthetic rehabilitation, through evidence and education, for the benefit of patients and the profession. It is committed to research and education, providing a network for the dissemination of best practice in pursuit of excellence and equity whilst maintaining cost effectiveness.

Aims of the Guidelines

This guidelines update has been produced to:

- facilitate best practice for physiotherapists working in lower limb prosthetic rehabilitation;
- identify and incorporate new published evidence into the guideline recommendations;
- assist clinical decision-making based on the best available evidence;
- inform prosthetic users and carers;
- inform service providers in order to promote quality and equity;
- reduce variation in the physiotherapy management of adults with lower limb prostheses across NHS services;
- facilitate audit and research.
- reduce unproven and ineffective practice

Objectives of the Guidelines

This guidelines update has been developed to:

- provide a comprehensive document which will inform physiotherapists in the management of adults with lower limb prostheses;
- rigorously appraise the current relevant literature;
- make recommendations for best practice based on the published evidence and expert consensus opinion;
- disseminate information;
- facilitate audit and benchmarking of local service provision against national best practice recommendations;
- identify any gaps in the evidence and areas for further research work.

The previous editions of this guideline were published in 2003 and 2012 ⁽¹⁾. This third edition seeks to integrate new scientific evidence and current best practice into the original recommendations using a similar methodology. The Delphi consensus method was replicated to ensure that recommendations, based on expert opinion, capture and continue to reflect current thinking and best clinical practice. Further amendments and additions have been made to the

BACPAR (2020) Evidence based clinical guidelines for the physiotherapy management of adults with lower limb prostheses, 3rd edition.

Good Practice Points (GPPs) from the previous edition. The impact of the new evidence and the 2019 Delphi consensus exercise are detailed at the beginning of each recommendation section; all new recommendations are marked (***) after the recommendation numbering and amended recommendations marked (~) for ease of identification.

This update of the guidelines have been split into 3 documents:

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

In addition, the following supplementary documents have been developed to support the guidelines update:

- The public information leaflet ("Information for the public about physiotherapy following amputation of a lower limb") was updated to cover both the BACPAR pre and post-operative guideline ⁽²⁾ as well as this guidelines update.
- A poster for use in the clinical environment, that signposts to the public information leaflet.

All three editions have been produced by members of the Chartered Society of Physiotherapy (CSP), who hold state registration with the Health & Care Professions Council (HCPC). At the time of production of these guidelines, 9 members of the guidelines update group (GUG) were practising physiotherapists and BACPAR members. The only exception is the 10th member of the third update GUG, who is not a physiotherapist, therefore does not have CSP/HCPC registration. She is a Professor of Clinical Biomechanics, with a special interest in lower limb amputation. At the time of the guidelines production, she was an allied associate member of BACPAR.

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.

Four patient representatives were invited to attend meetings with the GUG and, if unable to attend the meetings, were asked to comment on the minutes and actions. Their views were sought throughout the process to consider the information patients wanted in relation to the guidelines and the best format to provide it in (see Service User Involvement section, for more details). For future updates of these guidelines, it is recommended that at least two patient representatives are involved and invited to meetings.

These guidelines are intended for those adults who receive a prosthesis. However, BACPAR acknowledge that not everyone who undergoes a lower limb amputation will benefit from a prosthesis. It should also be acknowledged that not all lower limb prostheses wearers have undergone an amputation, for example those with congenital limb deficiencies.

Throughout this document, adults with lower limb prostheses may be referred to as individuals, amputees, adults with limb loss, patients, or service users. These guidelines do not constitute a

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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 recommend these guidelines should always be utilised in conjunction with the CSP Quality Assurance Standards ⁽³⁾.

If this document is being used for the purpose of prosthetic service planning, it should be read alongside other amputee-specific guidelines and documents developed by other healthcare professions ⁽³⁻⁸⁾ including groups representing service user views ⁽¹⁰⁾ and pertinent government publications whose findings can be extrapolated to the lower limb amputee population. The National Confidential Enquiry into Patient Outcomes and Deaths (NCEPOD) ⁽¹¹⁾ is one such example.

Conflict of interest

In accordance with NICE recommendations, a conflict of interest policy was developed. This policy is available from the Guidelines 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 BACPAR Executive committee and the GUG and was deemed not to be a conflict of interest, as these guidelines do not specifically recommend which products to use.

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 this 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

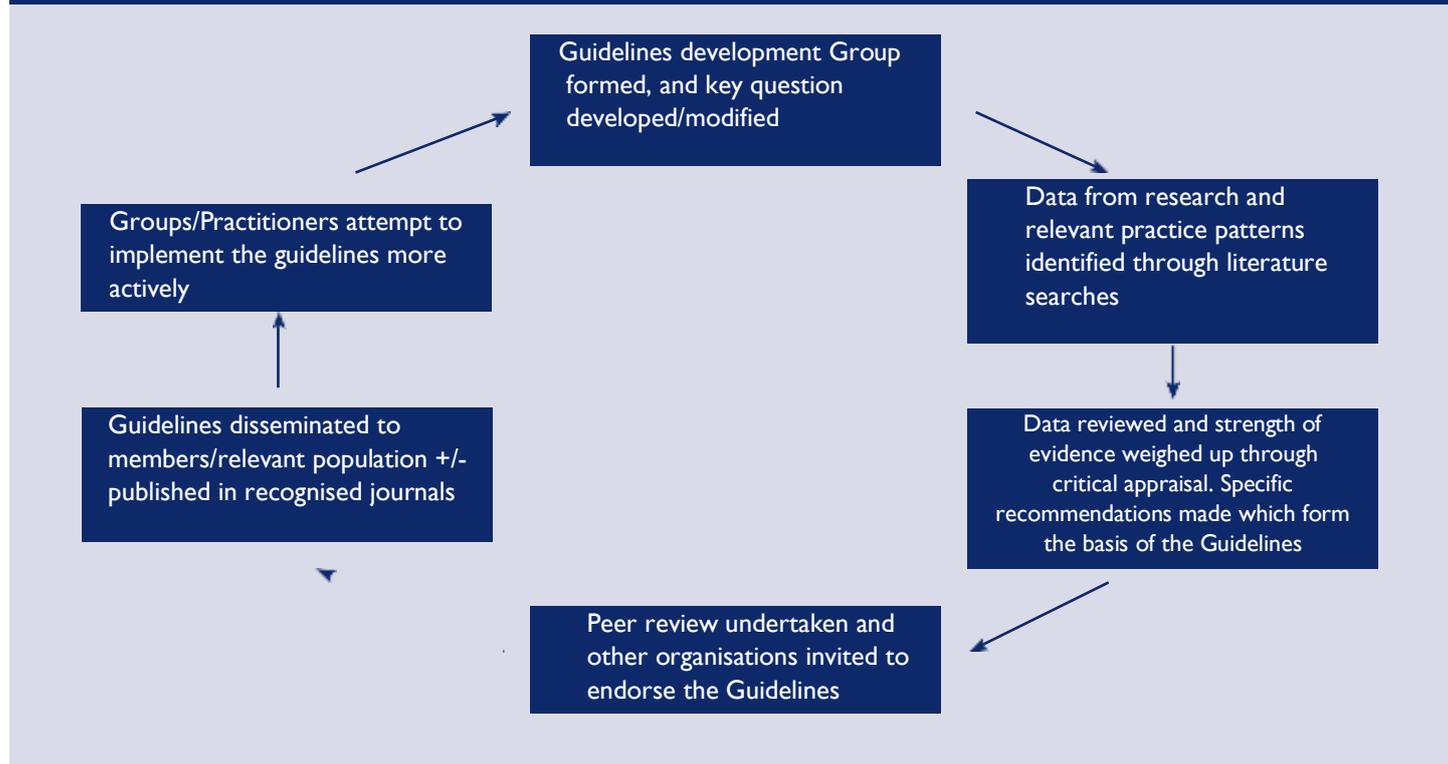
The need to drive up clinical standards and the quality of clinical services so that meaningful improvements for the patient are seen, whilst maintaining cost effectiveness, is a central theme found in all recent government publications pertaining to the NHS ^(12,13). Physiotherapists need to prove that they are providing clinically effective interventions and demonstrate their ongoing commitment to Continuing Professional Development (CPD) in order to maintain state registration ⁽¹⁴⁾.

In accordance with NICE guidance, 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 different ways ⁽¹⁵⁾:

- 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

Figure 1: Key stages of the Guidelines development process⁽¹⁷⁾



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development of local service provision and local protocols.

Evidence Based Clinical Guidelines

Definition of clinical guidelines

Evidence based guidelines are ‘*systematically developed statements to assist practitioner and patient decisions about appropriate healthcare for specific circumstances*’⁽¹⁶⁾.

The practice of evidence based medicine means integrating individual clinical expertise with the best available external evidence from systematic research⁽¹⁶⁾. **Figure 1**⁽¹⁷⁾ 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.⁽¹⁸⁾. 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 & Professional Responsibility

Clinical governance is a central theme promoted within the NHS. Evidence based practice is recognised as a statutory duty for health organisations to examine the quality of healthcare provided⁽¹⁹⁻²¹⁾.

Although there continue 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⁽²²⁾. The HCPC have now 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⁽¹⁴⁾.

Resource Implications

Since the previous edition of these guidelines, there have been many changes, and also challenges to national services for amputees⁽⁵⁾. 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 prosthetic limbs.

Major lower limb amputation has a profound effect on quality of life with high levels of morbidity and mortality⁽²³⁻²⁹⁾. The cost of prosthetics service to the NHS (£60 million per year in England)⁽³⁰⁾ requires an enormous commitment in terms of finances, equipment and resources and warrants maximum clinical effectiveness to ensure a cost-efficient service.

In a 2012 report⁽³¹⁾ it was stated that there were a total of

5,906 new referrals to prosthetics services in the UK. Lower limb amputations account for 91% of total amputations, with the most common cause remaining due to vascular disease, and a large portion also have diabetes mellitus⁽³¹⁾. More recent figures from NHS England are estimated that the number of service users at prosthetic centres in England is between 55,000-60,000⁽³⁰⁾.

In the latest SPARG report, data for amputations in Scotland for 2017 showed 798 new major lower limb amputees, but only 44% went on to have a prosthesis fitted⁽³²⁾. The Northern Ireland Prosthetic Service reported 144 major lower limb amputations for 2017-2018. The NHS Wales data reports 328 consultation episodes for major lower limb amputation over 2018-2019.

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

Since the 2nd edition of these BACPAR guidelines, there has been a significant transition of veteran amputees into the NHS prosthetic centres, once discharged from the armed forces. The Murrison Report⁽³³⁾ carried out in 2011, reviewed the significant increase of amputees in the armed forces.

The latest 2020 official statistics⁽³⁴⁾ of UK service personnel from the Afghanistan and Iraq conflicts, with injuries that included a traumatic or surgical amputation, totalled 336 (302 from Afghanistan and 34 from Iraq). In addition, 113 of those injured in the Afghanistan conflict incurred significant multiple amputations; there were fewer than 5 multiple amputations from the Iraq conflict. It can be seen from the yearly Ministry of Defence (MOD) statistics that there are still amputations occurring from injuries sustained during these conflicts, although the number is diminishing each year. This is in addition to the small number of amputations each year due to injuries sustained from service (for example, training accidents/non-work related injuries). There is ongoing research by the Defence Medical Rehabilitation Centre into the long-term outcomes (both medical and psychosocial) of battlefield trauma casualties.

The Murrison Report⁽³³⁾ also reviewed the commitment to provide ongoing access to specialist prosthetics provision in NHS prosthetic centres, which were not funded for this at the time. It was recommended that specialist prosthetic and rehabilitation services should ensure veterans have access to high-quality care, similar to that provided in the armed forces. Although veterans may choose to attend any NHS prosthetic centre, there are nine centres in England⁽³⁵⁾, selected to provide enhanced services to veterans to manage the challenges, expectations and complexities of veteran amputees.

The Veterans Prosthetic Panel was established in 2012 to allow veterans with service attributable injuries to apply for additional funding for specialist prosthetic limbs, through their NHS prosthetic centres.

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In Scotland, following implementation of the recommendations from the Murrison Report, the Scottish Specialist Prosthetics

Service was introduced in 2014, centralised at the prosthetic centres in Glasgow and Edinburgh. This service was made available to all Scottish prosthetics service users via a referral from their local prosthetic centre to access state of the art prosthetic limbs.

The invaluable knowledge, gained from the provision of this service, has been applied to the introduction of the NHS England Microprocessor Knee (MPK) Policy⁽³⁶⁾. The MPK policy was approved in December 2016 with immediate effect, making MPK's available to trans-femoral, hip disarticulation and knee disarticulation amputees under specific qualifying criteria and indications⁽⁴⁾. This has allowed every prosthetic centre in England to access MPK provision, for those patients who undertake successful MPK trials.

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

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 wide variation nationally in the quality, type of service and care offered by physiotherapists to adults with lower limb prostheses^(11,32).

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

'Senior colleagues' are the most relied upon source to inform and develop many clinicians' practice within specific areas of amputee rehabilitation⁽³⁷⁾. It is, however, recognised that a high number of these senior colleagues specialising in amputee and prosthetic rehabilitation are lone practitioners⁽³⁸⁾ 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'⁽³⁹⁾. 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^(16,40,41).

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 particular 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 and agreed goals, as well as local circumstances; patient consent should always be gained prior to any treatment⁽³⁾.

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/ prosthetic rehabilitation do report using these guidelines in a number of ways as identified in the introduction⁽¹⁵⁾.

Process of updating the guidelines

The NICE Guidelines manual⁽⁴²⁾ suggests that: "Any decision to update a guideline must balance the need to reflect changes in the evidence against the need for stability". NICE recommends there is an ongoing literature search and regular updates over 5 years.

In 2017, 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 reflecting the necessary experience and skills needed to compile clinical guidelines (Appendix 1a). All members had an understanding of the use of guidelines in assisting and informing clinical practice, with some members having post-graduate experience of guideline development. The BACPAR Guidelines co-ordinator led the working party. One member declared a conflict of interest but after discussion within the GUG, it was deemed not to be a conflict of interest (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 Guidelines Manual' developed by NICE⁽⁴²⁾ (**Figure 2**).

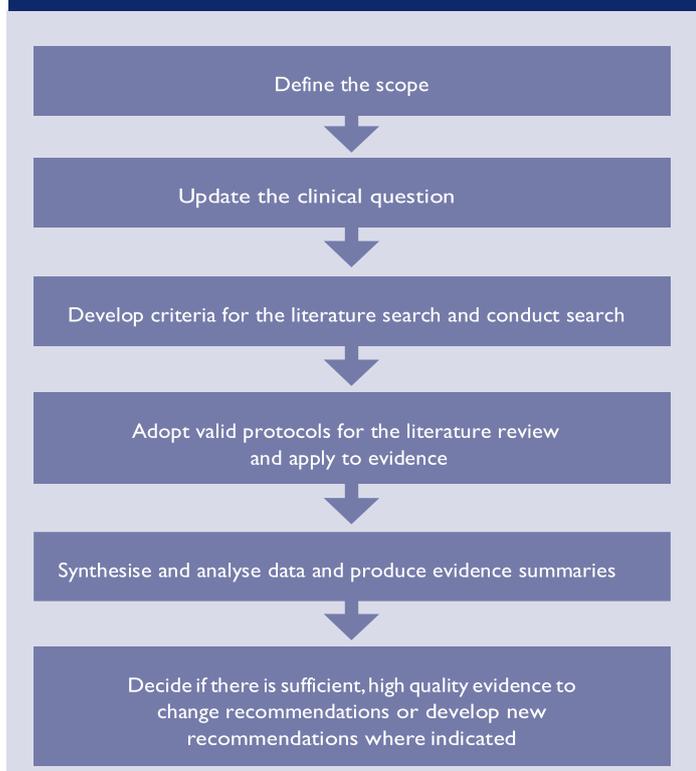
Service User involvement

Following advice from the NICE Guidelines Manual⁽⁴²⁾, patient representatives who had completed prosthetic rehabilitation, were recruited from a variety of prosthetic centres. Patient representatives have been part of the production of this update process. Four service users (3 males, 1 female) were initially recruited from various prosthetic centres by their physiotherapists. However, only two users were available attend the first GUG

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meeting which involved outlining the update process and their

Figure 2: Summary of the six basic steps identified in the updating of a Guidelines ⁽⁴²⁾



anticipated level of input. They were also the only users who continued to contribute significantly throughout the process, including a review of the final full guidelines and supporting documents. All users feedback has been sought throughout the update process, specifically during the update of the information for the public leaflet and the development of the poster.

At the beginning of the update, a focus group at one of the NHS prosthetic centres with service users was undertaken. Information was collected from them about the type of information they wanted to know about physiotherapy/ what to expect from their physiotherapist, the rehabilitation journey, in addition to the format of the information, and how service users and their carers would be able to access it. This feedback was consolidated into the Public information leaflet and poster.

Furthermore, the Westminster Cross Party Limb Loss Group (WCPLLG) representative (male, current service user) also reviewed all documents at the end of the process and provided substantial feedback which has been partly implemented in to these guidelines, and some comments taken forward for future updates (see appendix 13c).

The GUG acknowledge that there was not a wide representation of the patient population from the three male service users who contributed to this update. In future updates, the GUG will seek to encourage a wider variety of service users to participate in the process.

Funding

BACPAR, as a professional network, is funded by members' subscriptions and these funds support the development of any guidelines 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 time. Members of the GUG claim their travel expenses, to attend GUG meetings, from BACPAR.

During the update process, the authors successfully applied for funding from the CSP Professional Network fund to support the development and dissemination of these guidelines. The funding was awarded to BACPAR and will fund the publication of hard copies of the Recommendations document and the Audit and Implementation Guide document for members. It is expected this will be a small print run as all the guideline documents will be available electronically. A print run of the poster to support the Public information leaflet has already been completed during the update and was disseminated to members who requested them. The BACPAR Executive committee agreed to a re-print if numbers require this to be necessary and for future updates.

Scope of the Guidelines

The scope of these guidelines remains purposely broad. It was not the 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 physiotherapy management of adults with lower limb prostheses. They are applicable to all major levels of amputation, including bilateral amputation, regardless of the underlying aetiology or age. It should also be acknowledged that not all lower limb prostheses wearers have undergone an amputation, for example those with congenital limb deficiencies

These guidelines commence when the patient is assessed for the provision of a prosthesis and conclude when the patient is discharged from active treatment to a maintenance/review programme. The earlier physiotherapy management of a lower limb amputee is addressed in the "*Clinical guidelines for the pre and post-operative physiotherapy management for adults with lower limb amputations*" ⁽²⁾.

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

- trans-pelvic
- hip disarticulation
- trans-femoral
- knee disarticulation
- trans-tibial
- ankle disarticulation (Symes).

These guidelines **do not** cover:

- pre-operative and pre-prosthetic management of lower limb amputees
- the prescription of specific types of equipment such as walking aids, wheelchairs and prosthetic componentry.

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- upper limb amputees and prosthesis management
- care provided by members of the multidisciplinary

The Literature Search

The Clinical Question

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

What is best practice in the physiotherapy management of adults with lower limb prostheses?

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

Aims of the Search

To identify literature relating to physiotherapy management of adults with lower limb prostheses from September 2010 to December 2018.

The literature search was defined by:

Inclusion Criteria

Articles were included if they were:

- published from September 2010 until December 2018;
- relevant to lower limb amputees/people with limb loss;
- relevant to adults (18 years of age and older);
- relevant to all pathologies/causes of amputation;
- relevant to all major levels of amputation i.e. trans-pelvic, hip disarticulation, trans-femoral, knee disarticulation, trans-tibial and ankle disarticulations (excluding partial feet).

Exclusion Criteria

Articles were excluded if they were related to:

- pre-operative care of amputees;
- surgical management of amputees;
- immediate post-operative care of amputees;
- upper limb amputees;
- paediatric amputees;
- minor levels of amputation, e.g. partial foot;
- specific prosthetic products and articles that investigated the effects of prosthetic componentry.

Method of literature search

Literature searches were conducted in February 2018 and again in May 2019 under the supervision of a librarian using the search protocol and key words detailed in the first edition of the guidelines.

team (MDT) who are not physiotherapists.

The following databases were searched: AMED, BioMed Central, British Nursing Index, Cinahl, Cochrane, DARE, Embase, Medline, OT Seeker, PEDRO, and REHABDATA and Web of Science. Hand searches of relevant literature reference lists were also included.

Key words

The key words and free text used were:

Amputation, physical therapy, exercise therapy, hydrotherapy, massage, activities of daily living, early ambulation, rehabilitation, vocational, self care, physio*, amputation stumps, amputation traumatic, amputees, amput*, artificial limbs, prosthet*

Selection of relevant articles

All duplicates from the results from each database search were removed. All potentially relevant articles were then checked by title. The GUG undertook the appraisal by dividing into pairs and equally distributing the abstracts between the pairs. The abstracts were then reviewed by each member of the pairs to ensure the article met the inclusion criteria.

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

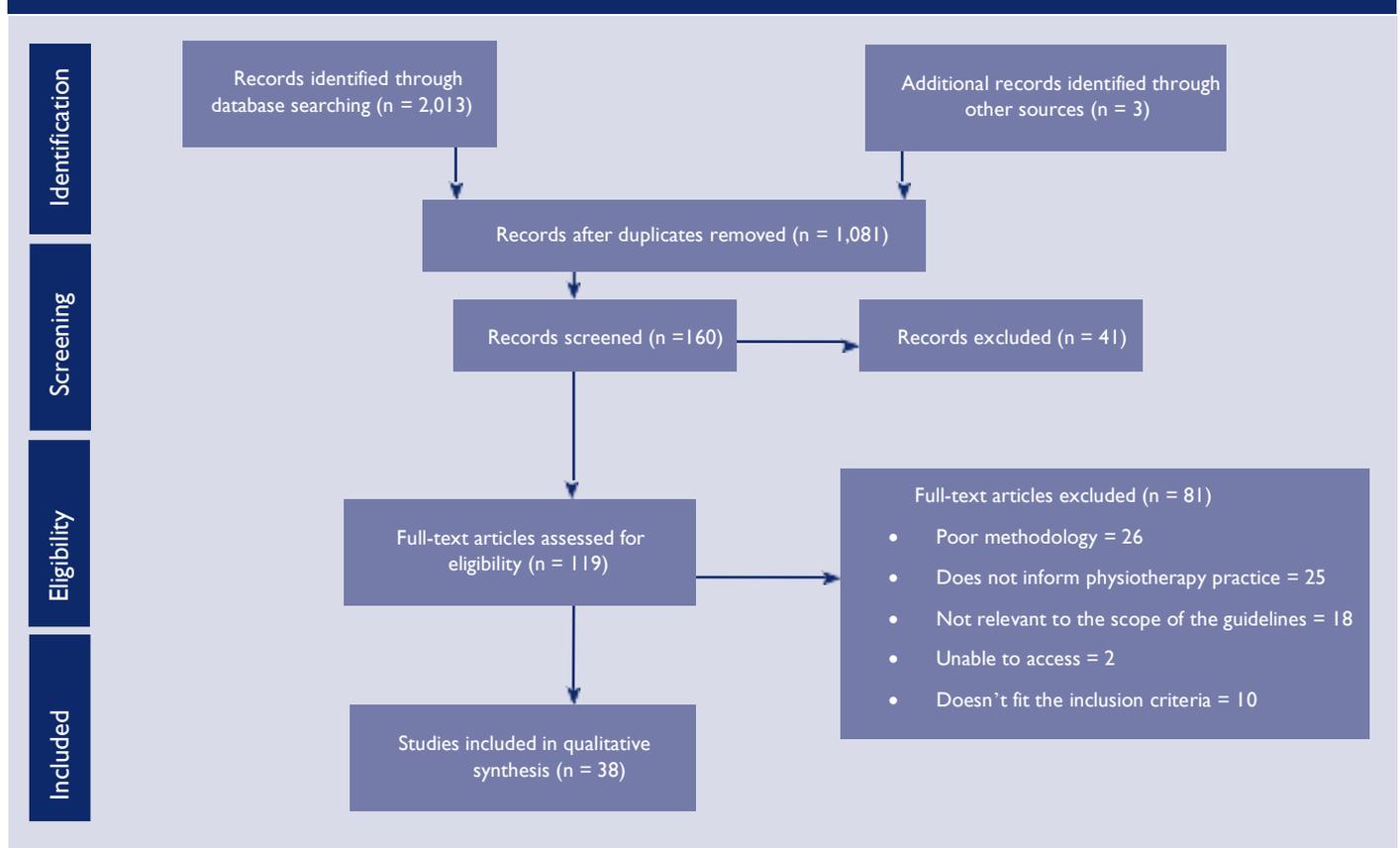
- not relevant to the guidelines;
- contained inconclusive evidence;
- purely descriptive;
- was a conference abstract and proceeding;
- was a feasibility study.

All relevant articles were then obtained in full-text to be critically analysed.

Moher et al. ⁽⁴³⁾ stated that poor reporting diminishes the value of systematic reviews and subsequent guidelines developed from such evidence. The Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) statement has been developed and distributed internationally and suggests many points to improve reporting quality and transparency.

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

Figure 3: PRISMA (2019) Flow diagram illustrating the flow of information through the different phases of the literature identification and review process



Reference: Moher et al. ⁽⁴³⁾ template accessed via www.prisma-statement.org

The Appraisal Process

The GUG undertook the literature appraisal (Appendix 4).

The Critical Appraisal Skills Programme (CASP) tools ⁽⁴⁴⁾, specifically developed to help evidence based analysis in health and social care settings, were selected to guide article appraisal. There are seven 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 in order 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 Scottish Intercollegiate Guidelines Network (SIGN) grading tool (Appendix 7).

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 was added.

Overall, thirty eight articles were identified as providing new evidence. The evidence tables for all articles utilised in the previous and current edition of these guidelines are found in Appendix 9. Details of the articles excluded after full review are displayed in Appendix 6.

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The Consensus Process

It was recognised in the previous edition ⁽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, the GUG thought it was important that the expert opinion (from which 'D' graded recommendations had been developed) were scrutinised to ensure they continued to truly reflect 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' ⁽⁴⁶⁾.

It is a widely utilised methodology within healthcare for gathering expert opinion and turning it into group consensus ⁽⁴⁷⁾. 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;
- practising clinicians have the opportunity to contribute to and develop the guidelines.

The Delphi process

In the original process, two rounds of postal questionnaires were sent out before recommendations were written. The recommendations were reviewed in the second edition of the guidelines, and GPPs were created. It was decided that the recommendations from the second edition, that still had a 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 current edition. This was in addition to any existing and new GPPs added by the GUG.

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' ⁽⁴⁷⁾.

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

participate were sent out by an appeal on the amputee network on the iCSP website ⁽⁴⁰⁾, closed BACPAR members Facebook site, or identified by the BACPAR and SPARG membership secretaries.

The panel inclusion criteria remain unchanged. Physiotherapists who:

1. had worked for more than three years in prosthetic rehabilitation;
2. spend more than 50% of their clinical time in prosthetic rehabilitation;
3. had postgraduate training in the field of amputation rehabilitation.

The membership requested clarification of these requirements, especially since the introduction of the MSc in Amputee Rehabilitation. This was the explanation provided:

1. less than three years may also be acceptable if they have significant experience working within a more acute amputee role prior to their current role in prosthetic rehabilitation;
2. it is appreciated that many roles may involve both acute care and prosthetic rehabilitation, but this is a guide that prosthetic rehabilitation should be a good part of their main role i.e., not just 1 day a week;
3. this does not have to be a formal MSc module, it can include any prosthetic rehab specific training e.g. BACPAR national conference/ regional study day.

For the next guidelines update, the wording of these criteria should be reviewed to reflect any changes within this specialist area of healthcare and education.

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

Delphi Results

A return rate of 72% was achieved with thirty-nine of the eligible fifty-four 'experts' returning a completed Delphi questionnaire. No questions produced consensus of less than 75%; therefore, a further round was not indicated.

- Appendix 10 displays the Delphi questionnaire sent out to the consensus panel.
- Appendix 10a displays the breakdown of the results that were received from the consensus panel results of the questionnaires.
- Appendix 10b outlines the comments and impact to the guidelines following the comments from the Delphi process.

Good practice points (GPPs)

“On occasions, guideline development groups find that there is not, nor is there likely to be any research evidence. This will typically be where the treatment is regarded as such sound clinical practice that nobody is likely to question it”⁽⁴⁵⁾.

The previous edition of the guidelines determined GPPs which in many instances are considered by the authors to reflect a ‘common sense’ approach to intervention. Several new GPPs were created during this review process and, along with existing GPPs, were re-examined by the consensus panel selected for the guidelines update.

When writing the GPPs, the authors have ensured that they are realistic, integral to the patient’s treatment and that the expert consensus panel agreed with them.

Drafting the Updated Guidelines

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

Section headings:

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

- CSP Standards of physiotherapy practice for the management of patients with amputations ⁽⁴⁸⁾;
- CSP Quality Assurance Standards ⁽³⁾;
- Knowledge and expertise of the working party.

For this update, it was agreed that the five of the six section headings utilised in the guidelines’ previous editions remained clinically relevant and representative of the evidence. However, Section 6 was renamed to reflect new evidence found for that topic.

Updating the guidelines 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 guidelines 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/GPP being developed. Once the new literature was amalgamated, levels of evidence for each recommendation were allocated (see Appendix 7) reflecting the strength of the supporting evidence from which they were formulated.

The recommendation grading system utilised gives guidelines’

users information about the quality of evidence upon which each recommendation is based; it does not rank recommendations according to the authors’ perceived level of importance. It is acknowledged that it is sometimes not appropriate to use a randomised controlled trial (RCT) to answer therapy research questions ^(39,40,45) hence there are very few ‘A’ graded recommendations.

The authors continue to find that there are large areas of physiotherapy input with prosthetic users where no supporting published evidence exists; in these instances, expert opinion has been revisited and recommendations derived from this can only receive a ‘D’ grading. Results & comments from the 2019 Delphi consensus ⁽¹⁵⁾ were reviewed and, where indicated, minor rewording was undertaken. Agreed GPPs were inserted into the text.

Guideline Audit tools

It is recognised by validated guideline appraisal tools (i.e. the AGREE 11 tool ⁽⁴⁹⁾) 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; comments were sought via the consensus panel about their practical experience of using the tool clinically. Comments received and actions taken by the authors whilst updating the audit tools are detailed in Appendix 11b.

The audit tool is available as a standalone document and can be found on the BACPAR website www.bacpar.csp.org.uk/. The audit tool remains split into 3 parts, giving three distinct tools:

- service led recommendations;
- personal achievement of GPPs;
- patient notes audit form.

It is hoped that these stand-alone 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 CPD. In addition to this, more guidance has been added to help guide clinicians with their CPD and to utilise the tool effectively to enable changes in clinical practice.

BACPAR feel it is reasonable to expect that any clinician providing physiotherapy treatment to adults using a prosthesis should aim to follow the recommendations and GPPs presented in this document as a minimum for safe practice. Local standards need to be set regarding the audit targets.

Public Information document

Following the feedback from patients/service users at the beginning of the update process and the review of the updated recommendations, the GUG used this feedback to develop an updated information document outlining what patients/service users should expect from their physiotherapist following a lower limb amputation. The information within the document is based on questions patients asked and the relevant recommendations within the guidelines document. The Public information document is

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available on the 'User Information' section on the BACPAR website.

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 deliver a quality judgement about these guidelines' usefulness and validity; see Appendix 12 for the specific domains examined^(42,45).

Review of the drafted guidelines updated

Once full drafts of the process document, the guidelines' recommendations, the audit and implementation tool, and the public information document were completed, these were sent with the AGREE II tool to:

- Peer reviewers (Appendix 13a),
- External reviewers (Appendix 13a),
- Patient representatives (Appendix 13a).

Peer Reviewers

Both specialist and non-specialist physiotherapy staff, with experience of treating lower limb amputees and/or prosthetic rehabilitation, were invited to comment upon the draft guidelines. A mixture of staff grades, clinical specialties and geographical locations were sought to maximise the strength of the peer feedback. This was carried out by inviting interested physiotherapists who responded to an invitation on the iCSP⁽⁵⁰⁾ amputee network website and the closed Facebook BACPAR 'members only' page.

External Reviewers

These stakeholders were approached to be part of the review process as they may have advised on previous editions or, as they are considered to represent all the multidisciplinary aspects of amputee rehabilitation, their expert opinion is highly valued.

- SPARG
- BAPO
- SIGAM (BSRM)
- WCPLLG
- ISPO
- Vascular Society
- RCOT
- Limbless Association

Service Users

Service users, who had been approached for comments at the beginning of the process to help develop these guidelines, were asked to comment on the updated Public Information document and the accompanying poster (Appendix 13c), as well as provide their thoughts on the rest of the guidelines. Unfortunately, only two of the service users continued to contribute to the process following the first GUG meeting. The GUG appreciates that along with the comments from the WCPLLG representative, (who is also a prosthetic service user), that they may only represent a small selection of the lower limb amputee population.

The recommendations and comments from all the reviewers

were considered by the GUG. They were collated and themed and where appropriate the document was amended to produce the final documents. See Appendix 13b for their comments and suggestions and actions taken.

Review and Further updates of the Work

Feedback from the membership, on the separation of the documents in the pre and post-operative guidelines, was positive especially regarding its accessibility and usability for clinicians. With some slight modifications, this format was maintained in this update.

NICE recommend that ongoing literature searches and appraisal of evidence-based practice is demonstrated as part of their accreditation process. Therefore, a regular alert of all search engines used in the appraisal process has been set up, and regular critical appraisal of relevant literature will be completed and shared with the membership on an annual basis. The BACPAR Guidelines co-ordinator will assess the need to update these guidelines when there is a significant amount of new evidence. A discussion will be held to establish whether there has been a change in clinical practice by either healthcare professions and/or patient and carer organisations. During any update of these guidelines, the BACPAR Guidelines co-ordinator will ensure that there is user involvement throughout the update process.

The role of the BACPAR Guidelines co-ordinator will be important in the continual review and updating of all the guidelines produced by BACPAR. The 2016 update of the *pre and post operative* guidelines explained a new updating process for the future. The prosthetic guidelines will follow the same process:

- The BACPAR Guidelines co-ordinator, liaising with BACPAR's Honorary research officer(s), will undertake an annual literature review, and if necessary, will utilise a working party to appraise any new, relevant articles.
- Any new evidence that is appraised as adding to the body of evidence will be added to the recommendations document yearly.
- Information about this new evidence will be disseminated throughout the BACPAR regional networks, the BACPAR annual conference, the BACPAR journal, iCSP and BACPAR's closed Facebook group for members.
- The BACPAR Guidelines co-ordinator will present any new evidence during the annual report at the BACPAR Executive committee.
- The BACPAR Guidelines co-ordinator liaises with the MSc Amputation and Prosthetic Rehabilitation (University of Southampton) course lead, the BACPAR Honorary education officer(s) and the BACPAR Honorary research officer(s), to consider the opportunity for participating students to identify areas lacking in evidence with the potential for supporting course assignments and/or research dissertations.

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 professionals and/or patient and carer organisations, that would warrant a major review and update. A decision will then be made either to update the guidelines or produce a statement detailing the reasons why it will be

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postponed.

BACPAR Executive committee, along with the BACPAR Guidelines co-ordinator, will 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 published evidence for physiotherapy practice within amputee management is small, will impact on the update process.

Health Benefits, Side Effects and Identified Risks

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

Implementation and Dissemination of the Updated Guidelines

Publication and Presentation:

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>).

BACPAR will fund the publication and dissemination of the 'Recommendations' document, 'Audit and Implementation Guide' document and the Public Information leaflet and poster (at further request of its membership) to improve accessibility of the information.

The regional networks of BACPAR membership will support the implementation and promotion of the guidelines update at a local level by supporting various CPD opportunities. The BACPAR Guidelines co-ordinator will also seek to present at relevant national conferences to disseminate to multi-professional audiences.

Dissemination of the guidelines can be further enhanced through the use of social media networks. This will be supported by the social media officer of the BACPAR Executive committee.

Barriers to implementation

In order to adopt the recommendations in these guidelines, a number of 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 of prosthetic rehabilitation was 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 in 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.

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Appendix 1a: Guidelines Update Group

Laura Burgess,

Guidelines update group member

Laura qualified from St Thomas' Hospital, London in 1990 and has been working in the field of amputee rehabilitation and prosthetics for twenty five years. Her current position, held for 20 years, is a clinical specialist physiotherapist at the Imperial College Healthcare NHS Trust London, which is both a regional vascular and major trauma unit.

She has been involved in research investigating the use of compression therapy in the UK, prosthetic use following discharge from rehabilitation and a piece of work evaluating the use of the Wii in rehabilitation. She has been an active member of BACPAR for many years and has held positions (including Chair) over many years on the executive committee for the United Kingdom National Members Society of the International Society for Prosthetics and Orthotics (ISPO). Laura has served on the ISPO Executive Board 2013-19 and continues on the Continuing Professional Development committee.

Laura has been involved in lecturing and running workshops at three of the uniting frontiers ISPO meetings held in Central America as well as a number of ISPO World Congresses, UK Meetings and BACPAR annual meetings. Laura sat on the Clinical Reference Group for Complex Disability Equipment (including Prosthetics) and on the Prosthetics Sub-Group in 2013. She was a consultee of the 2018 update of the BSRM Amputee and Prosthetic Rehabilitation Guidelines (3rd Edition).

Karen Clark,

Guidelines update group member. Past guidelines author.

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.

Mary Jane Cole,

Guidelines update group member. Joint BACPAR Journal Editor. Past Chair, vice-Chair, Research Officer and Education Officer

Mary Jane is a Senior Lecturer at Kingston University and St George's University of London. She has worked in the field of amputee rehabilitation for many years, mainly at Queen Mary's Hospital, Roehampton, London. Mary Jane's experience with people with limb loss includes pre and early post amputation management and prosthetic rehabilitation. She continues to practice on a part-time basis in the private sector and has an Honorary Contract with St George's NHS Trust.

Mary Jane has an MSc in Physiotherapy and Education. Recent activities within BACPAR have had an educational focus and include updating evidence based guidelines for students (amputee rehabilitation), collaboration with the University of Southampton in developing post-graduate learning at Masters level, and leading a working group to develop and implement learning for therapists working with amputees abroad post sudden onset disaster. Mary Jane has taken her experience to work and teach abroad for short periods and has presented at national and international conferences. Along with Sara Smith, Mary Jane is co-author of Chapters 'Amputee Rehabilitation' (Assessment and Treatment) in the Concise Guide to Physiotherapy, 2012, Editor Tim Ainslie.

Matthew Fuller,

Guidelines update group member

Matthew Fuller is a clinical specialist physiotherapist in vascular surgery and amputee rehabilitation working at Guys and St Thomas' NHS Foundation Trust. Matthew qualified as a physiotherapist in 2000 from the University of East London. Matthew has worked within vascular and acute amputee rehabilitation since 2006. Firstly, he held senior physiotherapist posts within a regional prosthetic centre working with pre-prosthetic, prosthetic rehabilitation and established amputees before moving to the vascular surgery department at St Thomas' Hospital in 2010. In 2011 Matthew completed a post-graduate certificate in amputee rehabilitation at The University of Bradford. In the past he has held the post of Public Relations Officer on the executive committee of BACPAR and has published several papers, been involved in guideline development and presented at national and international conference.

Rachel Humpherson,

Joint BACPAR Guidelines Co-ordinator/Joint chair of Guideline update group

Rachel qualified as a physiotherapist from Manchester Metropolitan University in 2011 and has worked full-time in amputee rehab since 2013. Having developed a keen interest for amputee rehabilitation straight away, she continued to gain experience in this area whilst working in the community, hospital and private clinics.

Rachel began working at the SMRC Preston in 2013, in a new role of Sports Physiotherapist in Amputee Rehabilitation. This involved a mixed caseload of NHS and Military Veteran amputee outpatients, providing experience of treating patients with a wide variety of Microprocessor Knees. The role also involved treating MSK issues in amputee patients, as well as an emphasis on getting amputees to engage with physical activity and exercise, treating both upper and lower limb patients. During this time she held the role of BACPAR North West regional rep for several years, created the initial publication of "So your Patient has an Amputation" and was part of the organising committee for several BACPAR Annual National Conferences. Rachel has been working at Össur since 2017 as the clinical specialist physiotherapist for the North Europe Regional Academy. Her role involves training physiotherapists in North Europe on using Össur products with patients and developing resources for both lower and upper limb amputations. Rachel has delivered seminars both in the UK and internationally, and organised a joint study day with BACPAR in 2017 with Bob Gailey as keynote speaker.

Ed Morrison,

Guidelines update group member

Ed Morrison is a senior specialist physiotherapist in amputee and prosthetic rehabilitation at Bowley Close Rehabilitation Centre in Crystal Palace, London. Ed qualified as a physiotherapist in 2008 from Oxford Brookes University and has been involved in amputee and prosthetic rehabilitation since 2012, initially gaining experience in Wolverhampton then working at the prosthetic centre in Birmingham for 2 years.

In 2015 Ed started work in London and has had posts both in the outpatient rehabilitation centre and in the specialist inpatient Amputee Rehabilitation Unit (ARU) gaining considerable knowledge and experience in both pre and post prosthetic rehab. In 2018 Ed delivered a 4-day training course in Moscow, Russia for prosthetists, doctors, physiotherapists and rehab technicians.

Lauren Newcombe,

Guidelines update group member

Lauren Newcombe is the clinical specialist physiotherapist in Amputee and Vascular Rehabilitation at Frimley Park Hospital and has been in this role since 2012. Working within the inpatient and outpatient setting, Lauren has developed significant experience in the management of acute amputee patients as well as the treatment of established prosthetic users. Lauren has developed the amputee service across different hospital sites with the production of MDT pathways and protocols, patient resources, staff training packages and patient support groups.

Lauren has taken an active role in the BACPAR Guidelines Update Group, having also been involved in the production of the Clinical guidelines for the pre and post-operative physiotherapy management of adults with lower-limb amputations. Lauren has written a chapter on stump oedema and wound management for the online Physiopedia amputee course and also works in the medicolegal sector, assessing amputee patients and making recommendations for their future care and rehabilitation needs. Most recently, Lauren has been undertaking an MSc in Amputee Rehabilitation at the University of Southampton and is in the final stages of this; conducting research into pre-operative assessments for lower-limb amputee patients.

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Sara Smith,

Joint BACPAR Guidelines Co-ordinator/Joint chair of Guidelines update group

Sara has been the amputee therapy team lead at Roehampton since 2008 and worked in amputee rehab since 1987. She is part of the team that co-ordinates the amputee course at Roehampton. She has been a regional rep for BACPAR and had previous experience with the guidelines as Guidelines co-ordinator and co-author of the *Clinical guidelines for the pre and post-operative physiotherapy management of adults with lower limb amputations*. As part of the update of these guidelines she facilitated BACPAR being the first physiotherapy guidelines to achieved NICE accreditation.

Along with Mary Jane Cole she is co-author of the Amputee Assessment and Amputee Treatment chapters of the: - Ainslie T editor. 2012. The concise guide to Physiotherapy Vol 1 Assessment and Vol 2 Treatment: Chapter 2 in each volume. Elsevier. She has presented nationally at BACPAR and ISPO conferences. She is currently working with the St Mary's University, Twickenham on a qualitative research project investigating the management of patient expectations and how this impacts on quality of life and outcome measures.

Natalie Vanicek,

Guidelines update group member

Natalie Vanicek is a Professor of Clinical Biomechanics in the Department of Sport, Health and Exercise Science at the University of Hull and she is an Allied Associate Member of BACPAR. Natalie's area of research involves clinical gait analysis and musculoskeletal biomechanics. Her work is aimed at reducing falls, improving function and attenuating musculoskeletal decline through exercise among individuals with reduced mobility. Much of her research has focused on people with a lower limb amputation and improving their mobility through exercise. Natalie founded a specialised community exercise programme called KEEP MOVING for adults living with limb loss in Hull. Because of the COVID-19 pandemic, the exercise programme has also been delivered online and as part of the Limbless Associations' Virtually Speaking Hub. Natalie has also led a multi-centre clinical trial in prosthetics for older patients with a non-traumatic amputation funded by the National Institute for Health Research.

Carolyn Wilson,

Guidelines update group member

Carolyn Wilson is a clinical specialist physiotherapist in amputee rehabilitation. She qualified in 1992 from the University of Ulster and has worked as a clinical specialist physiotherapist in the Regional Amputee Services at Musgrave Park Hospital in for past 15 years. She has a special interest in prosthetic rehabilitation. Carolyn has been the BACPAR Regional Representative for Ireland and member of executive committee for 10 years and has been on the Conference planning committee for several years. She has presented at ISPO conference and has recently submitted for publishing in Journal of Prosthetics and Orthotics, an audit to formulate normative values for the Timed Up and Go test, for patients with amputations. Carolyn has been involved in teaching therapists working with amputees in Cambodia in association with EXCEED Worldwide.

Appendix 1b: Patient Representatives who contributed to the development of the 3rd edition

Phil Bevan,

Patient representative member

Phil is retired from a career in heavy engineering and petrochemical construction, primarily North Sea Oil, onshore pipeline works and tunnelling. He specialised in cost control, contracts and procurement. Whilst having had no experience with physiotherapy, he has reviewed many process documents. He is a right above-knee amputee and was treated at Medway Maritime Hospital in January 2014, following an emergency operation caused by a DVT. He joined the Kent & Medway Disablement Services User Group about a year after becoming an amputee.

David Elliott,

Patient representative member

David underwent surgery at the Royal Bournemouth Hospital in November 2016 aged 60, following emergency diagnosis of a gangrenous foot. He found resuming his management role within the insurance industry too difficult and is now an active volunteer with his local credit union and church, where he is Treasurer. He drives an adapted car (left foot pedals), is a member of a "Walking for Health" group in Dorchester and participates in a weekly seated Yoga class.

Appendix 1c: Working parties for previous editions of the Guidelines

2003 1st edition:

Penny Broomhead

Chairman of 2003 working party

Diana Dawes

BACPAR Honorary Research Officer and Chairman

Carolyn Hale

BACPAR Prosthetic Guidelines Committee

Amanda Lambert

Former Honorary Secretary BACPAR

Di Quinlivan

BACPAR Prosthetic Guidelines Committee

Robert Shepherd

Honorary Public Relations Office

2012 2nd edition:

Karen Clark

Joint BACPAR Guidelines Co-Ordinator/Joint Chair of Guidelines Update Group

Jessica Withpetersen

Former BACPAR Guidelines Co-Ordinator.

Tim Randell

Joint BACPAR Guidelines Co-Ordinator/ Joint Chair of Guidelines Update Group

Appendix 2: Professional Advisors for 3rd edition

These professionals were approached for their support and comment during the production of these Guidelines update.

British Association of Chartered Physiotherapists in Amputee Rehabilitation (BACPAR)

- Chantel Ostler
- Dr Fiona Davie-Smith

Appendix 3: Literature Search

This appendix documents the original search which was recreated by the GUG performing the update of these Guidelines.

All results were then de-duplicated the searches - this resulted in results

Date parameters: September 2010 – December 2018

Search terms:	Databases to be searched:
Amputation	Amed
Physical therapy	BioMed
Exercise therapy	BNI
Hydrotherapy	CINAHL
Massage	Cochrane
Activities of daily living	DARE
Early ambulation	EMBASE
Rehabilitation, vocational	Medline
Self care	OT Seeker
Physio*	PEDRO
Amputation stumps	Psych info
Amputation, traumatic	REHABDATA
Amputees	Web of science
Amput*	
Artificial limbs	
Prosthet*	

Appendix 4: Literature Appraisers

2020 Guidelines Update Appraisal Group:

- Laura Burgess
- Karen Clark
- Matthew Fuller
- Rachel Humpherson
- Edward Morrison
- Lauren Newcombe
- Sara Smith
- Natalie Vanicek
- Carolyn Wilson

Appendix 5: Example of the CASP ⁽⁴⁴⁾ Literature Appraisal tool

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 those reviewing the new literature and which applied cohort study methodology.

These tools can be accessed via www.caspinternational.org.

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.
 - *Are the results of the study valid?*
 - *What are the results?*
 - *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.

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Appendix 6: Articles excluded after full-text review by the Literature Appraisal Groups

Reference	Study Design	Comments	Reason for Exclusion
Agrawal, VR., Skrabek, RQ., Embil, JM., Gross, P., Trepman, E., (2014) Effect of Socioeconomic and Health Factors on Prosthetic Use after Lower-Limb Amputation. <i>Journal of Prosthetics & Orthotics</i> , 26(2), pp. 79-86.	Cohort study	The aim of this study was to determine predictors of functional prosthetic use after transtibial or transfemoral amputation.	No new recommendations for guidelines. Review of predictors.
Albert MV., McCarthy, C., Valentin, J., Herrmann, M., Kording, K., (2013) Monitoring Functional Capability of Individuals with Lower Limb Amputations Using Mobile Phones. <i>Plos One</i> , 8(6) pp e65340, June	Case Control Study	Study of 10 subjects observed a correlation between K-level and the proportion of moderate to high activity over the course of a week, measured on mobile phone.	Not enough data to recommend use of mobile phones to monitor activity levels
Alphonso, AL., Monson BT., Zeher, MJ., Armiger, RS., Weeks, SR., Burck, JM., Moran, C., Davoodie, R., Loeb, G., Pasquina, PF., Tsao, JW., (2012) Use of a virtual integrated environment in prosthetic limb development and phantom limb pain. <i>Studies in Health Technology & Informatics</i> , 181, pp. 305-309.	n/a	Study on phantom limb pain (PLP) in the residual limb and limited functionality in the prosthetic limb for upper limb amputees.	Upper limb amputation and therefore not relevant to these guidelines
Anderson DR, Roubinov DS, Turner AP, Williams RM, Norvell DC, Czerniecki JM. (2017) Perceived social support moderates the relationship between activities of daily living and depression after lower limb loss. <i>Rehabil Psychol</i> . May;62(2):214-220.	Longitudinal study assessed by retrospective recall, with 12-month follow-up	This study explores the influence of perceived social support on ADLs and depressive symptoms during the first year following amputation. The sample was representative of the UK population.	This paper focuses on the social/metal aspects related to physical activity following amputation, which is not directly under the management of physiotherapists.
Anjum, H., Amjad, I., Malik, A., (2016) Effectiveness of Proprioceptive Neuromuscular Facilitation Techniques as Compared to Traditional Strength Training in Gait Training Among Transtibial Amputees. <i>Journal of the College of Physicians and Surgeons Pakistan</i> 2016, Vol. 26 (6): 503-506	Randomized control trial	To determine the effects of proprioceptive neuromuscular facilitation (PNF) techniques as compared with the traditional prosthetic strength training (TPT), in improving ambulatory function in subjects with transtibial amputation. Poor methodological detail.	No significant or relevant findings
Ballough, MG. (2018) Physical therapy management of the obese dysvascular patient with an amputation. <i>Dissertation Abstracts International: Section B: The Sciences and Engineering</i> . Vol.78. (9-B(E).	Case report.	One subject only. Dissertation thesis. Insufficient evidence.	Study not robust enough for inclusion in prosthetic guidelines.
Barton, GJ., De Asha, AR., van Loon, ECP., Geijtenbeek, T., Robinson, MA. (2014) Manipulation of visual biofeedback during gait with a time delayed adaptive Virtual Mirror Box. <i>Journal of Neuro Engineering and Rehabilitation</i> , 11:101	Technical paper	Outlines the process for development, set up and sampling for virtual mirroring and convergent video in a lab setting using 27 vicon cameras.	No clinical outcomes.

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Batten, HR., Kuys, SS., McPhail, SM., Varghese, PN., Nitz, JC., (2015) Demographics and discharge outcomes of dysvascular and non-vascular lower limb amputees at a subacute rehabilitation unit: a 7-year series. <i>Australian Health Review</i> , 39(1), pp. 76-84.	Cohort study	Study concludes that differences exist in social and demographic outcomes between dysvascular and non-vascular lower limb amputees.	Not applicable to the scope of these guidelines.
Bragaru, M., Meulenbelt, H. E., Dijkstra, P. U., Geertzen, J. H., & Dekker, R. (2013). Sports participation of Dutch lower limb amputees. <i>Prosthetics and Orthotics International</i> , 37(6), 454–458.	Cross sectional survey	Dutch amputees (adults) recruited from workshops (rehab) or national registry. Focused question - What factors in Lower limb amputees influence sports participation. 25% of all Dutch amputees surveyed (n=2039). Only 34% response rate, (n=780) of returned usable data. 34% response rate to questionnaire means only 8% of total amputee population surveyed. 75% of responders not vascular.	Poor methodology. Selection bias/ or more likely response bias, proportionately few vascular amputees. Being > 60, smoking and vascular cause all negatively associated with non-participation in sports. However, level of amputation was not correlated to participation.
Brede, E., Metter, E. and Talbot, L. (2017) “Neuromuscular electrical stimulation for pain management in combat -related transtibial amputees during rehabilitation and prosthetic training”, <i>J Appl Behav Res</i> , pp. 1-15	RCT	Not compatible with our population, poor methodology with limited outcomes. Most conclusive evidence in the pre-prosthetic stage of rehab	Not relevant to scope of prosthetic guidelines
Briseno, GG., and Smith, JD., (2014) Pedometer Accuracy in Persons Using Lower-Limb Prostheses. <i>Journal of Prosthetics & Orthotics</i> , /26(2), pp. 33-38.	Case control study	The objective of this study was to assess the accuracy of three commercially available pedometers in persons with lower limb amputations.	Comparison of 3 different brands of pedometer. Not within the scope of guidelines to recommend a specific brand of pedometer.
Burke TN, França FJ, Meneses SR, Pereira RM, Marques AP. (2011) Improving postural control in elderly with osteoporosis. Comparison of two treatments, a Randomized controlled trial <i>Physiotherapy</i> , 97.	RCT	This study evaluated postural control and other biomechanical parameters related to lower limb strength and flexibility in older women with osteoporosis.	Participants were able-bodied. The article was not relevant to individuals with lower limb loss.
Chin, T., Kuroda, R., Akisue, T., Iguchi, T., Kurosaka, M. (2012) Energy consumption during prosthetic walking and physical fitness in older hip disarticulation amputees. <i>Journal of Rehabilitation and Research and Development</i> . 49.8: 1255-1260.	Cohort study	To investigate energy consumption during prosthetic walking in 7 older hip disarticulation subjects. Suggestions that certain level of fitness necessary for successful community walking. Small sample, older population, convenience sampling, too specific to inform guidelines.	Evidence doesn't contribute to guidelines.
Cho, H-M., Seo, J-W., Lee, HJ., Kang, K-B., Kim J-R, Wee H-W. (2018) Mid to long term results of total hip arthroplasty after contralateral lower extremity amputation. <i>Acta orthopaedica et traumatologica turcica</i> . 52(5) 343-347.	Retrospective data study	Retrospective review of 54 patients with BKA who had hip arthroplasty on contralateral hip	Study not relevant to guidelines
Chockalingam, M., Thomas, NB., Duval, L. (2012) Should preparation for elite sporting participation be included in the rehabilitation process of war-injured veterans? <i>Prosthetics and Orthotics International</i> . 36.3:270-277.	Systematic Review	Evidence for positive role sport can play in rehab of injured military personnel (but only with relevance to some traumatic limb loss). Sport has therapeutic value post medical rehab.	Not relevant to scope of prosthetic rehabilitation guidelines. Relevant to small numbers of amputees only.

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Christiansen C., Fields T., Lev G., Stephenson R. and Stevens-Lapsley J. (2015) "Functional outcomes after the prosthetic training phase of rehabilitation after dysvascular lower extremity amputation", <i>PMR</i> , 7, pp. 1118-1126.	Cohort	Retrospective study with incomplete data and poor methodology. No standardised intervention programme	Does not support guidelines
Clemens, SM. (2018) The development and use of the component Timed-Up-and-Go Test to determine basic prosthetic mobility in people with lower limb amputation. <i>Dissertation Abstracts International: Section B: The Sciences and Engineering</i> . Vol 79(7-B(E))	Dissertation	Assessing psychometric properties of TUG	Not relevant to scope of guideline. Analysis of outcome measure. May be more suited to OM toolbox.
Columbo, J., Davies, L., Kang, R., Barnes, J., Leinweber, K., Suckow, B., Goodnev, P. and Stone, D. (2018) "Patient experience of recovery after major leg amputation for arterial disease", <i>Vascular and Endovascular Surgery</i> , 52(4), pp. 262-268	Qualitative study	Focuses on patient's experiences post amputation-not all prosthetic users	Does not support the guidelines
Corio F; Troiano R; Magel JR. (2010) The effects of spinal stabilization exercises on the spatial and temporal parameters of gait in individuals with lower limb loss. <i>Journal of Prosthetics and Orthotics</i> , Oct 1; 22(4): 230-6	Longitudinal study with pre-test post-test measurements	This paper evaluated the effects of spinal stabilisation training on temporal-spatial gait parameters evaluated using the GAITRite mat. 30 out of 34 participants were of traumatic aetiology. No control group was included. The only significant findings related to small increase in walking velocity (which was quite fast anyway) caused by increased stride length bilaterally. This is not novel and does not particularly reflect increased stability. Many of the spinal stabilisation exercises would not be feasible in an older population. However, the paper reinforces the notion that core strengthening is important for improving stability and prosthetic control.	The sample population is not representative of the wider amputee population as participants were younger, fitter and more active/physically fit than the majority of LLAs. Does not inform PT management.
Darnall, B (2008) Self delivered home based mirror therapy for lower limb phantom pain	Case report Qualitative	No clear statement of aims, no standardisation of methodology or explanation of why only 1 case study, not more pts, no attempt to standardise procedure and no clear record of how the intervention was carried out. Does not consider existing evidence of Phantom pain management.	Does not contribute to current body of knowledge. Not even expert opinion.
Desveaux, L., Goldstein, R., Mathur, S., Hassan, A., Devlin, M., Pauley, T. and Brooks, D. (2016) "Physical activity in adults with diabetes following prosthetic rehabilitation", <i>Canadian Journal of Diabetes</i> , 40, pp. 336-341	Cohort study	Not representative of the UK population (based in Canada) with elements of bias. Results not statistically significant.	Does not support guidelines
Desveaux, L. (2017) Community-based physical activity following rehabilitation in chronic disease. <i>Dissertation Abstracts International: Section B: The Sciences and Engineering</i> . Vol.78.(1-B(E)).	Study design unclear.	Dissertation thesis published only online. Unable to currently appraise.	Not currently applicable to prosthetic guidelines.

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Devan, H., Hendrick, P., Hale, L., Carmann, A., Dillon, M. and Ribeiro, D. (2017) "Exploring factors influencing lower back pain in people with nondysvascular lower limb amputation: a national survey", <i>PMR</i> , 9, pp. 949-959.	Cohort study	Not representative of population- does not involve any dysvascular amputees. The confidence intervals are large and the results are subject to survey response, honesty of self-reporting and patient perceptions of pain etc	Does not support guidelines
Devour, A., Coolsaet, R., Galen, S., Reid, K., Burzynski, E., Filippis, R., Eick, K., Pepin, ME. (2017) Physical activity, balance performance and K-levels in individuals with below knee amputations. <i>Cardiopulmonary physical therapy journal</i> . 28(1) 30-31	-	-	Excluded on basis of conference abstract.
Doyle, S. Lemaire E., Besemann, M. and Dudeck, N. (2015) "Changes to transtibial amputee gait with a weighted backpack on multiple surfaces", <i>Clinical Biomechanics</i> , 30, pp. 1119-1124	Cohort	Very specific population and not representative of our population. Very small sample. Not worth appraising	Does not support guidelines
Ebrahimzadeh, MH., Moradi, A., Bozorgnia, S., Hallaj-Moghaddam, M., (2014) Evaluation of disabilities and activities of daily living of war-related bilateral lower extremity amputees. <i>Prosthetics and Orthotics International</i> 2016, 40 (1) 51-57	Cross-sectional study	The aims of the study were to identify the long-term effects of bilateral lower extremity amputations on daily activities of veterans and understand how these amputees cope with their mobility assistive devices. Not applicable to our cohort of patients.	Not relevant to scope of the guidelines.
Esposito, E., Choi, H., Darter, B. and Wilken, M. (2017) "Can real-time visual feedback during gait retraining reduce metabolic demand for individuals with transtibial amputation?", <i>PLOS ONE</i> , 12(2), pp. 1-14.	Case Control	Don't have CAREN - not sure how to replicate in a gait lab or therapy dept setting there was only 1 intervention - how many would it take for there to be a sustained effect without VF. Weak findings	Does not support guidelines
Frieden, RA., Brar, AK., Esquenazi, A., Watanabe, T. (2012) Fitting an Older Patient With Medical Comorbidities With a Lower-limb Prosthesis. <i>The journal of injury, function and rehabilitation</i> , 4: 59-64.	Point/Counter point expert discussion	Case scenario of fitting an older comorbid patient with a prosthesis. Sets out the case for and against fitting an older comorbid patient. Highlights key areas for consideration and they are all referenced; Mortality and contralateral limb loss, Cognition, motivation, musculoskeletal, neurological, endurance, social support and economical.	Poor methodology
Giummarra, MJ. and Moseley, GL. (2011) Phantom limb pain and bodily awareness: current concepts and future directions. <i>Current Opinion in Anaesthesiology</i> . 24.5: 524-531.	Review	A review of the mechanisms and treatment interventions for people with limb loss. Not research, more a discussion on mechanisms and possible treatment options.	Opinion piece. Not applicable to prosthetic guidelines.
Grobler, L. Derman, W. (2018) Sport-specific limb prostheses in Para Sport. <i>Physical Medicine and Rehabilitation Clinics of North America</i> . 29(2) 371-385	Information piece.	Information about various prostheses used for upper and lower limbs	Not a study.

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Hak L; van Dieen JH; van der Wurff P; Houdijk H. (2014) Stepping asymmetry among individuals with unilateral transtibial limb loss might be functional in terms of gait stability. <i>Physical Therapy</i> . 94. 10: 1480-1488.	Observational and cross-sectional study.	10 participants, purposive sample (SIGAM E). Observed gait analysis of treadmill walking.	Insufficient quality to add to prosthetic guidelines.
Halsne EG; Waddingham MG; Hafner BJ. (2013) Long-term activity in and among persons with transfemoral amputation. <i>Journal of rehabilitation research and development</i> , Jan 1; 50(4): 515-30	Retrospective analysis of longitudinal data	This paper quantifies the long-term daily activity of 17 TFA provided with two types of prostheses (MPK and mechanical knee) over a 12-mo period. Daily activity was quantified as step activity data with an accelerometer-based activity monitor. Participants were classified initially as K2 or K3. A secondary objective was to evaluate seasonal changes in daily stepping activity. Overall, participants took on average 1,540 steps/day, less than previously reported for LLAs and less than 2,500 steps/day that defines 'sedentary' activity. Participants were most active in April-June, Sept and Dec, and least active in the summer months.	Participants were primarily of non-vascular aetiology, suffering from fewer comorbidities, of various time since amputation (2-67 years), and possibly younger than in other studies (mean age 49 years). This is an interesting study, but one that does not further physiotherapy management.
Harvey, ZT., Loomis, GA., Mitsch, S., Murphy, IC., Griffin, SC., Potter, BK., Pasquina, P. (2012) Advanced rehabilitation techniques for the multi-limb amputee. <i>Journal of Surgical Orthopaedic Advances</i> . 21.1:50-57.	Review	Account of experience of therapy management local to one USA centre for war veterans. Not research, raises some good points but low quality as study.	Not applicable to prosthetic guidelines. Opinion piece.
Hawkins A.T., Henry, J.H., Crandell, DM., Nguyen, LL. (2014) A systematic review of functional and quality of life assessment after major lower extremity amputation. <i>Annals of Vascular Surgery</i> . 28.3: 763-780.	Systematic review	40 studies included. Functional and QoL measures, amputee and non amputee-specific.	Not applicable to scope of the prosthetic guidelines.
Hawkins, EJ. Riddick, W. (2018) Reliability, validity, and responsiveness of clinical performance-based outcome measures of walking for individuals with lower limb amputations: A systematic review. <i>Physical Therapy</i> , Vol 98(12) 1037-1045.		Overview of psychometric properties of current OMs applicable to LL amputees	Not applicable to scope of the prosthetic guidelines. More suitable for OM toolbox.
Highsmith MJ, Andrews CR, Millman C, Fuller A, Kahle JT, Klenow TD, Lewis KL, Bradley RC, Orriola JJ. (2016) Gait training interventions for lower extremity amputees: a systematic literature review. <i>Technology and Innovation</i> Sep;18(2-3):99-113	Systematic review	Included 18 studies, overground gait training + treadmill-based training. Gait assessments included temporal-spatial, symmetry, biomechanical and bioenergetics outcomes, functional performance, walking test performance, weight-bearing activity. Treadmill-based studies focused more on bioenergetics than ambulation, per se. However, benefits observed through treadmill training also translated to overground training. Treadmill training studies were only supported by a low level of evidence. The most beneficial method of gait training could not be	The sample is not truly representative with younger participants and a higher percentage of TFA vs TTA. Information already widely recognised (overground gait training focused on practising gait with verbal and manual cues) improves gait performance. Does not inform PT management

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		identified in this systematic review due to the high variability of gait training methods.	
Hoffman, M., 2012. Bodies completed: On the physical rehabilitation of lower limb amputees. <i>Health 1-17.</i>	Qualitative	An ethnographic study, based on empirical work carried out in an Israeli rehabilitation hospital, discusses the physical rehabilitation of lower limb amputees, during which body normalcy is re-constructed. Difficult to understand.	No clinical relevance. No findings relevant to the guidelines.
Hordacre, B., Birks, V., Quinn, S., Barr, C., Patrilli, BL., Crotty, M., (2013) Physiotherapy Rehabilitation for Individuals with Lower Limb Amputation: A 15-Year Clinical Series. <i>Physiother Res Int.</i> Jun;18(2):70-80.	Cohort	This paper discussed the demographic and clinical characteristics of patients admitted for lower limb prosthetic rehabilitation over 15 years in South Australia, and how rehabilitation outcomes have changed over 15 years.	Not relevant to scope of the prosthetic guidelines. More relevant to pre and post op guidelines.
Houdijk, H., van Ooijen, MW., Kraal, JJ., Wiggerts, HO., Polomski, W., Janssen, TW., Roerdink, M., (2012) Assessing gait adaptability in people with a unilateral amputation on an instrumented treadmill with a projected visual context. <i>Physical Therapy</i> Vol 92 Number 11	Observational study	Purpose was only to validate an instrumented treadmill.	No findings relevant to these guidelines.
Houston, H. and Dickerson, A. (2015) "Improving functional outcomes for vascular amputees through use of mirror therapy and elimination of the effects of electromagnetic fields", <i>Occupational Therapy in Healthcare</i> , pp. 1-15	Trial or cohort	Mirror therapy -large number of confounding variables. Poor methodology.	Does not support guidelines
Imam, B., Miller, WC., Finlayson, H., Eng, J. J and Jarus, T. (2017) A randomized controlled trial to evaluate the feasibility of the Wii Fit for improving walking in older adults with lower limb amputation. <i>Clinical Rehabilitation.</i> 31.1: 82-92	Parallel, evaluator-blind randomised controlled feasibility trial	Feasibility of 'Wii,n.Walk' for improving walking capacity in older adults with LLA.	Not applicable to guidelines. Feasibility study only.
Imam, B., Miller, W., Finlayson, H., Eng, J. and Jarus, T. (2018) A clinical survey about commercial games in lower limb prosthetic rehabilitation, <i>Prosthetics and Orthotics International</i> , 42(3), pp. 311-317	Qualitative research	Does little more than show that sometimes commercial games are used in prosthetic rehab. Closed survey with poor methodological quality.	Does not support guidelines
Jayaraman A; Deeny S; Eisenberg Y; Mathur G; Kuiken T. (2014) Global position sensing and step activity as outcome measures of community mobility and social interaction for an individual with a transfemoral amputation due to dysvascular disease, <i>Physical Therapy</i> , Mar 1; 94(3): 401-10	Case report of a 76-year old woman	This paper quantifies the mobility of a 76-year old woman within the community with a GPS activity monitor over one month. Social interactions are also explored. The patient had a BKA revised to an AKA due to gangrene and suffered from multiple health comorbidities. She was classified as a K2 ambulator. Baseline measurements included 6MWT, 10mWT, BBS, AMP-Pro, PEQ, MFES, FSST, TUG, MMSE. The participant mostly engaged in these community trips: commercial, religious, medical reasons. The highest number of recorded daily steps in the home	The data are only representative of one person. The paper does not add to the existing knowledge (i.e. see Halsne et al study that followed 17 TFA over a one year period)

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		was 199. The average number of daily steps was 240.	
Kelly, V., Morgan, S., Amtmann, D., Salem, R. and Hafner, B. (2016) Association of self reported cognitive concerns with mobility in people with lower limb loss, <i>Disability and Rehabilitation</i> , pp. 1-8	Cohort study	Aimed to investigate whether cognition affected maintenance of activity. However not methodologically robust enough to draw any statistically significant conclusions.	Does not support guidelines
Kluding PM, Bareiss SK, Hastings M, Marcus RL, Sinacore DR, Mueller MJ. (2017) Physical Training and Activity in People With Diabetic Peripheral Neuropathy: Paradigm Shift. <i>Phys Ther</i> . Jan 1;97(1):31-43.	Clinical commentary/perspective	This paper discusses diabetic peripheral neuropathy (DPN) from pathology to specific impairments in this clinical population.	Although DPN is often a precursor to amputation, the article was not relevant to individuals with lower limb loss.
Latlief, G., Elnitsky, C., Hart-Hughes, S., Phillips, SL., Adams-Koss, L., Kent, R Highsmith, MJ. (2012) Patient Safety in the Rehabilitation of the Adult with an Amputation. <i>Physical Medicine and Rehabilitation Clinics of North America</i> . 23.2: 377-392.	Literature review	Poor outline of methodology. Poorly written. Poor quality review. Broad viewpoint, but no studies to support what seems to be a personal account/ experience of rehabilitation.	Poor methodology, not applicable to prosthetic guidelines.
Lee, I., Park, S., (2013) Balance Improvement by Strength Training for the Elderly. <i>Journal of Physical Therapy Sciences</i> . 25: 1591–1593, 2013	Randomised controlled trial	The purpose of this study was to investigate whether lower limb strengthening exercise leads to improved lower limb strength and balance function for the elderly. Not relevant to amputee population.	Not relevant to amputee population – does not fit inclusion criteria. Does not contribute to current body of knowledge for prosthetic rehabilitation.
Littman AJ, Boyko EJ, Thompson ML, Haselkorn JK, Sangeorzan BJ, Arterburn DE. (2014) Physical activity barriers and enablers in older Veterans with lower-limb amputation. <i>J Rehabil Res Dev</i> ;51(6):895-906.	Exploratory study, cross-sectional, questionnaire based study	This paper explored physical activities of older individuals with LLA, including barriers and facilitators to physical activity. The questionnaire explored participant demographics, wealth, use of wheelchair, pain, physical and mental health t-scores. The paper also explored barriers and facilitators to exercise. Respondents reported engaging most frequently in walking or wheeling activities outside of the home, followed by completing prescribed exercises. The most frequently reported barriers to exercise were resource- and pain-related. BKA reported more barriers to exercise compared to other levels of amputation, but AKA reported more fear of falling. The most commonly reported enabler to physical activity was financial assistance to join a gym and support from family and friends.	Although the sample population is representative of the UK amputee population, the paper does not specifically inform physiotherapy practice or management.
Littman A., Bouldin, E. and Haselkorn, J. (2017) This is your new normal: a qualitative study of barriers and facilitators to physical activity in veterans with lower extremity loss, <i>Disability and Health Journal</i> , 10, pp. 600-606.	Qualitative	Poor methodology, bias not mitigated for. Thematic approach flawed	Does not support guidelines

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Maguire, MT., Boulton J. (2010) Building a foundation of strength. Addressing the incidence of limb loss. <i>Rehab Management: The Interdisciplinary Journal of Rehabilitation</i> . Jul;23(6):20-3	Expert opinion.	Sets out rehab pathway and highlights things to assess and treat. Really good overview and simple message	Expert opinion which does not strengthen existing evidence levels for recommendations
Matthews, D., Sukeik, M., Haddad, F. (2014) Return to sport following amputation. <i>The Journal of sports medicine and physical fitness</i> August.	Literature Review	This paper is a discussion on the impact of limb loss on athletic ability. Not a systematic review. Does not contribute to current body of knowledge.	No findings relevant to guidelines
Meier, R., (2014) Ideal Functional Outcomes for Amputation Levels. <i>Physical Medicine and Rehabilitation Clinics of North America Volume: 25 Issue 1</i> .	n/a	n/a	Unable to access
Mikami, Y., Fukuhara, K., Kawae, T., Kimura, H. and Ochi, M. (2015) The effect of anti-gravity treadmill training for prosthetic rehabilitation of a case with below-knee amputation, <i>Prosthetics and Orthotics International</i> , 39(6), pp. 502-506	Case study	Not representative of the larger population.	Does not support guidelines
Miller, M., Stevens-Lapsley, J., Fields, T., Coons, D., Bray-Hall, S., Sullivan, W. and Christiansen, C. (2017) Physical activity behaviour change for older veterans after dysvascular amputation, <i>Contemporary Clinical Trials</i> , 55, pp. 10-15	Proposed RCT	Proposal, no data collection. No evidence gathered	Does not support guidelines
Miller, MJ. Jones J, Anderson CB, Christiansen CL. (2018) Factors influencing participation in physical activity after dysvascular amputation: a qualitative meta-synthesis. <i>Disability and Rehabilitation</i> . 1-10	Meta-synthesis	14 studies exploring perceptions of physical activity in people with lower limb amputations	No specific findings to support guidelines.
O'Neill, B., Moran, K., Gillespie, A. (2010). Scaffolding rehabilitation behaviour using a voice-mediated assistive technology for cognition. <i>Neuropsychological Rehabilitation</i> . 20.4: 509-527.	Review of assistive technology for function	Small study (8 participants) discusses issues of safety in relation to memory and function.	Not relevant to prosthetic guidelines.
Poonsiri, J., Dekker, R., Dijkstra, P., Hijmans, J. and Geertzen, J. (2018) Bicycling participation in people with a lower limb amputation: a scoping review, <i>BMC Musculoskeletal Disorders</i> , 19, pp. 1-12	Systematic Review	More focused on how prosthetics can be adapted to improve cycling participation. Small sample sizes and unable to do meta analysis due to variation across populations	Does not support guidelines
Ramazan, A. and Abdulkadir, A. (2018) Comparison of the demographic and clinical characteristics, functional status and quality of life of lower extremity amputees to identify the reasons for undergoing amputation, <i>Journal of Back and Musculoskeletal Rehabilitation</i> , 31(5), pp. 973-979	Cohort study	Does not discuss prosthetic rehabilitation. Focused on pre-amputation phase.	Does not support guidelines
Rothgangel A, Braun S, de Witte L, Beurskens A, Smeets R. (2016) Development of a clinical framework for mirror therapy in patients with phantom limb pain: an evidence-based practice approach, <i>Pain Practice</i> Apr;16(4):422-434	Clinical framework article	This paper relates to the development of a theoretical model for mirror therapy (MT) treatment of PLP. A literature review and qualitative study were conducted to refine a theoretical model. This paper does not critically analyse MT. The literature review included studies where participants were upper and/or lower limb amputees specified as 'no restrictions were made regarding localisation of	No contribution to physiotherapy management.

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		amputation'. However, data gathered as part of the qualitative study (questionnaire and semi-structured interviews) only included patients with a unilateral LLA. The findings do not inform the implementation of MT in clinical practice.	
Sahay, P., Prasad, S., Answer, S., Lenka, P., Kumar, R., (2014) Efficacy of proprioceptive neuromuscular facilitation techniques versus traditional prosthetic training for improving ambulatory function in transtibial amputees. <i>Hong Kong Physiotherapy Journal</i> , 32, 28e34	Randomised controlled trial	The objective of trial was to evaluate the efficacy of proprioceptive neuromuscular facilitation techniques in comparison to traditional prosthetic training in improving ambulatory function in transtibial amputees. Thirty participants with unilateral transtibial amputations participated in the study. Poorly described methodology. No significant findings.	No significant or relevant findings
Samuelsson, K., Toytari, O., Salminen, A-L., Brandt, A., (2011) Effects of lower limb prosthesis on activity, participation and quality of life: a systematic review. <i>Prosthetics and Orthotics International</i> 36 (2) 145-158	Systematic Review	Review of findings from studies on effectiveness of lower limb prostheses for adults in terms of activity, participation, and quality of life and secondarily in terms of user satisfaction, use/non-use, and/or cost-effectiveness. Inconsistency of results and quality of studies included in Review.	The studies included had methodological limitations resulting in a low level of evidence.
Sansam K; O'Connor RJ; Neumann V; Bhakta B. (2014) Clinicians' perspectives on decision making in lower limb amputee rehabilitation. <i>J Rehab Med</i> , May 1; 46(5): 447-53	Qualitative study with thematic analysis	This paper explores clinicians' perspectives related to prosthetic prescription for LLA during amputee rehabilitation. Clinicians' included physiotherapists, consultants/physicians and prosthetists, however their responses are generally pooled together. Four key themes were identified: patient choice, difficulties predicting outcomes, estimating outcome, barriers to prescribing. Clinicians did not use formal outcome assessment tools and relied more on their own clinical judgment. Motivation was cited as an important predictive factor but one that was difficult to quantify objectively.	Does not contribute to physio management. This paper only explored the clinicians' perspectives, and not the patients'. Moreover, perspectives and actual practice may have differed. Only MDT members in 4 prosthetics centres in the UK were interviewed. The paper primarily relates to prosthetic prescription and not physiotherapy management and may be more suitable for other guidelines.
Sawers, A., Hafner, B. (2018) Validation of the narrowing beam walking test in lower limb prosthesis users. <i>Archives of Physical Medicine and Rehabilitation</i> , 99(8), Pgs. 1491-1498.		This study investigates the psychometric properties of a narrow beam walk test for LLA. Participants in this study were on average 14+ years post amputation, with a range from 2-57 years and 25 out of 40 were traumatic, with over half at K3 level or above. In the end, the study is not an interventional study and. However, it supports	this paper would be more relevant for BACPAR's OM toolbox guidelines than for these guidelines. Does not inform Physio management.

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		that a broad range of OMs should be used to test function, and this test balance in particular, in unilateral LLAs.	
Sinha, R., and Wim J. A. Van Den Heuvel, W., (2011). A systematic literature review of quality of life in lower limb amputees. <i>Disability and Rehabilitation</i> ; 33(11): 883–899	Systematic literature review	Review studies on quality of life (QoL) in lower limb amputees. The variation in QoL instruments in the studies is large, which hinders a systematic comparison of outcomes.	Very few methodologically sound studies were found in this systematic review, which limits the generalisation of the findings
Sinha, R., van den Heuvel, WJA., Arokiasamy, P., van Dijk, JP., (2014) Influence of adjustments to amputation and artificial limb on quality of life in patients following lower limb amputation. <i>International Journal of Rehabilitation Research</i> 37:74-79	Randomised controlled trial	The objectives of this well-designed study are to investigate the relationship between adjustments to amputation and artificial limb, and quality of life.	Does not inform physiotherapy management
Spruit-van Eijk, M., van der Linde, H., Buijck, V., Geurts., Zuidma, S Koopmans, R. (2012). Predicting prosthetic use in elderly patients after major lower limb amputation. <i>Prosthetics and Orthotics International</i> . 36.1: 45-52.	Prospective design.	Not easy to interpret results or layout of paper. Multi morbidity did not contribute significantly to determining prosthetic use. Good cognition, low amp level, pre-op functional status predict physical prosthetic mobility.	Doesn't contribute further to evidence – level of evidence less than in 2012 guideline. Raises some good points in discussion but not strong enough study to improve any guidelines.
Sturk, JA., Lemaire, ED., Sinitski, E., Dudek, NL., Besemann M., Hebert, JS., Baddour, N. (2018) Gait differences between K3 and K4 persons with transfemoral amputation across level and non-level walking conditions. <i>Prosthetics and Orthotics International</i> Vol 42(6) 626-635.	Cross-sectional study	10 amputees + 10 able bodied subjects. Walking on treadmill over even and uneven terrain, speed measured.	Study not robust enough for inclusion
Tilak M, Isaac SA, Fletcher J, Vasanthan LT, Subbaiah RS, Babu A, Bhide R, Tharion G. (2016) Mirror therapy and transcutaneous electrical nerve stimulation for management of phantom limb pain in amputees -- a single blinded randomized controlled trial [with consumer summary] <i>Physiotherapy Research International</i> , Jun;21(2):109-115	Single blinded RCT	The participants in this study were upper and lower limb amputees. They were randomly allocated into a mirror therapy vs. TENS therapy treatment group to treat PLP. The results do not differentiate between upper and lower limb amputees.	Upper limb amputation was an exclusion criteria
Ülger, Ö., Topuz, S., Bayramlar, K., Erbahçeci, F., Sener, G., (2010). Risk factors, frequency, and causes of falling in geriatric persons who has had a limb removed by amputation. <i>Topics in Geriatric Rehabilitation</i> , 26(2), pp. 156-163.	?	This study investigated falls, their frequency, reasons, and consequences in twenty-five older patients with lower limb amputations. It was concluded assessing falling histories before planning rehabilitation programs enriched the rehabilitation programs by suggesting different types of activities.	Small study which highlights falls risks in amputees. No implications for guidelines.
van Twillert S; Postema K; Geertzen JH; Lettinga AT. (2015) Incorporating self-management in prosthetic rehabilitation: Case report of an integrated knowledge-to-action process. <i>Physical Therapy</i> , Apr 1, 95(4): 640-7	Case report	This paper was a case report of a 'knowledge-to-action' (KTA) process, where research knowledge and clinical practice mutually inform each other. The case report pertained to interventions of physical and occupational therapists involved with the treatment of LLAs. The training interventions were psycho-educational and motor skill training.	This article describes a reflective account of the KTA approach and hence the effectiveness of this approach was not evaluated quantitatively. This paper is more a reflection of a theoretical framework than a paper that relates to physiotherapy management.

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van Twillert, S., Postema, K., Geertzen, J. and Lettinga, A. (2015) Incorporating self-management in prosthetic rehabilitation: case report of an integrated knowledge-to-action process, <i>Physical Therapy</i> , 95, pp. 640-647	Case report	Self-management	Does not support guidelines
Vanicek, N., Strike, SC., Polman, R., (2015). Kinematic differences exist between transtibial amputee fallers and non-fallers during downwards step transitioning. <i>Prosthetics and Orthotics International</i> 39 (4)	Cross-sectional study.	The aim of this study was to compare the gait kinematics of fallers and non-fallers during downwards step transitioning in transtibial amputees. Very small sample size.	Not sufficient evidence. No statistical significance
Volz, JA. (2016) Continuum of care and recreational physical fitness for people with lower extremity amputations. <i>Dissertation Abstracts International: Section B: The Sciences and Engineering</i> . Vol.76.(9-B(E)).	Case report.	Dissertation thesis. Low level of research.	Not applicable to guidelines.
Wasaka, M., Seki, K., Fukuda, A., Sasaki, K., Izumi, SI., (2010) Muscle activity and postural control during standing of healthy adults wearing a simulated trans-femoral prosthesis. <i>J. Phys. Ther. Sci.</i> 22: 233-238.	Cohort	Study examined muscle activity in healthy individuals wearing a simulated transfemoral prosthesis.	Subjects were not amputees. So not reviewed or CASP done.
Wong, CK., Chen, CC., Welsh, J. (2013) Preliminary assessment of balance with the Berg Balance Scale in adults who have a leg amputation and dwell in the community: Rasch rating scale analysis. <i>Physical Therapy</i> Vol 93 (11)	Cross sectional Cohort	Preliminary assessment of balance with the Berg Balance Scale in adults who have a leg amputation and dwell in the community. Only a preliminary study. Needs further studies to consolidate.	Additional research with larger population required
Wong DW, Lam WK, Yeung LF, Lee WCC. (2015) Does long-distance walking improve or deteriorate walking stability of transtibial amputees? <i>Clinical Biomechanics</i> . 30:867-873	Cross-sectional study	Participants were 6 TTA, mostly traumatic patients, who were physically active and could walk continuously for 60 minutes. Measures of lateral sway velocity did not include the trunk and upper body as whole body kinematics weren't measured.	Not truly representative of the wider amputee population. No clear clinical implications.
Wong, C., Ehrlich, J., Ersing, J., Maroldi, N., Stevenson, C. and Varca, M. (2016) "Exercise programs to improve gait performance in people with lower limb amputation: A systematic review", <i>Prosthetics and Orthotics International</i> , 40(1), pp. 8-17	Systematic review	Explored the efficacy of exercise programmes to improve gait, however, studies of poor quality with elements of bias and large numbers of confounding factors. Sample sizes are also too small to draw any conclusions.	Does not support guidelines
Wong, C., Gibbs, W. and Sell, E. (2016) "Use of the Houghton scale to classify community and household walking ability in people with lower-limb amputation: criterion-related validity", <i>Arch Phys Med and Rehab</i> , 97, pp. 1130-6	Cohort study	Investigated use of Houghton scale to improve gait, however, large elements of bias throughout the study and poor methodological quality	Does not support guidelines
Wong, C., Varca, M., Stevenson, C., Maroldi, N. and Ersking, J. (2016) "Impact of a four-session physical therapy program emphasising manual therapy and exercise on the balance and prosthetic walking ability of people with lower-limb amputation: a pilot study", <i>Journal of Prosthetics and Orthotics</i> , 28(3), pp. 95-100	Pilot study	4 session PT program. Small sample size. Only a pilot. No significant results	Does not support guidelines
Wu J; Chan TS; Bowring G. (2010) Functional outcomes of major lower limb amputation 1994-2006: A modern series. <i>Journal of Prosthetics and Orthotics</i> , Jul 1; 22(3): 152-6	Retrospective 'cohort' study	This paper explored the medical records and patient characteristics of patients undergoing LLA at an Australian hospital between 1994-2006. The sample demographics are representative of the UK	The paper does not inform physiotherapy management but may inform resource allocation. Moreover, the data are over 10 years old.

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		population.	
Yang, L., Dyer, PS., Carson, RJ., Webster, JB., Bo Foreman, K., Bamberg, SJ., (2012) Utilization of a lower extremity ambulatory feedback system to reduce gait asymmetry in transtibial amputation gait. <i>Gait Posture</i> . Jul;36(3):631-4.	Experimental	The study evaluated the performance of the LEAFS feedback insole in three subjects with gait asymmetry	No clinical extrapolation possible at this stage of the research – does not inform physiotherapy management

Appendix 7: Definitions of the Scottish Intercollegiate Guideline Network (SIGN) Levels of Evidence ⁽⁴⁵⁾

These levels of evidence were assigned by subgroups of the Guidelines update group (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 (SIGN, 2008) 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 8: Definition of SIGN's 'Grades of Recommendations' ⁽⁴⁴⁾

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

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

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 Guidelines population Or A body of evidence rated as 1+ directly related to Guidelines 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 Guidelines 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 Guidelines population with consistency in the results presented. Or Results extrapolated from 2++ studies.
D	3 or 4	Evidence is gained from literature rated as 3 or 4 Or Results extrapolated from 2+ studies.

Appendix 9: Table of papers referenced within the updated Guidelines

This table lists the evidence appraised and used to inform the recommendations. The references are in alphabetical order with the reference number in brackets.

Evidence appraised for the first edition of the guidelines is in black text; evidence appraised for the second edition is in blue text. Readers are recommended to read the original references for more detail.

Each entry details a reference, a brief description of the design, the sample studied, the subject of the study (e.g. the intervention), and a conclusion or comment.

Citation	Study Design	Characteristics	Intervention	Comments	Level of Evidence
Altner, P.C [77]	Retrospective Case series	52 double-disability patients (hemiplegia and dysvascular lower limb amputation). No control group.	Hemiplegia	Neuromuscular status influences the mobility of amputees with a CVA. Eight patients attained independent prosthetic function while 16 patients were limited and six were non ambulatory. Cannot tell if follow-up was long enough but was complete. No blind, objective outcome criteria. Adjustment was not made for other prognostic factors.	3
Anaforoglu, B. [116]	Randomised Control trial	40 male unilateral transfemoral amputees with MLBP were randomly allocated into two groups	A back school program vs home exercise program.	The back school program, combined with an exercise program, decreased pain and disability and improved the spinal flexibility significantly in LLAs with MLBP ($p < 0.05$).	1+
Bailey, M [109]	Case series	10 consecutively presenting amputees with PVD, able to use PPAM Aid. No control group.	Walking	Resting ECG alone may be inadequate for safe prescription of exercise. Moderate walking exercise produces myocardial ischaemia in 30% of patients, despite 70% presenting with cardiac anomalies at rest. Small study, not blinded.	3
Bragaru, M. [124]	Systematic review	Papers reviewed included reference to sport and min of 10 amputees (upper and/ or lower). Most papers had cross-sectional designs.	Sports participation.	Sports should be included in rehab programmes. Participation associated with physical and psychological benefits. Better athletic performance in younger unilateral traumatic amputees. 'Individuals with limb amputations could be introduced to sports that do not require prosthesis use, such as wheelchair or sitting sports.' Most unaware of local sports facilities. Authors acknowledge interpretation with caution as few papers of high methodological value, just one RCT.	2++
Bruins, M [125]	Retrospective semi structured questionnaire	Study based in the Netherlands. 32 lower limb amputees aged between 18-60 yrs working before and after amputation. Subjects had to be at least 2 yrs post amp (aetiology- 5 vascular and 34 traumatic amputees). Equal numbers of trans tibial and trans femoral amputees.	Reintegration to work after amputation	The mean time between amputation and return to work was 11.5 months. 50% of participants returned to different work tasks or different job. Poor support of the implementing body which takes care of job re-integration and employer (34%) was the most mentioned obstacle to job reintegration. 56% of subjects thought that more co-operation between professionals would improve the reintegration process. Differences between Dutch and British social/ health systems may make extrapolating the results difficult. Some possibility of recall bias.	3

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Brunelli, S. [78]	Case control study	44 unilateral PVD (TT and TF) amputees due to peripheral vascular disease and presence of mild/moderate hemiparesis. 3 year follow up.	Dual impairment: Amputation and hemi paresis (stroke)	Mixture of amputation preceding/following hemiparesis due to stroke. Reviewed ADL's (Barthel Index) and walking ability (LCI). Measures taken on discharge from inpatient rehab then a follow up via telephone call 3 years later. Study concludes that female lower limb amputees who suffer contralateral strokes are more likely to have reduced functional status and prosthesis abandonment.	2+
Brunelli, S [114]	Retrospective review of notes	45 unilateral Trans femoral amputees. 30 male & 15 female subjects with vascular disease and Mild/moderate hemiparesis.	Dual impairment: Amputation and hemi paresis (stroke)	A retrospective study where only trans femoral amputees were studied. It is unclear whether CVA occurred before or after amputation. Uses Barthel outcome measure which assess lower and upper limb but only lower limb amputees included in the study. LCI measure also used & resultant scores were better in patients with ipsilateral impairment rather than contralateral. Patients with 'mild' impairments scored better than those deemed as having 'moderate' impairment. Study excluded amputees with poor cognition.	2+
Burger, H [107]	Literature Review	31 studies on reintegration of LLAs to work, with different inclusion criteria making meta analysis impossible and comparison difficult	Return to work after lower limb amputation	Return to work rate was approx 66% (but increased to 100% for patients with amputations due to tumour). Unfortunately, the aetiology of amputation not always discussed. Percentage of those not able to work post amputation stated from 3.5-8%. Time to return to work was between 9mths-2.3yrs. 55% of amputees stopped working within 2 years (78% of these due to amputee related issues). They concluded that those with higher amputation level had a lower return to work rate. It was stated that return to work was affected by cause of amputation but no further details given.	4
Chichuri, S. [131]	Retrospective Cohort study	255 subjects: All lower limb amputees participating in 'wellness-walking' program in USA.	Questionnaire about falls and injuries. Completed ABC, TUAG and 2MWT. However, no control group	The study highlights the association of female sex, non-white race, vascular and transtibial amputations with a higher likelihood of fall-related injury.	2-
Christensen, B [110]	Retrospective Case series	29 Danish, prosthetic transtibial & transfemoral amputees – all causes. 18 transtibial, 1 bilateral and 10 transfemoral amputees.	Rehabilitation with prosthesis	Trans tibial amputees achieve a higher level of prosthetic skill than trans femoral. Non-validated questionnaires (response rate not given) and unstructured interviews. Small sample, no adjustment made for other prognostic factors. Not blinded, over a short period of time (10 months).	3
Christiansen, C. [134]	Single blind, RCT (pilot)	38 participants, mostly men (n=35), Dysvascular TTAs (32 had T2DM, 22 had PAD, 16 had both T2DM and PAD).	12 weeks of phone calls of 30mins for home based behaviour change intervention (home ex, walking activity, disease self-mgt) Control group also had phone	Tested at baseline, 12 weeks (end of intervention) and 24 weeks. All tests at patient's home. Increased daily step counts (1135 – 87%) for those with dysvascular TTAs after intervention, remained signif. higher (990) steps after intervention ended. P=0.03 TUG didn't change however, may not be sensitive enough or increased step count didn't improve function.	2+

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			calls, general discussion about their week.		
Collin, C [27]	Case series	Elderly lower limb amputees with occlusive arterial disease	Amputation	Mobility is reduced post-amputation. Provision of a wheelchair should be routine. Provides very little information on a study performed by questionnaire. Poorly defined sample, generally refers to the elderly amputee. Cannot tell if there were blind, objective outcome criteria or if there was adequate follow up.	3
Collin, C [69]	Retrospective Case series	37 amputees referred to DSC for review. PVD or diabetes.	Prosthetic rehabilitation	The physical environment to which the patient is discharged can affect functional outcome. Modifications to the environment can improve functional outcome. Well defined sample at uniform (early) stage. Follow-up long enough & complete. No blind, objective outcome criteria. Adjustment made for other prognostic factors. No validation in independent test-set of patients.	3
Condie, E [79]	Systematic review	Review of outcome measures used in lower limb prosthetics between 1995 and 2005. 340 articles identified	All appropriate measures were assessed for reliability and validity, scaling and potential for bias.	Element of subjectivity as their appraisal tool did not appear to be validated. It was found that there are many measures in use with little agreement regarding which to use and when. There is no 'gold standard'. For measuring mobility the timed up and go test is highly appropriate for amputees. The report suggests that mobility, function and Quality of Life are measured when assessing lower limb amputees. It was concluded that generic, non amputee specific measures of function and quality of life are inappropriate for lower limb amputees.	1-
Couture, M [122]	Mixed method	15 Unilateral vascular amputees	Leisure activities post amputation, and constraints to participation and leisure satisfaction	Small sample 8 out of 15, commenting on leisure activities only 2-3 months post rehab. Describes the constraints to leisure post amputation. Change in leisure participation doesn't automatically mean less leisure satisfaction. Health care professionals need to understand the forces behind changes in leisure activities post amputation to support rehab efforts	3
Cunha, R. [119]	Randomised clinical trial	TTAs in two groups. Group A (experimental group, n=10): a goal-oriented mental practice (MP) task group. Group B (n=5): a non-motor MP task group. Both groups were similar in age (20-45 years) but with varied time since amputation.	Participants completed the MP tasks over a 4-week period, 3 times weekly for 40 minutes. The experimental group completed mental practice tasks in the first person, whereas the non-experimental group completed mental practice non-motor tasks.	The authors evaluated the effects of the MP task on gait parameters, specifically peak vertical, anterior-posterior and medial-lateral ground reaction forces (GRFs), at four time points: baseline, before and after the MP intervention, and at 4-week follow-up. They did not quantify walking velocity, although participants were asked to walk at their 'natural cadence'. Group A demonstrated improved symmetry in GRFs following the MP intervention which was retained one month post-intervention.	2-
Darter, B. [89]		8 Patients all traumatic or oncology. Young 26-53 mean 41.4 with and mean 15	Home based exercise on treadmill at 30	Does not talk about increased strength or cardiorespiratory fitness or proportion of total aerobic capacity being used. However, states	2+

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		years since amputation. Volunteers but does not state from where. Used GAitRite to measure temporal spatial performance. Used sub threshold /submaximal multispeed treadmill test and Cardio2 metabolic cart to measure physiological outcomes. 2 minute walk test and gait speed at SSWS and MWS for functional outcomes. Repeated measures at pre training , 4 and 8 weeks	minutes, 3 times a week for 8 weeks. Each session involved 5 cycles of 2minutes at 3 speeds (0.89, 1.12 and 1.34m/s). Measured compliance with diary and motion sensor.	walking became more efficient with 10% decrease in energy expenditure and improvements of 16-20% in 2 minute walk test and gait speed at SSWS and MWS. Excellent explanation of test protocols, reproducible. Walking became more symmetrical with reductions in stance time at both legs at both 4 weeks and again 8 weeks. Step length symmetry improved at 4 weeks but not further at 8. Seems like a reproducible and cost effective training regime but is limited in its interpretation and application to large sections of the amputee population as all used MPK and non vascular amputees.	
Deans, S [123]	Literature review	12 papers collected on all limb loss, but mixed disability sports papers excluded. 4 themes identified. Well conducted search covered all the major databases with table of search words and mesh terms	4 themes identified by the authors as barriers to participation: Components, body image, Barriers and motivations rehab outcomes	Generally poor participation rates in sport for amputees, lower than the general population. 68% inactive. Rehab outcomes: Suggest that those who have mastered their prosthesis are more likely to have better self-efficacy and thereby increase use and then participate in sports. Also, the importance of being a sports participant previous to amputation. Body image: People involved in sports have more positive feelings about their bodies but without cause and effect being proven. Components: Poor perception that you don't need a sports limb to participate unless at elite level. Barriers: Social, economic and stump pain, embarrassment, cost and clashes with work	1+
de Laat, F. [121]	Cross-sectional study.	155 total participants; mostly men across wide age range. 57 TFA or KD; 87 TTA or Syme; 11 bilateral. 81% were dysvascular.	No intervention. Main outcome measures included: Prosthetic Profile of the Amputee; ability to climb stairs with or without a handrail according to the Locomotor Capabilities Index; number of floors climbed; and Climbing Stairs Questionnaire	47% of participants had to climb stairs. 62% could climb stairs independently with a handrail, 21% without a handrail. 32% did not climb any stairs. 34% climbed half a floor to one floor; 34% climbed ≥ 2 floors. The median sum (IQR) score of the Climbing Stairs Questionnaire was 38 (19-63). Older amputees and women had more difficulty climbing stairs with and without a handrail.	2-
de Laat, F. [117]	Cross-sectional study.	172 total participants in 2 groups. One rehab setting, one nursing home. Questionnaires (LCI and QRIS) and personal and clinical characteristics (FCI) measured.	Analysis of perceived independence in rising and sitting down following LLA (wearing a prosthesis).	More attention to task and context specific rehab e.g. rising and getting up from floor needed as part of, or as a prerequisite for prosthetic walking. Nursing home participants perceived more difficulty.	2-

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Devan, H. [138]	Cross-sectional study.	Questionnaires sent to random sample of Transfemoral amputees (n=322) 145 returned questionnaires.	Questionnaire to investigate prevalence and relationship between LBP and physical activity levels in a national sample.	Significant relationship between LBP and residual limb problems eg. PLP, shrinkage, skin problems. However authors advise caution with interpretation due to diverse nature of remaining limb problems and lack of investigation of other factors eg. prosthesis type. No association between PA levels of persons with and without LBP. Further research recommended.	2-
Devan, H. [145]	Semi-structured interviews-qualitative	11 Participants – New Zealand- unilateral lower limb (trans-tibial and transfemoral) Aim was to explore the perceptions of adults with lower limb amputation and LBP as to the factors contributing to and affecting their LBP.	3 Focus groups 3 participants (same amp. Level same group) 2 Individual Interviews Transcribed verbatim – general inductive approach.	8 Trauma ; 1 Vascular; 1 congenital; 1 tumour. Patients reported their views that the main contributing factors to back pain were: uneven posture and compensatory movements of the back; fatigue; prosthesis related factors and multiple pain perceptions. Self management strategies enabled participants to manage their LBP symptoms and positively cope (seeking services by health care professionals; improving their physical fitness and being active).	2-
Dingwall J.B [100]	Prospective case control	6 unilateral amputees, aged 31-69 yrs. Established users. 6 matched controls.	CCF treadmill walking and visual feedback training.	Visual feedback training is an effective means of producing short term reductions in gait asymmetry. Non blinded RCT with intention to treat. Very small sample.	3
Dite, W, [130]	Prospective cohort non-random	47 initial, 40 completed. Unilateral Trans tibial prosthetic users. 18yrs + from a rehabilitation centre who were discharged with a prosthesis. Mainly PVD ± diabetes	Falls. Can Outcome Measures identify fallers and non-fallers in unilateral trans tibial amputees.	The study assessed trans tibial amputees only The 4 square step test. TUG, 180° turn, LCI. were all completed with a falls history interview at rehabilitation discharge and 6/12 after. It was found that 33% experienced multiple falls. Of the amputees with over 4 co-morbidities – 62% multiple fallers & 19% non-fallers. The TUG successfully identified 85% of multiple fallers.	2+
Fajardo-Martos, I. [91]	Retrospective observational cohort study	169 TT and TF amputee data analysed to determine and compare specific factors that could be associated and predictive with successful prosthetic rehabilitation in major lower-limb amputations.	Walking ability	Population similar to that of UK amputees, however failed prosthetic rehab included not being able to walk 45m or if they only used it for transfers, and no discussion of what the rehabilitation involved. Regarding walking ability with or without walking aids, male gender and transtibial level of amputation are independently associated with failure and success respectively, whereas older age and comorbidities can predict failed prosthetic rehabilitation when assistive walking devices are considered.	2+
Fisher, K. [126]	Qualitative face to face questionnaire	100 unilateral lower limb amputation. Aged 17-65. Amp >1yr. Prosthetic user. 1 centre.	Return to work following lower limb amputation.	The Socket comfort, Harold Wood Stanmore and London Handicap scores were used in addition to an employment questionnaire. It was found that no vocational rehab is available and that return to work should be encouraged.	2+
Frengopoulos, C. [76]	Retrospective cohort study.	176 participants. Association between cognitive scores and mobility and function.	Walking endurance and functional mobility. Using MOCA, L test & 2MWT	MOCA easy to use. Association between Moca and functional mobility statistically significant. Potential for differences on complex motor tasks for individuals with cognitive impairment but does not indicate a need to exclude them from rehab on basis of cognitive impairment alone.	2+
Gailey [99]	Literature review	Review of literature	None	Poorly explained literature search methods and no analysis of the strength of the literature but it did exclude non analytical studies from the review. A wide range of topics were covered with discussion. It was found that amputees have a high incidence of back pain.	3

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Gallagher, P. [118]	Secondary data analysis	Extrapolation of data for 148 people with major limb amputation from national database.	Upper and lower limb major amputations. Quality of life measures i.e. MAP (Measure of Activity and Participation) component of National database (NPSDD), Ireland. WHODAS 11 and ICF.	Illustrates common experiences of restriction and barriers to participation in society i.e. impact of service interventions on amputation. Most common barriers were climate, physical environment and income. Different profiles between upper and lower limb loss. People with LL prostheses experience more restriction in community activities and difficulty in joining community activities ie. this group more likely to experience physical environment as a barrier (than UL).	2+
Gauthier-Gagnon, C. [105]	Prospective Random control	11 unilateral elderly trans-tibial amputees with pvd or diabetes. 30 controls.	Use of mirrors combined with verbal and augmented sensory feedback	Mirrors, verbal and augmented sensory feedback are equally effective in the re-education of weight bearing & balance. Control of sway in amputees is dependent upon vision. When planning rehabilitation, exercises with & without visual feedback should be incorporated. Weight bearing on the prosthetic limb should be emphasised to reduce pressure on an already compromised circulatory system Non-blinded randomised controlled trial with intention-to-treat. Good methodology & random selection of patients but poor analysis of results. Small group, not followed up.	3
Geurts, AC [101]	Prospective Case control	10 unilateral lower limb amputees	Balance assessment	Amputees show a lower level of postural efficiency during attention demanding tasks, this decreased with rehabilitation. Can't tell if adjustment made for other prognostic factors. Follow-up complete & long enough. Not blind, objective outcome criteria Small sample study.	3
Gjovaag, T. [87]	Randomised crossover study	Reliability study for new testing protocol for VO2 max testing 3 Groups: Norwegian amputees - non-vascular =12; 6 male and 6 female- 2 years post amputation. Control Group= 12 (matched weight, height, age, sex & SPF) Reliability Group.	Used self reported fitness scores – 5 point likart scale. Walking VO2 test with increasing treadmill inclination to voluntary exhaustion at PWS.	Good science; well controlled; matched groups. All trauma; no vascular patients. Less fit amputees used more of their available capacity than fitter ones and walked slower Advice is to stay fit and healthy for fast and efficient walking. TFAs with less self reported fitness walked slower. Positive relationship between their 3rd walking speed and VO2 uptake. TF group used a much larger of their VO2 max during their PWS than the control group. VO2 max 30% lower than healthy controls. TFAs have considerably lower cardio-respiratory fitness than able bodies subjects.	2+
Greive, AC [26]	Prospective Case series	26 Dutch lower limb amputees, 5 months after amputation. No control group.	Amputation or rotational osteotomy	Co-morbidity is associated with lower levels of functional outcome. Can't tell if sample well defined at uniform (early) stage of illness. Follow-up complete but not long enough. No blind, objective outcome criteria. Adjustment made for other prognostic factors. No validation in independent test-set of patients. Small study with possible skewed results as age associated with presence of IDDM.	2-
Ham, RO [51]	Prospective Case control	75 vascular amputees. Control group of 25 patients received no specialist physiotherapy or surgical care.	Specialist care	Amputees benefit from care by a specialist multidisciplinary team and early delivery of a prosthesis. Non-blinded, non-randomised trial without intention-to-treat.	3

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Ham, R [52]	Prospective Case control	233 consecutive patients with pvd admitted for lower limb amputation	Team approach to rehabilitation	To achieve 1 patient going home with a prosthesis 1 patient needs to be treated by the team approach (95% C.I. 1.1 to 1.7) but study is seriously flawed. Non-blinded, non-randomised trial without intention-to-treat. Results for final stage of study incomplete due to staffing changes. Not representative sample of population	3
Hanspal, RS [72]	Retrospective Case series	100 unilateral transfemoral & transtibial amputees, aged 60+ yrs. No control subjects	Amputation	Functional outcome with a prosthesis is affected by cognitive and psychomotor function. Provides evidence for the need of accurate assessment and the setting of realistic functional goals. Well-defined sample. Cannot tell if follow-up long enough or complete. No blind, objective outcome criteria. No adjustment for other prognostic factors. Not randomised.	3
Hanspal, RS [73]	Cohort	32 lower limb amputees aged 54-72yrs. No control group	Cognitive Assessment Scale. Clifton Assessment Procedure. Harold Wood/ Stanmore Mobility Grade	There is a correlation between cognitive, psychomotor status and mobility level achieved. Follow up long enough but can't tell if complete. No blind objective outcome criteria. Adjustment was made for other prognostic factors. No validation in independent test set of patients.	3
Houghton, AD [129]	Retrospective Case series	102 Vascular lower limb amputees operated on in 1986 and 1988 in London.	Amputation	Rehabilitation is more successful in transtibial than transfemoral amputees. Non-validated rehabilitation questionnaires were sent to 179 patients, response rate was 81 per cent. Not blinded or randomised. No standardised rehabilitation programme.	3
Houghton, A [112]	Retrospective Cross section	169 unilateral amputees under 3 DSC's. 88 transfemoral, 54 knee disarticulation, 27 Gritti-Stokes.	Functional use of prosthesis	Amputees with a knee disarticulation rehabilitate better than those with a transfemoral or Gritti-Stokes level of amputation. Non-validated questionnaire, response rate 74%. Selected responders were used by matching for age & duration of amputation. Not blinded. Adjustment made for prognostic factors. Due to selection for matching numbers were small in each group.	3
Hubbard, W, [128]	Retrospective Case series	92 vascular amputees in Ballarat, Australia.	Rehabilitation and prosthetic fitting	Below knee amputees gain a higher level of mobility than above knee amputees. 20% amputees died within two years of primary amputation. All patients had been accepted into a rehabilitation programme. Not all assessed at similar stage of rehabilitation. Discusses earlier studies but not all use the same classification.	4
James, U, [103]	Prospective Case control	11 unilateral above- knee amputees in Sweden. Control group, matched for age, height & weight and health & employment.	Walking and cycling	Asymmetry of gait decreases with training. Training increases muscle strength. Good analysis of results but conclusions didn't match results. No follow-up. Small trial.	3

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Jayantunga, U [127]	Prospective Cohort	21 unilateral, diabetic trans-tibial amputees with no existing plantar ulceration Control group not used.	Foot orthoses & footwear	Natural feet in this group are subject to abnormal loading forces. These can be reduced by the provision of orthoses and proper footwear. The foot should be monitored and referred early for an orthosis. Well defined sample at uniform(early) stage. Follow-up complete & long enough. Can't tell if blind, objective outcome criteria. No adjustment for other prognostic factors. No validation in independent test-set of patients. Useful study but no figures shown to support claim that Orthotics reduced abnormal forces in diabetic foot.	3
Kegel, B [104]	Prospective Case studies	4 trans-tibial amputees. No control group.	EMG biofeedback	Stump exercises enhance retention characteristics of the stump. Stump exercises should become an integral aspect of routine physiotherapy management. Small study, not blinded. No follow-up. No adjustment for other prognostic factors.	3
Klenow, T. [65]	Systematic Review	Review of literature - 8 high evidence, 1 medium evidence, 1 low evidence articles appraised for predicting successful ambulation with LLA .	Exercise testing to predict prosthetic ambulation	The included articles do support exercise testing results to predict successful prosthetic ambulation in some demographics. Provides useful data that can be utilised in clinical environment.	1+
Kristensen, M. [62]	Case control/ tool development and psychometric properties examination.	106 dysvascular amputees whilst inpatients following amputation. Used 2 rater groups (one experienced, one less experienced)	Predictor tool for basic amputee mobility	BAMS applicable to all levels of amputation, and easily applicable within daily clinical practice. Used daily as inpatient, but applicable to use in different settings until patient independent with basic mobility. Well tested psychometric properties, and identified future research ideas (i.e. long term outcomes including prosthetic use).	2+
Kulkarni, J [106]	Prospective Cross sectional	164 consecutive lower limb amputees presenting to UK DSC. No controls.	Falls	Lower limb amputees are at risk from falling. Amputees should be educated what to do in the event of a fall, with written instructions provided. No differentiation made between pathologies, some may be at greater risk than others. Not blinded. Not randomised, no controls. Structured questionnaire expanded in light of pilot study.	3
Kulkarni, J [98]	Prospective Case Series	202 Traumatic amputees completed a semi- structured questionnaire. 20 amputees with back pain and 20 without underwent clinical examination and MRI scanning	Incidence of low back pain	Two distinctive parts of the paper – questionnaire establishing incidence of LBP and the scan findings of traumatic amputees with and without back pain. 69% of the amputees reported having back pain. No difference on MRI assessment in disc pathology between back pain and pain free subjects. Pain in the contra-lateral knee was also found to be common. Small subject numbers due to funding restrictions may have introduced bias. Only performed on traumatic amputees therefore could not extrapolate these findings to dysvascular patients.	2-
Lachman, SM [54]	Retrospective Case control	11 lower limb amputees with rheumatoid arthritis. Control subjects – matched amputees without rheumatoid arthritis.	Rheumatoid arthritis	Most amputees with rheumatoid arthritis use their prosthesis daily for help with transfers and cosmetic purposes. Small study size. Exposures were neither objective nor measured blind. Cannot tell if follow-up was long enough but was complete.	3

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Levy, SW, [60]	Descriptive Cohort study	Lower limb amputees	Prosthesis, skin infection, residual limb oedema	<ul style="list-style-type: none">) Skin disorders may be due to mechanical rubs, over or under zealous skin care) Oedema may be caused by incorrectly fitted socket, excessive negative pressure in suction socket, underlying vascular disorder) Rub & shear cause epidermoid cysts Subjects not defined. Exposures and outcomes not objective or blind. Cannot tell if follow-up was long enough or complete.	4
Lin, S. [143]	Cohort Study	22 subjects of which 20 completed the study. Convenient sample from community amputee support groups, no active medical co-morbidities, didn't need a walking aid. 18 set as minimum appropriate sample size. 12 BKA, 7 AKA 1 TKA. 35% vascular	Walked over Gait Rite during 6 minute walk test, looked at gait speed, step length and step length variance and step width.	Amputees don't walk at their most efficient SSWS so that assumption might be wrong in this paper. All amps walked slower than normal. Lots of variation in all measured parameters in this group which they suggest is representative of the amputee population. Limitation: data was collected from healthy TFAs with no cardiovascular/other diseases. However: Very strong Positive correlation between more steps correlated and faster SSWS. More steps correlated to further walking (more exercise capacity) and to lower step length variability and more step width variability. All not related to other anthropometric data or level of amputation. In this healthy, population they hypothesis is that the stronger and fitter are able to use and control the prosthesis better. Limitation of data subjectively collected on step length and demographics but otherwise fairly strong.	2+
Miller, C [140]	A cross-sectional, correlational, and descriptive study	52 lower limb amputees (mixed levels from symes to pelvic disarticulation)	Outcome measures and step activity monitor, and depression.	Measured: TAPES, LCI-5, TUG, 2MWT and step activity monitor datasets (worn for 1 week). Only showed that 2MWT results has some correlation reflecting community ambulation. Some elements of possible bias discussed by authors. Would need a more robust study, perhaps focusing on different amputation levels, however, relevant to the clinical outcomes used routinely in UK amputee rehab, provides an element of support for clinical reasoning in choosing these measures.	2-
Miller, W [94]	Prospective correlation study. Cohort	245 unilateral lower limb amputees. Daily prosthetic users. Users >6/12 Postal survey. Data collected twice, 2yrs apart. Community living amps	Balance confidence	It was found that trans femoral amputees did not significantly differ from trans tibial amputees in relation to balance confidence. In their cohort 52% of amps fell once a year (compared with 30% of community dwelling elders). The study did not fully describe outcome measures and had some areas poor methodology.	3
Moirenfeld, I [97]	Case series	11 trans tibial Israeli amputees aged 22-68. Regular independent walkers. No control.	Isokinetic strength and endurance tests in sound and amputated side.	In trans tibial amputees the maximal strength in the residual limb is lower than in the sound limb. Recommends trans tibial amputees should do strengthening exercises for residual limb. Small number of subjects. Results of individuals heterogenous, possibly due to differing age groups, time since amputation and stump length. Follow up long enough and complete.	3
Nicholas, J [23]	Case series	94 consecutive amputees in Pittsburgh answered questionnaires.	Amputation and rehabilitation	Patients felt vulnerable, defenceless, and conspicuous. Patient information should be given in written form. Treatment & assessment should be documented. Response to questionnaire 100%. Questionnaire piloted.	3

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O'Neill, B [74]	Prospective cohort study	34 amputees from a single limb centre. Multiple cognitive tests used to try and predict mobility after lower limb amputation. Follow up was 6 months	Adult amputees referred to limb centre deemed suitable for limb wearing	It was unclear when the outcome measures were applied. The study did not account for some confounding factors e.g. medical and prosthetic problems and follow up was not long enough (– only 6 months). There was some difficulty in selecting relevant results due to the number of variables and therefore many calculations displayed. The cohort appeared to have a high number of amputees due to drug use when compared to the national statistics from UK limb centres.	4
Özyürek, S. [95]	Cross sectional study.	12 transtibial amputees: 8 trauma and 4 vascular. All Male. Able to sit to stand from backless and armless chair independently. 19 able bodied male controls fairly well matched. Amputees found to have young age range 25 – 54.	Looked at weightbearing symmetry, postural balance/sway and knee extensor strength using the balance master system.	Amputees have greater asymmetry with greater weightbearing through the sound side. Lower rising index which shows reduced extensor strength and greater sway values showing worse postural control. Weight transfer time was equivalent between the two groups meaning the amputees were able to move their weight forward quickly over their feet but then slower to rise, ?? due to weakness.	2+
Pauley, T. [85]	Single blind cross over with randomisation. Two groups providing their own controls. Control first (arm bike) then experimental (Hip strengthening) and experimental first the control	Used hand held dynamometer to measure strength. baseline measures; Hip strength, ABC, Houghton scale, thigh girth. Improved on all measures except thigh girth, put improvements down to improved neurological adaptation to exercise as no hypertrophy of muscles	HITT strength training in “normal” type multigym equipment. 8 weeks of training, 8 weeks washout then 8 weeks training. 10 rep max calculated and performed 2x week for 8 weeks with increments of 5lb every time all 30reps. Performed with prosthesis on. But not to the level of normal and point out may need longer training protocol to muscle hypertrophy.	Limitations – they paid people to participate which may have improved compliance. BUT All patients were TFA with diabetes and or vascular disease 6 months post fitting. Blinded testing, a null hypothesis to test, power number etc. worked out Minimum detectable differences for TUAG A washout period between tests. Re-producible protocol.	2+
Pernot, HF [53]	Literature overview	71 studies concerning predictive or prognostic factors. Lower limb amputees 1983-1994 due to PVD		Increasing age, concurrent diseases and poor compliance are prognostic of a low functional level. Advocates multidisciplinary team. No homogeneity in studies. Can't tell if studies were multiple independent reviews of individual reports.	2++
Pinzur, MS [59]	Prospective Case series	14 trans-tibial amputees aged 25-74 yrs. 12 men, 2 women. Independent walkers, using prosthesis for >1yr. No controls, compared with contra lateral limb.	Prosthetic alignment	Small misalignments in a trans-tibial prosthesis will lead to increased loading of the residual limb. Small study. Subjects tested on a short walkway, therefore results not necessarily transferable to normal ambulation.	3

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Potter, PJ, [71]	Prospective Cohort	80 non-traumatic , unilateral amputees admitted consecutively to regional rehabilitation unit	Test for peripheral neuropathy	Peripheral neuropathy in the intact limb is nearly always present in diabetics requiring amputation. Peripheral neuropathy is also present in 2/3rds of non-diabetic amputees. Preventative measures of limb care should be utilized in all patients with an amputation. Well-defined cohort. Not blinded. Follow-up complete.	2+
Powers, C, [83]	Case control	10 unilateral trans-tibial amputees matched to 10 'normal' subjects	Motion analysis & EMG	Understanding gait mechanics by the team in the defined population promotes greater independence and increased functional status. T-T amputees exhibit reduced knee movement and power. There is greater physiological demand in T-T amputees. Small study, not randomised or blinded.	3
Powers, CM [108]	Case series	22 well healed unilateral, dysvascular, diabetic transtibial amputees. No control subjects	Gait analysis & muscle force measurements	Poor torque-producing capability is a major limiting factor in the gait ability of dysvascular trans-tibial amputees. Well-defined but small sample. Follow-up long enough and complete. Adjustment was not made for other prognostic factors	2+
Prinsen, E. [96]	Systematic review	13 articles included, split and compared between TT and TF levels, mostly traumatic causes.	Knee and hip adaptations of prosthetic side, intact side and a referent limb, during gait.	Some interesting data around adaptations for TT and TFA amputees during gait in both amputated and intact legs. However, caution with generalising to wider vascular amputee populations. It is suggested that a focus during rehab on strengthening hip extensors in particular could be beneficial according to these results.	2++
Quinlivan, DH [102]	Prospective Case control	8 unilateral transtibial amputees, 8 matched controls	Biofeedback and visual feedback.	Biofeedback training can assist in re-educating equal weight bearing. Small number in study. Non-blinded, non-randomised.	2-
Resnik, L. [80]	Systematic review	156 articles reviewed.	Community integration measures and recommended several self-report tools	Eights scales from 5 instruments—the TAPES, CRIS, SF-36, the 136-item SIP, and the WHODAS-II 12-item measure—had the strongest measurement properties. Some of the measures are currently not routinely used in clinical practice in the UK.	2++
Roffman, C. [82]	Cohort study with retrospective and prospective arms.	Australian amputees Consecutive tertiary rehabilitation patients, 135 retrospective and 66 prospective patients. Retrospective data used to form model and prospective to validate the model.	Risk of Prosthetic non-use at 4, 8 and 12 months was predicted using factors identifiable on discharge from rehabilitation.	Well written and thought out. Statistically heavy but appears to be correct. Perhaps some over simplified dichotomised reference points such as walking aid or no walking aid. Strong statistical correlations. Interesting that if multimorbid, frailer patients get through to 4 months without abandoning then they continue with prosthetics. Rehabilitation may focus on optimising transfers, wheelchair mobility, physical fitness and mental wellbeing rather than prosthetic gait for patients at high risk of not continuing with prosthetics. Need to start rehab early as delay >160 to prosthetic fitting was predictive of non use.	2+/++
Roffman, C. [133]	Retrospective cohort study	201 participants interviewed. Plus, retrospective data from medical notes	Association of locomotor performance during rehabilitation with abandonment 12 months post discharge.	Locomotor performance during rehab may predict future use of prosthetic nonuse. If 10MWT, 6MWT, TUGT, or Four Step Square Test (FSST) thresholds identified in study not achieved, this suggests high risk of prosthetic nonuse, specific strategies should be adopted to manage needs e.g. targeted rehab. However, minimum clinically important difference has yet to be established for these measures so value of function from rehab remains undefined at present.	2-

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Rowe, DA [144]	Cohort study	The aims of this study were to investigate walking speed and cadence in 17 adults with a non-traumatic unilateral below-knee prosthesis.	Walking speed, music	Mixture of aetiologies. Cadence, treadmill walking speed and energy expenditure were all highly correlated. They suggest prescribing brisk walking might be a feasible way of getting patients to exercise at or above 3 METS. Participants were asked to walk twice around a 45m track at a brisk pace with no prompts and again with music set at beat per min to mimic a set steps per minute target. Music did not help with symmetry but might help with compliance/regulating with a set speed (but they had difficulty with under estimating this due to problems with amps on a treadmill). Could use this for training regime for increasing fitness but not to do with the music and symmetry bit.	2+
Rueda, F. [88]	Observational study with a control group	15 independently mobile traumatic amps compared to healthy age matched individuals. Assessed gait and joint kinetics and joint moments with Vicom.	Assessment of muscle strength	Although the method is data collection is not applicable to everyday practice, the authors suggest that assessment should consider all planes of movement and aim to strengthen /stabilise proximal muscle groups and joints to improve gait. Suggests a focus for rehab.	2+
Rush, PJ [57]	Prospective Case series	16 healthy males (mean age = 48). Unilateral, prosthetic, transfemoral amputees for \geq 5 yrs. Compares bone density of amputated femur to contralateral femur.	Bone densitometry	There is an increased risk of developing Osteopenia in the femur of the amputated limb. Accounts for other prognostic factors. Small number in study, all healthy males. Not randomised or blind.	3
Sansom, K. [75]	Prospective observational study	71 patients followed through prosthetic rehab and up to 6 months when Timed Up and Go and SIGAM measured.	Outcome measures for predicting walking ability	Chose Timed Up and Go as most realistic measure to what amputees need to be able to do to be able to mobilise with a prosthesis. Found a predictive relationship between executive performance and walking ability. Needs to be evaluated in larger populations of amputees and geographically, however, easy measure to include in clinical practice that supports what is already done in the UK.	2+
Sapp, L [115]	Retrospective Cohort	132 lower limb amputees in Nova Scotia entering rehabilitation programme. No control group.	Rehabilitation programme	A rehabilitation program for lower limb amputees leads to functional prosthetic use. Poorly defined intervention. Review of charts and non-validated questionnaire (85% return). No blind, objective outcome criteria. Adjustment was not made for other prognostic factors.	3
Schafer, Z. [132]	Randomised control trial	15 unilateral LLAs (TT and TF) split into 2 groups, 1 performed a 12 week exercise program and the other did not.	Exercise programme	12-week exercise programme reduced falls, even at one-year follow-up, and significantly increased walking speed in a (small) group of community-dwelling lower limb amputees. Authors suggested that specialised exercise programmes for community-dwelling LLAs should be implemented as a method to reduce falls and improve walking performance in this population.	1+
Seroussi, RE [56]	Prospective Case control	Subjects: 8 healthy, non-dysvascular, transfemoral amputees. Controls : 8 healthy, normal ambulators, no other information given.	Gait analysis	Hip extensors (bilaterally), eccentric hip flexors and ankle plantar flexors benefit from strengthening. Small numbers in trial. Non-blinded, non-randomised trial without intention to treat. All prostheses fitted by the same, experienced prosthetist with the same system (worn for > 1 month)	2-
Sions, J. [64]	Cross-Sectional Study	47 participants aged 18-85 years with unilateral transtibial amputations.	Outcome measures	Demonstrates various outcome measures (Prosthetic Evaluation Questionnaire-Mobility Section, Activities-specific Balance Confidence Scale, and Houghton Scale of Prosthetic Use) in addition to daily step counts, can be used to classify functional status. Not	2-

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				methodologically robust, and data only collected over 5-7 days.	
Starholm, I. [90]	Case control study with a randomised crossover design	Participants were able-bodied controls and non-vascular TFA who were established users. Oxygen uptake (relative VO ₂), walking economy (Cw) and RPE were measured during treadmill and overground walking	Walking	The findings really only support existing literature that TFA operate at a relatively higher maximal aerobic capacity compared to AB controls. When walking at similar walking speeds, different walking surfaces had no effect on the % VO ₂ max for either group. There is no novel contribution to the literature.	2+
Steinberg, FU [55]	Prospective Cohort	116 lower limb amputees in the USA, aged 65-86 yrs. No controls.	Amputation	Elderly patients are suitable for prosthetic provision, assuming there are no co-existing mental disorders, severe neurological or cardiovascular defects, and contractures are of a manageable level. Rehabilitation on a daily basis for the elderly produces successful rehabilitation outcomes. Poorly presented statistics. Well defined population with adjustment made for other prognostic factors	2-
Wan-Hazmy CH, [68]	Cross sectional survey of amputations carried out over a three year period.	Data collected from all patients who had a lower limb amputation at a Malaysian hospital. Out of 213 patients 41 were continuing with rehabilitation and able to be contacted. N=30 at the end of the study. Transibial and transfemoral included.	Functional outcome post amp	A self constructed, unvalidated questionnaire (including the Barthel index) was applied. The study found that 67% used prosthesis <6hrs a day, but it was found that diabetes co-morbidities can lead to suboptimal use of prosthesis. 77% of the amputations were for diabetic related causes and 23% for trauma. Differences between Malaysian and British social/health systems makes extrapolating the results to the UK amputee population difficult.	3
Waters, R, [58]	Case control	70 unilateral prosthetic lower limb amputees, other pathologies not noted but had no stump pain, swelling or pressure sores. Number of controls unclear –“5 normal persons of each sex in each decade from third to seventh”, comparable results with other large studies for non amputees.	Walking	The higher the level of amputation, the higher the energy cost. Amputees adjust their velocity to maintain the rate of energy expenditure within normal limits. Age adjusted but not randomised or blinded. Large number in study.	2-
Wolf, E. [113]	Retrospective Case series	18 Israeli, bilateral vascular amputees, aged > 55yrs. No control group.	Rehabilitation	Rehabilitation of bilateral lower limb amputees can lead to independent function. Small number of subjects. Cannot tell if the follow-up was long enough, but was complete. Adjustment was made for other prognostic factors. Not blinded.	3
Wong, C. [135]	Cross sectional study	American amputees recruited via flyers and word of mouth in prosthetic clinics. 46 community dwelling adults recruited and inclusion and exclusion criteria defined. No co-morbidities that would affect balance. Retrospective modelling of prospective data.	Outcome measures	Good explanation of gaining appropriate sample size, but only achieved the minimum. Used validated o/m. Consistent testing procedure. Statistic heavy but strong correlations shown. Possible bias as patients volunteered. Berg balance items 9,10,11 and 12 should be highly weighted as gave greater statistical weight than the total score. BBS score >46 indicated satisfactory prosthetic use Cut-off ABC score of 77% was the most accurate discriminator between satisfactory and unsatisfactory prosthetic use for mobility. Balance confidence and ability both strong	2+

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		70% vascular aetiology. 52/48% TT/TF		indicators of satisfactory prosthetic use (Houghton >9). Suggested you can use these tests to highlight people who have not yet achieved satisfactory prosthetic use and may benefit from further rehab! Standing on one leg NOT a good indicator in regression modelling. Prospective work needed to see if this model is predictive/prognostic Turning to look behind; retrieving object from floor; stepping to place alternate feet on stool were most indicative of satisfactory prosthetic use.	
Wong, C. [66]	Cross-sectional qualitative study	54 patients recruited from prosthetic clinics and support groups in USA 74% vascular, mainly unilateral Multivariate regression model to predict fallers Cohort cross-sectional study Most participants prosthetic users with > 1 year use (85%) 53% had fallen (25.9% >1 fall and 27.7% 1 fall)	Outcome measures for falls	Number of fall confusing – especially the more than and recurrent categorise. Wide inclusion criteria, exclusions limited to those with known balance disorders. 96% of falls non injurious. Better balance in traumatic amputees. Higher BMI and higher balance ability suggested higher falls. Higher scores on BBS 10 increased odds of falling and 11 made it less likely to fall. All retrospective not prospective. Performance appears more important than age, BMI, medical co-morbidities years since amp and aetiology number of limbs amputated, prosthetic use and confidence in predicting falls but small sample. Suggests that people with better balance put themselves in more risk situations. Authors point out multiple limitations and lack of causal relationships from retrospective design.	2+
Ülger, Ö. [86]	Systematic review	Well-designed, systematic review over the last 15 years of 9 papers (low-moderate strength). Variety of Lower limb amputation levels and aetiologies. -One paper focused on Osseointegration. -One included Children/adolescents and Van Ness amputations (which does not reflect the scope of the adult guidelines).	Physiotherapy Rehab programs included: -weight bearing exercises -balance exercises (conventional and software based) -mobilising/treadmill training -acute care -individual therapy vs group exercises -functional training -strengthening exercises.	Highlighting paucity of good quality evidence-based studies in Amputee rehabilitation, especially detailing the content, duration and frequency of rehab. Key findings: -Virtual reality and software based programs for rehab are increasingly being developed and getting more support. -Conventional methods still possess high importance -Early mobilisation and balance exercises are effective for successful walking ability in unilateral amputees.	1+
Van De Ven, CM, [70]	Cohort	96 bilateral amputees aged>55 yrs. Amputation within 3 years living at home or residential care	Bilateral amputation	Bilateral amputees should be provided with a wheelchair and attend a home visit early in the rehabilitation process to allow successful return to the domestic environment. No control group. Follow-up was long enough and complete. No blind, objective outcome criteria. Adjustment was not made for other prognostic factors. Large study with data gathered from many variables.	3

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Van Ross, E [92]	Observational cohort study	Dysvascular trans tibial Amputees with unhealed residual limbs. N=66 but n=56 at end of Study.	Early mobilisation	Main outcome measures – residual limb healing time, trans cutaneous O2 pressure pre and post use of PPAM aids/pros mob. At 3-6 weeks (once mobile on PPAM aid) subjects were supplied with standard TTA prosthesis and progressed to full weight bearing mobility. There were strict medical and nursing protocols followed during the trial with intensive nursing input required. 46 achieved wound healing but some healed post refashioning surgery. It was concluded that early mob and smoking status may be significant factors in wound healing for trans tibial wounds.	3
Visser, J. [84]	Case control study.	10 bilateral amputees, Control – 11 non pathological reference subjects (non-amputees) with similar age and gender. Participants were free of CV disease and able to walk a min of 20m with or without use of 1 w/stick.	Walking	Results illustrate higher level of amputation correlate to less energy efficient gait; bilateral amputees reduce walking speed to regulate exercise intensity. PCI increased and correlated with amp level. Therefore, bilateral amputees need to increase overall level of CV fitness to cope with higher energy costs of prosthetic gait and improve walking speed. Findings illustrate why older bilateral amputees are unsuccessful in achieving functional mobility as have less potential for increasing physical fitness. Reduced hip muscle strength due to reduced muscle use. Increased activity levels related to greater hip strength, irrespective of amp level; hip strengthening prog may improve outcomes of bilateral amputees.	2+
Vrieling, A [120]	Observational cohort. Motion lab	Trans femoral and trans tibial amputees – 20. Control group of 10. Amp >8/12 Trauma, PAD. Prosthetic users. Walking >50m with no aids. 8 walks, 4 with obstacle, 4 without. Random order (obstacle/no obstacle) Not to touch obstacle.	Limit of function and coping strategies in obstacle crossing in LL amps.	Subjects walked at self selected speed over an obstacle: 0.1m high, 1m wide (only one obstacle height and width used). The gait velocity was slightly decreased in trans femoral amputees. It was found that the leading leg with obstacle crossing differed according to amputation level – TT favoured prosthetic side and TF favoured non amputated side. Outcome measures used: Amputee Activity Scale and Activities specific Balance Confidence. Specific trans femoral gait traits noted of ↓ knee flexion, external rotation with abducted hip/ circumduction. Well matched groups with good statistical analysis but small subject numbers mean that the influence of different prosthetic components was unable to be measured.	2+
Wezenberg, D. [139]	Quasi-experimental case-control study.	36 unilateral amputees using a prosthesis (mixed trauma and vascular disease; considerable variation in time since amputation); control 21 able bodied.	Exercise of non-prosthetic leg to exhaustion, modified for control group.	No statistical difference in leg fatigue as limiting factor. Both groups reached similar levels of exertion. Other measures were significantly lower for amputee group e.g. peak aerobic capacity, CO2 output and minute ventilation. Study concludes that this is a feasible and valid means for assessing peak aerobic capacity and exercise tolerance in people already walking with a prosthesis and can be used to design safe, effective and individualised exercise programmes.	2+

Section 2: Prosthetic Knowledge

Recommendations 2.1-2.4 have been evidenced.

- 2.5 Should the physiotherapist understand the pressure tolerant and pressure sensitive areas of the residual limb in relation to prosthetic fit?
- 2.6 Should the physiotherapist check the prosthesis for correct and comfortable fit, prior to each treatment, until the patient is able to do this for him/her self?
- 2.7 Should the physiotherapist examine the residual limb before and after prosthetic use until the patient is able to do this for him/her self?
- 2.8 Should the patient examine the residual limb before and after prosthetic use?

Recommendation 2.9 is evidenced.

GPP IV: The physiotherapist should understand the different methods of donning and doffing a prosthesis. Do you agree? Yes no

GPP V: The prosthetic centre should be contacted if there is malfunction of any componentry. Do you agree? Yes no

GPP VI: The prosthetic centre should be contacted if the socket requires adjustment in order to achieve a correct and comfortable fit. Do you agree? Yes no

Section 3: Assessment

Recommendations 3.1 – 3.6 are evidenced

GPP VII: The physiotherapist should be involved in the assessment and decision-making process around the provision of a prosthesis. Do you agree? Yes n no

GPP VIII: The rationale and clinical reasoning for prosthetic provision should be documented. Do you agree? Yes n no

GPP IX: The physiotherapist should be aware of the prosthetic componentry, type of socket and method of suspension being utilised and this information documented within the patient's notes. Do you agree? Yes n no

Section 4: The Prosthetic Rehabilitation Programme

Recommendations 4.1 – 4.7 are all evidenced.

4.8 Should prosthetic rehabilitation begin within 5 working days of receiving a prosthesis?

4.9 During prosthetic rehabilitation, patients should receive physiotherapy as often as their needs and circumstances dictate?

Recommendation 4.10 is evidenced

4.11 Should gait re-education commence within the parallel bars?

4.12 Should gait re-education progress through walking within the hospital environment to walking within the home environment?

4.13 Should walking aids be provided to ensure that prosthesis users, where possible, progress to being fully weight bearing through their prosthesis?

Recommendation 4.14 is evidenced.

4.15 Should rehabilitation be functional and integrated with activities of daily living?

4.16 Should the physiotherapist instruct the patient in appropriate functional tasks:

(Please tick the activities you agree should be taught and cross (x) those activities you do not agree should be taught)

Getting in/out of a car

Going up/down curbs, ramps, slopes

Walking in a crowded environment

Carrying objects whilst walking

Walking over uneven ground outdoors

Changing speed and direction

Picking objects up from the floor

Opening/closing a door

Using public transport

Using escalators

Comment:

Recommendation 4.17 – 4.19 is evidenced.

4.20 Should the physiotherapist, alongside other professionals, contribute to the care of wounds when these occur during rehabilitation?

4.21 Should the physiotherapist, alongside other professionals, treat scar problems when these occur during rehabilitation?

4.22 Should the physiotherapist contribute to the management of residual limb pain?

4.23 Should the physiotherapist contribute to the management of phantom sensation/pain?

GPP X: Where a prosthesis is provided for transfers only (or to assist with nursing care), instruction and advice on its safe use should be given by the Physiotherapist. do you agree? Yes n no n

Section 5: Patient Education

5.1.1 Should patients be given information about the type of prosthesis, its function and limitations?

5.1.2 Should patients be given information about the care of their prosthesis?

5.1.3 Should patients be given instruction on achieving correct socket fit, including pressure tolerant and sensitive areas of their residual limb?

5.1.4 Should the reasons for fluctuations in residual limb volume and its management be explained?

5.1.5 Should the physiotherapist give guidance on how long to wear the prosthesis and how this should be increased?
Recommendation 5.1.6 is evidenced.

5.1.7 Should the patient receive instruction in the use and care of prosthetic socks?

5.1.8 Should instruction be given in the correct use of the type of suspension used?

5.2.1 Should techniques for the management of phantom pain/sensation be taught?

5.2.2 Should the physiotherapist give advice on the factors influencing wound healing?

5.2.3 Should instruction be given on the methods to prevent and treat scar adhesion?

Recommendation 5.2.4 is evidenced

5.2.5 Should patients/carers be informed that sockets that no longer fit properly, for whatever reason, can cause skin problems?

5.3.1 Should patients/carers be taught to monitor the condition of the remaining limb?

GPP XI: Physiotherapists should establish links with their local diabetic foot/podiatry/chiropractic services to ensure that information and education given to patients and carers is accurate and consistent. Do you agree? Yes n no n

5.4.1 Should patients be made aware of the possible effects on psychological well-being following amputation and how and where to seek advice and support?

Recommendations 5.4.2 – 5.4.5 & 5.5.1 – 5.5.6 are evidenced.

5.6.1 Should patients be made aware of the possible effects on psychological well-being following amputation and how and where to seek advice and support?

5.6.2 Should patients be educated in how to prevent secondary disabilities that may occur as a result of prosthetic use?

5.6.3 Should information on the following be made available:

(Please tick the information you agree should be made available and cross (x) the information that should not)

National & local amputee support & user groups

Health promotion

Sporting and leisure activities

Driving after amputation

Employment/training

Benefits

Access to local social services

Are there any other agencies/topics you would add to the above list? if so what?

Section 6: Discharge, Maintenance and Participation

Recommendation 6.1 is evidenced

6.2 Should there be a process in place for the patient/carer to self-refer to physiotherapy after initial rehabilitation?

recommendations 6.3-6.5 are evidenced.

GPP XIV: A summary of the patient's function and mobility at transfer or discharge from active rehabilitation should be documented in the treatment notes.

GPP XV: A record of the patient's outcomes should be kept and compared on assessment and regular review.

GPP XVI: The prosthesis user should be provided with the necessary contact details to seek help and advice when required.

GPP XVII: If prosthesis use is discontinued during the rehabilitation programme, the reasons should be documented by the MDT.

GPP XVIII: If a prosthesis user requires further specialist assessments, then onwards referral should be made in a timely fashion.

General Comments

Please could you comment on your experience of using the 2012 Guidelines (Were they easy to read? Could you find the section you needed? etc)

- Have you used the audit tool suggested? Yes / no (please delete as necessary)
- If yes please comment on the audit tool's usability and usefulness:

Appendix 10a: Results from the Delphi Questionnaire

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.

The two open questions gained agreement as below:

4.16 Should the physiotherapist instruct the patient in appropriate functional tasks?

	% agreement
Getting in/out car	89%
Going up/down stairs, curbs, ramps, slopes	100%
Walking in a crowded environment	86%
Carrying objects whilst walking	89%
Walking over uneven ground outdoors	97%
Changing speed and direction	98%
Picking objects up from the floor	95%
Opening/closing a door	98%
Using public transport	76%
Using escalators	76%

5.6.3 Should information on the following be made available?

	% agreement
National and local amputee support and user groups	100%
Health promotion	97%
Sporting and leisure activities	100%
Driving after amputation	100%
Employment/Training	97%
Benefits	97%
Access to local social services	100%

Questionnaire Results (n=38)			
Recommendation	% Agreement	GPP	% Agreement
2.5	95.2	I	100
2.6	93.2	II	100
2.7	95.9	III	100
2.8	92.7	IV	100
4.8	94.9	V	100
4.9	92.4	VI	100
4.11	96.3	VII	100
4.12	91.8	VIII	100
4.13	91.8	IX	100
4.15	98	X	94.5
4.16	See List	XI	100
4.2	85.5	XII	100
4.21	97.0	XIII	97
4.22	92.3	XIV	94.5
4.23	92.3	XV	97
5.1.1	94.8	XVI	97
5.1.2	96	XVII	100
5.1.3	98.7	XVIII	100
5.1.4	98		
5.1.5	98.3		
5.1.7	97.7		
5.1.8	95.5		
5.2.1	93.4		
5.2.2	94.8		
5.2.3	93.2		
5.2.5	96		
5.3.1	98.6		
5.4.1	97.2		
5.6.1	97.3		
5.6.2	97.7		
5.6.3	See List		
6.2	92.7		

Appendix I0b: Comments from the Delphi Questionnaire and their impact upon the 2020 Guidelines update process

All comments made by the respondents to the Delphi questionnaire were read and, where appropriate, grouped together with others of a common theme. The majority were individual comments requiring no action. The table below outlines those statements where the comments resulted in changes to the statement or action from the GUG.

Related Guidelines Section Number	Common themes identified	Action taken by Guidelines Update Group
GPP 3	Not all physios are able to access opportunities to complete research.	Modified sentence to reflect that not all clinicians will be able to access all audit, research and education.
Rec 2.7	Patient needs to take ownership and responsibility. Joint effort by physiotherapist and patient, to give the patient confidence to do it alone, until patient is able to do themselves. Strategy should be implemented if patient is unable to do it themselves, e.g. involve carers.	No action taken – these comments are already part of this recommendation and also in 2.8.
GPP 4,5,6	Communication with the prosthetist/physiotherapist at the prosthetic centre is important – know who to contact for advice, prescribed componentry, prosthetic adjustments/malfunctions. Re: socket fit – comments about common troubleshooting first before contacting prosthetic centre.	This is already suggested under Local Implementation. Expanded on sentence about opportunities for CPD, to include examples, such as training at the local prosthetic centre or attendance at regional/national BACPAR study days/conferences. No action taken re: troubleshooting. If a physiotherapist didn't know to check sock/socket fit etc. first, they should contact the prosthetic centre to arrange training/support.
GPP 8	Should add non-provision should also be documented	This is discussed in GPP XVII – no action taken.
Rec 4.8	Ideal but there will always be service limitations.	No action taken.
Rec 4.16	The only disagreements were a result of where or not it was appropriate for all patients – individual patients may not achieve all of these activities/may not be relevant for them to complete them, difficulty accessing them to physically practice, but agreed the theory (or instruction) could be done by the physiotherapist or the OT.	Reworded the sentence introducing the activities. Agreed it is clear enough and that it is not expected all activities are undertaken, just that the physiotherapist should be able to instruct the patient on the task/activity.
Rec 4.19	All comments agreed it was good for physiotherapists to be involved, but that care of wounds would require specialist training. Need close liaison with nurse/medics for dressings etc.	For clarity, changed from <i>care</i> to <i>management</i> of wounds. This may remove the ambiguity of treating a wound, as opposed to working with the MDT to manage it.
5.1.1/5.1.2/5.1.3	Different types of information e.g. verbal, written should be available. Information should be provided by physio to support and complement the initial information which should be given by the prosthetist.	No action taken – already discussed further under Local implementation.

General comments:

- Lots of comments stating, “as appropriate”. No need to include this in the guidelines, as stated at the beginning of this document: *the 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 guardian or carer.*
- Comments regarding who in the MDT should document/manage certain things e.g. prosthetic provision. We did not take action on a lot of these comments, as often we used wording that the physiotherapist should contribute. This does not mean it is necessarily the physiotherapist that is solely in charge of whatever is being suggested in these recommendations/GPPs. The best approach is working as an MDT, and each locality may have different levels of staffing and processes.

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Appendix I Ia: Audit tools

Please see the full Audit and Implementation guide for details on use of the Audit tools.

Audit Tool 1: Service Evaluation					
Date Audit data collected:		Name of Auditor:			
Recommendation		Yes	No	n/a	Comments/Evidence:
2.1-2.5	There is documented evidence of on-going formal and informal training and CPD in prosthetics and prosthetic rehabilitation and reflective practise by the physiotherapist.				
2.7, 2.8	There is a local protocol for checking the prosthesis and residual limb before, during and after treatment.				
2.9	There is a local procedure in place which allows the physiotherapist to contribute to the decision making process regarding prosthetic prescription.				
3.1-3.5	A locally agreed physiotherapy assessment form is in clinical use which should include: - Previous and present function - Assessment of falls risk - Psychosocial status - Goals and expectations - Relevant pathologies - A problem list - A treatment plan, including agreed goals, is formulated in partnership with the patient				
3.6	Locally agreed, amputee specific Outcome measures are utilised, within agreed timeframes, by the Physiotherapy team.				
4.1	There is a local protocol in place for commencing prosthetic rehab.				
4.1-4.22	There are local protocols and competencies exist to cover specific treatment modalities and ensure that the physiotherapy team are working within appropriate scope of practice.				
5.1-5.5	Information is provided on: - Use of the Prosthesis - Care of residual limb - Care of remaining limb - Informed goal setting - Coping strategies following falls				
5.6	Information is available on the following: - National and local amputee support and user groups - Health promotion - Sporting and leisure activities - Driving after amputation - Employment/training Benefits - Social Services				
6.1-6.3, 6.5	There are local protocols for: - The review of patients after discharge from regular physiotherapy - The patient to self-refer to physiotherapy after initial rehabilitation - Accessing rehabilitation if an individual's circumstances change				

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Audit Tool 2: Personal Achievement of GPP's				
Date Audit data collected:	Name of Auditor:			
GPP	Yes	No	n/a	Comments/Evidence:
GPP I: The physiotherapist should encourage and facilitate the patient to take a self-management approach throughout their rehabilitation.				
GPP II: The physiotherapist should be aware of the referral pathways to the wider MDT/Stakeholders relevant to the holistic care of an amputee.				
GPP III: The physiotherapist should contribute to MDT audit, research and education.				
GPP IV: The physiotherapist should understand the different methods of donning and doffing prostheses.				
GPP V: The prosthetic centre should be contacted if there is a malfunction of any componentry.				
GPP VI: The prosthetic centre should be contacted if the socket requires adjustment in order to achieve a correct and comfortable fit.				
GPP VII: The physiotherapist should be involved in the assessment and decision-making process around the provision of a prosthesis.				
GPP VIII: The rationale and clinical reasoning for prosthetic provision should be documented.				
GPP IX: The physiotherapist should be aware of the prosthetic componentry, type of socket and method of suspension being utilised and this information documented within the patient's notes.				
GPP X: Where a prosthesis is provided for transfers only (or to assist with nursing care) instruction and advice on its safe use should be given by the physiotherapist.				
GPP XI: Physiotherapists should establish links with their local diabetic foot/podiatry/chiropractic services to ensure that information and education given to patients and carers is accurate and consistent.				
GPP XII: Where the patient has received education/information, the physiotherapist should check that they can demonstrate the recommendation correctly.				
GPP XII: Patient information should be available in a format suitable to that individual.				
GPP XIII: All advice/information given to the patient should be recorded.				
GPP XIV: A summary of the patient's function and mobility at transfer or discharge from active rehabilitation should be documented in the treatment notes.				
GPP XV: A record of the patient's outcomes should be kept and compared on assessment and regular review.				
GPP XVI: The prosthetic user should be provided with the necessary contact details to seek help and advice when required.				
GPP XVII: If prosthetic use is discontinued during the rehabilitation program the reasons should be documented by the MDT.				
GPP XVIII: If a prosthetic user requires further specialist assessment then onwards referral should be made in a timely fashion.				

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Audit Tool 3: Audit of Patient Notes			
There should be documentation found within the patient notes to support the recommendations. Where this information is found a tick (✓) should be inserted; where the information is absent a cross (x) should be inserted			
Date:		Name of Auditor:	
Recommendation		Patient:	Comments/Evidence:
3.1- 3.4	<ul style="list-style-type: none"> - A physical examination and assessment of previous and present function - Falls risk - Social situation - Psychological status - Patient goals and expectations - Relevant pathology including diabetic status - Present and past prosthetic componentry, type of socket and method of suspension 		
3.5	A problem list, treatment plan and goals have been formulated in partnership with the patient.		
4.1.2	Prosthetic physiotherapy began within a maximum of 5 working days after receipt of the prosthesis.		
4.5	There is evidence of a personalised exercise programme being devised for the patient.		
4.10	Gait re-education was commenced within the parallel bars (<i>if not, a reason for the variance should be documented</i>).		
4.12	Walking aids are provided to ensure, where possible, that prosthetic users progress to being fully weight bearing through their prosthesis.		
4.7-4.17	There is written evidence of prosthetic rehabilitation based on the treatment plan that includes: <ul style="list-style-type: none"> - Increasing time of prosthetic use - Functional tasks relevant to the goals set with the patient - Progression from walking within the hospital environment to walking within the home environment - Hobbies - Sport - Social activities - Driving 		
4.18	There is evidence of the patient's progress being measured throughout their prosthetic rehabilitation programme with validated amputee/prosthetic specific outcome measure(s).		
4.19-4.22	There is written evidence of the contribution of the physiotherapist to the management of: <ul style="list-style-type: none"> - Wounds - Scars - Residual limb pain - Phantom limb sensation/ pain 		
5.1.2-5.1.8	There is written evidence of information being given to the patient/carer in regard to: <ul style="list-style-type: none"> - Care of the prosthesis 		

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	<ul style="list-style-type: none"> - Achieving correct socket fit/ use of prosthetic socks & liners - Management of volume fluctuations of the residual limb - The length of time the prosthesis should be worn and how this should be increased - Changing footwear and alignment - Use and care of prosthetic socks & liner - Correct use of suspension 		
5.2.1-5.2.5	<p>There is written evidence of information being given to the patient/carer with regard to the following:</p> <ul style="list-style-type: none"> - Techniques for the self-management of phantom pain/sensation - Factors influencing wound healing - Methods to prevent and treat adhesion of scars - Residual limb skin care, including sweat management - The potential for skin problems caused by incorrect socket fit 		
5.3.1-5.3.2	<p>There is evidence that the patient/carer is taught to monitor the condition of the remaining limb and reducing the risks to their remaining foot.</p>		
5.4.1-5.4.4	<p>There is written evidence of information being given to the patient/carer with regard to:</p> <ul style="list-style-type: none"> - The effect of concurrent pathologies and previous mobility on realistic goal setting and final outcome of rehabilitation - Expected levels of function and mobility in relation to different levels of amputation - The reduction in levels of function compared to bipedal subjects - The energy cost of prosthetic walking in relation to different levels of amputation 		
5.5.2-5.5.6	<p>There is evidence of falls coping strategies being discussed/taught:</p> <ul style="list-style-type: none"> - Advice given in the event the patient is unable to rise from the floor 		
5.6.1-5.6.2	<p>There is written evidence of advice to the patient/carer on:</p> <ul style="list-style-type: none"> - How and where to seek psychological advice and support - Prevention of secondary disabilities that may occur as a result of prosthetic use 		
6.1	<p>There should be evidence of the patient being reviewed after discharge from regular physiotherapy intervention.</p>		
GPP XIV	<p>A summary of patient function & mobility at transfer or discharge is documented in the treatment notes.</p>		

Appendix 11b: Audit tool – Clinician comments from previous guidelines

Comments received re: Audit tool Usefulness	
<p>Very good.</p> <p>Easy to use, fit for purpose, helpful.</p> <p>Clear.</p> <p>Repeats itself a little/repetitive in places.</p> <p>Useful for assessing/reviewing service and implement a couple of things not doing.</p>	
Comments received re: Usability	Actions by Guidelines Development Team
<p>Unable to complete – requires guidance.</p> <p>Not used until now, like it but think analysis may be complex.</p>	<p>Expanded the information about audit, how the audit tool can be carried out and how it can then inform clinical practice in a range of settings.</p> <p>Provided audit stories and liaised with the BACPAR journal editors about how we can develop this into a regular feature in the journal, to disseminate best practice and how changes have been made following audit.</p>
<p>It was good to use to audit our service and implement a couple of things we were not doing.</p>	<p>See above regarding audit stories.</p>
<p>Could BACPAR members complete it simultaneously and annually? Send results in to BACPAR as evidence to lobby NHS for resources, perhaps through the parliamentary group?</p> <p>Find it useful, would like further info about whether results should be submitted to collect/provide national data.</p>	<p>Discussed within the GUG and the BACPAR Executive committee. Not appropriate as audit tools are to make local changes, not all clinical settings appropriate for this type of data collection. Could be used locally within a region. Maybe a project for regional reps or the research officers/MSc students to look at.</p>
<p>Gives a clear structure to audit to allow service review and development. Had all info, needs more space to write in supporting evidence/action boxes.</p>	<p>Altered the data capture forms so more space.</p>
<p>Used by service lead every year. Used to update patient information booklet, review communication processes with regional referrers/network. Easy to use, clear.</p>	<p>See above regarding audit stories.</p>
<p>Junior staff members have used it as a project and found it useful, easy to complete. Although not always easy to find all the answers as did not necessarily know the service as well as permanent staff members.</p>	<p>No action except for adding more information about the audit process into the guide.</p>
<p>More difficult for paperless notes.</p>	<p>Looked into how to make the tool editable on the computer – possibility for future updates.</p>

Appendix 12: Domains of the Appraisal of Guidelines for Research and Evaluation Instrument (AGREE II)

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:

Domain	Definition
Scope and Purpose	Clarity is needed about the overall objectives of the guidelines being developed and the potential impact on society and patient populations. There should be a clear description of the patient population to which the guidelines are applicable.
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 Guidelines (patients views should be included in this process). Target user are unambiguously identified and the guidelines 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 guidelines has been undertaken by appropriate group(s) of individuals.
Clarity and Presentation	Recommendations should be clear and 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 guidelines have been discussed with cost implications identified. Guidelines also suggest audit criteria so that their use and effects on clinical practice may be measured by the Practitioner.
Editorial Independence	Is there independence from the Editorial group from any Funding committee and declaration of any conflicts of interest?

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:

$$\frac{\text{Obtained score} - \text{Minimum possible score}}{\text{Maximum possible score} - \text{Minimum possible score}}$$

(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

Appendix 13a: External, patient and peer reviewers

Patient Reviewers who contributed to the review of the documents:

- David Elliot,
- Phil Bevan,
- Steve McNeice (Westminster Cross Party Limb Loss Group - WCPLLG).

External stakeholders who completed AGREE II tool:

- British Association of Prosthetists and Orthotists (BAPO);
- Special Interest Group for Amputee Medicine (SIGAM) – part of the British Society of Rehabilitation Medicine (BSRM);
- Scottish Physiotherapy Amputee Research Group (SPARG).

Peer Reviewers who completed AGREE II tool:

Peer Reviewer	Employing NHS Trust/Organisation	Clinical Specialty	Job Title
Gillian Atkinson	Sheffield Teaching Hospitals NHS Foundation Trust	Amputee Rehabilitation	Clinical specialist physiotherapist
Louise Whitehead	NHS Tayside	Amputee rehabilitation/ Community rehabilitation	Team lead physio amputee outreach service
Anne Harrill	North Bristol NHS Trust	Amputee rehabilitation	Specialist amputee physiotherapist
Jessica Withpetersen	North West Anglia NHS Foundation Trust	Rehabilitation	Clinical specialist physiotherapist
Louise Tisdale	The Royal Wolverhampton NHS Trust	Amputee rehabilitation	Clinical specialist physiotherapist
Miranda Asher	Private Physiotherapy Company	Community rehabilitation	Owner/ physiotherapist
Louise Vigar	East Suffolk and North Essex NHS Foundation Trust	Prosthetic rehabilitation	Physiotherapist
Sharon Wright	The Pennine Acute Hospitals NHS Trust	Amputee rehabilitation	Physiotherapist
Hayley Conroy	Nottingham University Hospitals NHS Trust	Prosthetics/amputee rehabilitation	Physiotherapist (clinical lead)
Helen Brandwood	Mid Yorkshire Community Therapy Services	Intermediate Care unit	Senior physiotherapist
Fiona Gillow	East Kent Hospitals University NHS Foundation Trust	Vascular	Clinical Specialist Physiotherapist
Helen Mullan	Belfast Health and Social Care Trust	Amputee rehabilitation	Physiotherapist

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Appendix I3b: Impact of comments from the external stakeholders and peer reviewers using the AGREE II tool upon the 2020 Guidelines update process

Each domain was scored using the scoring tool in appendix 12:

Domain 1: Scope and purpose = 96.42%
 Domain 2: Stakeholder involvement = 88.09%
 Domain 3: Rigour of development = 95.99%
 Domain 4: Clarity of presentation = 96.58%
 Domain 5: Applicability = 92.62%
 Domain 6: Editorial independence = 93.45%

Related AGREE II question/domain	Comments received	Action taken by GUG
General comments	The target population is very clear, aimed specifically at surgical amputation only - there is no discussion about management of congenital limb deficiencies using prostheses.	None – it does state that we acknowledge not all lower limb prostheses wearers have undergone amputation.
	Should be aimed at the interdisciplinary team working with adults with limb loss who could benefit from a prosthetic limb.	None – It is stated clearly the document is produced for physiotherapy management. Would be more comprehensive if we included wider MDT in its development.
	Comment about including how non-limb users should also benefit from rehab to reduce dependency.	These guidelines cover those who receive a prosthesis. Could be commented on in Section 6, it will be discussed at next update to see if literature can reflect this/a statement be included in the Delphi.
Qn 2	Comment regarding what is the physios role for those who only use a limb to transfer/when decision not to wear prosthesis.	These guidelines cover those who receive a prosthesis, literature for this may have been excluded due to it not being within scope of guidelines. Will review at next update, to discuss within literature/added to Delphi.
Qn 4	Comment about more professionals involved in the update as discuss MDT, so should look at prosthetists, OT's, nursing, medical contributors. Involve research officers/methodology expert.	For future updates the Guidelines co-ordinator will approach the appropriate external stakeholders, which form part of the relevant MDT to be involved in updates, other than the review process.
Qn 5	Although involved patient representatives throughout, should include a wider variety of service users (not just 2 males of a certain age) and discuss more about their involvement.	Aimed for 4 service users to participate initially. For future updates the GUG will endeavour to recruit wider variety of users. Updated the section explaining service users involvement during the update.
Qn 9	Inconsistencies in numbers from the PRISMA diagram and text	Error corrected
Qn 11	No discussion around side effects – for example, increasing physical activity may be related to an increase in falls. Maybe need the terminology of side-effects explaining, as more relatable to medication.	None – nothing reported within the literature regarding side effects of the physiotherapy management. This will be taken forward to the next update to be discussed in detail.

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Qn 13	Wider MDT review recommended	Invited all relevant professions from within amputee rehabilitation. Not all responded to review request. For future updates, we will aim to have a representative established in advance of the review, and ideally involved during the update of the Recommendations.
Qn 14	Not consistent with 5 yearly updates	The 2020 update completion was delayed until the end of the year due to the coronavirus pandemic. However, future update plans have already been put in place, as discussed within the document.
Qn 15	The wording “understood” when referring to knowledge gathering is ambiguous as the perception of understood is variable.	None at present – will review this at next update for updated literature to clarify this/discuss improved wording choice.
Qn 20	Guidelines imply the implications of the recommendations occurs within the current resources. While this is a possibility, it would empower service delivery if the guidelines recommend minimum staffing level and MDT structure to aid service planning and service development.	Local implementations were reviewed during the process. The GUG recognise there is currently no evidence to be able to recommend minimum staffing levels per patient population etc. These guidelines will not solely be used within regional prosthetic centres, and that would make recommending staffing levels more complicated.

Appendix 13c: User Feedback on ‘Public Information for physiotherapy management following lower limb amputation’ leaflet and poster

Question relating to the information	Yes	No	Not answered
Does it answer your questions?	3	-	-
Is it clear?	3	-	-
Is it readable?	3	-	-
General Comments	Action taken by GUG		
Guidelines: 1. <i>The recommendations have increased and in some cases are more relevant and up to date. No further comments.</i>	No action required		
Poster: 1. <i>It should be for patients/potential patients to know there is a source of information to go to for help. The BACPAR logo and details can be much smaller as patients are not interested in who produces the information.</i> 2. <i>Reduce the QR code size, as many older patients may not know what it is/ how to use it.</i>	Comments noted and taken forward to the next update of the poster. We will also ask the prosthetic centres/hospitals that have displayed the poster for any feedback from patients/their carers and whether or not they have accessed the leaflet through it.		
Leaflet: 1. <i>A few edits to wording and expanding on certain bits of information to make it more specific and personal to patients. Suggestions to include positive pictures and patient quotations.</i> 2. <i>Excellent, no comments</i>	Comments noted and taken forward to the next update of the leaflet, as this leaflet is intended to be viewed online, we could look at expanding it over the existing 2 pages for the next update. We will ask for a wider selection of patients, and who are at different stages of rehab to comment on this for the next update.		

Appendix 14: Definition of a Specialist Physiotherapist in Amputee Rehabilitation

A new pay structure, Agenda for Change ⁽¹⁴⁶⁾ was introduced to all NHS staff in 2004. The CSP Physiotherapy Framework ⁽¹⁴⁷⁾ in 2018 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. However, there is no automatic read-across from Agenda for Change bands to the CSP Physiotherapy Framework levels.

The National job profile for Physiotherapists ⁽¹⁴⁸⁾ is available, however, it has not been updated since 2005. Due to national variations in the banding allocated to similar jobs, it is no longer possible to define a Specialist Physiotherapist in Amputee Rehabilitation by banding alone.

The BSRM guidelines ⁽⁴⁾ recommend a minimum of specialist band 7 level physiotherapist. The guideline further describes the roles/skills a physiotherapist within referring hospitals and PARC's.

Previous BACPAR guidelines ^(1,2) described the following description, as been 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.

Appendix 15: Glossary of terms and abbreviations

The following recognised terminology and abbreviations were used in the guideline document:

Clinical effectiveness	The extent to which specific clinical interventions do what they are intended to do
Clinical governance	“The system through which NHS organisations are accountable for continuously improving the quality of their services and safeguarding high standards of care” ⁽¹⁴⁹⁾
Componentry	The different parts of a prosthesis
Discharge summary	Summary of the episode of care
Doffing	Removing the prosthesis
Donning	Putting on the prosthesis
Evaluation	Review and assessment for identifying opportunities for improvement
Goal setting	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	Separation of the femur from the acetabulum through the joint
Knee disarticulation	Separation of the tibia from the femur through the joint
Multidisciplinary team	A group of healthcare workers who are members of different disciplines, each providing specific services to the patient
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
Patient record	Refers to any document containing patient details. Can be a separate physiotherapy document or within multidisciplinary case notes
Residual limb/Residuum	Remaining part of the leg on the amputated side
Socket	Component of the prosthesis that contains the residual limb
Suspension	Mechanism of attaching the prosthesis to the limb
Symes	Separation of the foot from the ankle with removal of the medial malleolus and resection of the tibia
Trans-femoral amputation	An amputation through the femur
Trans-pelvic amputation	An amputation where approximately half the pelvis is removed
Trans-tibial amputation	An amputation through the tibia

Evidence based clinical guidelines for the physiotherapy management of adults with lower limb prostheses

Abbreviations

ACSM	American College of Sports Medicine
AfC	Agenda for Change
AGREE	Appraisal of Guidelines for Research and Evaluation
AMA	Amputee Mobility Aid
BACPAR	British Association of Chartered Physiotherapists in Amputee Rehabilitation
BAPO	British Association of Prosthetists and Orthotists
BSRM	British Society of Rehabilitation Medicine
CASP	Critical Appraisal Skills Programme
CPD	Continuing Professional Development
CSP	Chartered Society of Physiotherapy
EWA	Early Walking Aid
GUG	Guideline Update Group
GPP	Good Practice Point
HCPC	Health & Care Professions Council
HIIT	High Intensity Interval Training
iCSP	interactive Chartered Society of Physiotherapy website
ISPO	International Society of Prosthetists and Orthotists
LBP	Low back pain
MDT	Multidisciplinary team
METS	Metabolic Equivalents
MOCA	Montreal Cognitive Assessment
MOD	Ministry of Defence
MPK	Micro Processor Knee
NCEPOD	National Confidential Enquiry into Patient Outcomes and Deaths
NICE	National Institute of Clinical Excellence
PPAM aid	Pneumatic Post Amputation Mobility Aid
PRISMA	Preferred Reporting Items for Systematic Review and Meta Analysis
RCOT	Royal College of Occupational Therapy
RCT	Randomised Controlled Trials
SIGAM	Specialist Interest Group in Amputee Medicine
SIGN	Scottish Intercollegiate Guideline Network
SPARG	Scottish Physiotherapy Amputee Research Group
TAPES	Trinity Amputation and Prosthesis Experience Scale.
WCPLLG	Westminster Cross Party Limb Loss Group

Appendix 16: Useful Resources

Professional organisations:

British Association of Chartered Physiotherapists in Amputee Rehabilitation (BACPAR)

www.bacpar.csp.org.uk

British Association of Prosthetists & Orthotists (BAPO)

Sir James Clark Building, Abbey Mill Business Centre, Paisley PA1 1TJ

www.bapo.org

The Chartered Society of Physiotherapy (CSP)

14 Bedford Row, London WC1R 4ED

www.csp.org.uk

International Society for Prosthetics & Orthotics UK NMS (ISPO)

PO Box 2781, Glasgow, G61 3YL

www.ispo.org.uk

Royal College of Occupational Therapy (RCOT)

<https://www.rcot.co.uk/>

Scottish Physiotherapists Amputee Research Group (SPARG)

c/o Joanne Heberton (Vice-chairman)
WestMARC, Southern General Hospital, 1345 Govan Road, Glasgow, G51 4TF.

<http://www.knowledge.scot.nhs.uk/sparg.aspx>

Special Interest Group for Amputee Medicine for the British Society of Rehabilitation Medicine (SIGAM of the BSRM)

c/o Royal College of Physicians 11, St Andrews Place, London, NW1 4LE

<https://www.bsrm.org.uk/members/special-interest-group-for-amputee-medicine>

The Vascular Society of Great Britain and Ireland

The Vascular Society Office,
The Royal College of Surgeons of England
35-43 Lincoln's Inn Fields, London, WC2A 3PE

www.vascularsociety.org.uk

Society of Vascular Nurses

www.svn.org.uk

Useful organisations:

British Limbless Ex-Servicemen's Association (BLESMA)

Frankland Moore House, 185 High Road, Chadwell Heath, Essex RM6 6NA

www.blesma.org

Disabled Drivers Association

www.dda.org.uk

Disability Living Foundation

www.dlf.org.uk

Douglas Bader Foundation

www.douglasbaderfoundation.co.uk

Limbcare

www.limbcare.org

The Limbless Association

www.limbless-association.org

Limb Power – The British Ambulant Disabled Sports and Arts Association

www.limbpower.com

Parasport

<https://parasport.org.uk/useful-links>

Westminster Cross Party Limb Loss Group (WCPLLG)

feedback@apllf.co.uk

