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ORIGINAL REPORT

MALAWIAN PROSTHETIC AND ORTHOTIC USERS' MOBILITY AND SATISFACTION WITH THEIR LOWER LIMB ASSISTIVE DEVICE

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Objective: To investigate patients' mobility and satisfaction with their lower limb prosthetic or orthotic device and related service delivery in Malawi and to compare groups of patients regarding type and level of device and demographics.

Methods: Questionnaires were used to collect self-report data from 83 patients.

Results: Ninety percent of prostheses or orthoses were in use by patients, but approximately half of these needed repair. Thirty-nine percent reported pain when using their assistive device. The majority of patients were able to rise from a chair (77%), move around the home (80%), walk on uneven ground (59%) and travel by bus or car (56%). However, patients had difficulties walking up and down hills (78%) and stairs (60%). In general, patients were quite satisfied with their assistive device (mean of 3.9 out of 5) and very satisfied with the service provided (mean of 4.4 out of 5). Access to repairs and servicing were rated as most important, followed by durability and follow-up services. Lack of finances to pay for transport was a barrier to accessing the prosthetic and orthotic centre.

Conclusion: Patients were satisfied with the assistive device and service received, despite reporting pain associated with use of the device and difficulties ambulating on challenging surfaces.

Key words: orthosis; prosthesis; satisfaction; assistive technology; assistive device; Malawi; low-income country; mobility.

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INTRODUCTION

Satisfaction with lower-limb prosthetics and orthotics has been investigated in few studies involving low-income countries (1–3). Two studies in Vietnam have shown that 10% or less of patients are dissatisfied with their International Committee of Red Cross (ICRC) polypropylene prosthesis. In these studies, patients used their devices a mean of 8 h a day, and less than

10% of participants reported pain while using their prosthesis (1, 2). An additional study conducted in Vietnam reported that amputees were relatively satisfied with their prosthesis, but had limited ability to perform rigorous physical activity (3). A small study in India including 5 patients with post-polio syndrome indicated that the specific design of orthotic devices has an impact on patient mobility and satisfaction (4). In Iran, where both high-cost and low-cost technologies are used for production of prostheses and orthoses, patients were dissatisfied with the cosmetic appearance of the device, durability, and that the assistive devices tore their clothes. Patients were also dissatisfied with the process of service delivery, but indicated high levels of satisfaction for fit and ease of donning the assistive device (5). In high-income countries the overall satisfaction with lower-limb prostheses has been reported as moderate (6–10). Amputees have specifically reported being satisfied with the training they receive (10), the weight of the prosthesis (10) and their overall mobility with the prosthesis (7). However, patients have reported problems with comfort (7, 10) and socket fit (10).

Malawi is located in sub-Saharan Africa and is a low-income country with a population of 15 million people (11). The prevalence of disability is not fully documented (12), but Loeb & Eide (13) report that 43% of persons with disability in Malawi have physical disabilities and 17% of those with disabilities use assistive devices such as wheelchairs, crutches, walking sticks and standing frames. Approximately half of the assistive devices reviewed were not functioning well and people had difficulties in affording repairs or a new device (13). Specific evaluation of use of prosthetic and orthotic devices was not included in this study.

In general, little research is available related to prosthetics and orthotics in low-income countries (14). In the research that does exist, most focus has been directed towards evaluation of the product, for example durability (15, 16). Prosthetic and orthotic services need to be available and affordable in low-income countries in order to address articles within the Convention of Rights for Persons with Disabilities (CRPD), which relate to personal mobility (Article 20) and access to rehabilitation services (Article 26) (17). Studies including a detailed analysis of factors that influence patient satisfaction with assistive devices

and service delivery are, to our knowledge, not available from low-income countries using low-cost technology for production of prosthetics and orthotics. In low-income countries it is well known that certain groups, such as women and people living in rural areas, can be marginalized by society and have limited access to services. While the CRPD states that all persons with disability should have access to rehabilitation services, women (Article 6) and people living in rural areas (Article 26) are specifically mentioned (17). An evaluation of potential group differences is therefore of interest.

The aim of this study was to investigate patients' mobility and satisfaction with their lower limb prosthetic or orthotic device and related service delivery in Malawi. Further objectives were to compare groups of patients regarding type and level of devices and demographics.

METHODS

A cross-sectional study design was employed, in which a questionnaire including patients responses to questions was used to collect data. In this study assistive device refers to lower limb prostheses or orthoses. The general conditions of patients' devices were evaluated by the first author (LM), a certified prosthetist/orthotist. This study was performed in collaboration with local organizations and staff.

Setting

Prosthetic and orthotic service delivery in Malawi is provided by the Ministry of Health in cooperation with non-governmental organizations (18). Malawi has two prosthetic and orthotic centres, one in Lilongwe, opened in April 2009 and one in Blantyre, established in 1970. The clinical staff at the prosthetic and orthotic centres in Malawi were educated at the Tanzanian Training Centre for Orthopedic Technologists (TATCOT). The prosthetic and orthotic education at TATCOT comprises of 3–4 years of university-level education (19). At the time of the present study, 4 prosthetist/orthotists with university level education and 2 bench workers with on-the-job training were employed at the centre in Lilongwe (the centre included in this study). One of the staff had work experience from Norway and Tanzania. The manager was educated in Norway and had work experience from both Norway and Malawi.

Sampling

The sample of patients included in this study was selected from the patient register at the prosthetic and orthotic centre in Lilongwe. Patients were eligible if they were 16 years or older, had a lower limb disorder and had received prosthetic and/or orthotic treatment at the centre in Lilongwe between April 2009 and November 2010. Within the register there were 196 patients fulfilling the inclusion criteria. Contact details for 148 of these 196 patients were available from the centre's register. Attempts were made to contact all 148 patients. Of these, a local staff member was able to contact 97 patients who were asked to participate.

All the patients contacted were provided with information about the aim and design of the study. Patients were also informed that compensation for travel expenses would be provided and that a follow-up session with their prosthetist/orthotist would be organized if needed after the data collection. Reasons for not participating were that patients were not able to come to the workshop where the data collection was taking place due to illness ($n=2$) or not being able to travel on public transport ($n=3$). Another reason was that patients who said they would come or would call back never did so ($n=9$). Thus, 83 patients participated.

Patients

Of the 83 patients participating in the study, 36 (43%) were female and 47 (57%) male. The mean age was 36 years (range 16–74 years).

Forty-three percent of the patients lived in Lilongwe. Information about the patients' ethnic background, region of residence, religion, level of income and disability is shown in Table I. No statistically significant differences regarding sex, age, region of residence, and type and level of assistive device were found between the patients in the register who participated in the study ($n=83$) and those who did not ($n=113$).

Procedures

Questionnaire. The questionnaire for this study comprised of 32 items including components related to patients' mobility and use of their assistive device, general satisfaction with the device and the service received (Quebec User Evaluation of Satisfaction with Assistive Technology; QUEST 2.0) (20) and specific questions related to rehabilitation services. Specific questions related to rehabilitation services were generated from a literature review of relevant questionnaires, checklists and clinical experience (21, 22). Patients could also add their own comments to the items. Questions related to patient demographics and characteristics were also collected.

Quebec User Evaluation of Satisfaction with Assistive Technology. QUEST comprises 12 items and is a standardized assessment tool that identifies user satisfaction and dissatisfaction with assistive devices (8 items) and services (4 items). QUEST uses a 5-level response scale; 1: Not satisfied at all; 2: Not very satisfied; 3: More or less satisfied; 4: Quite satisfied; and 5: Very satisfied (20). Reliability and validity of QUEST has been well documented (23, 24). The instrument is widely applied to patients using wheelchairs as a means of following-up on user satisfaction (25, 26).

Permission was received to translate the English version of QUEST 2.0 to Chichewa from the Institute for Matching Person & Technology. The questionnaire was independently translated to Chichewa by 3 different people educated in the field of prosthetics and orthotics (27). The

Table I. Patients' demographics and characteristics ($n=83$)

Characteristics and demographics	Patients n (%)
Type of disability	
Symes or trans-tibial amputees	38 (46)
Trans-femoral amputees ^a	26 (31)
Ankle-foot orthotic users	8 (10)
Knee-ankle-foot orthotic users	11 (13)
Region of residence	
Central	75 (90)
Southern	5 (6)
Northern	3 (4)
Rural/urban areas	
Living in cities	41 (49)
Living in villages	42 (51)
Tribes	
Chewa	41 (49)
Ngoni	13 (16)
Tumbuka	11 (13)
Yao	8 (10)
Lomwe	5 (6)
Indian Malawian	1 (1)
Religion	
Christian	76 (92)
Muslim	7 (8)
Level of income	
No income at all	36 (43)
Irregular income	29 (35)
Regular income from employment	18 (21)

^aTrans-femoral amputees also include knee disarticulation, or extension prosthesis users.

Chichewa version was then translated back to English by one person educated in the field of prosthetics and orthotics and the translation was compared with the original English version of the questionnaire.

Data collection

Ethical clearance for this study was obtained from the National Health Sciences Research Committee of Malawi. Information about the study was read to the patients in Chichewa, or English if preferred. Written informed consent was obtained from all participating patients. The questionnaire was read to patients in Chichewa by a trained Chichewa-speaking assistant ($n=55$) or in English by the first author ($n=28$). In 3 cases the English version was translated to Tumbuka by a Tumbuka-speaking assistant. The questionnaire was administered face-to-face and lasted for 30–60 min. Responses to specific questions and subsequent comments were written down by the first author LM or the research assistant. The translated questionnaire was pilot tested on 5 patients and was considered to be acceptable.

Data analysis

Descriptive statistics were used to summarize responses to the items in the questionnaire. Means, standard deviations (SDs) and medians of QUEST items were calculated according to the QUEST manual (20). Sub-groups in the study population were compared with respect to the following variables; number of hours using the assistive device, use of crutches, pain, wounds and skin irritations, mobility, satisfaction with the assistive device, satisfaction of service and ability to pay for costs associated with the services. The sub-groups used for comparison were: sex; residential location (rural/urban), level of income (no income at all; irregular income; regular income from employment), type of assistive device (orthotics; prosthetics), and level of assistive device (below-knee assistive devices; above-knee assistive devices). χ^2 tests were used for comparing proportions between groups. The response alternatives "Yes, with difficulty" and "No, not at all" were combined into one group due to small numbers in specific categories when comparing mobility and daily activities between groups. When comparing perceived pain between groups the 4 response alternatives were collapsed into two groups: "Always/Often" and "Seldom/Never". Mann-Whitney U tests and Kruskal-Wallis tests were used when comparing age, hours of using device, and satisfaction between groups. p -values equal to or less than 0.05 were considered as statistically significant. SPSS version 19 was used for statistical analyses. Manifest content analysis was used to summarize the message in qualitative data and was applied to patient comments which related to problems and limitations regarding their lower limb assistive device. Comments from all questions were transcribed and read through several times in order to define the main content on descriptive level (28). Each comment was sorted in a systematic way according to QUEST items and subsequently counted.

RESULTS

Cause of disability, type and use of assistive device

Table II presents the underlying cause of disability and the type of assistive device used. The most common causes of disability were traffic accidents, non-healing wounds and fractures. Seventy-six percent of the assistive devices were prostheses and 24% orthoses. Ninety percent of the assistive devices were in use by patients. However, approximately half of the assistive devices that were in use needed repairs according to the researcher's evaluation. These patients were referred to their prosthetist/orthotist in order to have their device repaired (Table II). Ninety percent of patients had no spare device avail-

able and 10% had an old spare device available that often did not fit properly, but could be used if necessary.

The patients used their assistive devices for a mean of 9 h a day (median 12, range 0–14 h). Prosthetic patients used their device for a mean of 10 h a day and orthotic patients a mean of 7 h a day ($p=0.05$). Fifty-four percent of patients indicated that they use crutches, and the most common situation was that they use crutches together with a prosthetic or orthotic device (42%). Patients using below-knee assistive devices walked without crutches more often than patients with above-knee assistive devices (60% vs 31%, $p=0.03$). Only 6% of patients had a wheelchair.

Thirty-nine percent reported that they experienced pain often or always when using the assistive device and only 7% reported that they never experienced pain while using their device. Wounds from the prosthetic or orthotic device were also relatively common, 75% reported experiencing wounds or skin irritations. Patients with above-knee assistive devices reported wounds and skin irritations more often than patients using below-knee assistive devices (39% vs 16%, $p=0.002$).

Table II. Cause of disability, type and condition of assistive device ($n=83$)

	Patients <i>n</i> (%)
Cause of disability for prosthetic users	
Road traffic accidents	15 (18)
Non-healing wounds and fractures	12 (15)
Accidents	10 (12)
Congenital disorders corrected by surgery	7 (8)
Diabetes	8 (10)
Malpractice in healthcare	4 (5)
Opportunistic infections related to HIV + tuberculosis	2 (2)
Snake bites	2 (2)
Violence	2 (2)
Undefined cause	2 (2)
Cause of disability for orthotic users	
Polio	6 (7)
Accident	2 (2)
Paraplegic/hemiplegic	5 (6)
Opportunistic infections related to HIV + tuberculosis	2(2)
Stroke	2 (2)
Undefined cause	1 (1)
Type of assistive device	
Symes or trans-tibial prosthesis	33 (40)
Trans-femoral prosthesis ^a	27 (33)
Bilateral prostheses	4 (5)
Ankle-foot orthosis	7 (8)
Knee-ankle-foot orthosis	6 (7)
Double knee-ankle-foot orthosis	5 (6)
Trans-tibial amputees/ankle-foot orthosis	1 (1)
General condition of device ^b	
Never used	6 (6)
Broken cannot be used	3 (4)
In use but needs repair	44 (48)
In use good condition	40 (42)

^aTrans-femoral prosthesis also includes knee disarticulation prosthesis or extension prosthesis.

^bAssessment made by researcher, 10 patients had devices for both right and left leg, resulting in a total of 93 devices for 83 patients.

Mobility for prosthetic and orthotic patients

Table III presents responses to questions concerning patients' mobility. Approximately half of the patients were not able to walk at all without their assistive device while only a few reported that they could not walk at all with their assistive device. Twenty-one percent of patients could walk 100 m or more without their assistive device, while 76% reported that they could walk 100 m or a longer distance when using their device. The majority of patients had the ability to rise from a chair (77%), move around in their home (80%) and walk on uneven ground (59%) without difficulties when using their

Table III. *Mobility for prosthetic and orthotic patients*

	Patients n (%)
Walking distance without assistive device, n=83	
Not at all, 0 m	40 (48)
A few metres	26 (18)
Approximately 100 m	5 (6)
Approximately 1 km or more	12 (15)
Walking distance with assistive device, n=83	
Not at all, 0 m	5 (6)
A few metres	15 (18)
Approximately 100 m	14 (17)
Approximately 1 km or more	49 (59)
Ability to rise from a chair, n=83	
Yes, without any difficulty	64 (77)
Yes, with difficulty	17 (21)
No, not at all	2 (2)
Ability to move around in my home, n=81	
Yes, without any difficulty	65 (80)
Yes, with difficulty	12 (15)
No, not at all	3 (4)
Not applicable	1 (1)
Ability to walk on uneven ground/roads, n=82	
Yes, without any difficulty	48 (59)
Yes, with difficulty	28 (34)
No, not at all	6 (7)
Ability to walk up and down a hill, n=80	
Yes, without any difficulty	17 (21)
Yes, with difficulty	46 (58)
No, not at all	16 (20)
Not applicable	1 (1)
Ability to walk on stairs, n=79	
Yes, without any difficulty	30 (38)
Yes, with difficulty	34 (43)
No, not at all	13 (17)
Not applicable	2 (3)
Ability to get in and out of a car, n=80	
Yes, without any difficulty	45 (56)
Yes, with difficulty	31 (39)
No, not at all	3 (4)
Not applicable	1 (1)
Ability to and get in and out of a bus, n=79	
Yes, without any difficulty	44 (56)
Yes, with difficulty	29 (37)
No, not at all	5 (6)
Not applicable	1 (1)
I have the possibility to access the workshop (distance, transport, costs or availability, lack of assistance), n=83	
Completely true	24 (29)
Sometimes true	42 (51)
Completely false	17 (20)

prosthesis or orthosis. More than half had difficulties or were unable to ambulate up and down hills or on stairs. More than 90% had the ability to travel by car or by bus, although some had difficulty in doing so. Despite the ability to use public transport, lack of finances to pay for transport, accommodation and costs associated with the device were common barriers to accessing prosthetic and orthotic services (Table III). Patients with above-knee assistive devices had more difficulty walking on stairs than patients with below-knee assistive devices (79% vs 44%, $p=0.001$). Rising from a chair was more difficult for orthotic patients than prosthetic patients (44% vs 17%, $p=0.02$), so too was the ability to move around in the home (35% vs 15%, $p=0.05$). Patients living in urban areas had significantly more difficulties walking on uneven ground (53% vs 31%, $p=0.05$).

Satisfaction with assistive device and service

The results of QUEST showed that patients were quite satisfied with their assistive device. The total mean score was 3.9 (SD 0.7). Patients were also quite satisfied, or very satisfied, with the services received, with a total mean score of 4.4 (SD 0.7) (Table IV). No significant difference in level of satisfaction in subscale score for assistive device and service was found between female and male patients, between patients living in rural or urban areas, or between prosthetic patients and orthotic patients. A statistically significant difference was found regarding satisfaction with service between patients with below-knee assistive devices compared with those using above-knee assistive devices. Patients using below-knee devices (median 4.8) were more satisfied than patients using above-knee devices (median 4.3, $p=0.02$).

Patients reported high levels of satisfaction regarding training received, coordination between professionals, cosmetic look of the device and ease of keeping their assistive device clean (Table IV). Prosthetic patients were more satisfied with training than orthotic patients (median 5 vs 4, $p=0.001$). Prosthetic patients were also more satisfied with the coordination of rehabilitation professionals than orthotic patients (median 5 vs 4, $p=0.01$).

Patients were asked to choose what they considered to be the 3 most important items among the 12 items included in the QUEST. They reported that access to repairs and servicing of their assistive device was most important, followed by durability of the assistive device and provision of follow-up services (Table V). Weight and comfort were seen as less important.

Manifest content analysis was performed on 418 comments related to problems with their assistive device and service delivery (Table V). Seventy-five percent of the comments were from the QUEST items in the questionnaire. The majority of comments related to problems associated with comfort, that is, they experienced pain when using their assistive device ($n=99$), and the patients experienced limitations in effectiveness of their assistive device. The most common examples given were that they could not walk long distances or uphill with their assistive devices ($n=55$) and that they experienced problems with the dimensions of the device, including height, socket size and width ($n=41$). Many patients made comments

Table IV. Results of patients' level of satisfaction of assistive device and service

Response scale 1–5	Mean	
	n	(SD) Median
<i>Satisfaction assistive device</i>		
Q1. How satisfied are you with the dimensions of your assistive device?	82	3.7 (1.1) 4
Q2. How satisfied are you with the weight of your assistive device?	82	4.0 (1.1) 4
Q3. How satisfied are you with the ease in adjusting the parts of your assistive device?	82	4.1 (1.3) 5
Q4. How satisfied are you with how safe and secure your assistive device is?	82	3.7 (1.2) 4
Q5. How satisfied are you with the durability of your assistive device?	78	4.1 (1.0) 4
Q6. How satisfied are you with how easy it is to use your assistive device?	82	3.9 (1.1) 4
Q7. How satisfied are you with how comfortable your assistive device is?	81	3.5 (1.3) 3
Q8. How satisfied are you with how effective your assistive device is (the degree to which your assistive device meets your needs)?	81	3.9 (1.2) 4
Assistive device, total score	82	3.9 (0.7) 4
<i>Satisfaction services</i>		
Q9. How satisfied are you with the service delivery program in which you obtain your assistive device?	82	4.4 (0.9) 5
Q10. How satisfied are you with the repairs and servicing provided for your assistive device?	77	4.6 (0.7) 5
Q11. How satisfied are you with the quality of the professional services you received for using your assistive device?	82	4.4 (1.0) 5
Q12. How satisfied are you with the follow-up services received for your assistive device?	73	4.1 (1.4) 5
Services, total score	80	4.4 (0.7) 5
<i>Complementary questions</i>		
How satisfied are you with the training you received with your assistive device?	81	4.4 (1.1) 5
How satisfied are you with the coordination of prosthetic and orthotic services with other rehabilitation professionals (physiotherapist, community based rehabilitation worker, doctor, others)?	81	4.4 (1.0) 5
How satisfied are you with, the looks/cosmesis of your assistive device?	82	4.4 (0.9) 5
How satisfied are you with how easy it is to keep your assistive device clean?	80	4.4 (1.0) 5

SD: standard deviation.

related to safety ($n=35$) and indicated that they felt insecure and were afraid of falling when using the assistive device. Patients also commented that lack of money was a problem ($n=20$). They indicated that they could not afford transport costs in order to access prosthetic and orthotic services.

Eighty-two percent said they could not afford to pay expenses associated with receiving the services, including costs for appliances, accommodation and travel. Patients were dependent on funding from extended family, non-governmental

organizations or the government hospital. Patients living in rural areas had a significantly higher inability to pay for costs associated with receiving the service and appliances than the patients living in urban areas (95% vs 68%, $p=0.01$). Fifty-eight percent answered “completely true” when asked if staff gave them the opportunity to express their views about their assistive device. Eighty-two percent of patients said they completely trusted and had confidence that the staff at the centre were able to deliver quality services.

Table V. The most important items in Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST) and comments related to problems according to the patients

Importance of items according to the patients	QUEST items	The most important items $n=246^a$ (%)	QUEST Comments related to problems $n=312^b$ (%)	All comments related to problems $n=418^c$ (%)
1	Repairs/servicing, Q10	44 (18)	12 (4)	12 (3)
2	Durability, Q5	29 (12)	18 (6)	18 (4)
3	Follow-up service, Q12	28 (10)	20 (6)	21 (5)
4	Easy to use, Q6	24 (10)	25 (8)	25 (6)
5	Safety, Q4	22 (9)	33 (10)	35 (8)
6	Effectiveness, Q8	18 (7)	45 (15)	55 (13)
7	Adjustment, Q3	18 (7)	21 (7)	21 (5)
8	Dimension, Q1	16 (7)	41 (13)	41 (10)
9	Professional service, Q11	13 (5)	9 (3)	27 (6)
10	Weight, Q2	13 (5)	22 (7)	23 (6)
11	Comfort, Q7	12 (5)	53 (17)	99 (24)
12	Service delivery, Q9	9 (4)	13 (4)	21 (5)
	Lack of money			20 (5)

^aPatients were asked to choose the 3 most important QUEST items.

^bComments related to problems/limitations in the QUEST questionnaire part.

^cAll comments related to problems in all parts of the questionnaire.

DISCUSSION

The main findings show that patients were quite satisfied with their assistive device and very satisfied with the prosthetic and orthotic services provided. Despite reporting high levels of satisfaction, long hours of use and a high level of mobility, a high percentage of patients reported pain and wounds associated with use of their device. Follow-up services were scored slightly lower in service delivery and more than half of the devices needed repairs or were completely broken. In order to access repairs and follow-up services patients must be able to use public transport. In conducting this study we have demonstrated that of those who participated 90% were physically able to manage public transport, but 82% of patients were unable to pay for transport to the prosthetic and orthotic centre. It is also important to note that, 3 out of 14 (21%) of those who did not attend gave transport as a reason for not being able to participate. This indicates that the true prevalence of being able to use public transport for patients with lower-limb assistive devices may be slightly lower than observed.

Studies conducted in Iran (5) indicate that prosthetic and orthotic patients are less satisfied than participants in the present study. In the Netherlands (6, 8) and the USA (7, 9, 10) patients were equally or less satisfied compared with patients in the present study. These studies did not, however, use the same instrument to measure satisfaction as used in this study. The high education level of staff in Malawi may have contributed to the high rates of satisfaction with the service delivery programme and the quality of service. Patients had received their prosthetic and orthotic services from a newly opened rehabilitation centre and the majority had not had access to services at all before this centre opened. Therefore, the high level of satisfaction can be related to previous experience and expectations (29) and the fact that many of the patients had not received any prosthetic and orthotic services at all before the centre opened.

It is interesting to note that in previous studies comfort, dimension (10) and appearance (5) have been reported as items with the lowest satisfaction score related to prosthetic and orthotic provision. In the present study, comfort and dimension were items which received low satisfaction scores when asked what was most important. Access to repairs, durability of the device and follow-up services were rated more highly than comfort.

Questions related to daily activities indicated that patients living in urban areas had less ability to ambulate on uneven surfaces than patients living in rural areas. This is probably due to the fact that rural patients are forced to walk and train on uneven ground. Approximately half of the patients had difficulties or could not manage at all when walking on stairs and in slopes. They also considered pain to be an issue when walking longer distances. To facilitate walking on uneven ground, on stairs and up and down hills, one must consider the design of the prosthetic or orthotic device. Design features that have been demonstrated to facilitate walking on uneven and sloped surfaces include increasing the range of motion permissible at the ankle joint (30, 31), and in the case of prostheses, performing a dynamic alignment on uneven and sloped surfaces (32). Polypropylene technology developed by ICRC often results in prosthetic and orthotic devices with rigid

ankles, which may explain some of the difficulties observed in this study regarding walking on slopes and stairs.

Satisfaction can be affected by several factors, including previous experience, life conditions and values of the individual and the society (29, 33). A qualitative study by Braathen & Kvam (34) including urban women in Malawi with different types of disabilities showed that they had been treated well and cared for by their closest family and friends. Loeb et al. (13) found that disability did not affect the role one plays within the immediate Malawian family. They also indicated that there was a lack of knowledge about disability in society and that disabled women often experienced negative attitudes and behaviours from society as a whole. Disabled women were found to have poorer living conditions than people without disabilities. This included poorer social and health conditions, a lower level of education and a lower rate of employment (13). This suggests that high levels of satisfaction observed in the present study may, in part, be attributed to support from close family and friends. Differences in satisfaction with services identified between patients with below-knee vs above-knee assistive devices could reflect the fact that producing above-knee assistive devices requires more complex biomechanical knowledge and clinical skills and therefore presents a greater challenge for the clinician, but the result may also be due to the level of impairment itself.

The questionnaire used in this study was translated to Chichewa by 3 rehabilitation staff and subsequently back-translated; however, no specific validation study of the Chichewa version of QUEST has been carried out. The questionnaire was received and understood well by patients. One challenge was the Chichewa word for "comfortable". In the Chichewa language the same word is used to describe both physical comfort and comfort in a social setting. In order to prevent misunderstanding the interpreter was instructed to explain that the question related only to physical comfort. One limitation was the ceiling-effect when measuring satisfaction of services with QUEST, and another was the relatively few patients in the study group. As a result, the power was relatively low to detect small differences between subgroups in the population. Multiple statistical tests were also carried out, increasing the likelihood of type 1 errors, and we cannot rule out the possibility that some of the observed statistically significant differences between groups were due to chance.

Findings from the present study have numerous implications for the continued provision of prosthetic and orthotic services in Malawi. The patients were, in general, very satisfied with both devices fabricated with polypropylene technology developed by ICRC and the service received from the category II educated staff. The design and manufacture of prosthetic and orthotic devices can be further improved in order to accommodate for ambulation on uneven surfaces, hills and stairs, as well as increasing patients' ability to walk long distances with reduced pain. Increased or simulated ankle joint range of motion, careful dynamic alignment, more optimal dimensions of assistive devices, and training could facilitate improvements desired by patients. In order to facilitate access to follow-up services financial support for transport is needed when patients can manage to reach the rehabilitation centre by public transport.

In conclusion, Malawian prosthetic and orthotic patients were quite satisfied with their assistive devices and very satisfied with the services they received, despite the fact that more than half of the assistive devices were in need of repair and many patients experienced pain while using their device. Costs associated with transport to and from the prosthetic and orthotic facility prevented them from receiving follow-up and repair services. The majority of prosthetic and orthotic patients in this study had increased mobility when using their assistive devices. Difficulties were experienced when walking up and down hills and on stairs. Few differences were observed when comparing groups.

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