



## Understanding the benefits of prosthetic prescription: exploring the experiences of practitioners and lower limb prosthetic users

Elisabeth Schaffalitzky, Pamela Gallagher, Malcolm Maclachlan & Nicola Ryall

To cite this article: Elisabeth Schaffalitzky, Pamela Gallagher, Malcolm Maclachlan & Nicola Ryall (2011) Understanding the benefits of prosthetic prescription: exploring the experiences of practitioners and lower limb prosthetic users, *Disability and Rehabilitation*, 33:15-16, 1314-1323, DOI: [10.3109/09638288.2010.529234](https://doi.org/10.3109/09638288.2010.529234)

To link to this article: <https://doi.org/10.3109/09638288.2010.529234>



Published online: 23 Sep 2011.



Submit your article to this journal [↗](#)



Article views: 1543



View related articles [↗](#)



Citing articles: 17 View citing articles [↗](#)

RESEARCH PAPER

## Understanding the benefits of prosthetic prescription: exploring the experiences of practitioners and lower limb prosthetic users

ELISABETH SCHAFFALITZKY<sup>1,4</sup>, PAMELA GALLAGHER<sup>1,4</sup>, MALCOLM MACLACHLAN<sup>2,4</sup>  
& NICOLA RYALL<sup>3</sup>

<sup>1</sup>School of Nursing, Dublin City University, Dublin, Ireland, <sup>2</sup>School of Psychology, Trinity College Dublin, Dublin, Ireland, <sup>3</sup>National Rehabilitation Hospital, Dublin, Ireland, and <sup>4</sup>Dublin Psychoprosthetics Group

Accepted September 2010

### Abstract

**Purpose.** While lower limb prosthetic prescription is reliant on many physical indicators, it is clear that psychosocial factors need to be emphasised to a greater extent within this field if the needs of users are to be appropriately addressed. The aim of this study is to explore and identify the outcomes of prosthetic prescription through qualitative inquiry.

**Method.** Six focus groups with prosthetic service users and 10 semi-structured interviews with service providers were conducted and then analysed with inductive thematic analysis.

**Results.** The outcomes identified were: independence, not being in a wheelchair, balance and safety, improved quality of life and reaching potential.

**Conclusions.** These emergent themes challenge the predominating focus on physical functioning that many practitioners have. These findings are important for developing a user-based model of service provision and outcome evaluation.

**Keywords:** Amputation, lower limb, prosthetics

### Introduction

Lower limb amputation has become an area of increasing concern for those working in modern healthcare due to its increasing prevalence in society. This is not only due to the increase in amputations arising from warfare, but largely from the aging population and the increase in lifestyle related illnesses, such as diabetes and peripheral vascular disease, which can result in amputation [1–4]. Prosthetic rehabilitation following amputation is complex and multifaceted involving both physical and psychosocial challenges for the patient. Not everyone will benefit from the provision of a lower limb prosthetics or will master their use, with prosthesis use rates ranging from as little as 49%, up to 95% [5–10]. Consequently, outcomes of relevance differ from person to person and are not solely focused on hours of prosthetic use or other physical use indicators. Identifying the most impor-

tant outcomes and benefits of prosthetic prescription to both prosthetic users and service providers establishes a more informed foundation upon which to compare and evaluate research in the field, to understand why and when prosthetic technology should be provided and to identifying outcomes measures sensitive to users' life goals.

Currently, there is no consensus on the most important outcomes to measure in prosthetic rehabilitation, or concurrently, on the specific outcome measures to be consistently used in prosthetic rehabilitation [11]. The current prescription criteria are mainly based on subjective experiences of physicians, therapists and prosthetists, and it has been suggested that prosthetics as a field has fallen behind other fields in using evidence-based practice [12]. For example, Deathe et al. [13] have described how centres of care in Canada evaluated programme and patient outcomes: 31% reported that they did not use any formal outcome measure to assess

patient outcomes. Of those centres that did use formal measures, 67% did not use self-report measures, thus missing the user's own perspective on their rehabilitative outcomes. In fact, the majority of outcomes were concerned with only functional or physical aspects of rehabilitation, such as improved gait, timed walking or standing procedures. Heine-mann et al. [14] have noted how this narrow focus on clinical indicators in prosthetics can devalue and disregard important human and social outcomes. Similarly, research has emphasised the importance of psychosocial factors within lower limb prosthetic prescription and use [15,16]. It is becoming increasingly obvious that prosthetic prescription needs to address the psychosocial outcomes of prosthetic use, not just the physical as is currently practiced.

The understanding of health and illness behaviour and health interventions is incomplete unless the subjective reality of how health and ill-health affect the individual can be comprehended [17]. As rehabilitation outcomes are dependent on people's thoughts, attitudes and motivation regarding the rehabilitation process and as the rehabilitation process in itself builds on social interaction, studies with a qualitative design are useful tools in the development and improvement of rehabilitation [18]. Using qualitative methods ensures that the factors and areas that are important to the participant are highlighted to the researcher. Qualitative research can clarify the language and meanings attributed to the participants of the research, allowing people to speak in their own voice, rather than being confined to categories imposed on them by others [19]. By taking a qualitative approach to this research, it is hoped that a fuller understanding of what should be addressed as outcomes and benefits of prosthetic use can be gained.

Both service user and provider perspectives were sought for this research as they each provide unique perspectives on outcome evaluation. It was presumed that information garnered from service providers would reflect individual's clinical experience, while service users offer the client's perspective, not only of prosthetic services, but also, of the interconnecting services that can also play a critical role in their lives. Previous research has in fact highlighted how valuable it can be to include the service user within prosthetic and other assistive technology prescription [20,21], in order to improve user satisfaction and rates of prosthetic use.

When aiming to improve health services, focus group methodology can prove extremely useful as a range of ideas are generated and criticisms are expressed from service users who might be reluctant to directly give negative feedback or feel that problems may result from their own inadequacies [22,23]. This may be true in the prosthetic setting,

where some users may feel that problems with the use of their prosthesis arise from their own inadequacies rather than a fault in the technology or prescription. However, by talking to others, individuals can get the sense that their concerns are not unique and therefore, feel encouraged to express them. The focus group method has been used within a number of different studies to explore different aspects of rehabilitation, such as the bereavement model in stroke rehabilitation [24], the client perspectives of different types of rehabilitation [25,26], the impact of physical disability on body esteem [27] and patient information on phantom limb pain [28]. With amputation, Gallagher and MacLachlan [29] conducted focus group research into the adjustment to an artificial limb, and focus groups were also successfully used in a multi-stakeholder (users, researchers, clinicians and manufacturers) study on assessing the needs of lower limb prosthetic users [30]. The unique contribution of this study is to focus such group discussions on identifying outcome measures that are most sensitive to users' goals, whilst also interpreting these informed by the expertise of experienced clinicians gained through key informant interviews.

## Method

### *Participants*

Participant inclusion criteria included the person having a major limb amputation of one or both of the lower limbs, being over 18 years of age, having sufficient spoken English to engage effectively in group discussion and being at least 1 year post-amputation. A total of 24 participants took part across six focus groups. Group sizes in this study ranged from three to five. The demographic data for each group are presented in Table I.

With regard to service providers, the inclusion criteria included currently working in some facet of service provision with the prescription and use of lower limb prosthetics, being over 18 years of age, legally able to consent for themselves and having sufficient spoken English for the demands of the study. In total, 10 interviews were carried out, two of which took place over the telephone with the remainder conducted face-to-face. The sample consisted of six prosthetists, two physiotherapists, one psychologist and one consultant in rehabilitation medicine.

As there is no pre-set number of focus groups or interviews needed for a qualitative study, this research aimed to reach saturation, that is, the point at which no new information is being collected [31]. It was decided that after six focus groups and 10

Table I. Demographic details for each focus group.

Focus group 1	
PT1:	70, F, congenital, BK, 61 years
PT2:	45, F, trauma, AK, 40 years
PT3:	49, F, dysvascular, AK, 8 years
PT4:	29, F, trauma, BK, 7 years
Focus group 2	
PT1:	75, F, cancer, AK, 32 years
PT2:	70, M, aneurysm, BK, 10 years
PT3:	59, F, trauma, BK, 52 years
PT4:	50, F, infection, AK, 41 years
PT5:	81, M, infection, BK, 9 years
Focus group 3	
PT1:	56, M, dysvascular, AK, 4 years
PT2:	43, M, cancer, BK, 2 years
PT3:	55, M, dysvascular, BK,AK, 6 years
PT4:	74, F, dysvascular, 2BK, 12 years
Focus group 4	
PT1:	58, M, trauma, AK,10 years
PT2:	75, F, trauma, BK, 22 years
PT3:	63, F, cancer, AK, 45 years
Focus group 5	
PT1:	67, M, dysvascular, BK, 3 years
PT2:	84, M, dysvascular, BK, 6 years
PT3:	72, M, dysvascular/infection, 2BK, 3 years
PT4:	86, M, dysvascular, BK, 3 years
Focus group 6	
PT1:	66, F, infection, BK, 5 years
PT2:	65, M, trauma, BK, 25 years
PT3:	63, M, trauma, BK, 28 years
PT4:	64, M, trauma, AK, 42 years

Note: Age in years, male/female, cause of amputation, level of amputation, time since amputation.

interviews, saturation had been achieved, as similar themes were emerging from each group and interview. Therefore, no further data collection was deemed necessary.

#### Data collection

For service providers, individual semistructured interviews were chosen for data collection as focus groups were considered less feasible because of the difficulty in arranging a convenient time for a number of professionals to meet together for at least 90 minutes without it affecting the care of their patients. This would be especially true if individuals were coming from the same service provision centre.

Ethical approval for the study was obtained from the NHS ethics system, the National Rehabilitation Hospital in Ireland and Dublin City University. Intermediaries from various health services facilities in Ireland and the UK contacted individuals meeting the inclusion criteria. Individuals were contacted with a letter explaining the study and all other relevant information and were then asked to return a completed consent form to the researchers

who would then contact them to arrange the date and time for the focus group or interview to take place. The names of those contacted for focus groups were not known to the researchers until they had provided consent to take part in the study, meaning patient confidentiality was respected at all times. Informed consent was sought and obtained again from each person at the time of data collection. Each focus group and interview was recorded and transcribed with permission from the participants.

#### Interview guides

An interview and topic guide was developed for both the focus groups and interviews. The focus group topic guide included the following areas:

- What was the initial reaction to the first prosthesis? Were expectations met?
- What goals/achievements did individuals set themselves when they were fitted with a prosthesis?
- Were these goals reached? If not, what explanation was provided? If goals were reached, what helped in achieving them?
- What are the most common issues, if any, that arise from having a prosthesis?
- What are the most challenging aspects, if any, of having a prosthesis?

The following questions were used to guide the interviews:

- What does the job/role entail?
- How is the decision made about somebody being ready for a prosthesis?
- Is there anything that would prevent the prescription of a prosthetic limb to an individual or lead you to advise someone to give up their prosthetic limb?
- Are there factors that influence the choice of upgrading an individual's prosthesis? (prompt: physical, psychological and social?)
- How is it determined that someone is doing well?
- How do patients judge they are doing well? Is there a difference between when they feel they are doing well and when the service provider feels they are doing well?
- From their experience, are there preoperative characteristics, other than the physical ones, that can influence adjustment to amputation?
- As a (insert profession) what is felt to be the important outcomes of using a prosthesis for the patient?

- What do they consider to be a successful outcome for a patient?
- Is there anything that could make adjustment easier for the patient? Could the fitting service be changed to improve patients' satisfaction with their prosthesis? (In what way?)

These topic guides were used to also answer research questions that are not the focus of this article.

### *Analysis*

The two sources of data from users and service providers via focus groups and interviews, respectively, were combined in the analysis stage. This facilitated identifying where the two groups agreed and disagreed on certain issues of importance. The goal of the analysis was to identify themes as described by the participants and to describe the range of issues and experiences within each theme by using inductive thematic analysis. A theme is a pattern found in the data that 'at the minimum describes and organizes possible observations or at the maximum interprets aspects of the phenomenon' [32]. Thematic analysis is a widely applied and flexible method within and beyond psychology [33]. It was considered suitable for the purposes of this study because of its descriptive rather than interpretative function, as well as flexibility and theoretical freedom, making it preferable to other methods such as Interpretative Phenomenological Analysis and Grounded Theory. Importantly, Braun and Clarke [34] stress that the 'keyness' of a theme is not necessarily dependent on quantifiable measures but rather on whether it captures something important in relation to the overall research question.

The data were analysed using the process adapted from Kreuger and Casey [31]. First, transcripts of the focus groups and interviews were read line by line and any emerging codes that appeared were noted. A number of codes were first generated purely based on the transcribed data. Samples of the focus group and interview transcripts were then open-coded by a research associate to ensure that there was no researcher influence on the codes generated, that the codes were reliable and that the data were interpreted satisfactorily. Subsequently, the codes were entered into NVivo 8 as free-nodes, with the text of each instance of a code recorded and stored. These instances of text ranged from one line from one participant to large interactions among group members. Each free-node was then checked to ensure that the data references for each were relevant to the code they were under and also to see whether

the reference could also be labelled under another code. A number of different themes were generated that were found to be relevant to prosthetic outcomes and benefits.

### **Results**

A number of themes emerged from the data that informed a better understanding of what prosthetic users and prosthetic service providers consider the important outcomes and benefits of having a prosthetic limb. These themes were independence, not using a wheelchair, balance and safety, quality of life and reaching potential. These outcomes ranged from the physical to the psychological, and it was recognised that it is important to consider both in amputation rehabilitation:

Interview 7 (prosthetist): a successful outcome would be somebody, as I said before, that reaches their expectations, or exceeds their expectations as far as their mobility is concerned. Just their general well being, and sometimes their mental well-being as well. Try and look at it holistically rather than just focusing on the prosthesis as such. I think that's only part of it.

### *Independence*

Independence was identified as an important factor by both service users and providers. However, the concept of independence not only included functional independence but also the psychological benefits that come from functional independence. Notably, service providers tended to discuss independence as a functional outcome:

Interview 6 (prosthetist): getting people's independence, I think that's the main thing. People previous to most amputations would be vascular diabetes, and spend most their time in their chair, in an out of hospitals, and as soon as they get a leg it seems, it let's them get on with their lives again and I think that's a major thing, gives them independence. I think that, to me, is an important outcome.

In contrast, service users focused more on the psychological benefits of independence with increased feelings of self-efficacy and improved self-esteem. For service users, the smallest gain of function, for example being able to go to the toilet unassisted, was important to them:

#### Focus group 3

PT1: to have the independence to just go on and use the toilet on your own

PT2: yeah

PT1: without having to ask someone to help you

PT3: yeah  
 PT1: you know, that was a killer to me in the wards on the hospital, having to go to the toilet with curtains drawn around you and visitors all around the place  
 PT4: yes  
 PT1: that was, that was so degrading so it was  
 PT4: I think when you've lost your leg it's much worse than anything that can happen to you, your loss of independence  
 PT1: yeah, you feel embarrassed and you feel awkward about it

It was also important for service users to feel that they were independent at home rather than having to rely on others to help them within a care facility. Indeed, being in a care facility was considered by many to be the last place they would want to be:

Focus group 6  
 PT1: but when you are living in the country, and there's no one lives next to you, and you live on your own, it's either be put into a home,  
 PT3: I know I know  
 PT1: or survive and I said 'no, no way.'

*Not using a wheelchair*

A key outcome was 'not using a wheelchair'. For example, service providers noted that returning home was facilitated by having a prosthesis, in contrast with a wheelchair, that could prove too difficult to use in a home environment:

Interview 1 (clinical psychologist): I think an artificial prosthesis can do that, you know, make some people more mobile around their homes. Let some people stay in the homes they want to stay because a wheelchair is not an option because of the size.

These data emphasised the importance of regaining functional independence through prosthesis use rather than wheelchair use because of the greater opportunities that it affords to the user. Service providers also highlighted that for them not using a wheelchair was a sign of success. As prosthetists were the only service providers to mention this specifically, this may be indicative of the primary focus of their role that is to aid a person in being able to return to walking.

Interview 5 (prosthetist): oh, for me a successful outcome is if somebody walks in and they don't come in in a wheelchair. If you see somebody coming in so many times in a wheelchair and then there's a point, at some point they come in for a review and they walk in, and that just gets my heart, I feel like I like people to be walking.

From the service user perspective, the use of the prosthesis was also favoured as it was perceived to be less stigmatising than the use of a wheelchair.

Focus group 2  
 PT3: it was either a case of me sitting in a wheelchair or nobody was going anywhere because they weren't going to leave me, so we went to the mall, and I got a wheelchair, and I realised you're actually invisible when you're in a wheelchair cos the people talk to your family and the people round about you 'does your wife like this?' as if you're not there.  
 PT2: aye  
 PT3: which I find shocking  
 .....  
 PT2: I feel quite conspicuous when I get into the wheelchair. And helpless

These feelings regarding the use of wheelchairs were further substantiated by the fact that while individuals had disliked the look of their first prosthesis, they were still grateful for the opportunity proffered by the prosthesis to be able to stand and walk again:

Focus group 3  
 PT2: well I have to say I'm the opposite now, I had my first limb made by YX, and when you haven't had anything to stand up on for 6 months, and even when you've got this horrible  
 PT4: yeh yeh  
 PT2: your first limb on it, it's got a bigger leather strap on it, across your knee  
 PT1: yeh yeh  
 PT2: to keep it in place, and it was about this wide, jeans didn't fit over it or anything, I didn't care, I was standing up again, it was fantastic. And it was really heavy it was, but you put those things to the back if your mind, I'm back up walking again, I'm standing.

As a lower limb prosthesis can generally be concealed by clothing, if desired, a prosthesis user is not immediately recognised as having a physical impairment and therefore avoids potential stigmatisation due to wheelchair use, which is common [35].

*Balance and safety*

Balance and safety were seen as key physical outcomes of using a prosthesis by both users and practitioners. It was important for service providers that a sense of balance was achieved so that the user was able to walk safely.

Interview 2 (physiotherapist): And if you fall with the leg, the prosthesis on, it's much more serious than if you have a fall without a prosthesis on. Because, particularly with the transfemoral, you have a locked knee and the

knee doesn't give and you can do yourself quite a lot of damage, both to the residuum and to the rest of your body.

While safety and balance were also important outcomes identified by service users, they tended to focus on the way in which a sense of balance and safety instilled confidence and lowered self-imposed restrictions when walking in public. For users, falling may not only cause physical injury but can also cause personal embarrassment.

Focus group 3

PT3: I can move my leg in and out like that. And you don't have control.

PT2: no you have to have a tight fit

PT1: your confidence goes completely

PT3: yeah, cos you're afraid

PT1: you're afraid to fall, that's one of the reasons I carry a stick

PT3: that's why I'm on them (crutches)

-----  
PT1: But if I'm going out anywhere, I'm very conscious that I don't fall, I think that would knock me an awful lot, I make sure that there's nothing on the ground or in my way. For instance I was painting a bit of the parlour yesterday where somebody had marked the wall, and there was a Hoover lying on the ground, and I unfortunately went to step back and I stepped on the bar of the Hoover,

PT4: yes?

PT1: and I ended up on the floor there. Now if that had been anywhere else I would have died a hundred deaths you know? Cos the fact of trying to get back up again that's absolutely nearly impossible unless you've a chair or something to lean on

PT1: and if I'm walking down the street, I will walk as tight to the shop windows as I can.

PT4: so will I

PT1: So that I'm not knocked over and embarrassed you know?

These findings reiterate how physical outcomes are closely linked to social and psychological outcomes. The provision of the prosthesis and the improvements it creates physically in turn improve social interaction and psychological factors such as self-esteem.

### *Quality of life*

Improved quality of life, as an outcome, was commonly mentioned in the data, though mostly from the service providers.

Interview 2 (physiotherapist): A better quality of life. You know? That's one of the questions we ask the patients when they come to the clinic, is 'what do you

want to get out of this?' I mean we have patients who we give a limb to who we only want to transfer from A to B, we have others that want to go back to their jobs, we have others that want to go back to their, to driving, so it's very individual. And a better quality of life, is at the end of the day, the best thing to say.

Quality of life is a commonly used concept in health care, and in many ways would be considered a standard answer for service providers, taking into account a number of different outcomes without specificity. This may explain why no service users mentioned quality of life specifically as an outcome, but instead cited more specific ways in which their quality of life could be improved, such as becoming more self-reliant or being able to stay at home rather than living in a care facility. Service users may be unfamiliar with the term, or less likely to use it than service providers, or more readily break it down into more individually salient components, as described above.

### *Reaching potential*

A successful outcome indicated solely by service providers was whether an individual 'reached his/her potential'. Essentially, this referred to whether the user gained the mobility that it was estimated, they would achieve from their initial visits to the fitting centre. Indeed, the individual nature of assessing the expectations and potential of each person was highlighted. What is possible for one person is not possible for another, and prosthetic technology is prescribed in that manner.

Interview 10 (consultant): Generally when patients are not doing as well as expected, then you have to (as a clinician), work out why aren't they doing, or why aren't they able to do, as much as you think they should be doing. But yeah, I think that it is variable, there is no sort of general rule if you like, you take each individual case and try and work out what would be the best thing for that individual. If you ask anybody who has lost a leg 'what would you like to do?' they would all like to have a leg and be able to get back to their normal self, but unfortunately there are other factors which have a big influence in what they would be or could be.

This is an interesting point indicating that service providers need to establish an individual's potential based on their condition at presentation and relate that to their appropriate prescription. If a service provider inaccurately predicts potential, then it may impact on the rehabilitation of the individual. For example, if individuals do not reach their predicted outcome, they could encounter a negative or disappointed reaction from rehabilitation staff or

could become disappointed themselves with their own progress.

Interview 6 (prosthetists): They always assume that somebody who was a traumatic amputation for example will do better than somebody who maybe has vascular disease, but it doesn't seem to always work out that way. Or if somebody's young they're just going to get up and go, and all of the time they're a bunch of wimps!

Inaccurate prediction may also affect what technology is made available to them. Most prosthetic prescription practice is based on assumption rather than on an established evidence base [36], and as a consequence, the chance of error is increased. Gailey [37] discovered that 30% of those getting a lower limb prosthesis were 'underprescribed' or received prosthetic components designated for persons functioning at a lower level, due to a lack of agreement among prosthetists on the prescribed components for various functional levels.

## Discussion

A number of outcomes were identified in relation to lower limb prosthetic prescription. Many of these were related to physical outcomes, such as balance and safety and not being in a wheelchair, but others were related to how the physical outcomes can affect psychological well-being, such as remaining at home rather than being in a care facility, regaining independence and being self-reliant rather than having to rely on others. Although there was general agreement between service providers and users on these outcomes, there were some differences that could impact on the way prosthetic rehabilitation is carried out. While service providers considered the user walking or being out of a wheelchair as successful, it was also clear from users that even the smallest gains in function were appreciated; they were also celebrated for the psychological benefits they offered. Independence as an important outcome for service providers was related to functional independence, whereas for users independence was expressed as more of a psychological outcome, related to feelings of self-efficacy and self-esteem. Clearly, the two are related, but the subtle difference is important when studying outcomes in rehabilitation and furthermore when goal-setting during the rehabilitation process. In fact, one of the criticisms levelled at goal-setting in rehabilitation is that professionals have a tendency to set goals in terms of physical outcomes primarily concerned with mobility and physical independence, with goals that are psychological in nature appearing to be relatively rare [38]. This then raises the question that if users

and service providers have different ideas of what constitutes a good outcome, how can goal-setting be effective? With goal-setting recognised as an important factor in rehabilitation and healthcare, it is important to make sure that it is an effective strategy, by engaging the user in the process, making sure that the goals set are relevant to the person and taking into account the user's understanding of the process and its meaning [39].

The finding of independence as an important outcome from prosthetic use was not unexpected. The prosthesis offers the chance to those with lower limb amputations to regain mobility which in turn can lead each person to gain some level of independence. However, in this study, independence could be being able to go to the toilet unassisted. This finding contrasts with what many studies would consider a 'successful' rehabilitation with a prosthesis. Prosthesis use has been defined variously as wearing the prosthesis 'regularly', using it 'daily', ambulation indoors or outdoors, number of hours used per day and the number of activities done with the prosthesis [6]. With the above findings, it is clear that while these can be considered informative measures, even relatively small levels of functional independence seem to be appreciated, highlighting the value of providing a prosthetic limb for even modest gains in mobility, which may still constitute a successful outcome. As noted by Draper [40], in order to improve the quality of life for patients in healthcare, we must aim to remember what it means to be human, of which autonomy is a key element. Thus, cost-effectiveness in prosthetic prescription needs to be evaluated by considering what an improvement in physical functioning signifies to the user, rather than simply the degree of improvement in physical functioning per se.

'Not being in a wheelchair' as a benefit in this study resonates with previous findings [41]. In this study, many of the participants had also been given wheelchairs that necessitated an attendant to move them as they could not be propelled forward by the users themselves. This meant the individual was essentially dependent on the help of others to move about, which may well have helped them appreciate more the self-ambulatory potential of a prosthesis. It was evident that not being in a wheelchair was seen as increasing self-esteem and avoiding being so visibly disabled. This feeling may be echoed by other users of assistive technology, especially wheelchairs, who may feel that their use makes them identifiably disabled and thus subject to stigma or prejudice. As such, the way in which users of assistive technology identify with the technology means it has the potential to embody a 'disabled person' or someone who uses it to overcome disability [42].



A 'better quality of life' was a common outcome identified as important to service providers. This is not unusual considering how often it appears in rehabilitation literature and research. Quality of life is a difficult outcome to measure however, due to the number of conflicting definitions that exist and knowing which one applies best to prosthetic rehabilitation. In other studies, patients have reported high levels of life satisfaction while also reporting constant pain and inability to work or participate in desired leisure activities [43]. This finding suggests that quality of life is a highly subjective process that while considered important within amputation rehabilitation may prove complex to measure effectively. In many ways, quality of life is a standard answer for service providers, taking into account a number of different outcomes without much specificity. It is interesting that in this study, none of the service users mentioned quality of life specifically as an outcome but mentioned more specific ways in which their quality of life could be improved, such as becoming more self-reliant or being able to stay at home rather than living in a care facility. Therefore, quality of life may need to be further defined and broken down in relation to amputation and prosthetic provision if it is to be a sensitive index of what can be achieved by service provision. To date, Quality of Life had been measured in relation to amputation and the use of a prosthesis with a number of different measures, such as the Trinity Amputation and Prosthesis Experience Scales (TAPES), Prosthesis Evaluation Questionnaire (PEQ) and Orthotics and Prosthetics Users' Survey (OPUS). These measures have previously been found to have quite good validity [44–46] though they may all only be partially valid to the extent that they do not capture the full domain of users' experiences.

The final outcome identified by service providers related to how they wished users to 'reach their potential'. This reflects how individuals are evaluated for their rehabilitation potential when they are being fitted for a prosthesis, although it was not clear that there is any standardised method or evidence-based system by which to do this. Therefore, 'reaching potential' seems to be about meeting the expectations of the service provider as regards to a person's walking and physical ability based on broad probabilities, such as younger persons being more active than older persons, and those with comorbidities generally doing worse than healthier persons. This is not to say that these generalisations are inaccurate but rather to recognise that this 'potential' may not be something that has been established in a measurable or standardised way. Currently, the Amputee Mobility Predictor assessment instruments [47] along with the Medicare Functional Classification

Levels or K-levels [48] are considered the best rehabilitation guidance tools in terms of predicting prosthetic outcome [49], but notably only the AMP and AMPnoPRO are not based entirely on subjective measurements and have some predictive validity. From our data, it was not clear whether the service providers used these or any other specific measures for establishing the potential of each user, with only one service provider naming them as something that they used in their service setting. If users are being evaluated on their 'potential', which could affect their future care, it is important that what constitutes 'potential' is standardised and measurable. This finding may also be relevant to other physical rehabilitation settings where expected potential is established for goal-setting and may affect access to services or equipment. Perhaps most critically, 'potential' is not a static but rather a dynamic concept and should be continually reviewed, rather than trying to establish achievement on a previously determined set point.

By combining both user and service provider data, a rich insight was offered into what outcomes are important when prescribing a limb. Notably, there was not a large difference in opinion on what were considered the main outcomes and predictors, but having the two different viewpoints offered the chance to examine the prescription process, how it takes place and how it affects the individual, from both sides of the limb fitting process. As seen from the data, similar outcomes were identified by both groups, but the meaning of these outcomes, such as functionality outcomes from independence for service providers, but emotional outcomes from independence for service users, was different for the two groups. Therefore, by gaining both user and provider information, a greater understanding of the prosthesis prescription process was gained. Incorporating both perspectives in looking at other aspects of healthcare is recommended.

In terms of limitations, two interviews were lost due to faults with the recording equipment. While, the remaining 10 interviews were informative enough to reach saturation in terms of data collected, the potential pitfalls of digital recording and the need for notetaking during the interviews were highlighted.

## Conclusion

There are differences in what service providers and users consider important outcomes from prosthetic prescription. By identifying the most important outcomes of prosthetic prescription from both prosthetic users and service providers, we are better able to develop more appropriate outcome measures, to compare and evaluate research in the field and to

understand why and when prosthetic technology should be provided. Recently, research has begun in the development of the Patient-Reported Outcomes Measurement Information System (PROMIS) that aims to develop a way of measuring outcomes that are applicable to the individual in a more standardised and efficient way [50]. The current research has helped to identify important thematic areas that could be addressed by the PROMIS methodology.

In particular, our research indicated the importance of psychosocial outcomes in prosthesis prescription and use. They were considered as important as physical outcomes in an area of healthcare where improved physicality is one of the main aims of technological advances and research. Thus, advances in the technology, while offering important gains in mobility and improvement in gait, should also be seen as potentially reintroducing independence into an individual's life. Our findings also highlight that the provision of a prosthesis to those who may achieve only limited improvement in physical capabilities, but important gains in independence and self-esteem from small functional gains should be encouraged. Such improvements may in turn enhance individuals' capabilities and their rehabilitation potential.

### Acknowledgements

The authors acknowledge Brian O'Neill of the NHS in Scotland, and Mary Lyons and Stephen Hyland in James Connolly Hospital, Dublin, Ireland, without whom this research would not have been possible.

**Declaration of interest:** This research was funded using a grant provided by the Health Research Board, Ireland.

### References

- Dillingham TR, Pezzin LE, Shore AD. Reamputation, mortality, and health care costs among persons with dysvascular lower limb amputations. *Arch Phys Med Rehabil* 2005; 86:480–486.
- Nair A, Hanspal RS, Zahedi MS, Saif M, Fisher K. Analyses of prosthetic episodes in lower limb amputees. *Prosthet Orthot Int* 2007;32:42–49.
- Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes. *Diabetes Care* 2004;27:1047–1053.
- Ziegler-Graham K, MacKenzie EJ, Ephraim PL, Travison TG, Brookmeyer R. Estimating the prevalence of limb loss in the united states: 2005–2050. *Arch Phys Med Rehabil* 2008;89: 422–429.
- Schoppen T, Boonstra A, Groothoff JW, de Vries J, Goeken LN, Eisma WH. Physical, mental, and social predictors of functional outcome in unilateral lower-limb amputees. *Arch Phys Med Rehabil* 2003;84:803–811.
- Gauthier-Gagnon C, Grise M, Potvin D. Predisposing factors related to prosthetic use by people with a transtibial and transfemoral amputation. *J Prosthet Orthot* 1998;10:99–109.
- Gauthier-Gagnon C, Grise M, Potvin D. Enabling factors related to prosthetic use by people with transtibial and transfemoral amputation. *Arch Phys Med Rehabil* 1999; 80:706–713.
- Dolezal JM, Vernick SH, Khan N, Lutz D, Tyndall C. Factors associated with use and non-use of an AK prosthesis in rural, southern, geriatric population. *Int J Rehabil Health* 1998; 4:245–251.
- Dillingham TR, Pezzin LE, MacKenzie EJ, Burgess AR. Use and satisfaction with prosthetic devices among persons with trauma-related amputations. *Am J Phys Med Rehabil* 2001; 80:563–571.
- Karmarker AM, Collins DM, Wichman T, Franklin A, Fitzgerald SG, Dicianno BE, Pasquina PF, Cooper RA. Prosthesis and wheelchair use in veterans with lower-limb amputation. *J Rehabil Res Dev* 2009;46:567–576.
- Callaghan BG, Condie ME. A post-discharge quality of life outcome measure for lower limb amputees: test-retest reliability and construct validity. *Clin Rehabil* 2003;17:858–864.
- Ramstrand N, Brodtkorb T. Considerations for developing an evidenced-based practice in orthotics and prosthetics. *Prosthet Orthot Int* 2008;32:93–102.
- Deathe AB, Miller WC, Speechley M. The status of outcome measurement in amputee rehabilitation in Canada. *Arch Phys Med Rehabil* 2002;83:912–918.
- Heinemann AW, Fisher WP, Gershon R. Improving health care quality with outcomes management. *J Prosthet Orthot* 2006;18:46–50.
- Horgan O, MacLachlan M. Psychological adjustment to lower-limb amputation: a review. *Disabil Rehabil* 2004;26: 837–850.
- Gallagher P, Desmond D, MacLachlan M. Psychoprosthetics: an introduction. In: Gallagher P, Desmond D, MacLachlan M, editors. *Psychoprosthetics*. London: Springer; 2008.
- Meatherall BL, Garratt MR, Kaufert J, Martin BD, Fricks MW, Armeja AS, Duerksen F, Koulack J, Fong HM, Simonson N, Nicolle LE, Trepman E, Embil JM. Disability and quality of life in Canadian aboriginal and non-aboriginal diabetic lower-extremity amputees. *Arch Phys Med Rehabil* 2005;86:1594–1602.
- Ohman A. Qualitative methodology for rehabilitation research. *J Rehabil Med* 2005;37:273–280.
- Walker J, Sofaer B, Holloway I. The experience of chronic back pain: accounts of loss in those seeking help from pain clinics. *Eur J Pain* 2006;10:199–207.
- Geertzen JHB, Gankema HGJ, Groothoff JW, Dijkstra PU. Consumer satisfaction in prosthetics and orthotics. *Prosthet Orthot Int* 2002;26:64–71.
- Scherer MJ, Sax C, Vanbiervliet A, Cushman LA, Scherer JV. Predictors of assistive technology use: the importance of personal and psychosocial factors. *Disabil Rehabil* 2005;27: 131–1331.
- Kitzinger J. Qualitative research. Introducing focus groups. *BMJ* 1995;311:299–302.
- Syron M, Shelley E. The needs of informal carers: a proposed assessment tool for use by public health nurses. *J Nurs Manag* 2001;9:31–38.
- Alaszewkis A, Alaszewski H, Potter J. The bereavement model, stroke and rehabilitation: a critical analysis of the use of a psychological model in professional practice. *Disabil Rehabil* 2004;26:1067–1078.
- Ham R, Cotton L. *Limb amputation: from aetiology to rehabilitation*. London: Chapman and Hall; 1991.
- Crosbie JH, Lennon D, McNeill MD, McDonough SM. Virtual reality in the rehabilitation of the upper limb after

- stroke: the user's perspective. *CyberPsychol Behav* 2006;9: 137–141.
27. Taleporos G, McCabe MP. Body image and physical disability – personal perspectives. *Soc Sci Med* 2002;54: 971–980.
  28. Mortimer CM, MacDonald RJ, Martin DJ, McMillan IR, Ravey J, Steedman WM. A focus group study of health professionals' views on phantom sensation, phantom pain and the need for patient information. *Patient Educ Couns* 2004; 54:221–226.
  29. Gallagher P, MacLachlan M. Adjustment to an artificial limb: a qualitative perspective. *J Health Psychol* 2001;6: 85–100.
  30. Klute GK, Kantor C, Darrouzet C, Wild H, Wilkinson S, Iveljic S, Creasey G. Lower-limb amputee needs assessment using multistakeholder focus-group approach. *J Rehabil Res Dev* 2009;46:293–304.
  31. Kreuger RA, Casey MA. Focus groups, a practical guide for applied research. London: Sage Publications Inc; 2000.
  32. Boyatzis R. Transforming qualitative information: thematic analysis and code development. Thousand Oaks, CA: Sage; 1998.
  33. Kyriacou O, Easter A, Tchanturia K. Comparing views of patients, parents and clinicians on emotions in anorexia: a qualitative study. *J Health Psychol* 2009;14:843–854.
  34. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;3:77–101.
  35. Sapey BJ, Donaldson G. Increases in wheelchair use and perceptions of disablement. *Disabil Soc* 2005;20:489–505.
  36. Van der Linde H, Geertzen JH, Hofstad CJ, Van Limbeek J, Postema K. Prosthetic prescription in the Netherlands: an interview with clinical experts. *Prosthet Orthot Int* 2004;28: 98–104.
  37. Gailey RS. Predictive outcome measures versus functional outcome measures in the lower limb amputee. *J Prosthet Orthot* 2006;18:51–60.
  38. Wressle E, Oberg B, Henriksson C. The rehabilitation process for the geriatric stroke patient – an exploratory study of goal setting and interventions. *Disabil Rehabil* 1999;21:80–87.
  39. Siegert RJ, Taylor WJ. Theoretical aspects of goal-setting and motivation in rehabilitation. *Disabil Rehabil* 2004;26:1–8.
  40. Draper P. Nursing perspectives on quality of life. New York: Routledge; 1997.
  41. Legro MA, Reiber G, del Aguila M, Ajax MJ, Boone DA, Larsen JA, Smith DG, Sangeorzan B. Issues of importance reported by persons with lower limb amputation and prostheses. *J Rehabil Res Develop* 1999;36:155–163.
  42. MacLachlan M, Gallagher P. Imagining the body. In: Gallagher P, MacLachlan M, editors. *Enabling technologies: body image and body function*. Edinburgh, UK: Churchill-Livingstone; 2004.
  43. Nielson CC, Psonak RA, Kalter TL. Factors affecting the use of prosthetic services. *J Prosthet Orthot* 1989;1:242–248.
  44. Gallagher P, MacLachlan M. Development and psychometric evaluation of the trinity amputation and prosthesis experience scales (TAPES). *Rehabil Psychol* 2000;45:130–154.
  45. Legro MA, Reiber G, Smith DG, Del Aguila M, Larsen JA, Boone DA. Prosthesis evaluation questionnaire for persons with lower limb amputation: assessing prosthesis-related quality of life. *Arch Phys Med Rehabil* 1998;79:9–14.
  46. Heinemann AW, Bode RK, O'Reilly C. Development and measurement properties of the orthotics and prosthetics users' survey (OPUS): a comprehensive set of clinical outcome measures. *Prosthet Orthot Int* 2003;27:191–206.
  47. Gailey RS, Roach KE, Applegate EB, Cho B, Cunniffe B, Licht S, Maguire M, Nash MS. The amputee mobility predictor: an instrument to assess determinants of the lower-limb amputee's ability to ambulate. *Arch Phys Med Rehabil* 2002;83:613–627.
  48. HCFA. Common procedure coding system HCPCS 2001. Washington, DC: US Government Printing Office; 2001.
  49. Miller LA, McCay JA. Summary and conclusions from the academy's sixth state-of-the-science conference on lower limb prosthetic outcome measures. *J Prosthet Orthot* 2006;18:2–8.
  50. Rose M, Bjorner JB, Becker J, Fries JF, Ware JE. Evaluation of a preliminary physical function item bank supported the expected advantages of the patient-reported outcomes measurement information system (PROMIS). *J Clin Epidemiol* 2008;61:17–33.