USER SATISFACTION AND USE OF PROSTHESES IN ICRC'S SPECIAL FUND FOR THE DISABLED PROJECT IN VIETNAM

Wim H. van Brakel*, Peter A. Poetsma**, Phan Thanh Tam***, Theo Verhoeff****

ABSTRACT

This study investigated user satisfaction and prosthesis use in the ICRC/ SFD project in Vietnam. Clients who were satisfied with the use of their prosthesis were compared to those who were not. Similarly, those with no or light use (0-4 hours/day) were compared with those using the prosthesis more frequently. Multivariate logistic regression was done. Data on 818 clients were available for analysis. Their mean age was 52; 136 were women (16.6%). Only 54 reported to be unsatisfied (6.6%). The main factors negatively influencing user satisfaction were: prosthetic centre, occurrence of a problem, type of foot, pain and prosthesis needing replacement. Use of an outdoor walking aid, type of amputation, and use of another prosthesis, decreased use levels of the current prosthesis.

Most clients were satisfied with prosthesis provided and used it around 8 hours per day. The factors influencing user satisfaction or use levels could be used to further improve the quality of the project and the prostheses.These factors explained only part of the variation in satisfaction and use levels. Therefore, it is recommended that variables like activities of daily living, social participation, psychological factors and quality of life be included in future assessments.

INTRODUCTION

Amputation of limbs has saved many lives, but is also a source of significant disability, particularly in countries with a history of conflict. Lower limb amputation occurs most frequently, particularly due to mines and road traffic accidents. Even long after conflicts are resolved, people continue to be injured due to the large number of antipersonnel land mines and explosive remnants of war still in place. Vietnam has a large number of people who have

had a lower extremity amputation due to conflict, disease (e.g. leprosy) and, increasingly, road traffic accidents. This number was estimated to be 200,000 in 1996, with an annual increase of 3-4% (1). A very different estimate was reported in an internal briefing paper of the Special Fund for the Disabled (SFD) project. They estimated the prevalence of amputation in Vietnam to be 1 in 1,000 population, which would put the current figure at around 85.000 (2).

The professional field of prosthetics and orthotics has developed to advanced and high-tech standards in developed countries, with records of people using lower limb prostheses to run Olympic races and climb mountains like the Everest. At the same time, provision of prostheses in adequate quantities and of adequate quality to all those who need them in low-income countries remains a major challenge.

Vietnam has several major sources of prostheses and orthoses (P&O). Through a series of large rehabilitation centres, the Ministry of Labour, Invalids and Social Affairs of the Vietnamese government provides for the needs of mainly former North Vietnamese war veterans. The International Committee of the Red Cross' Special Fund for the Disabled (ICRC/SFD) supports these centres to facilitate access for other categories of amputees as well. Several other organizations are active in the prosthetics and orthotics (P&O) field, such as the VIETCOT school in Hanoi, the Vietnam Veterans of America Foundation (VVAF), Vietnam Assistance to the Handicapped (VNAH), Prosthetic Outreach Foundation (POF) and the Netherlands Leprosy Relief (NLR). In addition, there are centres from the Ministry of Health (MoH) and several private workshops.

The International Society for Prosthetics and Orthotics (ISPO) and the World Health Organisation (WHO) have developed quality standards and benchmarks for prosthesis in low-income countries. The WHO Technical Report Series No.100 listed the following criteria: (3)

1. Simplicity, ease of construction and possibility of local repair;
2. Durability;
3. Adaptability to local conditions of living and occupation; and
4. Inexpensiveness of primary cost and repair.

Jensen et al. have published quality benchmarks for trans-tibial prostheses and polypropylene sockets in terms of walking distance (>1 km at >85% of users), pain and discomfort (<10%), user satisfaction (>85%), good socket fit (>55%), misalignment (<15%), insufficient craftsmanship (<15%) and socket change needed (<15%) (4, 5). These are based on the performance of specialised P&O centres in Vietnam and Cambodia and refer to the polypropylene component and assembly system developed by the ICRC(6). This system has performed very well over the years and is now used widely throughout the developing world(7). Although, in most countries, the ICRC system relies on imported polypropylene, prosthetic components and pre-fabricated feet, the above criteria of simplicity, durability, adaptability and relatively low cost are met. The polypropylene components and prosthetic feet used in Vietnam and used for the clients of this study are produced locally. The ISPO has also developed ISO standards for assistive technology, which include manufacturing, description, classification and testing of prostheses and other devices.

While much has been written about the technical aspects and requirements of prostheses, appropriate technology and standards and methods of assessment, much less attention has been given to various user-relevant outcomes(8, 9). These include user satisfaction,(10, 11,12) activities of daily life(1, 13, 14), quality of life related to amputation and use of prostheses (9, 15, 16, 17, 18) and psychosocial outcomes, such as the impact of prosthesis use on social participation and psychological wellbeing(1,14,19). With the exception of the study by Matsen, none of these studies has addressed user-relevant outcomes in low-income countries.

The ICRC/SFD project in Vietnam has been actively involved in various quality studies. However, a detailed analysis of user satisfaction and prosthesis use, and the determinants related to these had not been done. Since technical performance in the project regarding production and craftsmanship were found to be above average(4), it was time to turn attention to user-centred outcomes. Data collected during routine assessment allowed an initial retrospective study of prosthesis use and user satisfaction, and their determinants, which is reported in this paper.

METHOD

The study used data collected in the ICRC/SFD Project in Ho Chi Min City (HCMC), Vietnam. All available records between 1st January 2002 and 31st December 2005 were

included. Although a follow-up element is involved, the study design was essentially cross-sectional.

During the study period, the ICRC/SFD-supported Rehabilitation Centres fitted prostheses for 8,315 people with a lower extremity amputation. Two months after fitting, as far as possible, recipients were contacted at home for a first follow-up assessment (FU1). A total of 5,640 people were checked during FU1 (68%). Of these, 176 people who had reported a problem (e.g. "I have pain", or "I can't use the prosthesis" due to a particular problem) requiring technical assessment (TA). They were invited for a TA at one of the seven centres, where their device had been produced. In addition, as a control group, a random sample of those who did not report a problem were also invited, to check whether the initial 'field assessments' had been carried out accurately. Care was given to achieve a 1:3 ratio of trans-femoral (TF) to trans-tibial (TT) amputees to ensure that an adequate number of TF amputees were included. Eighty-nine people with a problem showed up (51%), as did 729 of the control sample (64%). All TAs were done by a Category 1 prosthetist. Together these constituted the study sample.

Identification of eligible subjects and follow-up visits were carried out by the Vietnamese Red Cross Society (VNRC). Registration forms and follow-up questionnaires (FU1 and FU2) were administered by interview by volunteers of the respective provincial or district branch of the VNRC.

Data were collected at intake, initial follow-up and during subsequent TAs using standard questionnaires comprising client history, a small number of socio-demographic variables and a technical prosthetics assessment. The technical assessment carried out after fitting of the prosthesis comprised a review of clients' satisfaction with different aspects of the prosthesis and a technical assessment of the quality and 'fit' of the prosthesis itself. The latter included an assessment of the interface of the socket and residual limb, the length of the prosthetic leg compared to the other side, the alignment of the prosthesis, the fit of the socket and wear and tear of the various parts of the prosthesis (suspension strap/belt, socket lining, joint, if any, and foot).

Analysis

Data were entered in MS Access databases and analysed using Stata v.9.2. Frequency data are given as counts and percentages. We used means, standard deviations (SD) and 95% confidence intervals (95%CI) as summary measures for normally distributed parameters. The outcome measures are 'reported satisfaction with the prosthesis' and 'level of use'. For the former, the categories 'very satisfied' and 'satisfied' were combined and compared with those reporting to be 'unsatisfied' (see Table 1). For level of use, reported hours of daily use were divided in two categories, using the 25^{th} percentile as cut-off. No use or use up to four hours was labelled 'Light use' and >4 hours as 'Frequent use'. To examine the association between various possible determinants and, respectively, 'satisfaction' and 'use', the authors used univariate and multivariate logistic regression. The resulting odds ratios (OR) indicate the strength of the association, if any, between a determinant and an outcome measure (satisfaction or use). An OR above 1 indicates an increased 'likelihood of dissatisfaction' of a given variable category compared to the baseline category of that variable. An OR less than 1 indicates a decreased likelihood. In the 'use' analysis, the interpretation is the same, but related to the 'likelihood of a light use level'. Whether or not a subject belonged to the 'problem group' was included in the analysis as a possible determinant of user satisfaction and level of use.

Ethical considerations

The information used in this study was collected as part of the routine collection of the ICRC/SFD project in Vietnam. All clients took part in the project on a voluntary basis. Separate consent was therefore not required. Data analysis was done anonymously and no identifying information will be used or published in any report. The three co-authors have commissioned the study and are employed by the ICRC/SFD; the lead author (WvB), who also carried out the analysis is an independent research consultant specialising in disability-related research.

Table 1. Characteristics of the subjects in the ICRC/SFD prosthetics study (*N* = 818) at the time of the first technical assessment.

Variable		Frequency	Percentage
Centre			
	Thai Nguyen	18	2.2
	Ha Noi	70	8.6
	Thanh Hoa	76	9.3
	Vinh	90	11.0
	Da Nang	267	32.6
	Qui Nhon	183	22.4
	Can Tho	114	13.9
Sex			
	Men	682	83.4
	Women	136	16.6
Age group			
	9-40	137	16.8
	41-50	224	27.4
	51-60	249	30.4
	60+	208	25.4
Body build			
	Average	750	91.7
	Light	60	7.3
	Heavy	8	1.0
Environment			
	Urban	109	13.3
	Dry rural	432	52.8
	Wet rural	20	2.4
	Sea/water	49	6.0
	Mountain	208	25.4

Variable		Frequency	Percentage
Type of cause			
	Mine injury	396	48.4
	Gunshot/fragment	143	17.5
	Primary trauma	207	25.3
	Other	72	8.8
Prosthesis type			
	Trans Tibial	535	65.5
	Trans Femoral	253	30.9
	Through Knee	15	1.8
	Symes	15	1.8
Foot type			
	HCM 1+2	92	11.3
	BAVI	181	22.1
	Other	545	66.6
Cosmesis type			
	None	4	0.49
	EVA	1	0.12
	Polypropylene	807	98.7
	Polyurethane	4	0.49
	Other	2	0.24
Suspension type			
	Cuff/strap	514	62.8
	Supra condylar	4	0.49
	Thigh corset	18	2.2
	Silesian belt	253	30.9
	Suction	2	0.24
	Other	27	3.3

Variable		Frequency	Percentage
Days of physiotherapy	0	5	0.60
	1-3	259	31.6
	4-5	301	36.8
	6-7	170	20.8
	7+	83	10.2
No. of prostheses since amputation	1	165	20.2
	2	234	28.6
	3-4	296	36.2
	4+	123	15.0
Daily use (hrs)	0	7	0.86
	1-4	238	29.1
	5-8	214	26.1
	9-12	283	34.6
	13-16	76	9.3
Satisfaction with the prosthesis	Very satisfied	20	2.4
	Satisfied	744	91.0
	Unsatisfied	54	6.6
	Very unsatisfied	0	0
Load level of use	Very high (eg. farmer)	7	0.86
	High (e.g. walks a lot)	208	25.4
	Medium (office job)	446	54.5
	Low (mainly cosmetic)	157	19.2

Variable		Frequency	Percentage
Barefoot use			
	Yes	100	12.2
	No	606	74.1
	Mixed	112	13.7
Walking aids			
	None	254	31.1
	Canes	13	1.6
	Elbow crutches	500	61.1
	Axillary crutches	51	6.2
	Wheelchair	0	0
Walking aid use			
	None	256	31.3
	Indoor	411	50.2
	Outdoor	2	0.24
	Indoor and outdoor	149	18.2
Satisfied with shape			
	Very satisfied	10	1.2
	Satisfied	806	98.5
	Unsatisfied	2	0.24
Pain			
	None	804	98.3
	At rest	10	1.2
	While walking	4	0.49
	Both	0	

Variable		Frequency	Percentage
Prosthetic height difference (cm)	0	784	95.8
	1	22	2.7
	2	7	0.86
	3-4	5	0.61
Socket fit			
	Good	499	61.0
	Weak	221	27.0
	Poor	98	12.0
Alignment			
	Good	564	69.0
	Weak	160	19.6
	Poor	94	11.4
Repaired			
	No	606	74.1
	Yes	212	25.9
Replaced			
	No	760	92.9
	Yes	58	7.1

RESULTS AND DISCUSSION

The sample included 818 subjects who reported for the technical assessment; 136 women (16.6%) and the mean age was 52 (range 9-88). The mean number of days between fitting and the technical assessment was 125 (SD 86.4). The large majority of subjects was satisfied or very satisfied with the use of the prosthesis (93%, Table 1). The proportion of users who were dissatisfied was significantly higher among those in the problem group compared to the others, but not dramatically so (19.1% vs. 5.1%, $p<0.001$, Table 2). Load level and hours of daily use were not significantly different between these two groups (data not shown).

Table 1 shows details and frequencies of the 2 outcome variables and the possible determinants included in the analysis. Two-thirds of subjects had had trans-tibial amputation (65.5%). Almost all subjects had one or more days of physiotherapy after fitting of the prosthesis. 80% had had more than one prosthesis since amputation; 239 still had a spare prosthesis (29%), which they used on average 1.7 hours per day (95%CI 1.5-1.9), data not shown). The prosthesis under review was used for an average of 7.9 hours a day (95%CI 7.6-8.1), giving a total prosthesis use of 9.6 (95%CI 9.4-9.8) hours per day. The cause of the injury leading to amputation was war-related in 65.9% and due other trauma in another 8.8%. About two-thirds of the subjects used a walking aid; of these, 411 (73%) used it indoor only. The large majority was satisfied with the shape of the prosthesis and less than 2% reported pain. The technical assessment revealed problems of a technical nature in 166 subjects (20%, total not shown). These included a height difference of >2 cm (0.6%), and/or a poor socket fit (12%) and/or poor alignment (11%). One quarter of the subjects needed a prosthesis repair, while a replacement was needed in 7.1%.

Table 2. Associations between level of user satisfaction and characteristics of subjects and their prostheses in the ICRC/SFD prosthetics study (*N* = 818), assessed at the time of the first technical assessment.

Factor	Not satisfied (*N* = 54)	Satisfied* (*N* = 764)	Univariate analysis**	Multivariate analysis***
Cause of injury				
Mine injury	12 (3.0)	384 (97)	1	
Gunshot/fragment	10 (7.0)	133 (93)	2.4 (1.0-5.7)	1.4 (0.49-4.2)
Primary trauma	25 (12)	182 (88)	4.4 (2.2-8.9)	**2.8 (1.0-7.8)**
Other	7 (9.7)	65 (90)	3.4 (1.3-9.1)	**3.7 (1.1-13)**
Centre				
Da Nang	6 (2.3)	261 (98)	1	
Thanh Hoa	15 (21)	55 (79)	12 (4.4-32)	**11 (2.8-41)**
Thai Nguyen + Vinh	3 (3.2)	91 (97)	1.4 (0.35-5.9)	0.427 (0.06-3.0)
Ha Noi	17 (19)	73 (81)	10 (3.9-27)	**16 (2.8-87)**

Qui Nhon	10 (5.5)	173 (95)	2.5 (0.90-7.0)	1.8 (0.53-5.9)
Can Tho	3 (2.6)	111 (97)	1.2 (0.29-4.8)	3.2 (0.64-16)
Sex				
Women	8 (5.9)	128 (94)	1	
Men	46 (6.7)	636 (93)	1.2 (0.53-2.5)	
Age group				
9-40	13 (9.5)	124 (91)	1	
41-50	17 (7.6)	207 (92)	0.78 (0.37-1.7)	
51-60	16 (6.4)	233 (94)	0.66 (0.31-1.4)	
60+	8 (3.9)	200 (96)	0.38 (0.15-0.95)	
Daily use (hrs)				
0-4	29 (12)	216 (88)	1	
5-8	11 (5.1)	203 (95)	0.40 (0.20-0.83)	
9-12	11 (3.9)	272 (96)	0.30 (0.15-0.62)	
13-16	3 (4.0)	73 (96)	0.31 (0.09-1.03)	
Use of additional prosthesis (in hrs)	****	****	1.1 (1.05-1.2)	**1.5 (1.1-2.1)**
Suspension type				
Cuff/strap	23 (4.5)	491 (96)	1	
Silesian belt	26 (10)	227 (90)	2.4 (1.4-4.4)	**3.2 (1.5-6.8)**
Other	5 (9.8)	46 (90)	2.3 (0.84-6.4)	0.96 (0.27-3.4)
Foot type				
HCM 1+2	2 (2.2)	90 (98)	1	
BAVI	21 (12)	160 (88)	5.9 (1.4-26)	3.3 (0.50-21)
Other	31 (5.7)	514 (94)	2.7 (0.64-12)	**9.6 (1.7-53)**
Socket fit				
Good	15 (3.0)	484 (97)	1	
Weak	17 (7.7)	204 (92)	2.7 (1.3-5.5)	1.9 (0.81-4.4)
Poor	22 (22)	76 (78)	9.3 (4.6-19)	**2.7 (0.97-7.4)**

Alignment				
Good	26 (4.6)	538 (95)	1	
Weak	11 (6.7)	149 (93)	1.5 (0.74-3.2)	
Poor	17 (18)	77 (82)	4.6 (2.4-8.8)	
Pain				
No	49 (6.1)	755 (94)	1	
Yes	5 (36)	9 (64)	2.9 (1.7-5.1)	**7.6 (1.7-35)**
Problem				
No	37 (5.1)	692 (95)	1	
Yes	17 (19)	72 (81)	4.4 (2.4-8.2)	**4.6 (2.0-11)**
Replaced				
No	38 (5.0)	722 (95)	1	
Yes	16 (28)	42 (72)	7.2 (3.7-14)	**4.2 (1.5-12)**

* Number (row percentage); ** Odds ratios (logistic regression) + 95% confidence limits; *** Odds ratios adjusted for the effect of all factors with an independent effect in the final model (last column; included if p <0.10); **** This variable was fitted in the model as a continuous variable, so no breakdown in categories can be given. The odds ratio indicates the increase in risk of dissatisfaction for every hour of use of the additional prosthesis.

The associations between user satisfaction and multiple possible determinants are explored in Table 2. Except for the variable 'sex', only those with a significant association in the univariate analysis are shown. When adjusting for the combined effect of all other factors, the association with older age, hours of daily use and poor alignment disappear, indicating that they were due to confounding. Compared to those with an amputation due to landmine injury, people who suffered a non-violent trauma or other cause were more likely to be dissatisfied. A strong association was found between satisfaction and the centre that had supplied the prosthesis. Clients from the Rehabilitation Centres in Thanh Hoa and Ha Noi were much more likely to be dissatisfied than others. Having a Silesian belt suspension, a type of foot other than the HCM or the BAVI, a weak or poor socket fit, pain, having a problem with the prosthesis, or having needed a replacement prosthesis also increased the

likelihood of dissatisfaction very significantly. Just over a third of variation in user satisfaction was explained by these factors.

Table 3. Associations between 'prosthesis use level' and characteristics of subjects and their prostheses in the ICRC/SFD prosthetics study (*N* = 818), assessed at the time of the first technical assessment.

Sign	Light* (0-4 hrs/d) (*N* = 245)	Frequent (>4 hrs/d) (*N* = 573)	Univariate analysis**	Multivariate analysis***
Sex				
Women	34 (25)	102 (75)	1	
Men	211 (31)	471 (69)	1.3 (0.88-2.0)	
Age group				
9-40	35 (26)	102 (74)	1	
41-50	63 (28)	161 (72)	1.1 (0.70-1.8)	
51-60	73 (29)	176 (71)	1.2 (0.75-1.9)	
60+	74 (36)	134 (64)	1.6 (1.0-2.6)	
User satisfaction				
Not satisfied	29 (54)	25 (46)	1	
Satisfied	216 (28)	548 (72)	2.9 (1.7-5.1)	**2.2 (1.0-4.7)**
Environment				
Urban	25 (23)	84 (77)	1	
Dry rural	136 (32)	296 (69)	1.5 (0.95-2.5)	1.5 (0.83-2.9)
Wet rural/sea/water	25 (36)	44 (64)	1.9 (0.98-3.7)	**3.0 (1.3-7.1)**
Mountain	59 (28)	149 (72)	1.3 (0.78-2.3)	1.5 (0.77-3.1)
Walking aid use				
None	60 (23)	196 (77)	1	
Indoor	107 (26)	304 (74)	1.1 (0.80-1.7)	1.0 (0.63-1.6)
Outdoor	78 (52)	73 (48)	3.5 (2.3-5.4)	**6.0 (3.3-11)**

Prosthesis type				
Trans Tibial	129 (24)	406 (76)	1	
Trans Femoral	106 (42)	147 (58)	2.3 (1.7-3.1)	**3.1 (2.0-5.0)**
Through Knee	5 (33)	10 (67)	1.6 (0.53-4.7)	1.9 (0.43-8.2)
Symes	5 (33)	10 (67)	1.6 (0.53-4.7)	**4.8 (1.3-18)**
Spare prosthesis				
No	93 (16)	486 (84)	1	
Yes	152 (64)	87 (36)	9.1 (6.5-13)	**25 (15-40)**
Pain				
No	237 (29)	567 (71)	1	1
Yes	8 (57)	6 (43)	1.8 (1.0-3.0)	3.1 (0.82-12)
Socket fit				
Good	134 (27)	365 (73)	1	
Weak	74 (33)	147 (67)	1.4 (0.97-1.9)	1.5 (0.98-2.4)
Poor	37 (38)	61 (62)	1.7 (1.0-2.6)	**2.5 (1.2-5.0)**
Replaced				
No	228 (30)	532 (70)	1	
Yes	17 (29)	41 (71)	0.97 (0.54-1.7)	**0.40 (0.17-0.96)**

* Number (row percentage); ** Odds ratios (logistic regression) + 95% confidence limits; *** Odds ratios adjusted for the effect of all factors with an independent effect in the final model (last column; included if p <0.10)

Table 3 shows results of a similar analysis exploring associations between the level of use of the prosthesis and possible determinants. Men appeared to be more likely than women to use their prosthesis frequently, while older age had a opposite effect. However, neither was statistically significant in multivariate analysis. Subjects who were satisfied with their prosthesis were twice as likely to report frequent use as those who were not satisfied, while amputees living in a wet environment were less likely to use their prosthesis frequently than those living in other environments. Having a trans-femoral or Symes prosthesis, needing to use a walking aid outdoor, or a poor socket fit all increased the likelihood of only light use levels 2.5-6 times.

The strongest determinant of frequency of use of the current prosthesis was possession and use of a second prosthesis (sometimes more than one). Sixty-two percent of the light users also used another prosthesis for 2-14 hours per day, while this percentage was only 15% among those with frequent use (data not shown). Finally, replacement of the prosthesis significantly increased the likelihood of frequent use.

DISCUSSION

An important finding of this study is the high percentage of clients who report to be satisfied with their prosthesis (93%). This is well above the published benchmark of 85% and is to the credit of the dedicated and technically highly-skilled staff of ICRC/SFD-supported centres in Vietnam. The figure is higher than the 87% found by Matsen,(1) but slightly less than in a previous study involving the ICRC/SFD Rehabilitation Centre in HCMC(4), but these differences are possibly due to the fact that the latter study only involved clients with a trans-tibial amputation.

It is possible that this study sample was biased towards clients more satisfied than average, since 38% of those invited did not show up for evaluation. If these were, on average, less satisfied than those who did come for assessment, this type of bias would have occurred. In addition, although the interviews were done by people not directly connected to the project (Red Cross volunteers), it is possible that some people reported favourably about the prosthesis, because they wanted to please the interviewer. However, the opposite is also possible: people experiencing problems might have used the opportunity to get this sorted out by coming for an assessment. The fact that the current satisfaction figures are similar to those found before among clients from similar centres would indicate that the bias, if any, is not very different from that in other studies. It should be noted that the satisfaction and use level are user-reported data that may or may not concur with the professional opinion of the prosthetist about the quality of the prosthesis. In some cases, people appear satisfied with their prosthesis, while the prosthetist is of the opinion that the prosthesis is not technically optimal. In that situation, the user's view is respected and accepted.

Subjects used a prosthesis close to 10 hours per day on average, of which the current ICRC/SFD prosthesis accounted for almost 8. This is similar to the 9 hours in the study of Verhoeff et al. (6) and to the levels of use in two US-bases studies (11.4 and 10.1, respectively)(10,11).

It is significantly less than in the studies of Matsen (12.7),(1) Jensen (4) and Dougherty (14.1)(9). The differences may be due to age of the subjects. Those in the series of Jensen were around 10 years younger. Perhaps also, the much larger sample in the current study reflects better the wider range in use seen in every day life. Multivariate analysis showed that use of an additional prosthesis was associated with a decrease in satisfaction, which is understandable (Table 2). If a prosthesis fits poorly, causes pain or has other problems, users are likely to rely more on another prosthesis they may have available.

The current study may be the first to explore the combined effect of determinants of satisfaction and prosthetic use among users in a low-income country using multivariate analysis. The apparent association with older age turned out to be due to confounding. It is not clear why people with an amputation due to landmine injury were more likely to be satisfied than people who suffered a non-violent trauma or other causes. Possibly the latter included more people with stump problems giving rise to dissatisfaction, such as wounds due to sensory loss (e.g. after leprosy or diabetes), but the available data did not allow further exploration. Having problems with the prosthesis, either in terms of a poor socket fit or other problem requiring replacement, or in terms of pain all had a strong negative effect on satisfaction. The type of foot affected user satisfaction, but further exploration will be needed to understand the reasons behind this. There was a substantial variation in satisfaction between centres, with two centres accounting for almost half of those reporting to be dissatisfied (see Table 2).

An important proxy measure for utility and user satisfaction is level of use, measured as 'use in hours per day'. Such a measure was included in almost all studies that looked at user satisfaction. An alternative is the distance a user can walk with or without walking aids. This is the principle behind the Harold Wood/Stanmore 6-grade mobility scale for prosthesis users.(7,13) Possible associations were examined between the level of use of the prosthesis (light vs. frequent) and possible determinants. Prosthesis use in a wet environment is a known challenge for prosthesis users in agricultural settings in many countries (3, 8). Also in this study, people living in a wet environment were less likely to use their prosthesis frequently than those living in other environments. Environment should be taken into account in choosing the type of prosthesis, type of foot and in the training provided to users.

Users with a trans-femoral (TF) or Symes amputation, and those needing to use a walking aid outdoor used their prosthesis less frequently than others. People with a Symes may still

be able to walk on the stump itself, without a prosthesis, explaining the less frequent use. In addition, socket fit and alignment were relatively often indicated to be 'weak' or 'poor' in this group (data not shown). It is interesting to note that the association between having a Symes prosthesis and use level was significant only in multivariate analysis, indicating that one or more other factors confound this association. It is understandable that people with TF amputation used their prosthesis less often, since its use is more complicated and involves significantly higher energy consumption than use of a below-knee prosthesis (20, 21, 22). However, the level of amputation itself had no independent effect on user satisfaction. Instead, users of prostheses fitted with a Silesian belt suspension were less likely to be satisfied. Since a Silesian belt is only fitted on TF prostheses, this is likely to act as a proxy for having a TF prosthesis. In the use level analysis, the reverse was observed: only TF type prosthesis and not suspension type was negatively associated with use level. Better mobility among users of trans-tibial prostheses compared to trans-femoral was also found by Davies and Datta (13) in a UK-based study. In the US-based study by Dillingham et al., however, the level of amputation did *not* seem to affect satisfaction (10). As expected, pain or a poor socket fit also had a significant negative effect on use levels. Possession and use of another prosthesis was by far the strongest determinant of use level of the current prosthesis. Possession and use of sometimes multiple prostheses has been reported before (1, 6). Users in developed countries often have regular prosthesis replacements, but this is a luxury in many other countries. Use of another prosthesis is not necessarily a sign of dissatisfaction with the current prosthesis. Sometimes the new or 'better' prosthesis is kept for occasions when appearance or better function is important. Clearly, a well-fitting, new prosthesis promotes use. This is probably the reason that replacement of the prosthesis significantly increased the likelihood of frequent use.

Despite the fact that nine factors were found with a significant independent influence on user satisfaction, their joint effect explained only 35% of the observed variation in satisfaction. The same was true for level of use. The seven factors that played a role here together only accounted for 32% of the variation in use. This indicates that other factors not included in the current study to play a major role. These may be activities of daily living, also other than mobility (1, 23), psychosocial factors, such as social participation (24, 25), body image, coping and adjustment and psychosocial well-being (19, 26) and quality of life (14, 15, 17, 19).

Participation as conceptualised in the International Classification of Functioning, Disability and Health (ICF, WHO 2001) and quality of life (QoL) are well-established outcome measures in themselves.

Employment, a component of the participation domain of the ICF, is known to be an important determinant of perceived quality of life. This has also been shown to be true among people with amputations (14). To date, studies on employment and QoL have been done almost exclusively in developed countries. However, work and employment are recognised to be an important component of social participation, also in low-income countries (24). Among the current study subjects, work did not seem a major problem, since 75% of those up to 60 reportedly to have a job. The study was not able to explore whether prosthesis use affected type of work or income levels compared to the general population. The former was found the be an issue in the study of Schoppen et al (14).

Instruments to measure participation (including employment and income) have become available only recently (24, 27, 28). QoL has already been shown to be highly relevant in relation to prosthetic use (14, 16, 17, 29). In future, use of the above standard instruments in routine assessments of prosthesis clients will improve the quality of the project, particularly from the users' perspective.

CONCLUSION

1. The large majority of subjects were satisfied or very satisfied with prosthesis provided through the ICRC/SFD project and used it around 8 hours per day.
2. Several factors were identified that strongly influenced user satisfaction or use levels. Most of these are amenable to change, so could be used to further improve the quality of the project and the prostheses.
3. The factors examined only explained a small part of the variation in satisfaction and use levels. Therefore, it is recommended that other variables, such as activities of daily living, social participation, psychological factors and quality of life be included in future assessments.

*Address for correspondence
ICRC Special Fund for the Disabled
19, Avenue de la Paix, 1202 CH Geneva
+4122 730 2357, tverhoeff@icrc.org
www.icrc.org/fund-disabled

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