

**Evidence Check**

# Amputee care standards

An **Evidence Check** rapid review brokered by the Sax Institute for the  
NSW Agency for Clinical Innovation. November 2015.



**ACI** NSW Agency  
for Clinical  
Innovation

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**This report was prepared by:**

David Tivey, Joanna Duncan, Anje Scarfe, Robyn Lambert, Alun Cameron.

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# 1 Executive summary

## Purpose of this review

This review is intended to inform the NSW Agency for Clinical Innovation on currently available standards or guidelines for the management of children or adults with amputation. Further, this review is intended to identify recommendations related to post-operative dressings for people with lower limb amputation, and to summarise the peer-reviewed literature on post-operative dressings.

## Review questions

1. What are the currently available health care standards and/or clinical guidelines for the care of people with an amputation or limb loss, both in Australia and internationally?
2. How do these current standards and/or guidelines compare:
  - To one another?
  - To the existing 2008 Amputee Care Standards in New South Wales?
- 3.1 How could the existing Amputee Care Standards in New South Wales be revised or enhanced to reflect current international best practice as determined by the reviewers in assessing the identified standards and/or guidelines?
- 3.2 In the identified standards and/or guidelines, what specific recommendations are made on post-operative dressings following lower limb amputation?
4. What does the available peer-reviewed empirical research evidence indicate about the effectiveness and/or limitations of different types of post-operative dressings following lower limb amputation? Does the evidence support recommendations on the preferential use of particular types of dressings?

## Key findings

Searches of the peer-reviewed and grey literature identified 16 guidelines for inclusion in this review. Fourteen of these guidelines related to amputation in adults. Two contained information on paediatric amputee care. There is a paucity of current guidelines or standards covering care of patients with congenital limb deficiency.

The identified guidelines differ from one another significantly in several important ways: the intended audience (e.g. physiotherapists only versus whole health services); the jurisdiction of coverage (e.g. state versus single hospitals); the type of amputation level covered (e.g. upper limb only versus all types of amputation); and the extent of evidence review undertaken to inform guidelines. However, the guidelines do make similar recommendations. In particular, they emphasise the importance of:

- Multidisciplinary teams (MDTs) in amputee care
- Individually tailored rehabilitation commensurate with individual needs/goals and functional status
- Offering timely support services to patients and their families or partners.

Specific areas for revision in the current 2008 Standards were not readily identified. Many of the guidelines contained very similar content. However, some guidelines specifically considered the following areas:

- Pain management
- Falls prevention

- The specific needs of older patients.

All guidelines that address postoperative dressings recommend the rigid dressing approach for transtibial or lower leg amputees. The peer-reviewed literature reports more favourable outcomes associated with rigid dressings compared to soft dressings; however, these studies were found to be of poor quality. It is not clear how the identified methodological issues may have impacted the findings of the peer-reviewed studies.

## 2 Background

Amputation is a surgical procedure that involves the removal of an extremity or limb. Care standards are important to mitigate the impact of amputation on the physical and emotional wellbeing of patients. In Australia, the largest number of amputations is attributed to diabetes and vascular disease; however, trauma, infection, cancer and congenital limb deficiencies can also result in amputation.<sup>1</sup> Irrespective of cause, limb amputation results in changes to body structure and function, and it has profound effects on a person's physical and emotional wellbeing.

According to the Australian Institute of Health and Welfare (AIHW) National Hospital Morbidity Database (NHMD), a total of 10,235 amputation procedures were performed in the year 2012–13. Table 1 provides data from the AIHW on amputations from 2011–12 and 2012–13.<sup>2</sup> Most amputations in both years were lower limb amputations. Most amputations occurred in adults; however, it is possible to identify the number of amputations that occurred in persons aged 19 or under. In 2011–12, 420 amputations were performed in persons aged 19 or under; in 2012–13, 447 were performed. Although it is not possible to ascertain accurate figures regarding the number of children born with limb deficiencies, the Victorian support organisation Limbs 4 Life states that “each year, approximately 100 Australian children are born with limb deficiency, while a further 100 children face amputations due to cancer, infection and trauma-related causes”.<sup>3</sup>

**Table 1: Amputation procedures in Australian public hospitals 2011–12 and 2012–13<sup>2</sup>**

Amputation level	Procedures performed in 2011–12	Procedures performed in 2012–13
<b>All levels</b>	<b>9910</b>	<b>10,233</b>
Upper limb amputations	1501	1577
Lower limb amputations	8409	8658

# 3 Introduction

This Evidence Check review is part of a project overseen by the NSW Agency for Clinical Innovation (ACI) to review and update the 2008 Amputee Care Standards in New South Wales.<sup>4</sup> These standards were developed to assist clinicians in the management of people who have experienced amputation or limb deficiency. The current project to review and update the policy aims to ensure that the revised standards achieve the following:

- Reflect best practice
- Include the patient journey from pre-operative care to re-entering the community
- Facilitate equitable care for people with amputation
- Support implementation of best practice care by clinicians, managers and local health districts.

The primary audience for this review is members of the Agency for Clinical Innovation Rehabilitation Network overseeing the update process, other medical and allied health practitioners involved in the management of people who have experienced amputation or limb deficiency, and ACI.

The main purpose of the review is to enable the Rehabilitation Network's working group to consider what standards and/or guidelines are currently used in other jurisdictions, and how these compare to the existing standards in NSW. The second purpose of the review is to inform the working group's consideration on whether an update of the standards for NSW should include recommendations on post-operative dressings, and whether these recommendations should take the form of a guideline or a mandated policy.

Within this report, the 2008 Amputee Care Standards in New South Wales are referred to as the 2008 Standards.



# 4 Review question 1

*What are the currently available healthcare standards and/or clinical guidelines for the care of people with an amputation or limb loss, both in Australia and internationally?*

## Methods

In order to identify guidelines and standards relating to amputee care, two searches were undertaken. The first search aimed to identify guidelines and standards published in the grey literature. This involved the use of a variety of keywords associated with amputee care (amputee, amputation and stump) either alone or in combination with keywords for guidelines (guideline, standard and recommendation). The search strategy was altered to suit the platform being used; the results are shown in Table 2. All relevant documents were downloaded and reviewed for inclusion.

**Table 2: Grey literature search**

Portal/platform	Search results
<a href="#">National Guideline Clearinghouse</a>	amputee OR stump OR amputation <i>Publication year: 2005–2015</i>
<a href="#">Physiotherapy Evidence Database</a>	amputee OR stump OR amputation
<a href="#">National Health and Medical Research Council (NHMRC) guideline portal</a>	amputee OR stump OR amputation
<a href="#">The Department of Health</a>	amputee OR stump OR amputation
<a href="#">National Institute for Health and Care Excellence (UK): Evidence services</a>	amputee OR stump OR amputation, with filter for guidance
<a href="#">Canadian Medical Association Infobase: Clinical Practice Guidelines Database (CPGs)</a>	amputee OR stump OR amputation
<a href="#">Scottish Intercollegiate Guidelines Network</a>	amputee OR stump OR amputation
<a href="#">Guidelines</a>	amputee OR stump OR amputation
<a href="#">Guidelines International Network</a>	amputee OR stump OR amputation
<a href="#">Google</a>	(amputee OR amputation OR stump) AND (guideline OR standard OR recommendation)
<a href="#">British Association of Chartered Physiotherapists in Amputee Rehabilitation (BACPAR)</a>	amputee OR stump OR amputation

The second search was concerned with identifying guidelines or standards in the peer-reviewed literature. Text and MeSH terms relating to amputee care and guidelines were incorporated into a search strategy executed in:

- PubMed
- EMBASE (Ovid platform)

- EBM reviews, including Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects (DARE), Cochrane Central Register of Controlled Trials (CENTRAL), ACP Journal Club, Cochrane Methodology Register, Health Technology Assessment and NHS Economic Evaluation Database (NHSEED – Ovid platform)
- CINAHL (EBSCO platform).

The search strategy comprised extensive search terms, including both text and MeSH terms. Initial scoping searches were tested and additional terms added as appropriate. The search strategies were reviewed and approved by the project working group as being appropriate and comprehensive.

The search strategy used to search the PubMed and EBSCO platforms is provided in full in Table 3. The keywords and MeSH terms were adapted to the relevant medical subject headings for searches conducted using the Ovid platform. The adapted search strategy is provided in Table 4. Limits on the search included articles published from 2005 onwards, in the English language and in humans. Keywords were searched in all fields.

**Table 3: Search strategy for guideline search (PubMed and EBSCO platforms)**

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**Terms relating to the population**

prosthesis fitting[MeSH] OR artificial limb[MeSH] OR amputation/rehabilitation\*[MeSH] OR amputation stump[MeSH] OR amputation[MeSH] OR amputee[MeSH] OR loss of limb OR limb loss OR limb deficiency OR stump OR amputation OR amputate OR amputee

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**AND**

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**Terms relating to guidelines**

algorithm OR CPGs OR CPG OR position statements OR position statement OR position paper OR consensus OR clinical recommendations OR clinical recommendation OR clinical standards OR clinical standard OR clinical protocols OR clinical protocol OR clinical pathways

OR clinical pathway OR standards OR standard OR recommendations OR recommendation OR guidelines OR guideline OR care standards OR care standard OR consensus development[MeSH] OR conferences, consensus development as topic[MeSH] OR health planning guideline[MeSH] OR planning recommendation, health[MeSH] OR practice guideline[MeSH] OR practice guidelines as topic[MeSH] OR standards of care[MeSH]

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CPG: Clinical practice guidelines.

**Table 4: Search strategy adapted for Ovid platform**

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**Terms relating to the population**

exp disabled person or exp leg amputation/ or exp finger amputation/ or exp below knee amputation/ or exp limb amputation/ or exp traumatic amputation/ or exp arm amputation/ or exp hand amputation/ or exp amputation/ or exp foot amputation/ or exp above knee amputation/ or exp amputation stump/ or exp thumb amputation/ or exp knee amputation/ or exp amputation stump/ or amputee or amputate or amputated or amputat\* or amputation or limb deficiency or limb loss or loss of limb or exp limb defect/ or exp limb prosthesis/

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**AND**

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## Terms relating to guidelines

exp clinical pathway/ or exp clinical protocol/ or exp practice guideline/ or exp health care planning/ or position statement\* or position paper\* or policy statement\* or policy paper\* or practice parameter\* or best practice\* or guideline or guidelines or care standard or care standards or CPG or CPGs or (critical or clinical or practice or care) adj2 (path or paths or pathway or pathways or protocol or protocols or standard) or consensus or algorithm

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CPG: Clinical practice guidelines.

## Results

Sixteen guidelines, standards or reports<sup>1</sup> were identified for inclusion as a result of the formal searches.<sup>5-17</sup> Within this review, all identified documents are referred to as guidelines. The peer-reviewed literature search did not identify any guidelines that were not already found in the grey literature search. The formal searches did not identify guidelines pertaining to children. Subsequently, the working group identified a strong interest in the paediatric population. Therefore, the restriction on year of publication to 2005 onwards was removed, and one additional guideline published in 2003 was identified and included.<sup>18</sup> A supplementary article on care planning in children was also identified and included.<sup>19</sup> This work should not be considered part of the formal methodology and results; rather, it was supplementary activity conducted beyond the scope of the original project proposal owing to an identified paucity of information on this population.

Key features of the guidelines are summarised in Table 5 and include the amputation level, population and care phase covered. Table 5 also indicates the intended use of the document and whether it is literature-supported. A guideline was considered literature-supported if it reported conducting a literature search as part of guideline development. Where the methods for this were unclear or not reported but literature was clearly cited, the document was considered partially literature-supported. If no literature search was conducted and/or there was little evidence that the document was based on peer-reviewed data, it was not considered literature-supported.

Overall, the guidelines were diverse in terms of intended audience, scope of coverage period and evidence base for recommendations. Most guidelines noted that there is a paucity of evidence in the amputee field, and working groups or expert panels were usually used to reach consensus-based recommendations.

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<sup>1</sup>Guidelines, standards and reports are hereupon collectively referred to as guidelines.

Table 5: Review question 1 – summary of the identified guidelines and standards

Guideline author, year	Amputation level	Population	Coverage				Literature-supported	Intended use
			Preoperative	Post-operative	Rehabilitation phase	Lifelong care		
Australia								
Statewide Rehabilitation Clinical Network, SA Health, 2012 <sup>14</sup>	All	Adults and children	X	✓	✓ <sup>§</sup>	X	X	To support service change and best practice within the funds that have been allocated
Department of Health, WA, 2008 <sup>5</sup>	All	Adults <sup>#</sup>	✓	✓	✓	✓	Partial	Intended to outline a model of care for amputee services within WA
Netherlands								
Netherlands Society of Physical and Rehabilitation Medicine, 2012 <sup>13</sup>	Lower limb	Adults	✓	✓	✓ <sup>†</sup>	X	✓	For professionals involved in the treatment of amputee patients; not mandated
New Zealand								
Hockley D, unknown <sup>11</sup>	All	Adults <sup>#</sup>	✓	✓	✓	✓	Partial	To guide an updated approach to amputee management in Christchurch hospitals
UK								
Bouch E, Burns K, Geer E, Fuller M, Rose A (BACPAR), 2012 <sup>6</sup>	Lower limb	Adults	X	✓	X	X	✓	To guide application of best practice; not mandated
Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012 <sup>9</sup>	Lower limb	Adults	✓	✓	✓ <sup>‡</sup>	X	✓	A framework for best practice for physiotherapists

Holliday A, Solway, K Torbay and South Devon NHS Foundation Trust, 2015 <sup>12</sup>	All	Adults and children	X	X	✓	X	X	For use by physiotherapists within the Torbay and Southern Devon Health and Care NHS Trust
Andrews L, Anderson L, Fairbairn S, Downing L, 2011 <sup>19††</sup>	Lower limb	Children	✓	✓	✓	✓	Partial	To explore pathways of care for children undergoing lower limb amputation
College of Occupational Therapists, 2011 <sup>10</sup>	Lower limb	Adults	X	X	✓	X	✓	To guide the work of occupational therapists; not mandated
Blundell R, Bow D, Donald J, Drury S, Hirst L, 2008 <sup>20</sup>	Lower limb	Unclear	✓	✓	✓	✓	✓	To assist the multidisciplinary team in amputee rehabilitation
Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006 <sup>8</sup>	Lower limb	Adults	✓	✓	✓†	X	✓	To guide application of best practice; not mandated
British Society of Rehabilitation Medicine, 2003 <sup>^18,††</sup>	All	Adults and children	✓	✓	✓	✓	Consensus based	To guide application of best practice for clinicians and other service providers
<b>US</b>								
VA/DOD, 2014 <sup>17</sup>	Upper limbs	Military*	X	✓	✓	✓	✓	Professional recommendations; not mandated
US Army Institute of Surgical Research, 2012 <sup>15</sup>	All	Military	✓	✓	X	X	X	Applied by the Joint Theater Trauma System director in DOD facilities
Brigham and Women's Hospital department of rehabilitation services, 2011 <sup>7</sup>	Lower limb	Adults and children	X	✓	✓	✓	X	A guide for decision-making for physical therapy management

VA/DOD, 2007 <sup>16</sup>	Lower limb	Military*	✓	✓	✓	✓	✓	Designed to be adapted to facility needs and resources; not mandated
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§Up to 18 months post-discharge in community care; #Predominantly older persons; †Up to delivery of first prosthesis; BACPAR: British Association of Chartered Physiotherapists in Amputee Rehabilitation; ‡Until discharge to maintenance/review program; ††Identified through additional searches specific to the paediatric population; ^The 2008 Standards are based on this guideline with modifications for NSW conditions; VA/DOD: Department of Veterans Affairs/Department of Defense; \*Veterans and service members.

# 5 Review question 2

*How do these current standards and/or guidelines compare:*

- *To one another?*
- *To the existing 2008 Amputee Care Standards in New South Wales?*

## Methods

The identified guidelines were reviewed in terms of content and compared to one another and to the 2008 Standards. The results of this exercise are presented in tabular format for brevity and to enable comparison across relevant issues. Guidelines or standards that were not explicitly supported by the literature were included; however, where they are referred to, this has been noted.

## Identifying guidelines for each phase of care

Recommendations were compared across the different phases of amputee care and are presented in the following categories in line with the 2008 Standards:

- Preoperative phase
- Surgical phase
- Postsurgical phase
- Rehabilitation, rehabilitation with prosthesis and lifelong management phase.

The guidelines covering each phase of care were identified and key features are summarised in tabular format covering the amputation level and intended population, whether they were literature-supported, and how relevant the guideline is to that phase of care. The relevance to the phase of care was determined by the reviewer as follows:

- Low – the document covers only one type of service provider and/or does not specifically cover that phase of care; or the document pertains to service organisation rather than care practices or recommendations
- Medium – the document covers only one type of provider but covers that particular phase of care in detail; or the document is intended for a range of providers but does not cover that phase of care in detail
- High – the document is intended for all providers and covers the indicated care phase in detail.

Recommendations for overall service provision, staff development and specialist subsections were dealt with separately.

## Comparability of guidelines

Recommendations on each phase of care were compared and allocated to the following designation with respect to each care standard in the 2008 Standards in that phase of care:

- Concordant – wording may be different but the standards are underpinned by the same principle
- Similar – there are differences between the recommendations but the main elements are the same
- Discordant – the recommendations/standards are markedly different
- Contradictory – the recommendations/standards have opposing content

- Not applicable – other guidelines did not contain comparable recommendations.

## Results

Overall, the guidelines differ significantly in their scope and intended audience. Many of the guidelines identified are intended for physiotherapists or occupational therapists and are not relevant to the organisation of patient care services. Each guideline has been prepared for a particular audience (e.g. physiotherapists, MDTs or policy makers) and they are not easily compared to one another; moreover, many of the guidelines are either not literature-supported or do not report the methods of evidence collection and review. All guidelines note a paucity of clinical literature in this field, and recommendations are frequently based on consensus views of the guideline working groups.

Despite variability across these elements, some concordant themes were identified. In particular, guidelines were uniform in recommending that MDTs be responsible for amputee care. Similarly, guidelines noted the importance of patient-centred care in terms of:

- Setting appropriate and patient-relevant rehabilitation goals and plans
- Discussing treatment plans and outcomes
- Support for patients and their partners and families.

Guidelines also frequently recommend that patients be able to access and refer themselves to services they need in terms of physiotherapy or rehabilitation, and that care teams or facilities should have mechanisms in place for follow-up and monitoring of patients. In terms of prostheses, several guidelines state that patients should receive an interim prosthesis as soon as possible and that patients' use of and comfort with the prosthesis should be the subject of monitoring.

An additional report on the implementation of interdisciplinary care guidelines for the management of amputees in Christchurch hospitals<sup>11</sup> was identified but not formally included in the tabulated results. The recommendations are so specific to the jurisdiction the guideline was developed for that they are not relevant for comparison with the other reports. The document describes the process of producing guidelines for physiotherapists working in Christchurch Public Hospital (CPH). The recommendations are based on a review of local and international guidelines, peer-reviewed literature and grey literature. Stakeholder consultation with local and international multidisciplinary health professionals, patients and their representatives was also undertaken to identify key issues. While the guidelines are situation specific and outline the practices that should be followed at CPH, the key messages are concordant with the 2008 Standards.

Several guidelines contain recommendations on falls prevention and pain management. These areas are not included in the 2008 Standards; dependent upon the view of the working party, some recommendations on these areas could be included. Recommendations regarding pain management could be incorporated into the pre- and postoperative phases of care, and falls prevention into the postoperative and rehabilitation phases. Additionally, the review identified that it may be relevant to consider whether care standards differ for older amputees.

## Falls prevention

A fall is an unintentional event resulting in a person coming to rest on the ground. In the context of an amputee patient, falls may delay recovery, affect balance confidence and cause additional injury. Guidelines that contain information on falls include recommendations regarding:

- Education and exercises that can be helpful in the prevention of falls
- Education and instruction on coping with falls and getting up off the floor if and when falls occur.



Guidelines that contain some recommendations and information on falls prevention include:

- Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. Evidence based clinical guidelines for the physiotherapy management of adults with lower limb prostheses<sup>9</sup>
- College of Occupational Therapists. Occupational therapy with people who have had lower limb amputations: evidence-based guidelines<sup>10</sup>
- Department of Veterans Affairs, Department of Defense. VA/DOD clinical practice guideline for rehabilitation of lower limb amputation.<sup>16</sup>

A specific, short guideline on falls prevention in lower limb amputees was also identified:

- Blundell R, Bow D, Donald J, Drury S, Hirst L. Guidelines for the prevention of falls in lower limb amputees.<sup>20</sup>

The specific recommendations on falls prevention and the evidence base informing them are provided in detail in Table 6.

**Table 6: Specific recommendations on falls prevention**

<b>Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. Evidence based clinical guidelines for the physiotherapy management of adults with lower limb prostheses<sup>9</sup></b>
"All parties involved with the patient should be made aware that the risk of falling is increased following lower limb amputation. (grade C, Kulkarni J, et al., 1996)
Rehabilitation programmes should include education on preventing falls and coping strategies should a fall occur. (grade C, Kulkarni J, et al., 1996; Miller W, Deathe A, 2004; Dite W, Connor H, Curtis H, 2007)
Instructions should be given on how to get up from the floor. (grade C, Kulkarni J, et al., 1996)
Advice should be given in the event that the patient is unable to rise from the floor. (grade C, Kulkarni J, et al., 1996; Dite W, Connor H, Curtis H, 2007)
All patients should be asked if they have a fear of falling and, if indicating that they do, further therapy incorporating balance work should be considered. (grade C, Miller W, Deathe A, 2004)
Where a reduction in the individual's balance confidence is observed, all of the Prosthetic MDT should be made aware of the issue and, where indicated, further therapeutic input provided to address modifiable factors. (grade C, Miller W, Deathe A, 2004)"

#### **Evidence base for the recommendations**

All of the recommendations were rated by Broomhead et al. as being grade C.

Grade C: Must have a body of evidence rated as 2+ directly related to guideline population with consistency in the results presented. Or results extrapolated from 2++ studies.

- Level of evidence 2+: Well-conducted case-control or cohort studies with a low risk of confounding, bias and a moderate probability that the relationship is causal
- Level of evidence 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.

The recommendations are based on the following studies:

- Kulkarni J, Wright S, Toole C, Morris J, Hiron R. Falls in patients with lower limb amputations: prevalence and contributing factors. *Physiotherapy* 1996;82(2):130–36.
- Miller W, Deathe A. A prospective study examining balance confidence among individuals with lower limb amputation. *Disabil Rehab* 2004;26(14–15):875–81.
- Dite W, Connor H, Curtis H. Clinical identification of multiple fall risk early after unilateral transtibial

amputation. Arch Phys Med Rehabil 2007;88(1):109–14.

**College of Occupational Therapists. Occupational therapy with people who have had lower limb amputations: evidence-based guidelines<sup>10</sup>**

“Occupational therapists need to identify falls risk factors and provide appropriate individual interventions in collaboration with the multidisciplinary team (Kulkarni et al., 1996; Miller et al., 2001; Gooday and Hunter, 2004; Miller and Deathe, 2004; Pauley et al., 2006; Dyer et al., 2008) (Level V/4, V/6, III-3/4, V/8, V/6,IV/3 evidence)”

**Evidence base for recommendations**

Level I evidence obtained from a systematic review of all relevant randomised controlled trials.

Level II evidence obtained from at least one properly designed randomised controlled trial.

Level III-1 evidence obtained from well-designed pseudo-randomised controlled trials (alternate allocation or some other method).

Level III-2 evidence obtained from comparative studies (including systematic reviews of such studies) with concurrent controls and allocation not randomised, cohort studies, case-control studies, or interrupted time series with a control group.

Level III-3 evidence obtained from comparative studies with historical control, two or more single-arm studies, or interrupted time series without a parallel control group.

Level IV evidence obtained from case series, either post-test or pre-test/post-test.

Level V surveys, correlation studies, reliability and validity studies for outcome measure development, case studies and focus groups.

Quality:

- High quality (7/10 or greater)
- Medium quality (4–6/10)
- Poor quality (3/10 or less).

Evidence is assigned a level of evidence and a quality score out of 10 such that level V/4 represents an NHMRC level V study, which has a quality rating of 4/10.

The recommendations are based on the following studies:

- Kulkarni J, Wright S, Toole C, Morris J, Hirons R. Falls in patients with lower limb amputations: prevalence and contributing factors. Physiotherapy 1996;82(2):130–36.
- Miller WC, Deathe AB, Speechley M, Koval J. The influence of falling, fear of falling, and balance confidence on prosthetic mobility and social activity among individuals with a lower extremity amputation. Arch Phys Med Rehabil 2001;82(9):1238–44.
- Gooday HM, Hunter J. Preventing falls and stump injuries in lower limb amputees during inpatient rehabilitation: completion of the audit cycle. Clin Rehabil 2004;18(4):379–90.
- Miller WC, Deathe AB, Harris J. Measurement properties of the Frenchay Activities Index among individuals with a lower limb amputation. Clin Rehabil 2004;18(4):414–22.
- Pauley T, Devlin M, Heslin K. Falls sustained during inpatient rehabilitation after lower limb amputation: prevalence and predictors. Am J Phys Med Rehabil 2006;85(6):521–32.
- Dyer D, Bouman B, Davey M, Ismond KP. An intervention program to reduce falls for adult in-patients following major lower limb amputation. Healthc Q 2008;11(3):117–21.

**Department of Veterans Affairs, Department of Defense. VA/DOD clinical practice guideline for rehabilitation of lower limb amputation<sup>16</sup>**

“Patients should be educated in strategies to prevent falls and improve safety.

Limb protection should be emphasised, especially during the early phases when the risk of falls is greater.

- The patient should be instructed to wear an external protective device on the residual limb

- An external protective device may include a postoperative rigid dressing or a prefabricated rigid dressing.

Initiate, measure and adjust a balance re-training program to minimise a patient's risk of falling and increase the efficiency of gait, both with and without a prosthesis.

- Sitting and standing balance should be assessed throughout the rehabilitation process using standardised assessment tools such as the Berg or Tinetti Balance Assessment tools
- Interventions should start with sitting balance and progress to sitting weight shifts, then sit to stand, supported standing, single-limb balance, and dynamic balance training
- Balance should be challenged with a variety of activities, such as weight shifting on a soft surface, rocker board, ball rolling under the sound foot, and step-ups."

#### **Evidence base for recommendations**

While sections of the guideline are informed by peer-reviewed literature and recommendations are graded by level, it is not clear what evidence was used to inform the recommendations about falls prevention.

**Blundell R, Bow D, Donald J, Drury S, Hirst L. *Guidelines for the prevention of falls in lower limb amputees*<sup>20</sup>**

#### **"Multi-factorial falls prevention programs**

Programs should include:

- MDT approach (grade B)
- Environmental modifications (grade B)
- Exercise (grade B)
- Medication review (grade B)
- Gait training and provision of walking aid (grade B)
- Education (Grade B)
- Treatment of any acute illness (grade C)
- A comfortable fitting prosthesis.

Overall grade of recommendation = B

#### **Exercise programs**

Exercise programs recommended to reduce the risk of falls include:

- Balance exercise (grade B)
- Strengthening exercises (grade B)
- Tai chi (grade B)
- Endurance exercises (grade B)
- Stretching (grade D)
- Multiple task practice (grade D)
- Functional floor work
- Coordination
- Agility training
- Gait
- Transfers
- Aerobic exercise.

Programs should include a combination of exercises to be effective in reducing falls.

Overall grade of recommendation = B

#### **Environmental modifications**

Specific assessment by an occupational therapist to check for environmental hazards such as poor lighting, recommendations of modifications and assistance with their implementation.

Overall grade of recommendation = B

#### Other interventions

- Education of healthcare professionals regarding risk factors, safe use of prosthesis and environmental hazards
- Tapering and discontinuing of psychotropic medications

#### Evidence base for recommendation

Grade of recommendation:

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

Level of evidence

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

As this guideline is exclusively on falls prevention, the list of references is too large to include here but can be found on the BACPAR website <http://bacpar.csp.org.uk/publications/guidance-falls-prevention-lower-limb-amputees>

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#### Pain management

Several guidelines note that pain management is an important component of amputee care. Pain may be due to the initial injury, the amputation surgery, phantom limb pain or secondary musculoskeletal pain. Guidelines for physiotherapists produced by BACPAR contain recommendations for physiotherapists regarding recognising and treating pain. The VA/DOD guidelines recommend that "pain assessment and treatment using pharmacological and non-pharmacological means for pain control should start in the preoperative phase and continue throughout the rehabilitation and prosthetic training". Guidelines that make reference to pain management include:

- Department of Veterans Affairs/Department of Defense. VA/DOD clinical practice guideline for rehabilitation of lower limb amputation<sup>16</sup>
- Department of Veterans Affairs/Department of Defense. VA/DOD clinical practice guideline for the management of upper extremity amputation rehabilitation<sup>17</sup>

- Netherlands Society of Physical and Rehabilitation Medicine. Guideline: Amputation and prosthetics of the lower extremities<sup>13</sup>
- Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. Evidence based clinical guidelines for the physiotherapy management of adults with lower limb prostheses<sup>9</sup>
- Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. Clinical guidelines for the pre and post operative physiotherapy management of adults with lower limb amputation<sup>8</sup>
- Holliday A, Solway, K. Amputee rehabilitation guidelines for physiotherapists<sup>12</sup>
- Statewide Rehabilitation Clinical Network. Model of amputee rehabilitation in South Australia.<sup>14</sup>

The specific recommendations on pain management and the evidence base informing them are provided in detail in Table 7.

**Table 7: Specific recommendations on pain management**

<b>Department of Veterans Affairs, Department of Defense. VA/DOD clinical practice guideline for rehabilitation of lower limb amputation<sup>16</sup></b>	
"Pain assessment and treatment using pharmacological and non-pharmacological means for pain control should start in the preoperative phase and continue throughout the rehabilitation and prosthetic training."	
1.	"Pain should be assessed at all phases of rehabilitation, preferably with a tool specific to pain assessment in patients with lower limb amputations. [Expert opinion]
2.	When assessing pain, standardised tools should be used. Examples include: Visual Analogue Scale (VAS); Short Form McGill Pain Questionnaire (SF-MPQ); and Pain Interference Scale (PIS). [B]
3.	When possible, a postoperative treatment plan for pain control based on the preoperative pain assessment should be developed before surgery and treatment initiated. [I]
4.	Measurement of the intensity of pain should be separately assessed at each site (i.e. phantom limb pain, residual limb pain, low back pain) to achieve a thorough assessment of pain-related impairment. [B]
5.	Prophylactic pain management should be considered prior to initiation of physical rehabilitation intervention. [I]
6.	Narcotic analgesics should be considered in the immediate postoperative phase. [Expert opinion]
7.	Transition to a non-narcotic pharmacological regimen combined with physical, psychological and mechanical modalities should be considered throughout the rehabilitation process. Treatment should target pain related to the residual/phantom limb and address pain in other body parts from a primary care approach. [C]
8.	There is no consistent evidence to support or refute one specific type of pain control. Available modalities include: [I]
a.	Pharmacological: Anti-seizure medications (e.g. gabapentin), tricyclic antidepressants (TCAs), selective serotonin re-uptake inhibitors (SSRIs), non-steroidal anti-inflammatory drugs (NSAIDs), dextromethorathane and long-acting narcotics
b.	Epidural analgesia, use of patient controlled analgesia (PCA), or regional analgesia may be considered, although the benefit is unproven
c.	Non-pharmacological: Transcutaneous electrical nerve stimulation (TENS), desensitisation, scar mobilisation, relaxation and biofeedback."

#### **Evidence base for recommendations**

The evidence ratings used by the VA/DOD are as follows:

[A] A strong recommendation that the clinicians provide the intervention to eligible patients.

Good evidence was found that the intervention improves important health outcomes and concludes that benefits

substantially outweigh harm.

[B] A recommendation that clinicians provide (the service) to eligible patients.

At least fair evidence was found that the intervention improves health outcomes and concludes that benefits outweigh harm.

[C] No recommendation is made for or against the routine provision of the intervention.

At least fair evidence was found that the intervention can improve health outcomes, but concludes that the balance of benefits and harms is too close to justify a general recommendation.

[D] Recommendation is made against routinely providing the intervention to asymptomatic patients.

At least fair evidence was found that the intervention is ineffective or that harms outweigh benefits.

[I] The conclusion is that the evidence is insufficient to recommend for or against routinely providing the intervention. Evidence that the intervention is effective is lacking, poor quality, or conflicting, and the balance of benefits and harms cannot be determined.

**Department of Veterans Affairs, Department of Defense. *VA/DOD clinical practice guideline for the management of upper extremity amputation rehabilitation*<sup>17</sup>**

"Various types of pain experienced after upper extremity loss should be managed appropriately and individually throughout all phases using pharmacological and non-pharmacological treatment options."

"Preoperative: Assess for existing pain.

Postoperative: Assess and aggressively treat residual and phantom limb pain.

Pre-prosthetic: Assess for specific treatable causes of residual limb or phantom limb pain and apply specific treatments appropriate to the underlying aetiology. If no specific cause can be determined, treat with non-opioid medications and other non-pharmacologic, physical, psychological and mechanical modalities.

Prosthetic training: Assess for specific treatable causes of residual limb or phantom limb pain and apply specific treatments appropriate to the underlying aetiology. If no specific cause can be determined, treat with non-opioid medications and other non-pharmacological, physical, psychological and mechanical modalities.

Lifelong care: Assess and treat associated musculoskeletal pain that may develop."

**Evidence base for recommendations**

For the recommendation regarding pain, the evidence used was expert opinion, with a low certainty of net benefit and a perceived substantial magnitude of net benefit.

**Netherlands Society of Physical and Rehabilitation Medicine. *Guideline: Amputation and prosthetics of the lower extremities*<sup>13</sup>**

"The working group considers that:

- Acute postoperative pain should be treated in accordance with the insights detailed in the Dutch guideline for the postoperative treatment of pain
- Epidural treatment has a place in perioperative pain management
- Continuing pain treatment by epidural or perineural catheters, despite having no significant effect on phantom pain over the (medium) long-term, has a place in the treatment of acute postoperative pain following amputation
- Due to neurotoxicity, epidural infusion of ketamine cannot be recommended
- The use of gabapentin can be considered for patients with phantom pain
- The use of amitriptyline can be considered for patients with phantom pain."

**Evidence base for recommendations**

A systematic search of MEDLINE, EMBASE and PsycINFO (from 1990 to May 2009) was conducted. The search

yielded 204 abstracts. After screening for content and study design (RCT), seven relevant studies remained to address the question: What is the preferred approach to pain management (peri- and postoperative) in lower limb amputation and which interventions are useful in the prevention of chronic stump pain and phantom pain?

"In general, the studies were of reasonable to good methodological quality, and almost all studies showed well-executed randomisation and blinding of patients, clinicians and assessors. The reporting of co-interventions and compliance (therapy adherence) were points on which some studies were inadequate. Most of the studies included a limited number of participants, and four of the seven studies showed a high dropout rate."

**Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. *Evidence based clinical guidelines for the physiotherapy management of adults with lower limb prostheses*<sup>9</sup>**

The prosthetic rehabilitation program:

- "The physiotherapist should be aware of the incidence of low back pain among prosthetic users and work alongside the prosthetic MDT to optimise prosthetic alignment, fit and minimise postural asymmetries (D)
- The physiotherapist, alongside other professionals, should contribute to the management of residual limb pain (D)
- The physiotherapist, alongside other professionals, should contribute to the management of phantom sensation/pain (D)."

Care of the residual limb:

- "Techniques for the self-management of phantom pain/sensation should be taught (D)."

Discharge, maintenance and long-term needs:

- "The physiotherapist should be aware that secondary musculoskeletal disorders (such as low back pain) can develop over time and adversely affect prosthetic functioning (C)."

**Evidence base for recommendations**

All evidence for pain recommendations was rated D, meaning that evidence is gained from non-analytic studies, e.g. case reports, case series or expert opinion; or results are extrapolated from well-conducted case-control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal.

**Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. *Clinical guidelines for the pre and post operative physiotherapy management of adults with lower limb amputation*<sup>8</sup>**

"The physiotherapist, as part of the MDT, should contribute to the management of pain as necessary. C (IV)

The physiotherapist is aware that pain (of the residuum, phantom or lower back) may affect the quality of life of the amputee. B (III)

Methods of pain relief for the postoperative treatment of phantom pain/sensation are understood by the physiotherapist. B (III)

Pain control should be optimised prior to physiotherapy treatment preoperatively. C (IV)

Patients should be made aware of the possibility of experiencing phantom limb pain. B (III)

Patients should be given accurate and timely knowledge of phantom limb pain. B (III)

Information regarding phantom limb pain should be given by clinicians with appropriate knowledge and training. B (III)

Appropriate treatment should be given for phantom limb pain. C (IV)

Appropriate treatment should be given for residual limb pain. C (IV)

Techniques for the self-management of phantom pain/sensation should be taught. C (IV)"

## Evidence base for recommendations

Evidence pertaining to the recommendations on pain were grades B and C.

B: Well-conducted clinical studies but no randomised clinical trials on the topic of the recommendation (evidence levels IIa, IIb and III)

C: Expert committee reports or opinions and/or clinical experience of respected authorities. This grading indicates that directly applicable clinical studies of good quality are absent (evidence IV).

### **Holliday A, Solway, K. *Amputee rehabilitation guidelines for physiotherapists*<sup>12</sup>**

"The physiotherapist should contribute to the management of residual limb pain.

The physiotherapist should contribute to the management of phantom sensation/pain.

Techniques for the self-management of phantom limb pain/sensation should be taught."

## Evidence base for recommendations

It is not clear whether the recommendations on pain are evidence based. However, this guideline references the following documents:

- Clinical guidelines for the pre and post operative physiotherapy management of adults with lower limb amputation. BACPAR (British Association of Chartered Physiotherapists in Amputee Rehabilitation), Chartered Society of Physiotherapy, London, 2006
- Evidence based clinical guidelines for the physiotherapy management of adults with lower limb prostheses. BACPAR, Chartered Society of Physiotherapy, London, 2003
- BACPAR Outcome Measure Toolbox.

Chartered Society of Physiotherapy Core standards of Physiotherapy Practice.

### **Statewide Rehabilitation Clinical Network. *Model of amputee rehabilitation in South Australia*<sup>14</sup>**

#### **Organisation of services**

"Amputee rehabilitation should occur as close as possible to a patient's home, and as such general hospitals with a rehabilitation service (Modbury Hospital, The Queen Elizabeth Hospital, Repatriation General Hospital) should be capable of delivering inpatient and ambulatory rehabilitation (centre-based day and home-based rehabilitation) to its local amputee population, and be able to provide a suitable rehabilitation plan regardless of whether the individual is prescribed a prosthesis. In addition, each region should offer a regular multidisciplinary clinic for individuals who have had a lower limb amputation to prescribe new limbs, review pain issues, review and intervene appropriately following a decline in independence."

#### **Key requirements – access and triage**

"A consultation re pain management should occur prior to amputation."

#### **Shared care models in the acute setting – key requirements**

"Wound care, residual limb dressing, controlling of limb volume changes, optimisation of blood glucose levels, pain management and education must be a focus postoperatively. Bandages, shrinkers and residual limb socks need to be available to assist with this. Additionally, chest care, trunk and body motor control and stability, bed mobility, transfers and early ambulation promoting residual limb activity and prevention of contractures are also important aspects to be addressed."

#### **Key requirements – inpatient rehabilitation**

"Optimisation of their medical status, including phantom pain management."

"Ongoing pain management should be provided, with specialist input and advice as needed."



### Key requirements – ambulatory rehabilitation

“Ongoing input for the management and prevention of contractures, controlling of residual limb volume changes and pain management should be provided by the interdisciplinary team as needed. Any postoperative complications or potential risk of developing further complications should also be monitored.”

### Key requirements – ambulatory rehabilitation

“Input may involve management of ongoing pain issues (including phantom limb pain), counselling and support, driving and transport (if not previously addressed) and ongoing maintenance therapy. Some individuals may continue to attend either public hospital outpatient services or private clinics to receive these services.”

### Workforce

“The interdisciplinary team may include surgeon (vascular/orthopaedic), anaesthetist, rehabilitation specialist, specialist nursing including vascular, prosthetist, physiotherapist, occupational therapist, social worker, dietitian, psychologist, podiatrist, amputee coordinator and staff with expertise in pain management. The membership of the team will be influenced by the phase across the continuum and individual patient need. Access to psychology services in each Local Health Network for all amputees should be mandatory.”

### Evidence base for recommendations

The document states: *“The model of amputee rehabilitation is patient centred, based on the best available evidence, and aims to achieve consistency of practice, equity of access and sustainability of rehabilitation and prosthetic services.”* No documentation regarding searches or evidence collection and appraisal was identified by reviewers. This may have occurred as background to the publication of the report.

### Specific needs of older people

No guidelines make specific recommendations about older persons; however, the WA Department of Health’s Amputee Services & Rehabilitation Model of Care is focused on the elderly population and provides information about service organisation priorities when considering that older amputees may have specific care needs related to their age.<sup>5</sup>

No guidelines pertaining to children with congenital limb deficiency were identified, and many of the identified guidelines explicitly exclude children.

The guideline on upper limb amputation rehabilitation, a specialist subsection in the 2008 Standards, is broadly concordant with the care standards.

The following sections examine guidelines specifically with respect to the 2008 Standards. Summary tables are provided and organised according to care phase and subsections. There are two tables for each care phase. The first table describes the guidelines that cover each phase of care, while the second table presents the results of a comparison of guidelines to the 2008 Standards. The second table can be read as follows:

- Dark grey lines contain the text of the 2008 Standards
- The lighter grey lines give an indication of the degree to which the other guidelines contain similar or different recommendations when compared with the 2008 Standards
- The white lines provide a reference to the guidelines that contain a similar recommendation.

All recommendations in the 2008 Standards that were able to be compared to other guidelines are included in tabular format. Tables are organised in the same structure as that found in the 2008 Standards.

## Overall service provision

The 2008 Standards contain recommendations related to overall service provision in the NSW jurisdiction. Both the SA<sup>14</sup> and WA<sup>5</sup> models of care make recommendations about service provision; the report from New Zealand<sup>11</sup> also contains some information about service organisation within Christchurch. However, it is not possible to compare these reports to one another or the 2008 Standards as each jurisdiction's health services, funding and organisation operate differently.

## Preoperative phase

Four of the guidelines make specific recommendations covering the preoperative phase. Of these guidelines, two are focused exclusively on physiotherapists and their role in the care of amputees. Table 8 describes the guidelines that cover the preoperative phase of care. Although guidelines differ in scope and intended audience, they are similar in recommendations, and contradictory recommendations were not identified. Concordant themes across guidelines include:

- Interdisciplinary or MDTs are required for assessment and preoperative management. All guidelines note the importance of MDTs in preoperative assessment and management of patients. The recommended composition of these teams varies but tends to include specialist physicians and physiotherapists or rehabilitation specialists
- Counselling and psychological support should be made available to patients and their family members as early as possible. Peer support and amputee support groups are important. The provision of pre-amputation counselling and support is also recommended by several guidelines.

**Table 8: Summary of guidelines covering the preoperative phase of care**

Guideline author, year	Amputation level and population	Literature-supported	Relevance to the preoperative phase of care
Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012 <sup>9</sup>	Lower limb Adult population	✓	<b>Medium</b> Covers physiotherapists only
Netherlands Society of Physical and Rehabilitation Medicine, 2012 <sup>13</sup>	Lower limb Adult population	✓	<b>Medium</b> Focuses on specific clinical questions
Department of Health, WA, 2008 <sup>5</sup>	All Adult population*	Partial	<b>High</b>
Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006 <sup>8</sup>	Lower limb Adult population	✓	<b>Medium</b> Covers physiotherapists only

BACPAR: British Association of Chartered Physiotherapists in Amputee Rehabilitation; \*Predominantly older persons.

Table 9 summarises the level of concordance with the 2008 Standards.

**Table 9: Preoperative phase of care**

*Facilities where planned amputations occur are to have access to a specialist team. This includes but is not limited to a suitably experienced surgeon, rehabilitation physician, prosthetist, nurse, occupational therapist and physiotherapist.*

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**Similar**

Other guidelines largely relate to isolated professions or services, but no overall recommendations about facilities were identified. However, two guidelines contain similar recommendations relating to the involvement of MDTs, and guidelines are concordant in the sense that both note that a multidisciplinary assessment and/or management team should be used in the assessment and preoperative management of patients.

- *Netherlands Society of Physical and Rehabilitation Medicine, 2012<sup>13</sup>*
- *Department of Health, WA, 2008<sup>5</sup>*

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*A pre-amputation consultation is to be conducted for all planned amputations and should include the patient and team members who will be involved in rehabilitation after the surgery.*

**Concordant**

Three guidelines make concordant recommendations. One of the guidelines pertains exclusively to physiotherapists.

- *Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012<sup>9</sup>*
- *Netherlands Society of Physical and Rehabilitation Medicine, 2012<sup>13</sup>*
- *Department of Health, WA, 2008<sup>5</sup>*

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*Experienced clinical counselling and psychological support is to be made available to patients and their significant others, particularly for those patients where amputation is unanticipated. This should begin in the acute phase and continue if required as part of lifelong management.*

**Similar**

Two of the guidelines make similar recommendations, although neither makes note of unanticipated amputations.

- *Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012<sup>9</sup>*
- *Department of Health, WA, 2008<sup>5</sup>*

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*Unless clinically contraindicated, a rehabilitation program should be commenced preoperatively.*

**Concordant**

Two of the guidelines make recommendations that are concordant with this statement.

- *Department of Health, WA, 2008<sup>5</sup>*
- *Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006<sup>8</sup>*

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*All surgical departments should provide patients undergoing elective amputations with access to information regarding local peer support and/or amputee associations.*

**Concordant**

Three of the guidelines make recommendations concordant with this statement. Two of these relate specifically to physiotherapists.

- *Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012<sup>9</sup>*
- *Department of Health, WA, 2008<sup>5</sup>*
- *Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006<sup>8</sup>*

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BACPAR: British Association of Chartered Physiotherapists in Amputee Rehabilitation.

## Surgical phase

The surgical phase includes all issues relating to the amputation surgery. Table 10 describes the guidelines that cover the surgical phase of care. Seven documents cover this phase of care in some way; however, two of the guidelines have low relevance to this phase of care. No guidelines make recommendations contradictory to the 2008 Standards. The 2008 Standards relating to rigid dressings and the data collection form (standards 3.4 and 3.5) are not applicable to guidelines from other jurisdictions. In the surgical phase of care, guidelines concordance points were:

- The importance of rehabilitation specialists in both pre- and postoperative care; guidelines recommend multidisciplinary care is started as soon as possible
- Amputation level should be considered with respect to future rehabilitation potential
- Surgical expertise within the field of amputation is important.

**Table 10: Summary of guidelines covering the surgical phase**

Guideline author, year	Amputation level and population	Literature-supported	Relevance to the surgical phase of care
Department of Veterans Affairs/ Department of Defense, 2014 <sup>17</sup>	Upper limb Military population*	✓	<b>High</b>
Netherlands Society of Physical and Rehabilitation Medicine, 2012 <sup>13</sup>	Lower limb Adult population	✓	<b>Medium</b> Focuses on specific clinical questions
Statewide Rehabilitation Clinical Network, SA Health, 2012 <sup>14</sup>	All Adults and children	X	<b>Medium</b> Focuses on service organisation
US Army Institute of Surgical Research, 2012 <sup>15</sup>	All Military population	X	<b>Medium</b> In a setting of acute injury
Department of Health, WA, 2008 <sup>5</sup>	All Adult population <sup>†</sup>	Partial	<b>Medium</b> Focuses on service organisation
Department of Veterans Affairs/ Department of Defense, 2007 <sup>16</sup>	Lower limb Military population*	✓	<b>Low</b> Focuses on rehabilitation
Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006 <sup>8</sup>	Lower limb Adult population	✓	<b>Low</b> Covers physiotherapists only

\*Veterans and service members; <sup>†</sup>Predominantly older persons; BACPAR: British Association of Chartered Physiotherapists in Amputee Rehabilitation.

Table 11 summarises the level of concordance with the 2008 Standards.

**Table 11: Surgical phase of care**

*Each hospital where planned amputations are performed is to have access to a surgeon with specialist expertise in amputation surgery.*

### Not applicable

Other guidelines make related recommendations; however, they do not refer to hospital resources.

One guideline notes the importance of an experienced surgeon.

- *Netherlands Society of Physical and Rehabilitation Medicine, 2012<sup>13</sup>*

*An amputation is to be performed or supervised by a suitably experienced surgeon using currently recognised operative techniques. All surgical interventions must take into consideration future rehabilitation potential and prosthetic use, except in cases of extreme urgency.*

### Similar

Five guidelines make recommendations similar to the above statement. All guidelines state that the surgical interventions should be considered in light of rehabilitation potential and prosthetic use.

- *Department of Veterans Affairs/Department of Defense, 2014<sup>17</sup>*
- *Netherlands Society of Physical and Rehabilitation Medicine, 2012<sup>13</sup>*
- *Statewide Rehabilitation Clinical Network, SA Health, 2012<sup>14</sup>*
- *Department of Veterans Affairs/Department of Defense, 2007<sup>16</sup>*
- *Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006<sup>8</sup>*

*The surgical team is to liaise with the rehabilitation service to ensure continuity of care.*

### Concordant

Four guidelines make recommendations concordant or similar to the above statement. All four guidelines note the importance of interdisciplinary care in the pre- and postoperative phase for positive patient outcomes.

- *Department of Veterans Affairs/Department of Defense, 2014<sup>17</sup>*
- *Netherlands Society of Physical and Rehabilitation Medicine, 2012<sup>13</sup>*
- *Department of Health, WA, 2008<sup>5</sup>*
- *Department of Veterans Affairs/Department of Defense, 2007<sup>16</sup>*

*Rigid dressings should be applied according to the NSW Health Guideline, Amputee care – the use of postoperative dressings in transtibial amputees. Refer to standard 6.2.*

### Not applicable

All guidelines cover the use of dressings to some extent. This is covered under review question 3.2.

*The NSW Department of Health Dressing Data Collection Form is to be completed for all patients postoperatively whether a rigid or soft dressing is used. See the NSW Health Guideline on Rigid Dressings.*

### Not applicable

This statement is not applicable to other guidelines.

BACPAR: British Association of Chartered Physiotherapists in Amputee Rehabilitation.

## Postsurgical phase

The postsurgical phase incorporates the patient's journey immediately postoperatively until the patient is ready for rehabilitation. Table 12 describes guidelines identified that cover this phase of care. Several identified guidelines make recommendations regarding the postsurgical phase, and some of these recommendations are similar. Although guidelines differ in scope and intended audience, contradictory recommendations were not identified. In the postsurgical phase of care, guidelines concordance points were:

- Patients should be assessed by the MDT throughout the postsurgical phase
- Amputation level should be considered with respect to future rehabilitation potential
- Surgical expertise within the field of amputation is important.

**Table 12: Summary of guidelines covering the postsurgical phase**

Guideline author, year	Amputation level and population	Literature-supported	Relevance to the postsurgical phase of care
Department of Veterans Affairs/ Department of Defense, 2014 <sup>17</sup>	Upper limb Adults*	✓	<b>High</b>
Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012 <sup>9</sup>	Lower limb Adults	✓	<b>Low</b> Covers physiotherapists only
Statewide Rehabilitation Clinical Network, SA Health, 2012 <sup>14</sup>	All Adults and children	X	<b>Medium</b> Focuses on service organisation
Holliday A, Solway, K Torbay and South Devon NHS Foundation Trust, 2015 <sup>12</sup>	All Adults and children	X	<b>Low</b> Covers physiotherapists only
Department of Health, WA, 2008 <sup>5</sup>	All Adults <sup>#</sup>	Partial	<b>Low</b> Focuses on service organisation
Department of Veterans Affairs/ Department of Defense, 2007 <sup>16</sup>	Lower limb Military* population	✓	<b>High</b>
Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006 <sup>8</sup>	Lower limb Adults	✓	<b>Low</b> Covers physiotherapists only

\*Veterans and service members; #Predominantly older persons; BACPAR: British Association of Chartered Physiotherapists in Amputee Rehabilitation.

Table 13 summarises the level of concordance with the 2008 Standards.

**Table 13: Postsurgical phase**

*All patients are to be referred for assessment by the rehabilitation team.*

**Similar**

Four guidelines note that interdisciplinary assessments of patients postoperatively are important and that patients should be assessed by a rehabilitation physician early in the postoperative period.

- Department of Veterans Affairs/Department of Defense, 2014<sup>17</sup>
- Statewide Rehabilitation Clinical Network, SA Health, 2012<sup>14</sup>
- Department of Health, WA, 2008<sup>5</sup>
- Department of Veterans Affairs/Department of Defense, 2007<sup>16</sup>

*All relevant clinical information, incorporating any special needs, is to be made available to the rehabilitation team at the point of referral.*

### Concordant

Three guidelines make concordant recommendations; one explicitly states that relevant clinical information must be reviewed by the rehabilitation team.

- Department of Veterans Affairs/Department of Defense, 2014<sup>17</sup>
- Statewide Rehabilitation Clinical Network, SA Health, 2012<sup>14</sup>
- Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006<sup>8</sup>

*All patients are to be assessed by the appropriate members of the multidisciplinary team to assist in the patient's ongoing management and care.*

### Concordant

Six guidelines make concordant recommendations. Wording is different; however, all emphasise the importance of the MDT in patients' ongoing management and care.

- Department of Veterans Affairs/Department of Defense, 2014<sup>17</sup>
- Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012<sup>9</sup>
- Torbay and South Devon NHS Foundation Trust, 2012<sup>12</sup>
- Department of Health, WA, 2008<sup>5</sup>
- Department of Veterans Affairs/Department of Defense, 2007<sup>16</sup>
- Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006<sup>8</sup>

*All patients are to be consulted about the outcome of assessments and their ongoing healthcare plan.*

### Similar

Four guidelines make similar recommendations about including patients in communication regarding their assessment and ongoing health plans.

- Department of Veterans Affairs/Department of Defense, 2014<sup>17</sup>
- Statewide Rehabilitation Clinical Network, SA Health, 2012<sup>14</sup>
- Torbay and South Devon NHS Foundation Trust, 2015<sup>12</sup>
- Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006<sup>8</sup>

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BACPAR: British Association of Chartered Physiotherapists in Amputee Rehabilitation.

## Rehabilitation, rehabilitation with a prosthesis and lifelong management

This phase covers the postsurgical care of amputees, incorporating their rehabilitation and ongoing journey. The majority of the identified guidelines focus on this phase of care, and Table 14 describes the guidelines dealing with this. Overall, recommendations on rehabilitation are similar in emphasising a need for:

- Rehabilitation to be responsive to individuals' needs and function, and to changes in these
- Access to rehabilitation specialists as required
- Vocational support if possible
- Information about support services
- Documentation of the reasons for limb abandonment
- Lifelong care and mechanisms for follow-up.

**Table 14: Summary of guidelines covering rehabilitation to lifelong management**

Guideline author, year	Amputation level and population	Literature-supported	Relevance to the postsurgical phase of care
Department of Veterans Affairs/ Department of Defense, 2014 <sup>17</sup>	Upper limb Military* population	✓	<b>High</b>
Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012 <sup>9</sup>	Lower limb Adults	✓	<b>Low</b> Covers physiotherapists only
Netherlands Society of Physical and Rehabilitation Medicine, 2012 <sup>13</sup>	Lower limb Adult population	✓	<b>Medium</b> Focused on specific clinical questions
Statewide Rehabilitation Clinical Network, SA Health, 2012 <sup>14</sup>	All Adults and children	X	<b>Medium</b> Focuses on service organisation
Torbay and South Devon NHS Foundation Trust, 2015 <sup>12</sup>	All Adults and children	X	<b>Low</b> Covers physiotherapists only
The College of Occupational Therapists, 2011 <sup>10</sup>	Lower limb Adults	✓	<b>Low</b> Covers physiotherapists only
Department of Health, WA, 2008 <sup>5</sup>	All Adults†	Partial	<b>Low</b> Focuses on service organisation
Department of Veterans Affairs/ Department of Defense, 2007 <sup>16</sup>	Lower limb Military* population	✓	<b>High</b>
Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006 <sup>8</sup>	Lower limb Adults	✓	<b>Low</b> Covers physiotherapists only

\*Veterans and service members; †Predominantly older persons; BACPAR: British Association of Chartered Physiotherapists in Amputee Rehabilitation.

Table 15, Table 16 and Table 17 summarise the level of concordance with the 2008 Standards for rehabilitation, rehabilitation with a prosthesis and lifelong management respectively.

**Table 15: Rehabilitation**

*All patients, including those who may not be a prosthetic candidate, are to be provided with an opportunity to participate in a rehabilitation program in accordance with the policies and procedures of the treating facility.*

**Not applicable**

No statements comparable to this were identified.

*All referrals for rehabilitation should be acknowledged and suitable follow-up provided in a timely manner.*

**Not applicable**

No statements comparable to this were identified.

*Rehabilitation is to be responsive to changes in the individual patient's lifestyle, occupation and/or general health.*



### Similar

Five guidelines contain recommendations similar to this statement. Guidelines acknowledge that rehabilitation should be tailored to individual needs and goals.

- Department of Veterans Affairs/Department of Defense, 2014<sup>17</sup>
- Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012<sup>9</sup>
- Netherlands Society of Physical and Rehabilitation Medicine, 2012<sup>13</sup>
- Torbay and South Devon NHS Foundation Trust, 2015<sup>12</sup>
- Department of Veterans Affairs/Department of Defense, 2007<sup>16</sup>

*All patients undertaking a rehabilitation program are to be assessed and realistic rehabilitation goals are to be established in conjunction with the patient and/or carers. These goals and reasons for any inability to achieve goals are to be documented.*

### Concordant

Four guidelines make concordant recommendations.

- Department of Veterans Affairs/Department of Defense, 2014<sup>17</sup>
- Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012<sup>9</sup>
- Department of Veterans Affairs/Department of Defense, 2007<sup>16</sup>
- Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006<sup>8</sup>

*When a prosthesis is not prescribed, reasons for the decision are to be clearly documented and alternative rehabilitation plans implemented. Outcomes must be reported back to referring agencies and the patient/carer.*

### Not applicable

No statements comparable to this were identified.

*All patients should have access to members of the specialist team as required.*

### Similar

Three guidelines make similar recommendations; however, two of these pertain only to physiotherapists.

- Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012<sup>9</sup>
- Torbay and South Devon NHS Foundation Trust, 2015<sup>12</sup>
- Department of Veterans Affairs/Department of Defense, 2007<sup>16</sup>

*The rehabilitation service should provide access to counselling and support services consistent with the needs of the patient and their significant others.*

### Similar

Eight guidelines make similar recommendations. All recognise the need for support services in amputee care.

- Department of Veterans Affairs/Department of Defense, 2014<sup>17</sup>
- Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012<sup>9</sup>
- Netherlands Society of Physical and Rehabilitation Medicine, 2012<sup>13</sup>
- Statewide Rehabilitation Clinical Network, SA Health, 2012<sup>14</sup>
- Torbay and South Devon NHS Foundation Trust, 2015<sup>12</sup>
- College of Occupational Therapists, 2011<sup>10</sup>
- Department of Health, WA, 2008<sup>5</sup>
- Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006<sup>8</sup>

*All patients should be provided with referral/access to vocational support services where appropriate.*

### Similar

Seven guidelines make similar recommendations. Guidelines recognise the need to provide patients with support to return to work.

- Department of Veterans Affairs/Department of Defense, 2014<sup>17</sup>
- Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012<sup>9</sup>
- Torbay and South Devon NHS Foundation Trust, 2015<sup>12</sup>
- College of Occupational Therapists, 2011<sup>10</sup>
- Department of Health, WA, 2008<sup>5</sup>
- Department of Veterans Affairs/Department of Defense, 2007<sup>16</sup>
- Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006<sup>8</sup>

*Patients are to be educated about the care of their intact limb where a risk of amputation exists.*

### Concordant

Five guidelines make concordant recommendations about patients monitoring the condition of the intact limb.

- Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012<sup>9</sup>
- Statewide Rehabilitation Clinical Network, SA Health, 2012<sup>14</sup>
- Torbay and South Devon NHS Foundation Trust, 2015<sup>12</sup>
- Department of Veterans Affairs/Department of Defense, 2007<sup>16</sup>
- Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006<sup>8</sup>

*The rehabilitation service is to have a system in place for managing patient review and follow-up based on appropriate assessment and referral criteria.*

### Similar

Four guidelines make recommendations about having follow-up systems in place for managing patients. Two of these pertain only to physiotherapists.

- Department of Veterans Affairs/Department of Defense, 2014<sup>17</sup>
- Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012<sup>9</sup>
- Torbay and South Devon NHS Foundation Trust, 2015<sup>12</sup>
- Department of Veterans Affairs/Department of Defense, 2007<sup>16</sup>

*The general practitioner and other relevant agencies are to be regularly updated on progress and discharge planning via appropriate documentation.*

### Not applicable

No statements comparable to this were identified.

*All patients are to be provided with suitable discharge arrangements and follow-up services based on their individual rehabilitation goals.*

### Similar

Three guidelines make similar recommendations about discharge arrangements.

- Department of Veterans Affairs/Department of Defense, 2014<sup>17</sup>
- Netherlands Society of Physical and Rehabilitation Medicine, 2012<sup>13</sup>
- Broomhead P, Dawes D, Hancock A, Unia P, Blundell A, et al. (BACPAR), 2006<sup>8</sup>

BACPAR: British Association of Chartered Physiotherapists in Amputee Rehabilitation.

**Table 16: Rehabilitation with prosthesis**

*If prosthetic rehabilitation is planned, the prosthesis should be prescribed in consultation with relevant members of the multidisciplinary team.*

**Similar**

Five guidelines make similar recommendations about discharge arrangements.

- Department of Veterans Affairs/Department of Defense, 2014<sup>17</sup>
- Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012<sup>9</sup>
- Netherlands Society of Physical and Rehabilitation Medicine, 2012<sup>13</sup>
- Torbay and South Devon NHS Foundation Trust, 2015<sup>12</sup>
- Department of Veterans Affairs/Department of Defense, 2007<sup>16</sup>

*A mechanical interim prosthesis manufactured by a prosthetist is to be made available to all amputees assessed as suitable for prosthetic rehabilitation. This is not required for amputees who are only suitable for a cosmetic prosthesis. The NSW ALS will fund the manufacture of a patient's mechanical interim limb where the area health service (AHS) has implemented the NSW Department of Health Guideline, Amputee care – the use of postoperative dressings in trans-tibial amputees, by 1 January 2008. Refer to standard 3.4. Training on the application of rigid dressings is available through the NSW ALS. Cost savings for AHSs as a result of this change are to be redirected into compliance with this policy directive.*

**Not applicable**

No statements comparable to this were identified.

*Prosthetists are to follow the manufacturers' instructions and guidelines on risk management, and any deviations from standard practice are to be fully documented.*

**Not applicable**

No statements comparable to this were identified.

*If the patient abandons limb use, reasons are to be documented and the treating physician informed.*

**Similar**

Four guidelines make similar recommendations.

- Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012<sup>9</sup>
- Statewide Rehabilitation Clinical Network, SA Health, 2012<sup>14</sup>
- Torbay and South Devon NHS Foundation Trust, 2015<sup>12</sup>
- College of Occupational Therapists, 2011<sup>10</sup>

*The amputee service should have a written and agreed policy for the provision of prosthetic limbs such as a cosmesis, leisure limbs, and water activity limbs to patients. For clients of the NSW ALS, please refer to the NSW ALS policy.*

**Not applicable**

No statements comparable to this were identified.

*Facilities for the design and supply of custom-made/one-off appliances required for amputees, especially for work-related activities, should be available and managed within the policies and procedures of the treating facility. For clients of the NSW ALS, please refer to the NSW ALS policy.*

**Not applicable**

No statements comparable to this were identified.

BACPAR: British Association of Chartered Physiotherapists in Amputee Rehabilitation; AHS: Area health service; ALS: Artificial Limb Service.

**Table 17: Lifelong management**

<i>All service facilities are to have a written policy on patient follow-up.</i>
<b>Similar</b> <p>Four guidelines make recommendations that the service facility should have a system for patient follow-up.</p> <ul style="list-style-type: none"> <li>• <i>Department of Veterans Affairs/Department of Defense, 2014<sup>17</sup></i></li> <li>• <i>Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012<sup>9</sup></i></li> <li>• <i>Torbay and South Devon NHS Foundation Trust, 2015<sup>12</sup></i></li> <li>• <i>Department of Veterans Affairs/Department of Defense, 2007<sup>16</sup></i></li> </ul>
<i>The amputee service is to offer the patient access to the rehabilitation team for the purpose of review to meet the changing needs of individual patients.</i>
<b>Similar</b> <p>Four guidelines make recommendations about the long-term follow-up and self-referral of patients to the rehabilitation team.</p> <ul style="list-style-type: none"> <li>• <i>Department of Veterans Affairs/Department of Defense, 2014<sup>17</sup></i></li> <li>• <i>Broomhead P, Clark K, Dawes D, Hale C, Lambert A, et al. (BACPAR), 2012<sup>9</sup></i></li> <li>• <i>Torbay and South Devon NHS Foundation Trust, 2015<sup>12</sup></i></li> <li>• <i>Department of Veterans Affairs/Department of Defense, 2007<sup>16</sup></i></li> </ul>
<i>Feedback to the treating physician and any other relevant services should be provided on follow-up when clinically indicated.</i>
<b>Not applicable</b> <p>No statements comparable to this were identified.</p>

BACPAR: British Association of Chartered Physiotherapists in Amputee Rehabilitation.

## Staff development

The 2008 Standards contain a section on standards about the continued professional development of staff. The SA model of care states that, “It is expected that organisations involved in providing services across the continuum of care to individuals with an amputation will actively support and encourage their staff to participate in professional development activities and further education.” The WA model of care also contains some recommendations about education and training, stating that the workforce should be appropriately trained and supported within the Aged Care and Rehabilitation Care Teams, and future directions for training could consider extended care practitioners.

## Specialist subsection – upper limb

The 2008 Standards contain a specialist subsection on upper limb amputation. The only other guideline that contains specific information on upper limb amputation is the Department of Veterans Affairs/Department of Defense clinical practice guideline.<sup>17</sup> The recommendations in this guideline are concordant with those made in the 2008 Standards.

## Specialist subsection – children with congenital limb deficiencies

The 2008 Standards contain specialist subsections on children with congenital limb deficiencies. Due to a paucity of recently published guidelines or standards covering paediatric populations, a focused search for older literature was conducted. One guideline from the British Society of Rehabilitation Medicine (BSRM)<sup>18</sup> was identified and included. Similarly, an article pertaining to children with a lower limb amputation (due to any cause) was identified and included.<sup>19</sup> This is not a guideline, but it has been included due to the limited information available about paediatric amputee populations.

The guideline from the BSRM aligns very closely with the 2008 Standards as it is the basis for the 2008 Standards. The BSRM standards and guidelines have not been updated since publication in 2003; an update is expected to be released in 2016. Concordance with the 2008 Standards is summarised in Table 18.

**Table 18: Children with congenital limb deficiencies**

*If a limb deficiency is detected antenatally, referral to a geneticist for advice on diagnosis and management should occur as soon as possible, with subsequent referral to a Limb Deficiency Clinic.*

### **Concordant**

One guideline contains concordant recommendations.

- *British Society of Rehabilitation Medicine, 2003*

*If a congenital limb deficiency is detected at birth, the paediatrician should make a referral to a geneticist for advice as soon as possible and to the rehabilitation physician in the Limb Deficiency Clinic within one month of birth.*

### **Concordant**

One guideline contains concordant recommendations.

- *British Society of Rehabilitation Medicine, 2003*

*Parents/guardians are to be made aware of general and specific expert advice on all relevant treatment options (including the advisability or otherwise of prosthetic and surgical management).*

### **Concordant**

One guideline contains concordant recommendations.

- *British Society of Rehabilitation Medicine, 2003*

*The child and parents/guardians should be seen in a specialist Limb Deficiency Clinic within 3 months of birth.*

### **Concordant**

One guideline contains concordant recommendations.

- *British Society of Rehabilitation Medicine, 2003*

*Where appropriate (for example, where there are major joint abnormalities), the paediatrician or rehabilitation physician must, in consultation with parents/guardians, refer the child to a specialist orthopaedic surgeon.*

### **Concordant**

One guideline contains concordant recommendations.

- *British Society of Rehabilitation Medicine, 2003*

*All children with congenital limb deficiency are to have access to a therapist experienced in the management of limb deficiency.*

**Concordant**

One guideline contains concordant recommendations.

- *British Society of Rehabilitation Medicine, 2003*

*Prosthetists experienced in congenital limb deficiency are to be involved in the assessment, treatment and ongoing management of all children with congenital limb deficiency.*

**Concordant**

One guideline contains concordant recommendations.

- *British Society of Rehabilitation Medicine, 2003*

*Expert orthotic advice and treatment should be readily available.*

**Concordant**

One guideline contains concordant recommendations.

- *British Society of Rehabilitation Medicine, 2003*

*Specific prosthetic solutions should be incorporated into treatment plans to facilitate participation in sport, leisure and recreation.*

**Not applicable**

No statements comparable to this were identified.

*Participation in school activities should be facilitated by the physiotherapist, occupational therapist and rehabilitation physician in consultation with the school.*

**Not applicable**

No statements comparable to this were identified.

*The multidisciplinary team is to provide ongoing care for the child and parents/guardians with an appropriate and documented follow-up plan.*

**Concordant**

One guideline contains concordant recommendations.

- *British Society of Rehabilitation Medicine, 2003*

*Experienced clinical counselling and psychological support is to be made available for all children and their families.*

**Similar**

One guideline contains similar recommendations about help and advice.

- *British Society of Rehabilitation Medicine, 2003*

*Planning for transition to an appropriate adult amputee service is to commence one to two years prior to school leaving.*

**Similar**

One guideline contains similar recommendations about transition to other services or agencies.

- *British Society of Rehabilitation Medicine, 2003*

The following main points are raised by the authors of the article on care planning in children with lower limb amputations<sup>19</sup>:

- Preparation within the MDT is crucial to minimising the impact of amputation
- The MDT may include a play team, psychologist and physiotherapist
- Psychological care and/or intervention should begin as early as possible
- The prosthetist's role is to restore maximum function, cosmesis and symmetry
- Children require new prostheses in line with their growth and development; this could be as often as twice a year between the ages of 5 and 12
- Healthy lifestyles involving sports and recreation should be encouraged.

This article is broad and overarching, making it less specific in its recommendations compared to the 2008 Standards.

## 6 Review question 3.1

*How could the existing Amputee Care Standards in New South Wales be revised or enhanced to reflect current international best practice as determined by the reviewers in assessing the identified standards and/or guidelines?*

Following a search of both the peer-reviewed and grey literature, several standards and/or guidelines on amputee care or limb deficiency were identified. Overall, the guidelines produced by the VA/DOD in the US<sup>16,17</sup>, BACPAR<sup>8,9</sup> and the Netherlands Society of Physical and Rehabilitation Medicine<sup>13</sup> stood out as being the most methodologically rigorous as they reported structured literature review methods and appraisal of identified literature, and provided evidence of basing recommendations on evidence identified. In particular, the BACPAR guidelines report using the Delphi method to make recommendations for which there was a paucity of literature. However, all guidelines note that there is a paucity of well-conducted peer-reviewed literature in this area. Therefore, consensus techniques or working groups were often employed to formulate recommendations. It is unclear to what extent the lower level of methodological rigour in other guidelines will affect the applicability of the recommendations to the NSW context.

When considering these guidelines with reference to the 2008 Standards, there are many concordant themes and all guidelines agree on several main areas; including:

- Care of amputees should be provided by a MDT
- Rehabilitation should be tailored to individual needs/goals and functional status
- Counselling and psychological support should be provided to patients and their families or partners.

All guidelines were intended to facilitate best practice in specific jurisdictions, and in many cases they were developed for certain practitioners, such as physiotherapists or occupational therapists. If considered appropriate by the working party and relevant to the NSW context, the 2008 Standards could be expanded to include recommendations with respect to pain management and falls management. These aspects of amputee care are not addressed in the 2008 Standards; however, they do form parts of recommendations made by other guidelines (see results of review question 2). The 2008 Standards are more comprehensive than many comparable standards in that they cover special populations, such as children and upper limb amputees, as well as acknowledging that amputees require lifelong care.

Further, it was observed that the 2008 Standards are generally not clinically prescriptive in that they do not recommend specific time frames for follow-up or specific surgical techniques. However, extracting this information from other guidelines for adaptation to the 2008 Standards may not be appropriate because the intended audience of other guidelines is often more specific than that of the 2008 Standards (e.g. physiotherapists).



## 7 Review question 3.2

### *In the identified standards and/or guidelines, what specific recommendations are made on postoperative dressings following lower limb amputation?*

All guidelines containing recommendations regarding postoperative dressings recommend the rigid dressing approach for transtibial or lower leg amputees. The following specific recommendations in the identified standards/guidelines were made:

- A rigid dressing is the treatment of choice during the early postoperative phase in patients with transtibial amputation or knee disarticulation. Rigid stump dressings are not recommended following transfemoral amputation<sup>13</sup>
- Developing and implementing evidence-based guidelines and protocols suitable for use in the Enterprise Patient Administration System (EPAS) is recommended. This ensures the adoption of a rigid removable dressing protocol in all SA hospitals undertaking inpatient and amputee care to reduce the time until the stump is ready for casting, therefore reducing rehabilitation inpatient length of stay and protecting the stump if a fall occurs<sup>14</sup>
- There are positive outcomes (undefined) related to the application of rigid removal dressings at the surgical stage by theatre staff for below the knee amputation<sup>5</sup>
- Rigid dressing and knee immobilisers may be considered for patients with a transtibial amputation to prevent knee flexion contractures.<sup>16</sup>

## 8 Review question 4

*What does the available peer-reviewed empirical research evidence indicate about the effectiveness and/or limitations of different types of postoperative dressings following lower limb amputation? Does the evidence support recommendations on the preferential use of particular types of dressings?*

### Methods

A literature search was conducted to identify peer-reviewed literature on the effectiveness and/or limitations of different types of postoperative dressings following lower limb amputation. Text and MeSH terms relating to amputation and postoperative dressings were incorporated into a search strategy in four databases. The search strategy was comprehensive, and limits included articles published from 1 January 2000 onwards, English language and humans. The search strategy and databases searched are detailed in Table 19 and Table 20.

Peer-reviewed databases searched:

- PubMed
- EMBASE (Ovid platform)
- EBM reviews including Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects (DARE), Cochrane Central Register of Controlled Trials (CENTRAL), ACP Journal Club, Cochrane Methodology Register, Health Technology Assessment and NHS Economic Evaluation Database (NHSEED – Ovid platform)
- CINAHL (EBSCO platform).

**Table 19: Search strategy for review question 4 (PubMed and CINAHL databases)**

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#### Terms relating to the population

prosthesis fitting[MeSH Terms] OR artificial limb[MeSH Terms] OR amputation/rehabilitation\*[MeSH] OR amputation stump[MeSH] OR amputation[MeSH] OR amputee[MeSH] OR loss of limb OR limb loss OR limb deficiency OR stump OR amputation OR amputate OR amputee

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#### AND

bandage[MeSH Terms] OR dressing[MeSH Terms] OR post-operative care/methods\*[MeSH Terms] OR soft dressing OR soft dressings OR rigid dressing OR rigid dressings OR removable rigid dressing OR removable rigid dressings OR dressing OR dressings OR bandage OR bandages OR elastic bandage\* OR soft bandage OR soft bandages OR juzu sock OR juzu socks OR shrinker sock OR shrinker socks

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**Table 20: Search strategy adapted for the Ovid platform**

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#### Terms relating to the population

exp disabled person or exp leg amputation/ or exp finger amputation/ or exp below knee amputation/ or exp limb amputation/ or exp traumatic amputation/ or exp arm amputation/ or exp hand amputation/ or exp amputation/ or exp foot amputation/ or exp above knee amputation/ or exp amputation stump/ or exp thumb amputation/ or exp knee amputation/ or exp amputation stump/ or amputee or amputate or amputated or amputat\* or amputation or limb deficiency or limb loss or loss of limb or exp limb defect/ or exp limb prosthesis/

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**AND**

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exp bandage/ or exp pressure dressing/ or exp wound dressing/ postoperative care/ or soft dressing or soft dressings or rigid dressing or rigid dressings or dressing or dressings or bandage or bandages or elastic bandage or elastic bandages or soft bandage or soft bandages or juzo sock or juzo socks or shrinker sock or shrinker socks or removable rigid dressing or nonremovable rigid dressing or non-removable rigid dressing

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Inclusion criteria were any NHMRC level I to III studies<sup>21</sup> (i.e. systematic review of RCTs or any primary study of comparative design) on dressings for use following lower limb amputations (including partial foot amputations) or congenital limb loss. Studies were excluded if they were NHMRC level IV studies (case series with either post-test or pre-test/post-test outcomes) or reports of single cases. Studies on upper extremity amputation wounds were also excluded in line with scope provided from the NSW Agency for Clinical Innovation. Primary studies that were included in the systematic reviews were excluded from analysis to avoid duplication of data in accordance with the agreed scope of this review.

The quality of the systematic reviews was assessed using the AMSTAR tool.<sup>22</sup> This tool is used to assess reviews on 11 criteria including: use of *a priori* design; duplication in study selection and data extraction; the comprehensiveness of the literature search; inclusion of study quality and patient characteristics; and appropriate methods for data synthesis. The median score of 6 was chosen to differentiate good quality systematic reviews (score greater than or equal to 6) from poor quality reviews (score less than 6). The quality of RCTs and non-randomised comparative studies was assessed using a modified version of the Downs and Black tool.<sup>23,24</sup> Included primary studies were examined with respect to the adequacy of allocation concealment and blinding, handling of losses to follow-up and any other aspect of the study design or execution that may have introduced bias. Each study was assessed on internal validity (measures of bias and confounding) and external validity (generalisability). The quality of the practitioner survey studies was assessed using a tool adapted from the STROBE statement.<sup>25</sup> This included criteria on participant sampling, participant characteristics and response rates, transparency in questions asked, and appropriate description of results and conclusions.

Data extraction was performed by one reviewer using *a priori* designed extraction tables. Where available, data were extracted from systematic reviews. Data were only extracted from primary studies when they were not included in any systematic review or when the review only reported a proportion of the available outcome data.

## Results

### Synthesis of results

Due to the observed heterogeneity in identified studies, it was not considered appropriate to combine the results statistically or determine an overall estimate of effect size for any outcome. A narrative synthesis of the results is provided in this section; a more detailed description of the results from the primary and secondary evidence is provided in the following sections.

Five systematic reviews<sup>26–30</sup> and an additional six primary studies<sup>31–36</sup> were identified on the use of postoperative dressings following trans-tibial amputation. Results from the identified primary and secondary literature support the use of rigid removable dressings (RRD) compared to soft dressings in patients who have undergone a trans-tibial amputation. RRDs were consistently associated with faster wound healing, with mean/median healing times of 46–76 days compared to 65–127 days for soft dressings. In studies that directly compared the two dressing types, rates of wound healing were higher in patients receiving RRDs (67–100%) than in those receiving soft dressings (56–78%). Rates of surgical revision were lower among

patients receiving RRDs (6–15% vs 17–22%). Finally, RRDs were consistently associated with equal or faster prosthetic fitting times than soft dressings (23–58 days compared to 23–110 days).

While the results from the included literature are mostly consistent, significant methodological issues have been identified with the studies and the results should be interpreted in light of this. No study reported safety issues associated with the use of RRDs. A detailed discussion of these results is provided in the below section on trans-tibial amputation.

Two RCTs (reported in three publications) on the use of dressings following partial foot amputation were identified.<sup>37–39</sup> Results from two reports of one RCT suggest that negative pressure wound therapy may be more effective and associated with lower costs than traditional moist wound therapy for patients undergoing partial foot amputation.<sup>37,38</sup> Results from a second RCT suggest that polyhexanide-containing biocellulose dressings may reduce pain and dressing adherence compared to dialkyl carbamoyl chloride-containing hydrophobic dressings.<sup>39</sup> More research on dressing use following partial foot amputation is required before any recommendations can be made. A detailed discussion of these results is provided below in the section on partial foot amputation.

There is insufficient evidence to comment on the safety or effectiveness of any dressing following transfemoral amputations, and no study was identified that commented on the use of post-amputation dressings in a paediatric population.

## Transtibial amputation

### Summary of systematic reviews

Literature searches identified five systematic reviews that provided analysis on the effectiveness of different dressing protocols following lower limb amputation.<sup>26–30</sup> Summaries of these systematic reviews are provided in Table 21.

All of the systematic reviews included primary studies on patients who had undergone a transtibial amputation (TTA) with the exception of one primary study<sup>40</sup>, which included 16 patients with a TTA and 5 patients with a transfemoral amputation.

There was little overlap between the primary studies in the systematic reviews (see Appendix A, Table 26). Two of the reviews<sup>28,30</sup> took a broad approach to the topic and included studies reporting any type of dressing regimen and all outcome measures. Sanders and Fatone<sup>29</sup> focused on stump volume changes for all types of dressings. Churilov et al.<sup>27</sup> looked at the time between amputation and first prosthetic fitting in patients who had received a rigid dressing (RD) compared to those who received a soft dressing. The 2012 review by the Canadian Agency for Drugs and Technologies in Health<sup>26</sup> looked at the comparison between RRD and RD and included one study (see Table 21).

**Table 21: Summary of systematic reviews**

Study ID	Question of review	Review supports use of RRD over SD	Further research recommended	Quality of review <sup>^</sup>
Sanders and Fatone, 2003 <sup>29</sup>	What is known about the measurement and management of residual limb volume changes in persons with lower limb amputation?	✓ (stump volume, moderate level of confidence)	✓	Poor

Study ID	Question of review	Review supports use of RRD over SD	Further research recommended	Quality of review <sup>^</sup>
Smith et al., 2003 <sup>30</sup>	What is the evidence on post-amputation dressing and management strategies, and what are the limitations in the published literature?	✓ (healing, stump volume, complications and revision rates)	✓	Poor
Nawijn et al., 2005 <sup>28</sup>	What is the optimal post-amputation management following transtibial amputation?	✓ (healing, stump volume)	✓	Poor
Churilov et al., 2014 <sup>27</sup>	Does the application of rigid dressings reduce the time to first prosthetic casting compared to soft dressings?	✓ (time to prosthetic fitting)	✓	Good
Canadian Agency for Drugs and Technologies in Health, 2012 <sup>26</sup>	What clinical evidence, cost-effectiveness and guidelines are there relating to the use of RRDs compared with rigid dressings in patients undergoing leg amputation?	NA*		Good

RRD: Rigid removable dressing; SD: Soft dressing; <sup>^</sup>Reviews were rated as 'good' for scores of  $\geq 6$  on the AMSTAR checklist. Reviews with a score of  $<6$  received a 'poor' rating; \*Review compared two types of RRD.

### Quality of systematic reviews

The quality of the systematic reviews was assessed using the AMSTAR appraisal tool.<sup>22</sup> Two of the reviews were rated 'good' quality<sup>26,27</sup> and three reviews were rated 'poor' quality.<sup>28-30</sup> No review used a second reviewer to cross-check or independently perform study selection or data extraction, or to assess publication bias. Only the Canadian Agency for Drugs and Technologies in Health<sup>26</sup> reported a list of excluded studies and any conflict of interest in the included studies. Other frequently identified methodological and reporting issues included a failure to search grey literature sources and a failure to report comprehensive characteristics of the included studies.

### Results from the systematic reviews

The data extracted from the systematic reviews are summarised in Table 22, and the most commonly reported outcomes are discussed below.

#### *Rigid removable dressings (RRDs) vs soft dressings<sup>2</sup>*

All of the systematic reviews included studies that compared RRDs to soft dressings.

Compared to soft dressings, RRDs were consistently associated with:

- Faster wound healing (one level II study<sup>41</sup>, two level III-3 studies<sup>42,43</sup>)
- Higher proportion of patients with wound healing (two level II studies<sup>44,45</sup>, one level III-2 study<sup>46</sup>)
- Fewer surgical revisions (one level II study<sup>44</sup>, one level III-2 study<sup>47</sup>)

<sup>2</sup>The data from primary studies reported here was extracted from the systematic reviews in accordance with the methodology of this review.

- Shorter times between amputation and prosthetic fitting (two level II studies<sup>41,48</sup>, four level III-3 studies).<sup>42,49–51</sup>

Results on residual limb volume were mixed; one study reported no differences in volume change<sup>52</sup>, one study reported faster volume decrease associated with RRDs but no difference at the four-week follow-up<sup>53</sup>, and one study reported significantly decreased limb volume in the RRD group.<sup>54</sup>

Two studies reported fewer postoperative complications in the RRD group.<sup>41,51</sup> One study reported a higher percentage of complications in the RRD group; however, this difference was not statistically significant.<sup>48</sup>

Four of the systematic reviews recommended the use of RRDs over soft dressings<sup>27–30</sup> (the review by the Canadian Agency for Drugs and Technologies in Health<sup>26</sup> compared two types of rigid dressing, therefore this recommendation was not applicable).

### *RRD with immediate postoperative prosthesis (IPOP) vs soft dressings<sup>3</sup>*

Results comparing an RRD with IPOP to RRD alone were mixed. One early (1974) level III-3 study<sup>30</sup> found that RRD with IPOP had inferior patient outcomes compared to soft dressings.<sup>55</sup> Results from this study were not in concordance with other, more recent, comparative studies reported in the systematic reviews. Results from the remaining studies indicate that compared to soft dressings, RRD with IPOP is associated with fewer surgical revisions (two level III studies<sup>56,57</sup>, one study with level NR<sup>58</sup>). One study (level III-3) reported lower rates of postoperative complications associated with RRD with IPOP.<sup>57</sup> One study (level NR) reported no statistical difference in postoperative complication rates.<sup>58</sup>

### *RRD with IPOP vs RRD<sup>4</sup>*

Three studies reported in Smith et al.<sup>30</sup> and/or Nawijn et al.<sup>28</sup> made a comparison between RRD with IPOP and RRD alone. One level III-3 study reported higher primary healing rates, lower rates of postoperative complications and fewer surgical revisions associated with the use of IPOP.<sup>56</sup> One level III-2 study reported higher levels of surgical revisions required in the IPOP group.<sup>47</sup> One study (level III-2) found no significant changes in residual stump volume between the IPOP, RRD and soft dressing groups.<sup>52</sup>

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<sup>3</sup>The data from primary studies reported here was extracted from the systematic reviews in accordance with the methodology of this review.

<sup>4</sup>The data from primary studies reported here was extracted from the systematic reviews in accordance with the methodology of this review.

Table 22: Results on comparative effectiveness of dressings from the systematic reviews<sup>26-30</sup>

Outcome	Primary study ID*	NHMRC level of evidence†	Total number of patients assessed	Soft dressing	RRD	RRD with IPOP	Other RRD	Shrinker socks
<b>Time to wound healing (days)</b>	Deutsch et al., 2005	Level II	50	65 ± 30 days	51 ± 19 days	-	-	-
	Sumpio et al., 2013	Level III-3	151	127 days (median)	76 days (median)**	-	-	-
	Wu et al., 1979	Level III-3	49	110 days‡	46 days‡	-	-	-
	Vigier, 1999	Level II	56	97 ± 55 days	-	-	Plaster cast with silicon sleeve: 71 ± 32 days	-
<b>Primary wound healing</b>	Baker et al., 1977	Level II	51	n = 14 (58%)	n = 18 (67%)	-	-	-
	Barber et al., 1983	Level II	70	n = 19 (56%)	n = 23 (68%)	-	-	-
	Cohen et al., 1974	Level III-3	48	n = 35 (90%)	-	n = 4 (44%)	-	-
	Moore et al., 1972	Level III-3	100	-	n = 43 (53%)	n = 40 (85%)	-	-
	Nicholas and DeMuth, 1976	Level III-2	27	n = 11 (78%)	n = 13 (100%)	-	-	-
<b>Morphine equivalents</b>	Kane and Pollak, 1980	NR	52	3.47 mg/day	-	3.9 mg/day	-	-
	Nicholas and DeMuth, 1976	Level III-2	27	48.4 morphine equivalents/week	41.6 morphine equivalents/week	-	-	-
<b>Postoperative complications</b>	Kane and Pollak, 1980¶	NR	52	n = 3 (17%)	-	n = 7 (21%)	-	-
	Deutsch et al., 2005§	Level II	50	n = 3 (50%)	n = 0 (0%)	-	-	-
	Moore et al., 1972¶	Level III-3	100	-	n = 7 (14%)	n = 1 (2%)	-	-
	Schon et al., 2002¶	Level III-3	42	n = 15 (65%)	-	Prefabricated pneumatic IPOP n = 3 (15%) **	-	-

Outcome	Primary study ID*	NHMRC level of evidence†	Total number of patients assessed	Soft dressing	RRD	RRD with IPOP	Other RRD	Shrinker socks
<b>Postoperative complications (cont.)</b>	Van Velzen et al., 2005	Level III-3	149	n = 10 (19%)	n = 1 (1%)**	-	-	-
	Woodburn et al., 2004#	Level II	112	n = 10 (18%)	n = 12 (21%)	-	-	-
<b>Higher-level revision required</b>	Baker et al., 1977	Level II	51	n = 4 (17%)	n = 4 (15%)	-	-	-
	Cohen et al., 1974	Level III-3	48	n = 1 (3%)	-	n = 3 (33%)	-	-
	Kane and Pollak, 1980	NR	52	n = 8 (44%)	-	n = 9 (26%)	-	-
	Mooney et al., 1971	Level III-2	182	n = 17 (22%)	n = 3 (6%)	n = 7 (12%)	-	-
	Moore et al., 1972	Level III-3	100	-	n = 13 (24%)	n = 5 (11%)	-	-
	Schon et al., 2002	Level III-3	42	n = 10 (44%)	-	n = 0 (0%)**	-	-
<b>Residual limb volume decrease</b>	Golbranson, 1988	Level III-2	36	No significant change in volume compared to other methods	No significant change in volume compared to other methods	No significant change in volume compared to other methods	-	-
	Graf et al., 2003	Level II	16	-	1.31% ± 0.92% per day	-	RRD with gel sock: 1.31% ± 0.62% per day	-
	Janchai et al., 2008	Level II	26	2 weeks: 22 ± 118 cm <sup>3</sup> 4 weeks: 83 ± 113 cm <sup>3</sup>	2 weeks: 42 ± 62 cm <sup>3</sup> 4 weeks: 79 ± 103 cm <sup>3</sup>	-	-	-
	Manella, 1981	Level II	12	Increase of 16.5 cm <sup>3</sup>	-	-	-	Decrease of 63 cm <sup>3</sup> **
	Mueller, 1982	Level II	16	31 ± 49 cm <sup>3</sup>	70 ± 21 cm <sup>3</sup> **	-	-	-



Outcome	Primary study ID*	NHMRC level of evidence†	Total number of patients assessed	Soft dressing	RRD	RRD with IPOP	Other RRD	Shrinker socks
Time from amputation to prosthetic fitting	Deutsch et al., 2005	Level II	50	23 ± 16 days	23 ± 20	-	-	-
	Johannesson, 2008	Level II	23	-	34 ± 8 days	-	Vacuum formed RRD: 37 ± 7 days	-
	Ladenheim et al., 2007	Level III-3	76	84 ± 8 days	Plastic laminate 58.4 ± 3.6 days**	-	-	-
	MacLean and Fick, 1994	Level III-2	40	Max 120 days (extrapolated from Kaplan-Meier curve)	-	-	Semi-rigid dressing: Max 60 days (extrapolated from Kaplan-Meier curve)	-
	Sumpio et al., 2013	Level III-3	151	75 days (median)	Plaster cast or plastic laminate: 43 days (median)**	-	-	-
	Taylor et al., 2008	Level III-3	65	36.4 (IQR 24–50)	27.6 (IQR 21.2–32.7)**	-	-	-
	Van Velzen et al., 2005	Level III-3	149	110 ± 73 days	50.1 ± 27.3 days	-	-	-
	Wong and Edelstein, 2000	Level II	21	30% ready for fitting 64 days	-	-	Semi-rigid dressing: 30% ready for fitting 34 days	-
	Woodburn et al., 2004	Level II	96	42 (95% CI = 36–45)	36 (95% CI = 30–47)	-	-	-

\*Primary study references are not included in the report reference list but can be found in the systematic reviews<sup>26–30</sup>; †NHMRC level of evidence was as described in the systematic reviews and was not determined by the authors of this review. Some discrepancy may exist, e.g. Barber et al, 1983) is described as an RCT; however, the methodology of the study details alternate allocation of patients; RRD: Removable rigid dressing; IPOP: Immediate postoperative prosthesis; ‡Statistical significance not assessed by authors of the primary study; \*\* $p < 0.05$ ; ††Postoperative complications include residual limb infections, bruising, burns, ulcers and necrosis; §Postoperative complication was stump breakdown following fall; ||Postoperative complication was knee flexion contractures; #Postoperative complication was infection; IQR: Inter-quartile range; CI: Confidence interval.

### Limitations identified by systematic reviews

All of the systematic reviews discussed significant limitations in the primary evidence base; these are reported in Table 23. The most commonly discussed limitations were a lack of RCTs, failure to blind outcome assessors, inconsistent outcome measures and no defined end points for outcome measures. All of the systematic reviews highlighted a need for further methodologically rigorous studies.

**Table 23: Limitations identified in the systematic reviews**

Study ID	Small sample sizes	Limitations in study design	Minimal data reported	Lack of defined end points	Lack of blinding	Lack of consistent outcome measure	Confounding variables
Sanders and Fatone, 2003 <sup>29</sup>		✓	✓	✓		✓	
Smith et al., 2003 <sup>30</sup>		✓		✓	✓	✓	✓
Nawijn et al., 2005 <sup>28</sup>		✓		✓		✓	✓
Churilov et al., 2014 <sup>27</sup>	✓	✓	✓	✓	✓		
Canadian Agency for Drugs and Technologies in Health, 2012 <sup>26</sup>	✓		✓		✓		✓

### Results from the primary studies

In addition to the studies included in the systematic reviews, six primary studies were identified in the literature searches (see Table 24).<sup>31–36</sup>

The quality of the primary studies is listed in Table 24. While the external validity (generalisability) of the studies was generally good, all studies were appraised to have a risk of bias (moderate or poor internal validity).

Ali et al.<sup>31</sup> and Hordacre et al.<sup>35</sup> compared RRDs (with or without IPOP) to soft dressings in retrospective reviews of consecutive case records. Both studies reported results that favoured RRDs. Topuz et al.<sup>36</sup> found that complex decongestive physiotherapy reduced stump oedema to a greater extent than conventional bandaging. Duwayri et al.<sup>34</sup> found that compliance with a custom-designed amputation protection and compression system was associated with earlier prosthetic use compared with patient noncompliance. Two surveys of clinical practice – one of consultant members of the UK Vascular Society<sup>32</sup> and the other of surgeons in Department of Veterans Affairs hospitals in the US<sup>33</sup> – found that about two-thirds of practitioners reported using soft dressings following lower limb amputations.

**Table 24: Primary studies identified in addition to the systematic reviews**

Study ID	Study setting, country, study design	Patients	Intervention comparator	Conclusions	Quality of study
Ali et al., 2013 <sup>31</sup>	Tertiary hospital US  Retrospective consecutive case review	Patients undergoing below knee (digital, ray, transmetatarsal and trans-tibial) amputation who were eligible for IPOP	RRD with IPOP  Soft dressing	The use of an IPOP is of physiological and psychological benefit to the patient as it allows for earlier ambulation and shorter rehabilitation periods, and minimises postoperative immobility	IV = moderate  EV = good
Hordacre et al., 2013 <sup>35</sup>	Repatriation hospital  Australia (SA)  Retrospective observational study of consecutive patients	Patients with lower limb amputation (68% trans-tibial) on the physiotherapy list	RRD  Soft dressing	Introduction of RRD was associated with a significant reduction in the time to wound healing, initial prosthetic casting and independent walking	IV = poor  EV = moderate
Topuz et al., 2012 <sup>36</sup>	Tertiary Hospital  Turkey  RCT	Geriatric patients with a trans-tibial amputation	Complex decongestive physiotherapy  Conventional bandaging	Complex decongestive physiotherapy could be preferred in the treatment of post-amputation stump oedema	IV = poor  EV = good
Duwayri et al., 2010 <sup>34</sup>	Tertiary hospital  US  Retrospective case review of consecutive patients	Patients with a trans-tibial amputation	Patients offered and compliant with CAPCS Patients offered and not compliant with CAPCS	Compliant use of CAPCS is associated with earlier and more frequent prosthetic use. Well-designed prospective studies are needed to confirm this association	IV = poor  EV = moderate
Barnes et al., 2014 <sup>32</sup>	N/A  UK  Survey of 168 consultant members of the UK Vascular Society	N/A	N/A	The preferred dressing for above knee amputation is soft dressings (62.5%).  The preferred dressing for below knee amputation is a stump dressing (61.9%).  No difference was reported in infection rate with respect to dressing used	Good

Study ID	Study setting, country, study design	Patients	Intervention comparator	Conclusions	Quality of study
Choudhury et al., 2001 <sup>33</sup>	N/A US Survey of 111 surgeons in VA hospitals who perform trans-tibial amputation	N/A	N/A	In 1999: Soft dressings were used on 67% of patients; conventional rigid dressings were used on 14% of patients; RRDs were used on 14% of patients; IPOP was used on 5% of patients	Good

IPOP: Immediate postoperative prosthesis; RRD: Removable rigid dressings; IV: Internal validity; EV: External validity; RCT: Randomised controlled trial; CAPCS: Customer-designed amputation protection and compression system; N/A: Not applicable; VA: Veterans Affairs.

## Partial foot amputation

### Systematic reviews

No systematic reviews were identified that addressed the use of postoperative dressings following partial foot amputations.

### Results from the primary studies

Three primary studies were identified on the use of postoperative dressings in patients who had undergone partial foot amputations.<sup>37–39</sup>

The quality of the studies is outlined in Table 25. Both RCTs were appraised to have a risk of bias (moderate or poor internal validity); the generalisability of both studies was good.

Armstrong et al.<sup>38</sup> and Apelqvist et al.<sup>37</sup> both reported results from the same RCT of 162 patients conducted in the US. Patients were randomised to receive either negative pressure wound therapy (NPWT) or standard moist wound care. Armstrong et al.<sup>38</sup> reported the clinical results from the trial and found that NPWT was associated with higher rates of wound healing (56% vs 39%,  $p = 0.04$ ) and faster wound closure ( $p = 0.005$ ). Two patients in the NPWT group compared to nine patients in the control group required surgical revision. The frequency and severity of adverse events (most commonly infection) was the same for both groups. Apelqvist et al.<sup>37</sup> reported the resource utilisation and economic costs from the trial and found that NPWT was associated with an average cost to achieve wound healing of \$US25,954 compared to an average cost of \$US38,806 for the moist dressing group. There was no difference in the length of hospital stay between the two groups. The increased costs associated with moist dressings were due to increased antibiotic use and higher numbers of dressing changes required.

Nielsen and Andriessen<sup>39</sup> reported results from an RCT of 60 patients randomised to receive either a polyhexanide-containing biocellulose dressing or a dialkyl carbamoyl chloride-containing hydrophobic dressing following partial foot amputation. Patients receiving the biocellulose dressing reported lower pain and less dressing adherence than those in the hydrophobic dressing group.

**Table 25: Primary studies identified on partial foot amputation**

Study ID	Study setting, country, study design	Patients	Intervention comparator	Conclusions	Quality of study
Armstrong and Lavery, 2005 <sup>38</sup>	Tertiary hospital US RCT	162 patients with a partial foot amputation (up to transmetatarsal level) due to diabetes	NPWT (vacuum assisted closure system)  Moist wound care	NPWT seems to be a safe and effective treatment for complex diabetic foot wounds and could lead to faster healing and a higher proportion of healed wounds than standard care	IV = moderate  EV = good
Apelqvist et al., 2008 <sup>37</sup>	Tertiary hospital US RCT	162 patients with a partial foot amputation (up to transmetatarsal level) due to diabetes	NPWT (vacuum assisted closure system)  Moist wound care	Treatment of diabetic patients with post-amputation wounds using NPWT resulted in lower resource utilisation and a greater proportion of patients obtaining wound healing at a lower overall cost compared to moist wound care	IV = moderate  EV = good
Nielsen and Andriessen, 2012 <sup>39</sup>	Tertiary hospital Europe RCT	60 patients with a partial foot amputation due to diabetes	Polyhexanide-containing biocellulose dressing  Dialkyl carbamoyl chloride-containing hydrophobic dressing	Pain levels were significantly lower and dressings adhered significantly less in patients receiving polyhexanide-containing biocellulose dressings compared to those receiving dialkyl carbamoyl chloride-containing hydrophobic dressings, demonstrating a better quality of life in the former group	IV = poor  EV = moderate

RCT: Randomised controlled trial; NPWT: Negative pressure wound therapy; IV: Internal validity; EV: External validity.

## 9 Conclusions

Following a review of 16 reports, guidelines and standards pertaining to amputee care, the following key elements of care were identified:

- The use of MDTs in care planning and rehabilitation
- Individually tailored rehabilitation programs
- Timely and comprehensive psychological and emotional support services for patients and families.

Specific areas for revision in the current 2008 Standards were not readily identified.

However, it may be relevant to consider incorporating recommendations on pain management, falls prevention and specific needs of older patients. No more recent guidelines pertaining to paediatric populations were identified in this review.

All guidelines containing recommendations regarding postoperative dressings recommend the rigid dressing approach for trans-tibial or lower leg amputees. Overall, the identified guidelines were literature-supported; however, all noted a paucity of peer-reviewed literature on amputee care (review questions 1–3).

The results from the review of peer-reviewed literature were consistent with the recommendations made by the guidelines and report favourable outcomes associated with the use of RRDs. No study reported safety issues associated with the use of RRDs. However, significant methodological issues have been identified with the primary peer-reviewed evidence base (see Table 23), and the clinical impact of the results has not been ascertained.

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# 11 Appendix A

**Table 26: Analysis of primary study overlap in the identified systematic review**

	Included in Sanders and Fatone, 2011 <sup>29</sup>	Included in Smith et al., 2003 <sup>30</sup>	Included in Canadian Agency for Drugs and Technologies in Health, 2012 <sup>26</sup>	Included in Churilov et al., 2014 <sup>27</sup>	Included in Nawijin et al., 2005 <sup>28</sup>
Baker, 1977		✓			✓
Barber, 1983		✓			✓
Cohen et al., 1974		✓			
Deutsch et al., 2005				✓	
Golbranson, 1988					✓
Graf et al., 2003	✓				
Janchai et al., 2008	✓				
Johannesson, 2008			✓		
Kane and Pollak, 1980		✓			
Ladenheim et al., 2007				✓	
MacLean et al., 1994	✓				✓
Manella, 1981	✓				✓
Mooney, 1971		✓			✓
Moore et al., 1972		✓			
Mueller, 1982	✓	✓			✓
Nicholas and DeMuth, 1976		✓			✓
Schon et al., 2002		✓			
Sumpio et al., 2013				✓	
Taylor et al., 2008				✓	
Van Velzen et al., 2005				✓	
Vigier, 1999					✓
Wong and Edelstein, 2000*	✓				✓
Woodburn et al., 2004				✓	
Wu et al., 1979		✓			

\*Study included patients with both a transtibial amputation (75% of patients) and a transfemoral amputation (25% of patients).