

Thearith Heang et al.

A prosthetics fitting camp, Cambodia

This online first version has been peer-reviewed, accepted and edited,
but not formatted and finalized with corrections from authors and proofreaders

Quality and user satisfaction scores for prosthetic limbs provided in a fitting camp, Cambodia

Thearith Heang,^a Sisary Kheng,^a Maggie Donovan-Hall,^b Amos Channon,^c Alex Dickinson^d & Carson Harte^e

^a Exceed Cambodia, Phnom Penh, Cambodia.

^b School of Health Sciences, University of Southampton, Southampton, England.

^c Department of Social Statistics and Demography, University of Southampton, Southampton, England.

^d School of Engineering, University of Southampton, Southampton, England.

^e Exceed Worldwide, Lisburn Square, Lisburn, BT28 1TS, Northern Ireland.

Correspondence to Carson Harte (email: carson@exceed-worldwide.org).

(Submitted: 28 February 2025 – Revised version received: 4 August 2025 – Accepted: 11 August 2025 – Published online: 30 October 2025)

Abstract

Objective To evaluate prosthetic devices delivered during an intensive fitment camp in Cambodia, considering device quality and client satisfaction.

Methods We conducted an observational cohort study in which we assessed prosthetic devices produced and delivered by an international nongovernmental organization at an intensive fitting camp. We conducted our assessment in two stages: at prosthetic device provision using a checklist to assess device quality and client satisfaction at discharge, and at 3-month follow-up using a telephone interview to assess the client's device usage and preference for a future device.

Findings We found that many of the devices fitted at the camp failed to meet International Society for Prosthetics and Orthotics standards. Assessments revealed dissatisfaction with workmanship (33%; 175/525), fit (57%; 297/525) and function (26%; 139/525). At follow-up, 36% of clients (115/321) reported discomfort or pain. Most clients (78%; 238/305) stated preference for a domestically-produced device in future. Most clients (81%; 253/313) reported using their new device not very often, rarely or never, whereas 88% (243/277) of clients with a previous device reported using that device often or always. At least 29% (93/321) continued to use a previous device that they had described earlier (during the camp) as unused, broken, painful, or poorly fitting.

Conclusion Our findings indicate that shortcomings in quality and satisfaction of the studied prosthesis system persist as many clients rely on an inadequate or potentially dangerous prosthesis. The findings also raise new questions about client selection and the effective use of funding for the intensive camp provision format.

Introduction

Functional limb prostheses (artificial legs and arms) can greatly enhance the lives of individuals with amputation by improving mobility, fostering independence and enabling social participation.^{1–4} However, in low-resource settings, particularly those affected by humanitarian disasters, conflicts or landmine legacies, the unmet need for prosthetics and orthotics is disproportionately high.^{5,6}

Short-term initiatives such as prosthetic and orthotic fitting camps aim to address such unmet need by providing devices to large numbers of individuals during intensive sessions, a similar principle to vaccination camps. These camps are distinct from mobile services operated by local prosthetic providers,⁷ as they are typically funded and delivered by nongovernmental organizations (NGOs) who often operate internationally. Although such camps are well intentioned, the International Society for Prosthetics and Orthotics has raised concerns around the standard of device design, quality of fabrication and adequacy of aftercare.⁸ Potential harm may arise from delivering devices without sustainable care plans, which can negatively affect both individuals and existing local services. The society's definition⁹ of appropriate technology in prosthetics and orthotics stresses that prosthetic rehabilitation services should ensure proper fit and alignment based on sound biomechanical principles, meet individual needs and remain both affordable and sustainable with local resources. Notable examples of established devices include the polypropylene technology limbs introduced by the International Committee of the Red Cross^{10–12} and devices produced by the India-based NGO Jaipur Foot.¹³

Following the Viet Nam War (1955–1975), Cambodian Civil War (1967–1975) and subsequent genocide under the Khmer Rouge regime (1975–1979), Cambodia serves as a compelling case study of positive results from international support, for example for landmine clearance as well as physical rehabilitation and associated community services. Although the Cambodian government reportedly struggled to manage a multitude of other external health interventions,¹⁴ NGOs operating in the country have successfully established sustainable, locally-managed prosthetics and orthotics services.

Between the late 1980s and early 1990s the original Jaipur Foot devices were replaced with polypropylene technology devices from the International Committee of the Red Cross; around the same time, training from the International Society for Prosthetics and Orthotics and the World Health Organization (WHO) became available. The polypropylene devices are often used with domestically-produced rubber feet which are well designed and tested;

although somewhat heavy, these feet have excellent longevity, even with barefoot walking.¹⁵ By 2023, Cambodia's physical rehabilitation network comprised 11 centres run by the Cambodian government and international NGOs, all using the standardized polypropylene technology devices mentioned earlier.

At the time of writing, Jaipur Foot reports having held 111 on-the-spot prosthetic fitting camps since 1975 across 44 countries in Africa, Asia and Central and South America.¹⁶ In March 2023, Jaipur Foot organized an intensive prosthetic limb fitting camp near the city of Sisophon in Cambodia's Banteay Meanchey Province, near the Cambodia–Thailand border. Following diplomatic discussions with the Indian Embassy, the Cambodian Mine Action and Victim Assistance Authority requested that the authors independently assess the Jaipur Foot prosthetic devices fitted by visiting technicians during the camp. In this paper we outline how we responded to this request, evaluating the quality of devices delivered as well as client satisfaction.

Methods

We use the Strengthening the Reporting of Observational Studies in Epidemiology cohort study guidelines to report this study.¹⁷ Ethical approval for data collection was granted by the National Ethics Committee for Health Research in Cambodia (ref.160) and approval for analysis was granted by the University of Southampton Ethics and Research Governance Office (ref.102303).

Study design

Our study design was tailored to assess outcomes and user experiences during and after an intensive fitting camp. We were permitted to conduct assessments but not to intervene, so our cohort study was purely observational.

We invited all clients attending the camp to participate. We evaluated service quality and client satisfaction using a two-stage approach. The first stage included a standardized assessment of device quality, completed jointly by a prosthetist and the client immediately after device fitting and discharge (that is, at device delivery). The second stage, 3 months later, involved a telephone interview with the client.

Stage 1: device delivery

International Society for Prosthetics and Orthotics-certified prosthetist–orthotist clinicians from the Cambodian School of Prosthetics and Orthotics completed a device assessment procedure and checklist, administered via a Microsoft Form (Microsoft, Redmond, United

States of America). The assessment procedure and checklist were based on those used at device assessment in Cambodian physical rehabilitation centres (online repository),¹⁸ and reflect the professional standards used by the Cambodian School of Prosthetics and Orthotics to assess a final-year prosthetist–orthotist students’ skills and readiness to graduate and gain International Society for Prosthetics and Orthotics-certification. The checklist included twelve questions, evaluating five factors associated with device quality (workmanship, socket fit, height, dynamic gait and alignment, and residual limb condition) and seven factors related to client acceptance (comfort and stability, adequacy of suspension and straps, independent use, client’s needs, cosmesis [aesthetic appearance], device care, and satisfaction). Finally, the clinicians provided further comments on the assessment form, allowing a summary of their observations and any additional detailed comments made to them by the clients. Pairs of clinicians from a team of nine assessed device quality. Each pair included a senior prosthetist (more than 15 years’ experience) and a second prosthetist (minimum of 5 years’ experience). These assessors had no prior knowledge of the clients and were independent from the technicians that provided the devices.

Stage 2: follow-up interviews

Three months after device delivery, five of the prosthetists involved in stage 1 conducted follow-up telephone interviews with consenting, contactable clients. Interviews were semi-structured, with questions focused on the status and frequency of use of the new device, the ongoing use of any previous device, and client preferences for a future device. The 3-month follow-up period was chosen as sufficient for the client to get used to their new prosthesis.

Data analysis

To maintain objectivity and reduce researcher bias, three authors who did not participate in data collection conducted the data analysis.

Stage 1: device delivery

We coded data from the positive and negative responses to the twelve checklist questions and analysed the data using descriptive statistics. We included categories for missing data. We analysed open-ended responses using content analysis,¹⁹ an established way to categorize text and summarize response frequencies. For coding, we treated each response as a separate unit and assigned a descriptive code based on content. We then organized codes into a coding frame which we used to analyse related responses; we added new codes if existing codes did not adequately capture the content. We used the final coding frame to systematically code the data and determine the frequency of responses. Two authors discussed and revised the coding

process and tentative categories throughout the analysis. Consensus was high, with only minor modifications needed.

Stage 2: follow-up interviews

We coded data from the telephone follow-up interviews into categories representing device status, use level and preference. We then analysed data using descriptive statistics.

Results

Stage 1: device delivery

The team completed device delivery assessments for 532 individual clients who received a total of 542 devices. Data were collected for all except six clients who left the camp before they could be spoken to. We left nine orthotic devices out of the subsequent analysis, leaving 533 prosthetic limbs prescribed to 525 individual clients (Table 1).

The median age was 59 years (interquartile range, IQR: 54–64). Clients were predominantly male, the most common amputation level was transtibial, and the most common cause of amputations was landmine or other weapon or ordnance injury. The median time since last device delivery was 5 years (IQR: 3–11). All except five clients consented to be followed up.

Device delivery assessments (Fig. 1 and Table 2) identified several areas in which the new devices did not meet safety, workmanship and client satisfaction criteria. Examples of poor workmanship and cosmetic appearance are shown in Fig. 2. Overall, the clients' opinion was more positive than the prosthetists'; notably, nearly two-thirds of clients (286/453) who already had a device were not sufficiently satisfied with the new device to give up their previous device.

Analysis of open-ended comments

Content analysis of free-text responses made by clinicians at device delivery in the open-ended section of the assessment form (Table 3) revealed a wide range of reasons for client dissatisfaction and highlighted inadequacies associated with use and mobility, cosmesis and finish, device fit and client experience. Such inadequacies are consistent with the quality assessment of devices and photographic evidence (Fig. 2). Clinicians reported gait deviations (139/525; 26%), wrong height (110/525; 21%) and poor alignment (66/525; 13%). The majority also reported observing, or the client reporting, a socket fit that was either too loose (230/525; 44%) or too tight or high pressure (67/525; 13%), and with poor finishing (175/525; 33%), for example, with pen marks, exposed rivets, sharp trim lines and unadhered

rubber cosmeses. Nevertheless, the clinicians reported that some clients commented positively on the device's light weight (51/525; 10%).

Stage 2: follow-up interviews

Between 25 May 2023 and 12 June 2023, 327 clients were contacted and completed a follow-up telephone interview. Clients that did not answer the telephone despite multiple attempts or that had telephone numbers that were found to be incorrect were considered as lost to follow up. Responses for six clients who were orthosis users were set aside, leaving 321 prosthesis user clients followed up.

Analysis of interview questions at the follow-up, excluding missing data, showed that a total of 140 (44%) clients considered their new device comfortable or somewhat comfortable, compared to 115 (36%) not comfortable or painful (Table 4 and online repository).¹⁸ Six reported the new device was broken.

Of the clients able to compare between new and previous devices, 12% (35/292) said they could walk further and faster with the new device compared to 81% (236/292) who selected their previous device, while 7% (21/292) reported both devices were similar (Table 4 and online repository).¹⁸ Most clients who could compare said they would prefer a domestically-produced Cambodian device in future (78%; 238/305).

Finally, we assessed clients' usage of both the new and previous prosthetic devices at 3-month follow-up (Table 4 and Fig. 3). Most respondents (253/313; 81%) reported never, almost never or rarely using their new device, or using it for short periods, some days, or not very often, while 60/313 (19%) reported always using their new device. Asked about their previous device, of clients who still had one, 243/277 (88%) reported using it always, often or most of the time. A high proportion who had a previous device at the camp visit had reverted to using it always, often or most of the time across all previous device condition categories (Fig. 4). Of clients whose previous device was damaged or worn out, only 28% (27/96) were using their new device all the time.

Discussion

Our study was conducted at the request of the Royal Government of Cambodia's Mine Action and Victim Assistance Authority following the organization of a camp providing Jaipur Foot devices. We found that the outcomes did not meet International Society for Prosthetics and Orthotics benchmarks, which include 95% compliance, 90% satisfaction, 60% good socket fit (including a maximum of 10% needing socket change), 90% acceptable

alignment and 90% good craftsmanship.^{20,21} In conventional Cambodian physical rehabilitation centres, devices failing any of the twelve quality or satisfaction checks assessed in this study at delivery would be reworked, especially when failures might lead to poor function or potential injury, for example by modifying to correct the device's fit, length or alignment. Additionally, the outcomes were less favourable than those reported in multiple other low-resource settings.¹⁵

While the Jaipur Foot devices used in fitting camps meet many mechanical, social and cultural-specific needs, they have faced criticism for their weight, lack of manufacturing standardization and limited durability, particularly for individuals with higher body weights.^{22,23} Our findings suggest low quality and low client satisfaction remain key concerns for these devices, aligning with reports from more than 20 years ago when International Society for Prosthetics and Orthotics-affiliated authors conducted a three-country, approximately 3-year follow-up of these devices at transtibial²⁴ and transfemoral²⁵ levels. They identified poor craftsmanship in 56% of transtibial and 86% of transfemoral devices, primarily poor fit, alignment, socket wall adequacy and leg length discrepancy. Although satisfaction and compliance were reported to be good for transtibial device users (85% and 94%, respectively) and moderate in transfemoral device users (58% and 65%, respectively) fewer than half the participants could walk more than 1 kilometre and many reported discomfort and pain. While these papers^{24,25} reported a considerably longer follow up than in our study, the device fit, length and alignment shortcomings we found at 3 months cannot be expected to improve without further intervention. It is important to note that measures to manage inadequate fit, such as accommodating socket looseness by wearing socks, would likely be undesirable in the warm, humid climate experienced for most of the year in Cambodia.²⁴

We found that many clients retained their old devices, with a large proportion reverting to them within 3 months of receiving their new prosthesis. This observation suggests that, despite initially more positive assessments about the new devices, over time clients' experience aligned with prosthetists' assessments at fitting. We found that clients expressed some satisfaction with their new devices despite noting discomfort, imperfect fit and concerns about cosmesis and workmanship. Such deference may reflect historical cultural norms in Cambodia,²⁶ with clients being unaccustomed or reluctant to voice concerns about their physical rehabilitation care and prosthetic devices. Such behaviour may be more prominent in rural communities, especially when services are provided free of charge.²⁷

Our findings also raise questions about client selection, specifically whether camp attendees needed a new device. Camp organizers recruited clients for the camp with the assistance of local authorities but had no insights into clinical need. Previous analysis of an established, NGO-established and locally-run physical rehabilitation service in Cambodia showed a median time for device repair of 2 years.¹² In our study, clients reported using previous devices for a median of 5 years, suggesting a notable proportion of clients had poorer access to physical rehabilitation services than those served by conventional physical rehabilitation centres in the previous study. However, we also found a quarter of clients had a previous device deemed still in good condition at the point of new device delivery. Some previous devices were delivered within the last year, with some devices being less than 3 months old. At the same time our findings also suggest a large number of clients were tolerating an inadequate or potentially dangerous prosthesis. Although 209 clients had a previous device reported as unused, broken, painful or poorly fitting, at least 93 of them had reverted to using these devices often, most or all of the time within three months. Notably, both the percentages of clients who had a well-functioning alternative device before the camp (indicating poor client selection), and those who had returned to using an inadequate device 3 months after it (indicating poor device quality), are likely to be underestimates, given that a quarter of clients had a previous device whose condition could not be determined from the responses.

Our study has some limitations. We used an assessment checklist which considered quality and satisfaction against criteria previously defined by the International Society for Prosthetics and Orthotics. This checklist was not previously standardized or validated; nevertheless, it reflects the device delivery assessment procedure used as part of the ISO 9001 quality management system at established Cambodian physical rehabilitation centres for over 20 years.¹⁸

We found that using the checklist in the field led to some heterogeneity in completion of questions and some potentially valuable client data, such as gender, were not captured. In addition, errors and occasional data conflicts might have arisen due to needing to assess all clients and collect large amounts of data in a timely manner. The relatively large number of assessors collecting data potentially increased likelihood of inter-assessor subjectivity; notably, our protocol did not include a process of recording or cross-checking interview transcripts. About two fifths of the study participants could not be contacted for the follow-stage 2 telephone interviews and were considered lost to follow up. However, no substantial differences were observed between the stage 1 data for the clients lost to follow up and the

full group (online repository),¹⁸ indicating no systematic link between satisfaction or quality and loss to follow up.

Co-inventor of the Jaipur foot, Dr Sethi, stated his vision was to increase prosthetic knowledge and simplify technology, with camps not only providing devices but also training local artisans to fabricate, adjust and repair them.¹³ Despite the large number of camps and delivered devices reported,¹⁶ it has been stated that “[s]omewhere down the line, the number of amputees fitted at these camps overtook the concept of imparting training to the local artisans, and it all boiled down to a game of numbers.”²⁸ This situation has been attributed in part to replacement of aluminium sockets with thermoplastics. Fabrication is now quicker and cheaper than before, but the thermoplastic prosthetics are heavier, and it is more difficult to achieve the desired alignment and fit. An International Society for Prosthetics and Orthotics-affiliated follow-up study of these devices in 2004²⁵ reported that while “material and components are of high technical standard and could provide a low-cost possibility... The untrained, so-called technicians are unable to adapt a prosthesis to an amputation stump.” That study also stated that “recogni[z]ed prosthetics training is required to ensure proper use of materials and correct alignment of the prosthesis.” We offered the camp organizers to provide both a training needs analysis and training for technicians working in the camp, but this was not accepted.

Although we cannot confirm generalizability, our study suggests that previous concerns regarding quality and satisfaction with the studied prosthesis system may persist. Despite the camp organizer’s best intentions to provide care to those who may not be able to access it, our study also presents new evidence that questions whether provision of prosthetic limbs at intensive limb fitting camps represents an inclusive model of care or an effective use of funding. Previous research has shown that device durability and access to repairs and servicing are reported as issues of top priority to people in low-resource settings who use prostheses and orthoses.^{4,29,30} Inadequate training of people designing, fabricating and fitting devices, and inadequate follow-up care may burden local physical rehabilitation services (where they exist), or leave vulnerable clients without support, especially as the camp format and devices delivered do not integrate with the currently available services.

Building on our findings, we suggest that camps may be more appropriate for clients whose need is clearly demonstrated, should be fully integrated with existing services, and should leave behind adequate materials and components for repairs and replacement.

Screening clients for need is an essential prerequisite, as is engagement with the local practitioners who will be expected to continue client care.

Acknowledgements

We thank the Exceed Research Network. We dedicate the paper to our late colleague Prum Sovann.

Funding:

The Nippon Foundation funded this study.

Competing interests:

TH, SK and CH declare employment at Exceed Worldwide. MDH, AC and AD previously collaborated with Exceed Worldwide.

References

1. Wyss D, Lindsay S, Cleghorn WL, Andrysek J. Priorities in lower limb prosthetic service delivery based on an international survey of prosthetists in low- and high-income countries. *Prosthet Orthot Int*. 2015 Apr;39(2):102–11. <https://doi.org/10.1177/0309364613513824> PMID:24335154
2. Mundell BF, Kremers HM, Visscher S, Hoppe KM, Kaufman KR. Predictors of receiving a prosthesis for adults with above-knee amputations in a well-defined population. *PM R*. 2016 Aug;8(8):730–7. <https://doi.org/10.1016/j.pmrj.2015.11.012> PMID:26690021
3. Stuckey R, Draganovic P, Ullah MM, Fossey E, Dillon MP. Barriers and facilitators to work participation for persons with lower limb amputations in Bangladesh following prosthetic rehabilitation. *Prosthet Orthot Int*. 2020 Oct;44(5):279–89. <https://doi.org/10.1177/0309364620934322> PMID:32686604
4. Ramstrand N, Maddock A, Johansson M, Felixon L. The lived experience of people who require prostheses or orthoses in the Kingdom of Cambodia: A qualitative study. *Disabil Health J*. 2021 Jul;14(3):101071. <https://doi.org/10.1016/j.dhjo.2021.101071> PMID:33583726
5. Borg J, Lindström A, Larsson S. Assistive technology in developing countries: a review from the perspective of the Convention on the Rights of Persons with Disabilities. *Prosthet Orthot Int*. 2011 Mar;35(1):20–9. <https://doi.org/10.1177/0309364610389351> PMID:21515886
6. Ikeda AJ, Grabowski AM, Lindsley A, Sadeghi-Demneh E, Reisinger KD. A scoping literature review of the provision of orthoses and prostheses in resource-limited environments 2000–2010. Part one. *Prosthet Orthot Int*. 2014 Aug;38(4):269–86. <https://doi.org/10.1177/0309364613500690> PMID:24026045
7. Farrar M, Niraula YR, Pryor W. Improving access to prosthetic services in western Nepal: a local stakeholder perspective. *Disabil Rehabil*. 2023 Apr;45(7):1229–38. <https://doi.org/10.1080/09638288.2022.2057599> PMID:35387522
8. Harte C. Prosthetic orthotic missions: ethics and efficacy. *Prosthet Orthot Int*. 2022 Oct 1;46(5):407. <https://doi.org/10.1097/PXR.0000000000000186> PMID:36215055

9. Jensen JS, Sexton S. Appropriate prosthetic and orthotic technologies in low income countries (2000–2010). Brussels: International Society for Prosthetics and Orthotics; 2010. Available from: https://www.ispoint.org/wp-content/uploads/2022/02/appropriate_prosthetic__orth.pdf [cited 2025 Sep 30].
10. Jensen JS, Heim S. Evaluation of polypropylene prostheses designed by the International Committee of the Red Cross for trans-tibial amputees. *Prosthet Orthot Int*. 2000 Apr;24(1):47–54. <https://doi.org/10.1080/03093640008726521> PMID:10855438
11. Weerasinghe S, Aranceta-Garza A, Murray L. Efficacy of rehabilitation after provision of ICRC lower limb prostheses in low-income and middle-income countries: a quantitative assessment from Myanmar. *Prosthet Orthot Int*. 2024 Jan 1;48(1):5–12. <https://doi.org/10.1097/PXR.0000000000000300> PMID:37870366
12. Dickinson AS, Gates L, Metcalf CD, Owen C, Kheng S, Heang T, et al. Understanding repair and replacement of prosthetic limbs using routinely-collected data: a retrospective study over three decades in Cambodia. *medRxiv*. 2024 1–27. <https://doi.org/10.1101/2024.10.15.24315396>
13. Sethi PK. The Knud Jansen lecture. Technological choices in prosthetics and orthotics for developing countries. *Prosthet Orthot Int*. 1989 Dec;13(3):117–24. <https://doi.org/10.3109/03093648909079418> PMID:2608418
14. Bourdier F. Health inequalities, public sector involvement and malaria control in Cambodia. *Sojourn: Journal of Social Issues in Southeast Asia*. 2016;31(1):81–115. <https://doi.org/10.1353/soj.2016.0018>
15. Steen Jensen J, Sexton S. Appropriate prosthetic and orthotic technologies in low income countries (2000–2010). Brussels: USAID/ISPO; 2010.
16. BMVSS Jaipur Foot [internet]. Jaipur: JaipurFoot; 2023. Available from: <https://www.jaipurfoot.org> [cited 2024 Dec 16].
17. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP; STROBE Initiative. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *Bull World Health Organ*. 2007 Nov;85(11):867–72. <https://doi.org/10.2471/BLT.07.045120> PMID:18038077
18. Heang T, Kheng S, Donovan-Hall M, Channon A, Dickinson A, Harte C. Supplementary information for “Quality and user satisfaction scores for prosthetic limbs provided in a fitting camp, Cambodia” [online repository]. Southampton: University of Southampton; 2025. <https://doi.org/10.5258/SOTON/D3663>
19. Mayring P. Qualitative content analysis: step-by-step guide. London: SAGE Publications; 2021.
20. Jensen JS, Nilsen R, Zeffer J. Quality benchmark for trans-tibial prostheses in low-income countries. *Prosthet Orthot Int*. 2005 Apr;29(1):53–8. <https://doi.org/10.1080/17461550500085147> PMID:16180377
21. Jensen JS, Raab W, Fisk J, Hartz C, Saldana A, Harte C. Quality of polypropylene sockets for trans-tibial prostheses in low-income countries.

- Prosthet Orthot Int. 2006 Apr;30(1):45–59.
<https://doi.org/10.1080/03093640600568336> PMID:16739781
22. Arya AP, Klenerman L. The Jaipur foot. *J Bone Joint Surg Br.* 2008 Nov;90-B(11):1414–6. <https://doi.org/10.1302/0301-620X.90B11.21131>
PMID:18978257
23. Huber I, Fischenich KM, Wolynski J, Niese B, Teater R, Mali HS, et al. Epidemiological study of failures of the Jaipur Foot. *Disabil Rehabil Assist Technol.* 2018 Nov;13(8):740–4.
<https://doi.org/10.1080/17483107.2017.1369593> PMID:28844167
24. Jensen JS, Craig JG, Mtalo LB, Zelaya CM. Clinical field follow-up of high density polyethylene (HDPE)-Jaipur prosthetic technology for trans-tibial amputees. *Prosthet Orthot Int.* 2004 Dec;28(3):230–44.
<https://doi.org/10.3109/03093640409167755> PMID:15658636
25. Jensen JS, Craig JG, Mtalo LB, Zelaya CM. Clinical field follow-up of high density polyethylene (HDPE)-Jaipur prosthetic technology for trans-femoral amputees. *Prosthet Orthot Int.* 2004 Aug;28(2):152–66.
<https://doi.org/10.1080/03093640408726700> PMID:15382809
26. Chandler DP. *Facing the Cambodian past: selected essays 1971–1994.* Chiang Mai: Silkworm Books; 1998.
27. Un K. State, society and democratic consolidation: the case of Cambodia. *Pac Aff.* 2006;79(2):225–45. <https://doi.org/10.5509/2006792225>
28. Bhargava R. The Jaipur foot and the ‘Jaipur Prosthesis’. *Indian J Orthop.* 2019 Jan-Feb;53(1):5–7. https://doi.org/10.4103/ortho.IJOrtho_162_18
PMID:30905976
29. Magnusson L, Ahlström G. Patients’ satisfaction with lower-limb prosthetic and orthotic devices and service delivery in Sierra Leone and Malawi. *BMC Health Serv Res.* 2017 Feb 1;17(1):102. <https://doi.org/10.1186/s12913-017-2044-3>
PMID:28143549
30. Kombe E, Prior Y, Ackers HL, Day S, Donovan-Hall M. A qualitative synthesis to explore clinician and user experiences of accessing prosthetic and orthotic services in low- and middle-income countries using the three-delays model as a framework. *Disabil Rehabil.* 2025 Jun 9;1–15.
<https://doi.org/10.1080/09638288.2025.2516170> PMID:40488607

Table 1. Client demographics, their health characteristics and details of previous prosthetic device(s), Cambodia, 2023

Characteristic	No. (%)
Client demographics (<i>n</i> = 525)	
Gender ^a	
Women	24 (9.0)
Men	243 (91.0)
Missing ^b	258 (49.1)
Age, in years	
0–29	3 (1.8)
30–39	8 (4.7)
40–49	8 (4.7)
50–59	68 (39.8)
60–69	70 (40.9)
≥ 70	14 (8.2)
Data missing ^b	354 (67.4)
Client health history (<i>n</i> = 525)	
Client type	
Experienced (prosthesis user)	475 (91.2)
Primary (no previous device)	46 (8.8)
Data missing ^c	4 (0.8)
Cause of amputation	
Landmine, weapon or ordnance	465 (89.9)
Electric shock	7 (1.4)
Traffic accident	19 (3.7)
Illness	5 (1.0)
Trauma and/or machine injury	12 (2.3)
Congenital	8 (1.5)
Other	1 (0.2)
Data missing ^c	8 (1.5)
Year of amputation	
2020–2023	14 (2.8)
2010–2019	27 (5.3)
2000–2009	34 (6.7)
1990–1999	212 (42.0)
1980–1989	212 (42.0)
1970–1979	6 (1.2)
1960–1969	0 (0.0)
Data missing ^c	20 (3.8)
No. of previous devices	
1	54 (12.2)
2–3	145 (32.8)
4–6	154 (34.8)
7–10	67 (15.2)
11–20	22 (5.0)
Data missing ^c	83 (15.8)
Condition of previous device	
Good	125 (24.0)
Condition unclear	138 (26.5)
Broken and/or damaged and/or worn	127 (24.4)
Old	30 (5.8)

Poorly fitting and/or painful	46 (8.8)
Stopped using	8 (1.5)
None (first device, lost, etc.)	47 (9.0)
Data missing ^c	4 (0.8)
Time elapsed since prescription of previous device	
0–1 years	72 (14.7)
2–3 years	72 (14.7)
4–5 years	82 (16.7)
6–9 years	78 (15.9)
10–19 years	109 (22.2)
20 or more years	32 (6.5)
No previous device	46 (9.4)
Data missing ^c	34 (6.5)
Device (n = 533)	
Amputation level	
Partial foot	1 (0.2)
Ankle disarticulation	3 (0.6)
Transtibial	374 (70.2)
Knee disarticulation	12 (2.3)
Transfemoral	106 (19.9)
Wrist disarticulation	2 (0.4)
Transradial	34 (6.4)
Transhumeral	1 (0.2)
Data missing ^c	0 (0.0)
Side	
Right	252 (50.6)
Left	236 (47.4)
Bilateral	10 (2.0)
Data missing ^c	35 (6.6)

^a Gender was ascertained by the assessor.

^b High numbers of records were missing for gender and age because these were not collected in the digital study record; a partial record was replicated from paper notes.

^c Some responses were missing for individual clients as the form did not have mandatory fields.

Note: Inconsistencies arise in some values due to rounding.

Table 2. Prosthetist assessments of quality and client feedback on satisfaction at the point of discharge from the camp, Cambodia, 2023

Question	No. (%)	
	Yes	No
Prosthetist assessments		
Is the general workmanship appropriate?	15 (2.9)	507 (97.1)
Is the socket fit of device correct? (Weightbearing, total contact, shape, socket fitting, comfortable?)	45 (8.7)	474 (91.3)
Is the height of the device correct when the client is standing?	315 (60.8)	203 (39.2)
Are the dynamic gait and alignment correct when the client is walking? (Pole vertical, foot full contact, stable, any major gait deviations?)	44 (8.7)	462 (91.3)
After doffing (removing) the device, is the client's residual limb in good condition? ^a	407 (79.2)	107 (20.8)
Client feedback		
While standing, walking and sitting is the device comfortable and stable?	333 (63.9)	188 (36.1)
While walking and sitting, is the suspension (or are the straps) adequate?	272 (52.3)	248 (47.7)
Can the patient use the device independently (e.g. during donning, doffing and walking)?	495 (94.8)	27 (5.2)
Does the device's function meet the patient needs?	285 (55.4)	229 (44.6)
Is the device's cosmetic appearance appropriate for the client's needs?	47 (9.0)	475 (91.0)
Has the client been informed about device care?	35 (6.7)	487 (93.3)
Is the client satisfied with new device and willing to give up their current device?	167 (36.9)	286 (63.1)

^a Pressure on the number of clients to see at the camp within the study period meant that residual limb condition was assessed after only ten minutes-or-so of device use; this time may be insufficient to detect risk of residual limb injury. In a conventional clinic, residual limb injury is usually assessed after approximately one hour of device use (i.e. gait training).

Table 3. Content analysis of free text comments at prosthetic device delivery immediately after camp discharge, Cambodia, 2023

Category and code	No. of responses
Use and mobility	
Client can walk, do activities of daily living	4
Gait deviation	139
Prosthesis wrong height	110
Poor alignment	66
Difficulty donning and doffing	14
Difficult or unstable walking	12
Knee functions poorly, or hard to control	12
Noise when walking	6
Difficulty wearing device	5
Requires training or practice	5
Cannot walk unaided	3
Walks with knee locked	2
Cannot walk at all	1
Cosmesis and finish	
Client likes appearance	2
Poor cosmesis or finish in general	175
Trim line sharp or uneven	74
Cuff suspension visible through long pants	5
Rivet or cuff not secure	2
Socket attachment broken or loose	2
Visible when sitting	2
Rivet showing	1
Rubber not stuck (unadhered cosmesis)	1
Prosthesis not strong enough	1
Socket fit	
Good socket fit in general	19
Too loose	230
Poor socket fit in general	143
Too tight, or high pressure	67
Incorrect trim line height	29
Inadequate suspension	10
Experience	
Client likes light weight	51
Socket causes pain	19
Socket not smooth	10
Prosthesis uncomfortable	6
Prosthesis too heavy or bulky	2
Straps too tight	1

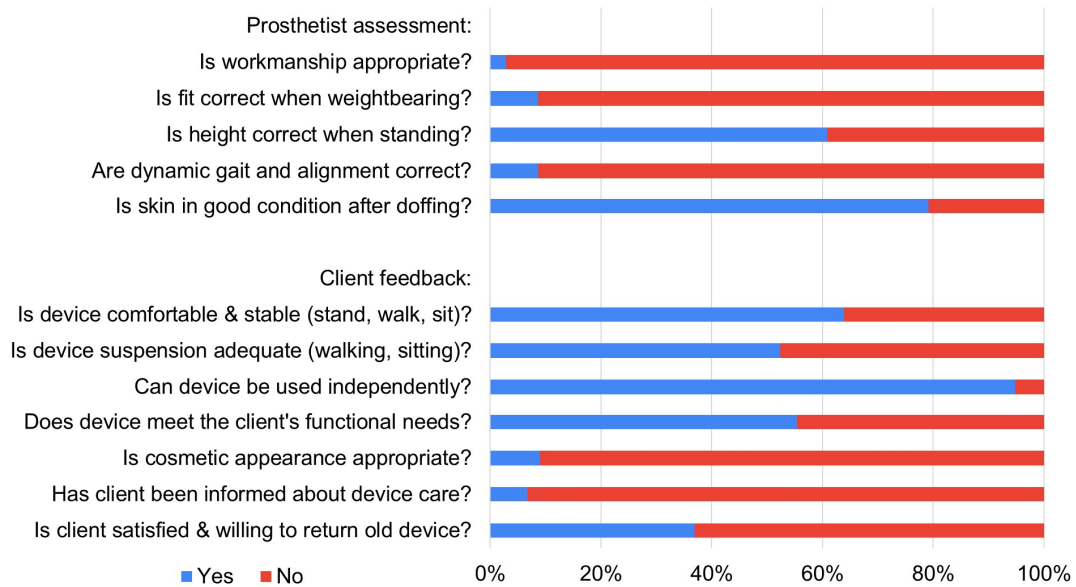
Table 4. Responses to questions regarding prosthetic device condition, use level and preference during telephone interviews with clients at 3-month follow-up, Cambodia, 2023

Question	No. (%)
What is the condition of the new device?	
Comfortable	107 (33.3)
Somewhat comfortable	33 (10.3)
Not comfortable, or painful	115 (35.8)
Broken	6 (1.9)
Do not use	55 (17.1)
Other	5 (1.6)
If you can compare, which device can you walk further and faster on?^a	
New device	35 (12.0)
Previous device	236 (80.8)
Neither, or the same	21 (7.2)
Cannot compare	29 (excluded)
In the future, which device would you prefer to have?^a	
Another like the new device	47 (15.4)
A domestically-produced Cambodian device	238 (78.0)
No preference, or the same	20 (6.6)
Cannot compare	5 (excluded)
Data missing	11 (excluded)
What is the use level of the new device?^b	
Always	60 (19.2)
Often	0 (0.0)
Short periods	125 (39.9)
Rarely	95 (30.4)
Never or cannot	33 (10.5)
Data missing, or time not stated	8 (excluded)
What is the use level of the previous device?^b	
Always	180 (65.0)
Often	63 (22.7)
Short periods	1 (0.4)
Rarely	15 (5.4)
Never or cannot	6 (2.2)
Broken	12 (4.3)
Does not have	40 (excluded)
Data missing, or time not stated	4 (excluded)

^a Excludes those that cannot compare devices, such as primary patients, as they do not have a previous device.

^b Use level categories represent pooled responses: never or cannot ("never" or "cannot use"); rarely ("rarely" or "almost never"); short periods ("short periods every day" or "short periods some days" or "not very often"); often ("often" or "most of the time"); always ("always" or "all day").

Fig. 1. Prosthetist assessments of quality, and client feedback on satisfaction, immediately after camp discharge, Cambodia, 2023



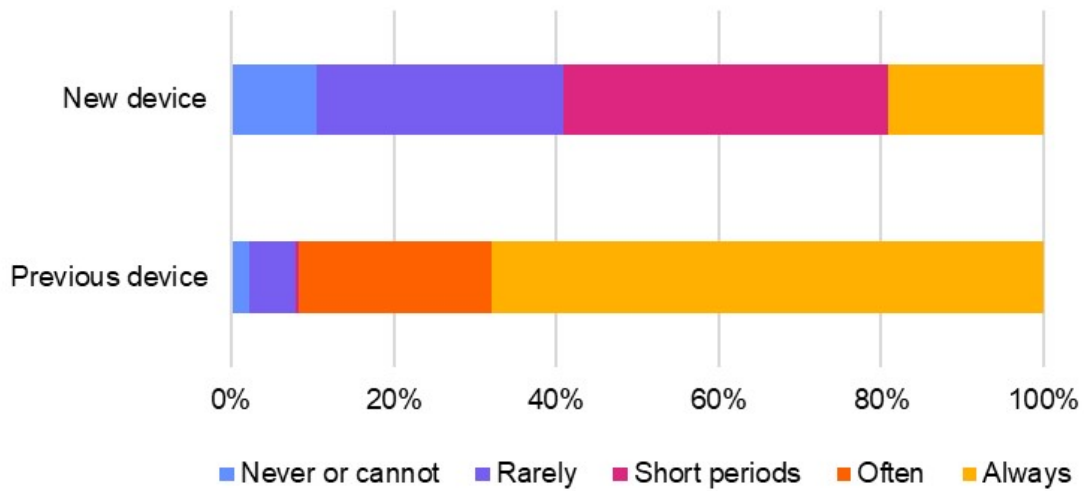
Note: absolute numbers are available in Table 2.

Fig. 2. Photographs of representative example transtibial prosthetic devices showing poor device design and fabrication quality, Cambodia, 2023



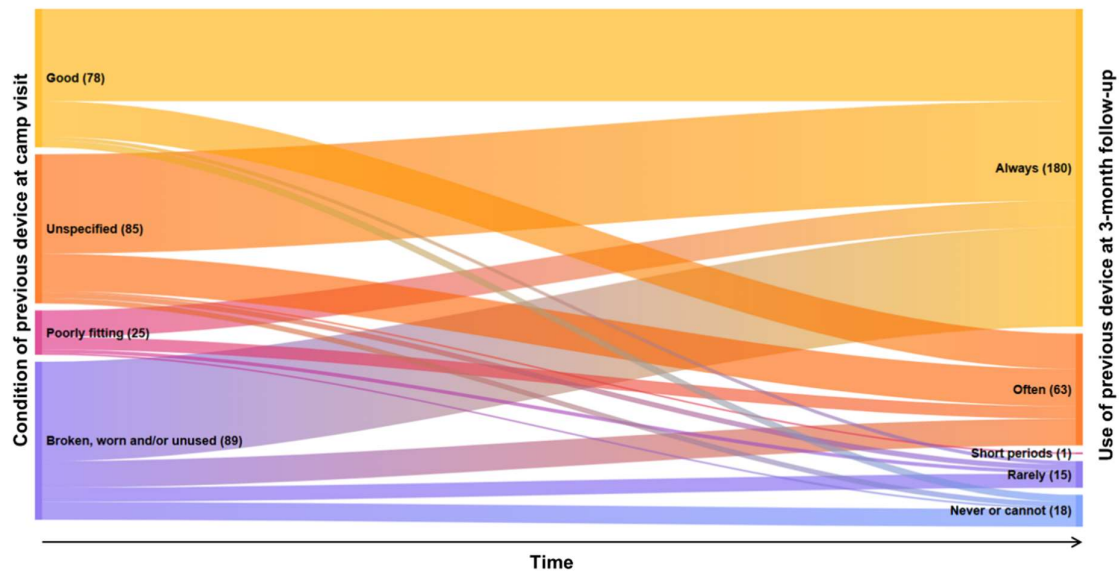
Notes: top row, left to right: devices and liners were observed to have thick walls, with roughly finished brims. Some had exposed screws at the ankle, and poor cosmesis including pen marks, excess adhesive, and visible transition between cosmesis and foot. Bottom row, left to right: other devices had poor alignment of componentry such as knee-axis height, or the socket positioned in flexion, or poorly-sized liners and sockets.

Fig. 3. Client report of new and previous prosthetic device usage at 3-month follow-up, Cambodia, 2023



Note: absolute numbers are available in Table 4. Use level categories represent pooled responses: never or cannot (“never” or “cannot use”); rarely (“rarely” or “almost never”); short periods (“short periods every day” or “short periods some days” or “not very often”); often (“often” or “most of the time”); always (“always” or “all day”).

Fig. 4. Mapping from the clients' reported previous prosthetic device condition to their level of use of their previous device at 3-month follow-up, Cambodia, 2023



Note: condition categories represent pooled responses: Good ("Good" or "OK"); Unspecified ("Cannot determine" or "Condition not specified"); Poorly fitting ("Painful" or "Tight" or "Loose"); Broken, worn and/or unused ("Broken" or "Damaged" or "Worn out" or "Needs repair" or "Old" or "Stopped using"). Use level categories represent pooled responses: never or cannot ("never" or "cannot use"); rarely ("rarely" or "almost never"); short periods ("short periods every day" or "short periods some days" or "not very often"); often ("often" or "most of the time"); always ("always" or "all day").