PROSTHETICS & ORTHOTICS IMPACT ASSESSMENT

EAST AFRICA: Tanzania, Kenya and Uganda

The impact of training personnel to the minimum standards ISPO Category I & II:

Tanzania Training Centre for Orthopaedic Technologists

Authors: Sandra Sexton, Harold Shangali, Baraka Munissi

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Cover image: Monduli Rehabilitation Centre, Tanzania

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ISPO

International Society
for Prosthetics and Orthotics
22-24 Rue du Luxembourg
BE-1000 Brussels, Belgium
Telephone: +32 2 213 13 79
Fax: +32 2 213 13 13
E-mail: ispo@ispoint.org
Website: www.ispoint.org

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In finalizing this report, we would like to thank Mrs Diana Corrick of Diana Corrick Consultancy, for editing to improve the clarity of the report. This editing was particularly insightful based on her experience as the CEO of the charity PORT-ER and her perceptiveness as a prosthetic service user.

Together we can continue moving beyond physical disability

Contents:

Section 1: Executive summary

There is a tremendous need for personnel to provide prosthetic and orthotic services in Africa[1]. The Tanzania Training Centre for Orthopaedic Technologists has graduated over 400 Prosthetists/Orthotists and Orthopaedic Technologists from programs which were recognized at ISPO Category I and ISPO Category II level respectively. Graduates now work in clinics in different low income countries in Africa.

As part of ISPO's USAID funded program *Rehabilitation of physically disabled people in developing countries*, and building on past work[3], we studied the impact of training personnel to the minimum standards ISPO Category I & II and conducted a partial audit of graduate clinical skills and competencies. Our hypothesis was that *Training personnel to ISPO Category I and II standards provides basic knowledge, skills and experience to enable them to provide and/or improve prosthetic and orthotic services for persons with physical disabilities*. We developed a causal model and framework for studying impact based on the USAID Impact Assessment Primer Series[2]. We also determined the professional development needs of graduates in 3 East African countries, namely Tanzania, Kenya and Uganda.

The field visits included tours of clinical and technical facilities, discussions with government Ministries, Heads of Hospital Services and Heads of Prosthetics and Orthotics departments (known as Orthopaedic Technology departments) were also conducted. Furthermore, following study recruitment by invitation, visits to graduates in the clinical setting were arranged in Tanzania, Uganda and Kenya. Each graduate participated in a structured interview about lower limb clinical care during a client review. The graduate and interviewer then identified at least 3 areas for clinical practice development. At the end of the interview graduates were given a note of feedback and a personal development plan.

We were able to demonstrate that ISPO certified graduates of TATCOT had a positive impact on:

- the establishment of services
- the appropriateness of prosthetic and orthotic service delivery
- clinical leadership
- professional communities

Most importantly, provision of assistive technologies was shown to have a profound impact on the lives of persons with physical disabilities to help them realize their potential to achieve better independence, participate in education, work, social activities, activities of daily living and contribute to the local economy.

Graduates work in a range of professional environments ranging from unsupervised lone working to rehabilitation teams. ISPO Category I graduates were shown to be leading and managing clinical services and demonstrated better client assessment skills than ISPO Category II personnel.

Graduates working in clinical services in Africa are usually expected by the professional community to maintain and improve their clinical competencies in the years after graduation. This is particularly challenging in African countries where there are limited resources or existing professional networks. Detailing a specific development plan can assist the individual clinician to reflect on their practice. This information can, in turn, be used by employers and sponsors to target precious resources.

Our observations and analysis of the situation in Tanzania, Kenya and Uganda also caused us to make a number of recommendations to provide guidance to graduate personnel, their services, and the wider East African

professional community. The TATCOT leadership team and TATCOT graduates should also be cognisant of these recommendations in their future strategic planning.

Appropriateness of prosthetic and orthotic service delivery:

RECOMMENDATION 1: Areas for professional development and clinical practice were identified for each graduate and this information should be used in future professional development planning including TATCOT course review, ISPO certified graduate personal development planning, consideration of national short courses, upgrading training, national conference topics and clinical interest groups.

RECOMMENDATION 2: The national referral services need to raise the standards and quality of their practice and services to become national benchmark services in prosthetics and orthotics. The priority for this with regard to ISPO certified personnel lies with the TATCOT associated services at KCMC, Tanzania, since this is the place where students observe and undertake their first experiences of prosthetic and orthotic practice and KCMC should offer exemplary clinical practice, publish their progress and initiatives and share good practice with TATCOT alumni.

Clinical leadership:

RECOMMENDATION 3: Orthopaedic technology service managers (including ISPO certified graduates) should form a professional network to discuss management issues and develop strategies to help support national rehabilitation plans.

Professional communities:

RECOMMENDATION 4: ISPO certified graduates from TATCOT should actively engage in national professional communities in Tanzania, Kenya and Uganda.

Prosthetics and Orthotics and Orthopaedic Technology as a career:

RECOMMENDATION 5: ISPO certified graduates should be encouraged to practice by building on their professional training and best available evidence. They should document their activity at least thorough problem oriented medical records that also records outcomes and they should support local and national data collection initiatives to better prove the effectiveness of their practice.

RECOMMENDATION 6: More open competition in the employment market would certainly assist in the selection of graduates to vacant posts and is especially important for more senior roles, giving services greater surety that the best available candidate had been matched to and offered a post.

Provision of assistive technologies:

RECOMMENDATION 7: Ongoing training of professionals to the minimum ISPO standards should continue to enable persons with physical disabilities to achieve independence through the provision of prosthetic and orthotic devices.

Cost and supply chains:

RECOMMENDATION 8: ISPO graduates should firstly focus on more cost effective practices to improve capacity and reduce waste. ISPO graduates who are service managers should seek local and on-the-job management training and focus on cost effective practice. ISPO certified graduates should become more aware of national tendering and procurement systems and initiatives and utilize these to influence better prescription choice.

Section 2: Introduction and context

The International Society for Prosthetics and Orthotics (ISPO) certifies prosthetists/orthotists (ISPO Category I) or orthopaedic technologists (ISPO Category II) graduating from ISPO evaluated courses of study. ISPO has a program of activity grant funded by USAID named "Rehabilitation of physically disabled people in developing countries". One of the objectives of the grant is to assess the impact of ISPO recognized Category I and II training.

There is a tremendous need for personnel to develop prosthetic and orthotic services in Africa to meet the needs of persons with disabilities[1]. The Tanzania Training Centre for Orthopaedic Technologists (TATCOT) has ISPO evaluated programs and 425 students have graduated and now work in clinics in different low income countries in Africa and Asia. Some of these graduates were sponsored in their professional education with scholarship funding from the United States Agency for International Development (USAID) either directly via an ISPO collaborative agreement with USAID, or through agreements with other organizations.

We considered various ways to measure impact from published literature and used the USAID Impact Assessment Primer Series as guidance[2] and developed a causal model and analysis framework (see Sections 3 and 4 for further information).

Our hypothesis was that

Training personnel to ISPO Category I and II standards provides basic knowledge, skills and experience to enable them to provide and/or improve prosthetic and orthotic services for persons with physical disabilities.

In association with ISPO's current USAID funded program *Rehabilitation of physically disabled people in developing countries*, we conducted field visits to Tanzania, Kenya and Uganda, interviewed Ministry officials, Heads of Hospital Services and Heads of Prosthetic and Orthotic Departments and conducted a partial audit of graduate clinical skills and competencies whilst determining the professional development needs of graduates in 3 African countries. We also listened to service users hearing the stories of how services had impacted upon their lives.

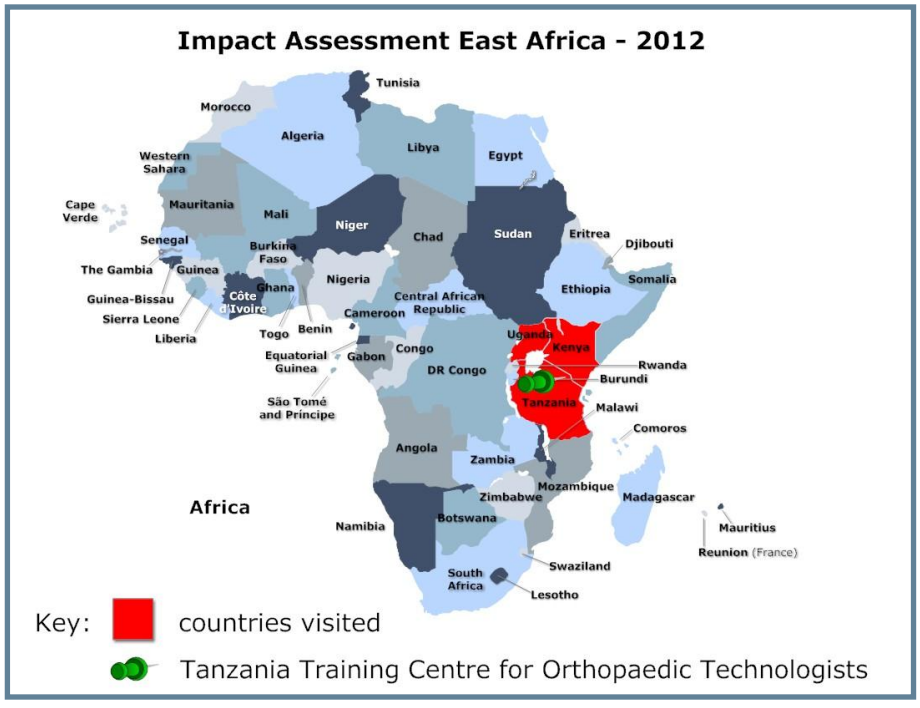


Figure 1. Map of Africa highlighting East African countries visited.

Section 3: Hypothesis and causal model

Hypothesis tested in the impact assessment causal model:

Training personnel to ISPO Category I and II standards provides basic knowledge, skills and experience to enable them to provide and/or improve prosthetic and orthotic services for persons with physical disabilities.

Pre-intervention activities	**General:** • Develop and publish international professional standards ISPO Category I (prosthetist/orthotist) and ISPO Category II (orthopaedic technologist) • Evaluate and recognise programs training students to ISPO Category I and ISPO Category II standards. ***USAID funded scholarships:*** • *Identify training providers in developing countries evaluated and recognised by ISPO as meeting ISPO professional standards* • *Set criteria for scholarship awards and design scholarship application, selection and award processes* • *Liaise with ISPO recognised training providers to raise awareness of scholarship program*
Program activities	**General** • Maintenance of register of ISPO Category I and ISPO Category II evaluated programs. ***USAID funded scholarships:*** • *Facilitate training of clinicians for prosthetic and orthotic services through provision of a global ISPO Scholarship Program by:* *1) Liaising with ISPO recognised training providers to clarify scholarship availability and encourage applications* *2) Networking with non-government organisations and international organisations to raise awareness of scholarship availability and explain the criteria* *3) Receiving and screening candidate applications from training providers, seeking more information where appropriate* *4) Notifying training providers of the results of their applications* *5) Administering scholarship awards*
Outputs	**General:** • Certification of individual graduates of ISPO Category I and ISPO Category II recognised programs ***USAID funded scholarships*** • *Financial support for training institutes through student fee provision* • *Financial support for students from developing countries through the funding of professional training fee and living costs*
Outcomes	**General:** • Increased number of ISPO certified graduates • Development of national personnel to internationally recognised standards able to provide minimum standards of treatment for persons requiring prosthetic and orthotic devices. ***USAID funded scholarships*** • *Increased numbers of graduate prosthetists orthotists and orthopaedic technologists from low income countries*
Impacts	• Establishment and development of prosthetic and orthotic clinical and technical services for persons with physical disabilities • Appropriate prosthetic and orthotic service delivery by ISPO Category I and ISPO Category II certified personnel • Increased clinical leadership from prosthetic/orthotic personnel • Development of professional bodies and communities of practice in prosthetics and orthotics • Enabling students to graduate as professionals and follow a career
	• Provision of assistive technologies (prosthetic limbs and orthotic braces for the limbs and spine) that enable persons with physical disabilities to achieve their potential to participate in society • Enabling persons with disabilities to achieve independence • Enabling persons with disabilities to access education and employment • Enabling persons with disabilities to provide for themselves and their families • Enabling persons with disabilities to contribute to the local economy

Section 4: Framework for studying impact

The following is the framework for studying the impact of training to ISPO Category I & II standards:

Baseline assessment: assessment of graduate skills and knowledge as part of the ISPO accredited training program. Assume that certified graduates have threshold knowledge and skills at the point of the final clinical examination. At this stage the graduates will have demonstrated that their skills and knowledge to fulfil professional practice as defined in the ISPO professional profile at ISPO Category I or ISPO Category II[3]. The baseline assessment level assumes provision of basic services immediately upon graduation (without management or leaderships responsibilities/skills).

Follow up assessment:

Levels of Analysis	Domains of Impact	Impact Variables	Sources of Information
ISPO Category I and II Certified Graduate	Demonstrated appropriate clinical skills.	Appropriateness of prosthetic or orthotic provision. Nature and scope of clients seen. Level of professional clinical decision making.	Structured graduate interview and client case review.
"	Provided appropriate clinical services for people with disabilities.	Demonstration of skills, knowledge and Practices. Use of techniques and technology.	Structured graduate interview and client case review. Discussion with P & O Service Manager. Discussion with Head of Hospital Service. Previously published data.
"	Demonstrated career Progression.	Career histories of ISPO certified graduates.	Structured graduate interview. Discussion with P & O Service Manager.
"	Worked within a scope of practice.	Capacity to manage a range of presenting conditions.	Structured graduate interview and client case review.
"	Increased clinical specialism (ISPO category I).	Capacity to handle complex cases and specific conditions (including advisory role). Capacity to problem solve.	Structured graduate interview and client case review. Discussion with P & O Service Manager. Previously published data.
"	Keeps up to date.	Accesses information. Evidence of use of new or emerging techniques.	Structured graduate interview and client case review.
"	Active professional Membership.	Engagement with professional groups. Evidence of contributing to the development of services or the profession locally, regionally or nationally.	Structured graduate interview. Secondary information from publications and other evidence in the public domain. Previously published data.
"	Contributed to clinical Records.	Evidence of appropriate medical and social history taking, patient assessment and review.	Structured interview and case note review.
"	Performed appropriate client assessment.	Demonstrated an understanding of the functional and social needs of their client.	Structured interview and case note review.
"	Embedded clinical Practice.	Demonstrated all areas of appropriate clinical practice including client care, health and safety, multidisciplinary working and quality management procedures.	Structured graduate interview and client case review.
"	Prescribed & specified prosthetic and orthotic devices.	Demonstrated justified decision making based on clinical findings and resource availability.	Structured graduate interview and client case review.

“	Developed technical Skills.	Demonstrated appropriate technical outcomes (quality of design and finish of devices).	Structured graduate interview and client case review.
“	Planned personal Development.	Demonstrates a past and future development plan.	Structured graduate interview.
Patient/client /user	Enabled inclusion and participation in society.	Reflection upon the importance of the service in enabling the client to access education, employment and social life.	Structured graduate interview and client review. Case stories. Clinical audits and surveys. Previously published data.
“	Enabled independence.	Reflections about activities of daily living. Income generating potential. Source of household income.	Structured graduate interview and client review. Case stories. Clinical audits and surveys.
P & O service manager	Contributed to an appropriate staff profile.	Evidence of seniority in larger services with Category I personnel evolving into clinical leaders.	Discussion with P & O Service Manager. Discussion with Head of Hospital service.
“	Improved quality of Services.	Evidence of change improvement in services.	Discussion with P & O Service Manager. Discussion with Head of Hospital service. Physical tours of facilities. Previously published data.
“	Contributed to a national rehabilitation plan.	Evidence of the way services support rehabilitation structures.	Discussion with P & O Service Manager. Discussion with Head of Hospital service. Physical tours of facilities. Previously published data.
“	Enabled access to services.	Evidence of client demographics and service statistics.	Discussion with P & O Service Manager. Previously published data.
“	Supported decentralisation of services.	Evidence of outreach programs, satellite clinics and local working.	Discussion with P & O Service Manager. Discussion with Head of Hospital service.
“	Supported assessment of services.	Evidence of assessments of quality of service.	Discussion with P & O Service Manager. Previously published data.
“	Lead and provided expertise on service development (ISPO category I).	Local, regional or national recognition of expertise.	Discussion with P & O Service Manager. Discussion with Head of Hospital service. Previously published data.
“	Recognition of personnel by government.	National scheme of service.	Discussion with Ministry. Secondary data.
Hospital Service	Demonstrated a history of development of services.	Scope and nature of prosthetic and orthotic services.	Discussion with Head of Hospital service. Tour of facilities.
“	Alignment of prosthetic and orthotic services with hospital scheme services.	Integration and multi-professional working across hospital departments or community services.	Discussion with P & O Service Manager.
“	Served specific patient populations and contributed to income generation.	Client demographics (condition/disability/device). Financial stability of service. Growth of service.	Discussion with P & O service manager. Discussion with Head of Hospital service.
Government Ministry	Supported development of services nationally.	National geographic location of services. Ministry governance of services. ISPO Category I and II professionals as part of services.	Discussion with Ministry. Discussion with Head of Hospital service. Discussion with Head of P & O service. Previously published data.

Section 5: Methodology

This impact assessment focussed on completing a partial audit within three countries where graduates of an ISPO recognised program were working. Each national follow up of graduates reported on:

1. Country context, Rehabilitation, Prosthetics and Orthotics Services.

2. Discussions with Ministers, Head of Hospital Services, Prosthetics and Orthotics Service Managers.

3. Interviews with graduates together with their clients.

Figure 2: Baraka Munisi & Harold Shangali, (Sandy Sexton taking image), preliminary field visit briefing, Tanzania.

The assessment was conducted by the authors during a field visit to Tanzania, Kenya, and Uganda between June 16 – 27, 2012 (see Appendix 7 for the field visit schedule).

1. Country context, Rehabilitation, Prosthetics and Orthotics Services

The FATO survey[1] raw data was used, along with discussions in the field in each country and other published data to inform a description of the country considerations regarding: Prosthetics and Orthotics services within the wider rehabilitation services; the current in-country situation; and reflections on the ISPO recognised programs at TATCOT.

2. Discussions with Ministers, Heads of Services and Prosthetics and Orthotics service Managers

Letters of invitation were sent to Ministers and Heads of Services and email or telephone recruitment of Prosthetics and Orthotics Services Managers was undertaken.

Discussion guides (Appendix 1) were used in the following meetings:

A. Courtesy visit with Government Ministries involved with delivery of Prosthetics & Orthotics services
This helped determine the commitment of governments to develop services for persons with physical disabilities.

B. Meetings with Directors of Hospital Services
This helped determine the history and development of services and facilities in addition to how prosthetics and orthotics fit into the overall scheme of services. The population served and service structure was also explored.

C. Meetings with Prosthetic/Orthotic Services Managers
This helped determine the staff profile. It also helped establish the impact of having graduate personnel working in a prosthetic/orthotic service. Furthermore, leadership, national recognition and service development were discussed.

3. Interviews with Graduates together with their clients

This part of the study had a specific methodology involving one hour interviews with graduates.

Title: A study of professional skills and development needs of clinical personnel in prosthetics and orthotics in lower income countries.

Investigators: Study investigators lead a structured interview with study participants. It was intended that this initial African country investigation would establish the study methodology for other global studies. In each study, investigators were selected from the formal list of ISPO evaluators, regional program heads and/or key senior personnel from a lower income country who have extensive postgraduate experience.

Location: The study was conducted in the workplace; one or more prosthetic/orthotic clinics in Tanzania, Uganda and Kenya.

Objectives of investigation: The study addressed the wider program objective to assess the impact of ISPO Category I or II training on:

- the end user of prosthetic and orthotic devices
- the quality of prosthetic/orthotic treatment

This African Graduate Audit survey specifically aimed to:

- determine the scope and level of professional practice
- audit TATCOT graduate skills
- determine the professional development needs of the graduate

ISPO Category I and II training aligns with ISPO published professional profiles for prosthetist /orthotists (ISPO Category I) and orthopaedic technologists (ISPO Category II).

Nature of the participants: ISPO certified graduates of the Tanzania Training Centre for Orthopaedic Technologists working in Tanzania, Kenya and Uganda with at least 1 year post-graduate experience and having a scope of practice in lower limb prosthetics and/or lower limb orthotics patient management.

Consents: Written consent was sought from graduate participants following provision of a Participant Information Sheet. Clients/patients were asked to verbally consent to their involvement following a verbal explanation by their participating clinician in the local language.

Recruitment of participants: Potential participants were identified from the graduate lists supplied by TATCOT and verified through the ISPO list of certified professionals. Following study recruitment by letter, email or telephone invitation from the program head, visits to graduates in the clinical setting were arranged in Tanzania, Uganda and Kenya.

Structured interview: A structured interview was developed, building on past graduate follow-up work conducted by ISPO[3] over the last decade and funded by USAID. The protocol was recently re-developed following a 2010 graduate audit field trip to Vietnam and then faced validity testing by two experienced clinicians (Ethiopia and Tanzania). Further to this, the structured interview data collection forms were redesigned to enable improved ease of use. The most recent methodology is presented here.

Prior to entering the interview, the graduates were given a 2 page form to complete showing demographic data about themselves and their client. They also answered questions about professional practice. Each participating graduate was then interviewed about lower limb clinical care at the end of a client review appointment both with their client (PART A) and then without their client present (PART B). A data collection form was used and this also acted as an aide memoir to prompt areas for further discussion during the interview.

PART A: with the client present, the interviewer asked the graduate to present their client case. The interviewer took notes on the data collection form during the interview which covers competencies expected of an ISPO certified professional. This part of the interview took about 30 minutes to complete.
PART B: once the client had left, the interviewer reviewed the interview form with the graduate and identified at least 3 areas for clinical practice development that the graduate could work on alone. It was estimated that this part of the interview took about 30 minutes to complete.

Where graduates demonstrate consistent good practice, other development needs were discussed. At the end of the interview participants were given a note of feedback and a personal development plan.

Independent scrutiny: The methodology was reviewed by Dr Angus K McFadyen, Statistical Consultant from AKM-STATS, Glasgow, Scotland, UK, with a request for advice about the questionnaire design and the intent to perform exploratory data analysis. The methodology was then improved prior to use.

Data collection, storage and security: Data collection was undertaken by the investigators using the structured interview process and hard copy data collection form. Data was made anonymous when electronically processed and both raw data and electronic data are securely held by the ISPO program manager, and remain the property of USAID until at least 3 years after the last date of the program (3 years after 31 December 2015). At this point data will be destroyed.

Potential risks or hazards: No risks were identified.

Ethical issues: Participation was voluntary. All forms were coded and no identifying information has been provided in any study report.

Any payment to be made: Participant travel and subsistence expenses were provided for people away from home over 2 hours.

Participant debriefing: Participants were immediately given their feedback and personal development plan. Once available, participants will be sent a copy of this final study report.

Outcomes dissemination: The outcomes of the study will be widely published on the ISPO website, presented at conference and submitted to peer reviewed Journals.

Section 6: ISPO certified graduates in Tanzania, Kenya & Uganda

Around 425 Prosthetists/Orthotists and Orthopaedic Technologists have graduated with certificates from ISPO Category I or II programs at TATCOT since 2005. The Director of TATCOT selected follow up in three countries, namely Tanzania, Kenya and Uganda to determine the impact of such professional training in these nations as part of the East African Community. In the field of prosthetics and orthotics (not including wheelchairs) ISPO has certified the following TATCOT graduates: 104 students from Tanzania; 28 from Kenya; and 18 from Uganda. The impact assessment took the form of a partial audit in East Africa.

Graduate participants in this impact study

A sample of 25 ISPO certified graduates working in Tanzania, Kenya and Uganda participated in this study comprised of 7 Category I personnel and 18 category II personnel. Their average age was 44 years old ranging from 25 to 56. We saw 8% of all ISPO certified Tanzanian personnel, 29% of Kenyan personnel and 50% of Ugandan personnel. 28% of the sample was female (comparing with about 13% of all Tanzanian TATOT Category I and II graduates).

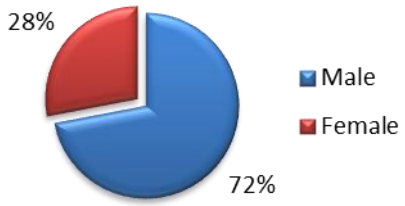


Figure 3

	Average age	Age range		Average yrs graduated
		low	high	
Tanzania	36	25	46	5
Kenya	46	32	56	16
Uganda	48	43	54	15
Overall	44	25	56	12

Graduates Interviewed (n=)		ISPO Category I	ISPO Category II
Tanzania	8	4	4
Kenya	8	2	6
Uganda	9	1	8
Total	25	7	18

Professional Practice

Scope of practice: 68% of graduates in the sample practice all levels of prosthetics and orthotics including lower and upper limb and spinal. Two graduates reported that they also work with wheelchairs. One graduate exclusively does fracture management (with Plaster of Paris). Only two technology suppliers were cited: ICRC and Otto Bock

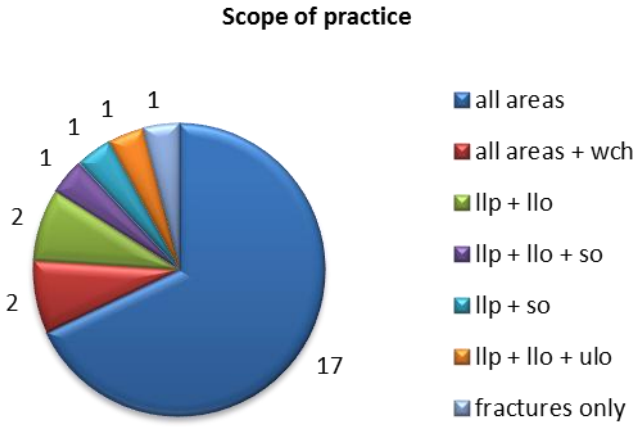


Figure 4

Specialist care: 80% of graduates do not specialise but work as generalists. 20% of graduates specialise in a particular condition/treatment (2 in complex cases, 1 in paediatrics, 1 in Congenital Talipes Equino Varus (CTEV, club foot) and 1 in CTEV plus spinal management).

Activities and caseload mix: On average, graduates reported that they spend 65% of their time in delivering patient care and 35% of their time on administrative tasks (Figure 5). The greatest patient load is in lower limb prosthetics and orthotics (Figure 6).

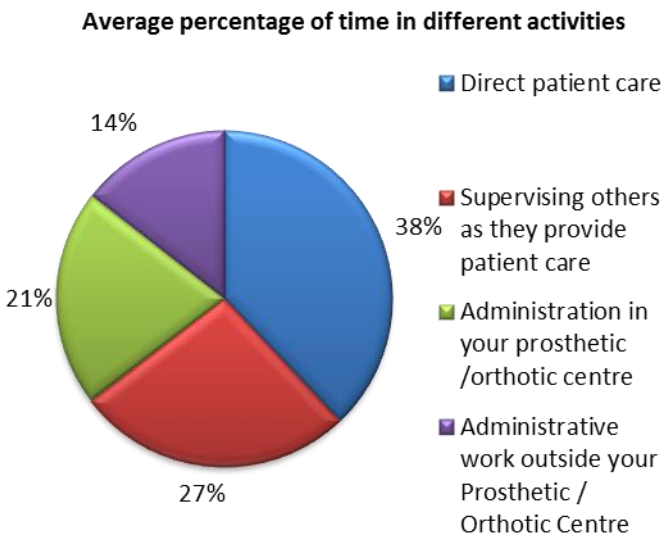


Figure 5

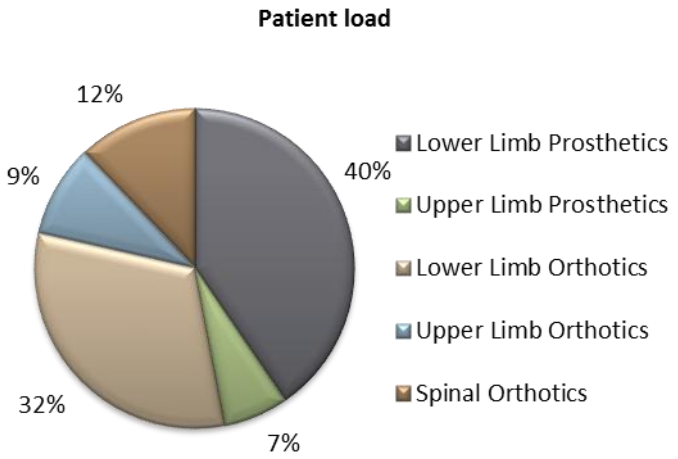


Figure 6

Level of competence: Most graduates reported that they felt most competent in practicing lower limb prosthetics and/or lower limb orthotics. This aligns with the average patient load.

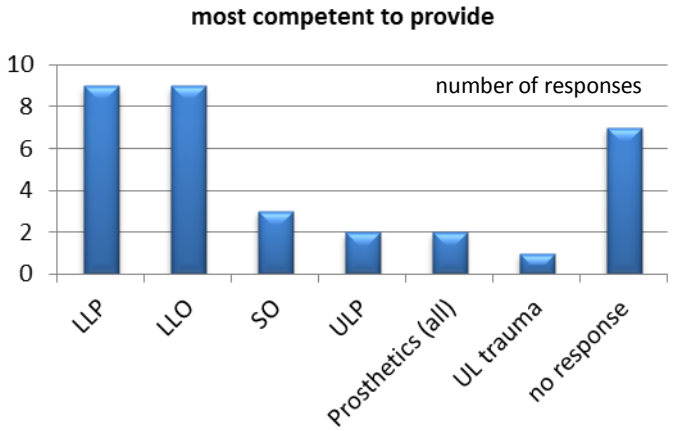


Figure 7

Seeking advice for complex cases: 92% of graduates seek advice from someone else for complex cases. This was most frequently from a doctor or a Category I Prosthetist/Orthotist. 36% of these graduates reported that the person they sought advice from worked somewhere else. Graduates seek advice from different kinds of personnel.

Figure 8

Keeping up to date with information: 12% of graduates in the sample do not access the internet to keep up-to date. Only 20% of graduates reported that they read full text journal articles.

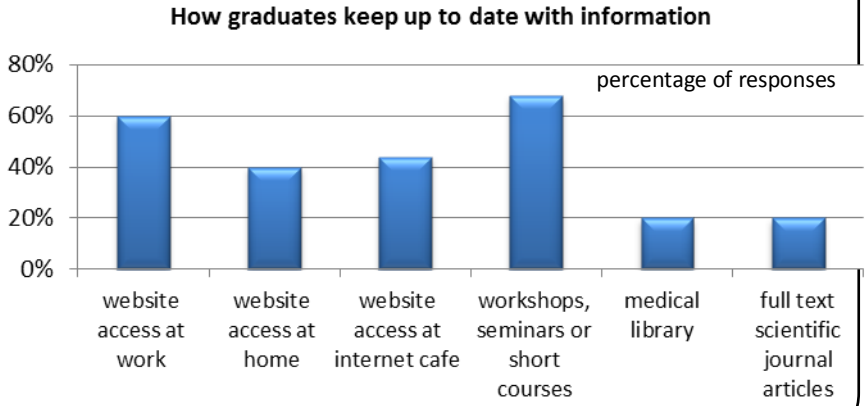


Figure 9

Membership of professional bodies and clinical interest groups: 92% of graduates reported being a member of a professional association or society (mostly national societies). No-one reported being a member of a clinical interest group.

Client participants

20 clients were seen in total by 23 graduate participants. Some acted as demonstration clients for graduates who had travelled or who were far away from base and three were seen twice. One lone worker graduate did not have a client because they were seen at their own centre late in the day as the investigators were delayed by traffic and their patient could not stay. One manager graduate did not participate in the client section of the interview. 15 prosthetic clients and 5 orthotic clients were seen. The average age of client participants was 42 years old ranging from 10 years old to 80 years old. There were 11 male and 9 female client participants.

Prosthetic clients		Orthotic clients	
Conditions	n =	Conditions	n =
diabetes	3	arthrogryposis	1
vascular (non-diab)	3	polio	4
trauma	6		
congenital	1		
cancer	1		
infection	1		
Total	**15**		**5**

Figure 9 *Figure 10*

All clients reported that their prosthesis or orthosis improved their mobility in one way or another. Some example responses (translated) included:

"I am happier and more confident"

"I am able to perform some work and carry a small bucket of water, attend church and the market. I cannot do this without a leg. I can walk a long distance with a prosthetic leg".

"I can walk 12 km. Without the prosthesis I would find it hard to walk. The prosthesis helps me to go to church – I am a practicing catholic. The prosthesis helps me not use crutches. It helps me to walk faster than using crutches. I have no crutches at home"

"It is very positive with the prosthetic leg. Without this I could be grounded and poorer economically".

5 orthotic clients (7 affected legs) were presented including 3 unilateral Knee Ankle Foot Orthoses (KAFO) users, 1 with KAFO plus AFO and one not yet supplied with an orthosis (post-operative foot/ankle surgery with arthrogryposis awaiting healing).

15 prosthetic clients (17 limb absences) were presented including 2 bilateral trans-tibial amputees, 7 unilateral trans-tibial amputees and 5 trans-femoral amputees. 1 unilateral trans-tibial amputee using crutches said they had broken then lost their prostheses some years previously.

Professional practice

23 graduate participants completed this section.

Referral prescriptions: A referral prescription was available for 35% of the sample (not all verified), usually from an orthopaedic surgeon

Clinical Records: An adequate assessment was seen to be recorded in 13% of the sample. 16% of the graduates reported that they did not keep clinical records at all. Mostly the clinical notes of the clients seen were not made available to the interviewers despite verbal requests on the day of interview. In most centres clients are seen on demand, however the notes had to be specifically requested from a filing department and this would take more than a day to achieve, which meant in usual clinical practice, the note could not be entered for clients on the day they are seen. Systems of simple clinical record keeping were not obvious. Most graduates indicated that the clinical note was a brief note and that a full clinical assessment was not recorded.

History taking: All graduates took an adequate medical history; however, only 26% of graduates took a full social history. The other 74% did not seek information about the physical home and work environment, independence, and mobility for daily living.

Description of physical disability: 83% of graduates reported physical disability clearly. 17% of graduates reported general descriptors and did not report on detailed functional limitations.

Prosthetic/orthotic history: Graduates were readily able to determine prosthetic or orthotic history, but missed details of specification and dates when presenting their cases.

Physical examination: The majority of graduates reported an adequate physical examination. Some graduates were not confident in presenting their client but generally could offer information following prompting. Generally Category I personnel demonstrated greater confidence and clarity in presenting their examination of the clients. Two Category II personnel missed elements of physical examination (sound side, upper limb function for lower limb presentation). Two Category II personnel had very poor anatomy knowledge.

Functional rating of user: 56% of graduates described the functional activity of the client. Only one graduate (Category I) used a functional rating scale. Others used general descriptors (e.g. "active enough" which is very subjective). Category I personnel were better at describing function than Category II personnel.

Devices meeting client's needs: Most graduates reported that where they were used by clients, the device generally met the client's needs given the limitations of their service, however they did not have a strong picture of the home or work environment of their clients. There was limited component choice and service affordability.

Appropriateness of device: 72% of interviewer responses were that the devices were appropriate (considering limitations).

Prosthetic and Orthotic prescription and specification: A relatively limited range of prosthetic and orthotic designs were in evidence (see later sections for more information).

Component suppliers were predominantly ICRC and Ottobock. Two prosthetic clients had components from other suppliers: Chas A Blatchford & Sons Ltd (via a donated second hand prosthetic leg which was in a poor state of repair) and Roadrunner Foot Engineering SRL.

Prosthetic feet were mainly Solid Ankle Cushioned Heel (SACH) feet with the exception of one multiaxis foot (Endolite Multiflex™) and those used by bilateral transtibial amputees which were two poorly constructed Jaipur feet and two dynamic walking feet (Walking Foot MP™ by Roadrunner).

Most trans-tibial prosthesis were patella tendon bearing (PTB) with Ethylene Vinyl Acetate (EVA) liners and supracondylar suspension (2 had PTB cuff suspension); with 2 exceptions these were a total contact hydrostatic design of sockets with sleeve/ratchet pin suspension (Roadrunner).

The five trans-femoral amputees used uniaxial knees as part of 2 exoskeletal and 3 endoskeletal prostheses. They used 3 quadrilateral sockets, 1 "triangular" socket and 1 ischial containment socket. Four of these sockets were suspended by vacuum and one with a silesian belt.

Most prosthetic sockets were polypropylene, and there were 5 laminate sockets. 2 of the laminates were made from commercially available resins and one using direct application. None of the laminate sockets were manufactured using the usual industry Health & Safety fume extraction for irritant gases.

All 5 of the orthotic devices were made from polypropylene. 4 KAFOs had side members with drop locks and strapping was leather or webbing. 1 KAFO had very thin plastic wall thickness around the angle and was failing in stance phase.

Durability of device: "*Very durable, very worn out".* Most clients paid for their device and several were using very worn devices which need to be replaced because of loose, worn joints and/or feet, but they were limited financially to do this. Clients were wearing devices that were on average 5 years old (calculation excluded one 36 year old peg leg used by a client in Uganda). One prosthetic client with bilateral trans-tibial amputations had Jaipur feet delivered only months earlier but both were rattling and loose due to inadequate foot/shank fixings.

Devices: 36% of devices seen were manufactured by the graduate interviewed and most clients were using their most recent device.

Follow up since delivery: 79% of people had been followed up since delivery of their device. This was mostly via client self-referral back into service rather than routine review. Length of wearing time and also review appointments were limited by client affordability. If the service was orthopaedic surgeon led, the client had to pay the surgeon for an assessment then an orthopaedic technologist for their device. It was noted that poorer clients do not attend for review unless in a crisis and they either had no device or extremely worn out parts.

Treatment goals identified and noted: Where treatment was planned all graduates identified treatment goals, although these were not routinely noted in the clinical record.

Improvements for devices seen: almost all graduates reported that they would improve on the client's device. The table below shows the various areas for improvement. Some devices had more than one area for improvement. Only one graduate felt there were no improvements needed. The investigators agreed with this.

The interviewers noted that Category II graduates needed significantly more coaxing from the interviewers to critically appraise their own work or the work of others and to highlight areas for improvement in client prosthetic or orthotic interventions.

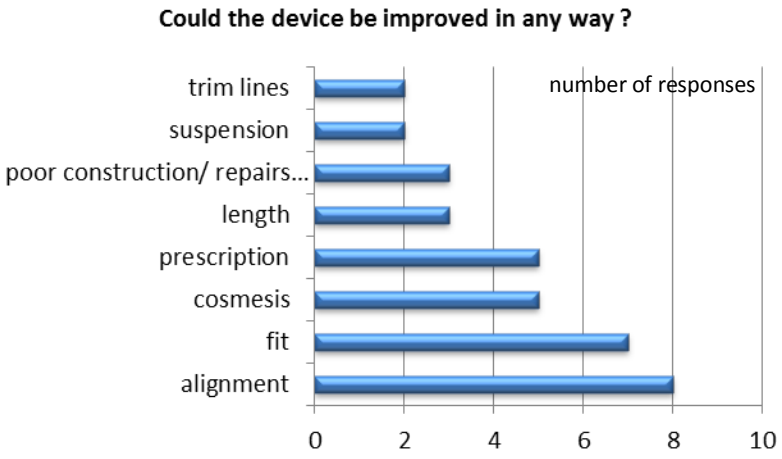


Figure 11

Most beneficial part of professional training:
Graduates most frequently rated all training and clinical practice as being of greatest benefit to them. They felt that a range of topics was important and that they particularly appreciated practical sessions. This was closely followed by prosthetics and biomechanics course content.

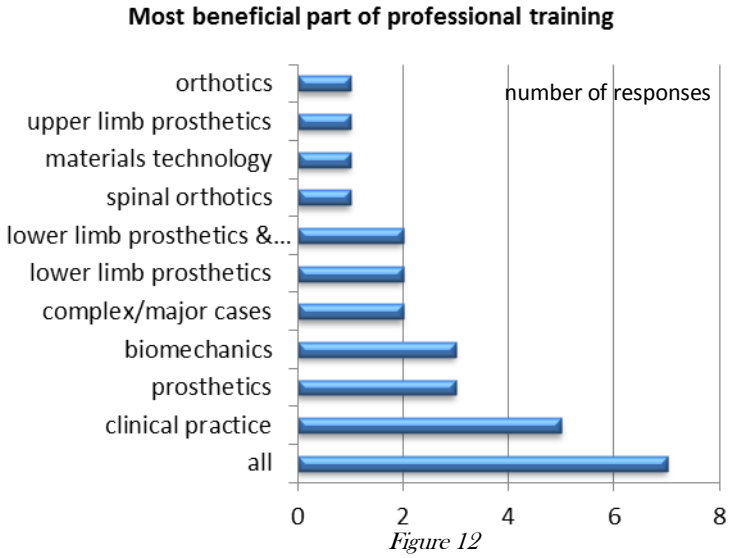


Figure 12

Topics which could have been better covered in course:
Upper limb prosthetics was the most frequently reported topic that graduates wished to have learned more about on the course. The incidence of upper limb trauma is rising in East Africa. A couple of graduates explained that they had not received any practical training in upper limb because of course changes while they were students.

Biomechanics, pathology and anatomy were the next most frequently reported topics that graduates reported they wished they had learned more about and this is mirrored in other areas of this impact assessment report.

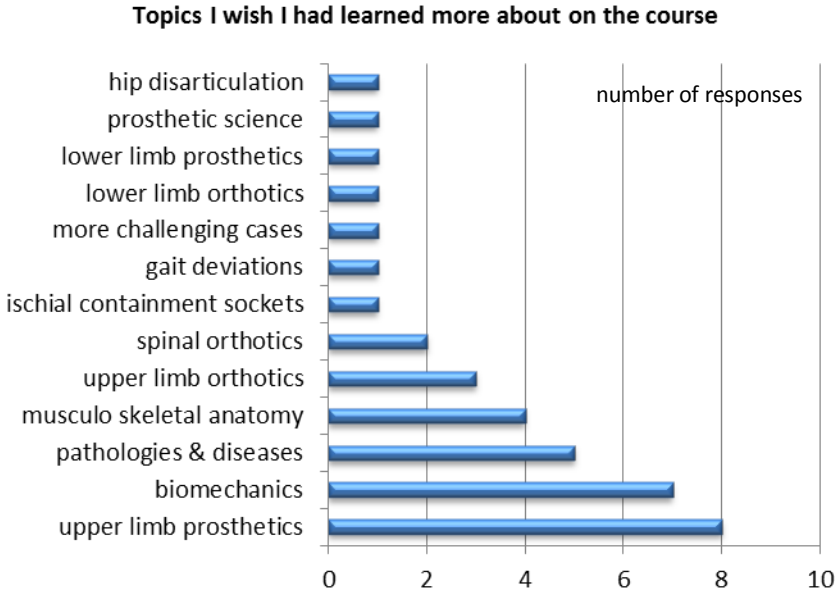


Figure 13

Desire for continuing education courses:

There was a wide range of topics highlighted in this section linked to the individual needs of graduates. Graduates have very limited opportunities for continuing education courses.

Graduates most frequently desired to attend courses on upper limb prosthetics. This is most likely linked to the growing incidence of upper limb amputation in East Africa (see country reports), their limited exposure at undergraduate level and their limited experience and familiarity with upper limb prosthetic management together with a desire to offer upper limb services to local clients.

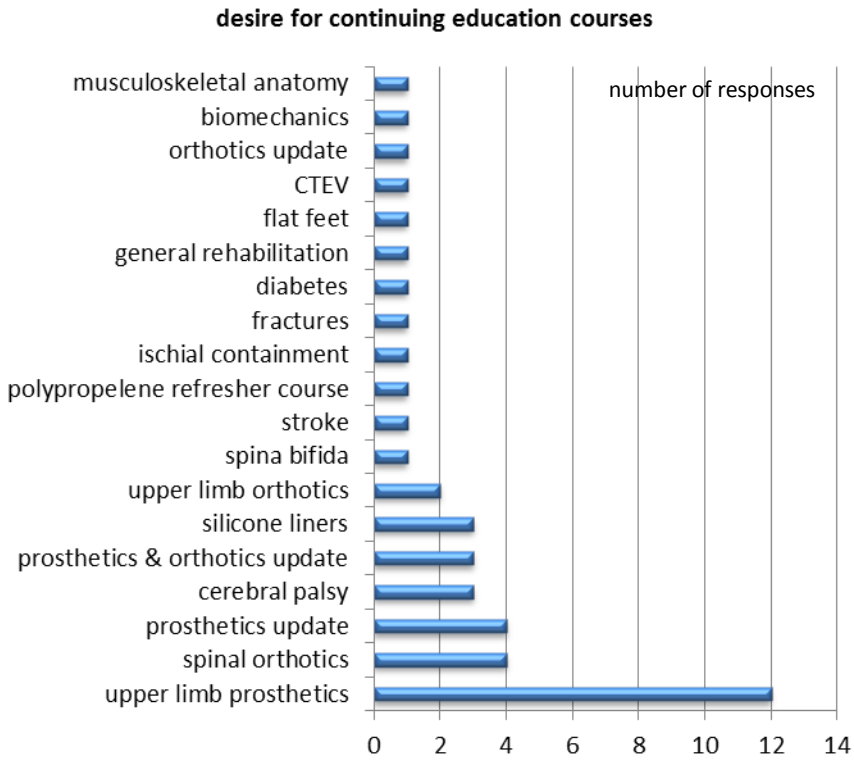


Figure 14

Desire to introduce new technologies:

The most frequently reported technologies that graduates wished to introduce and/or improve are plastics manufacturing techniques – either polypropylene or acrylic resin lamination moulding techniques. This appeared to be aligned to the two materials and component suppliers Otto Bock and ICRC.

Modular systems and prosthetic techniques were the next most frequently reported topics.

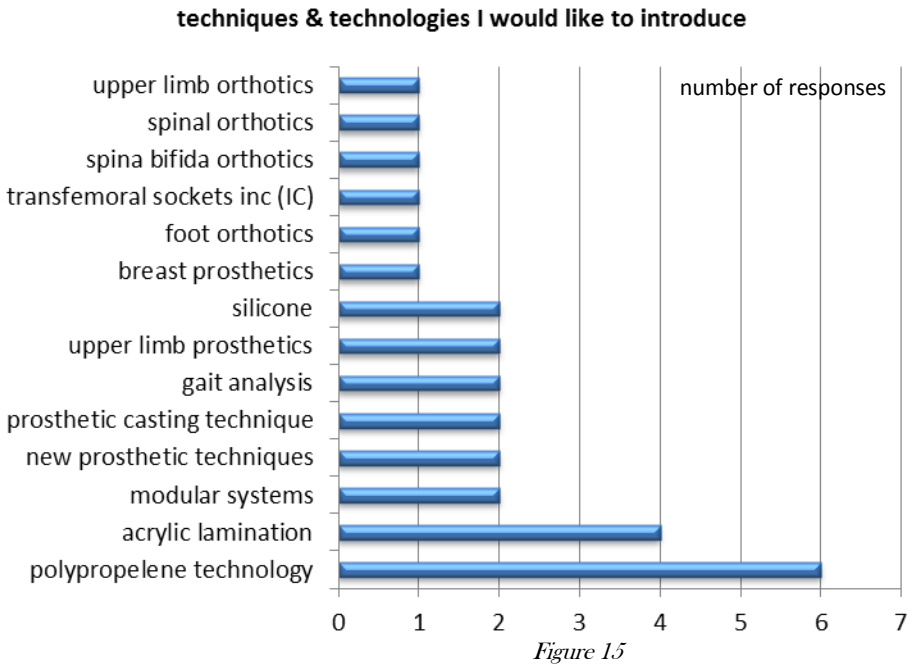


Figure 15

Personal development planning

The data collection form was reviewed by the investigator and graduate without the client present and three development needs were identified for each graduate participant. The following table shows a summary of those development needs. Where needs were identified because of the client presentations these were prioritized first. Where graduates demonstrated consistently good practice and there were no further issues with their client presentations, other professional development needs were identified through discussion.

The greatest development need identified was for graduates to improve their patient assessment skills, followed closely by prosthetic and orthotic clinical and technical skills.

Development needs summary			
	need 1	need 2	need 3
Clinical skills updates (34 needs)			
patient assessment	9	1	
musculoskeletal knowledge	1	1	
spinal and upper limb anatomy		1	
pain - understanding and assessment	1	1	
functional grading	10	6	1
understanding gait analysis			1
fracture related anatomy and pathology			1
Conditions/pathologies (3 needs)			
CTEV (club feet)		1	
cerebral palsy		1	
spina bifida		1	
Prosthetics and Orthotics clinical & technical skills) (33 needs)			
general technology update			1
ICRC technology			3
prosthetic technology			1
prosthetic sockets - all levels	1		
silicone liner & hydrostatic weight bearing	1		3
ischial containment & quadrilateral socket refresher			1
upper limb prosthetics		7	7
lamination techniques (trans-femoral)		1	
polio – KAFO		1	
upper limb orthotics		2	
spinal orthotics	1	1	
polypropylene KAFO & AFO		1	
foot orthoses			1

Figure 16

Section 7: Impact in Tanzania

COUNTRY CONTEXT:

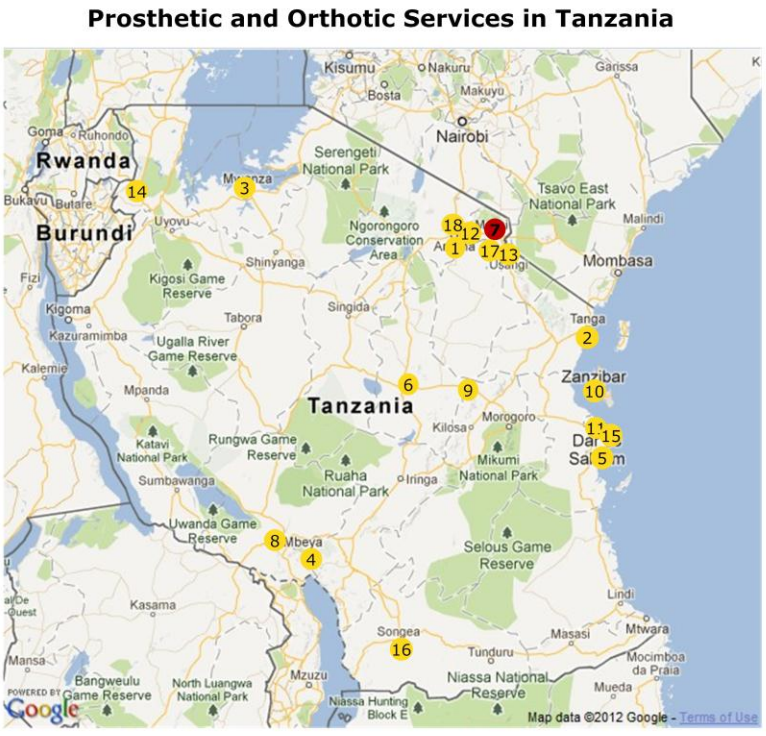
Population = 43,739,000[1];
World Bank Country Classification = Low income (< US$1,025 Gross National Income per capita)[6];
Life expectancy = 58 years[5];

There is no specific data on the number of people with disabilities in Tanzania[1], although there is a national action plan for disability. Tanzania has a specific strategy for functional rehabilitation and/or orthopaedic devices outlined in the Tanzania Health Sector Term III (2008-2015) and in social policies, however in implementation, activity is limited in relation to giving people with disabilities access to quality services. We were unable to meet with Ministry representatives during the visit since they were away but met during the FATO meeting in 2011.

The Ministry of Health and Social Welfare has responsibility for the rehabilitation sector in Tanzania. Associations for professionals include the Association of Prosthetists & Orthotists, Tanzania, the Pan African Wheelchair Association, the Tanzania Occupational Therapist Association and the Association of Physiotherapists in Tanzania. Rehabilitation institutions exist in the public sector at capital and regional level. Non-Government organizations (NGOs) have rehabilitation centres regionally. The level of private sector provision is unknown[1]. At regional level, there is an East African Association of Prosthetists and Orthotists.

PROSTHETICS & ORTHOTICS SERVICES WITHIN THE WIDER REHABILITATION SERVICES:

Prosthetics and orthotics services in Tanzania are generally known as "Orthopaedic Technology" workshops (this refers to clinical and technical facilities). The Orthopaedic Technology workshop at the National Referral Centre, Kilimanjaro Christian Medical College is strongly affiliated with the Orthopaedic Department of the Hospital. Indeed, this pattern is common across Tanzania with prosthetics and orthotics being affiliated with orthopaedic departments and the burden of orthopaedic cases is heavy and growing in developing countries[12].
Figure 17 shows a geographic concentration of prosthetics and orthotic services to the north and east of the



1	Arusha Regional Hospital, Arusha
2	Bombo Hospital, Tanga
3	Bugando Hospital, Mwanza
4	Bulongwa Rehabilitation Centre
5	CCBRT, Dar Es Salaam
6	Dodoma Regional Hospital
7	KCMC, Moshi
8	Mbeya Referral Hospital
9	Mlali Rehabilitation Centre
10	Mnazi Mmoja Hospital, Zanzibar
11	MOI, Dar Es Salaam
12	Monduli Rehabilitation Centre, Arusha
13	Mwanga District Hospital, Kilimanjaro
14	Ngara Orthopaedic Centre
15	Salvation Army, Dar Es Salaam
16	Songea Regional Hospital
17	St Joseph Hospital, Kilimanjaro
18	USA River Rehab Centre, Arusha

Note: the Degree in Prosthetics and Orthotics and the Diploma in Orthopaedic Technology are taught at TATCOT, Moshi

Figure 17. Prosthetic and Orthotic services in Tanzania

country. Services can be multi-professional, although this is more likely in the capital city or National Referral Hospital where wider multidisciplinary consultant led services are available.

The National Referral Centre at KCMC is adjacent to the only national training centre for pre-professional education of prosthetists/orthotists and orthopaedic technologists, which is affiliated with Universities as academic awarding bodies.

REFLECTIONS ON THE IMPACT OF ISPO RECOGNISED PROGRAMS

Tanzania has the benefit of TATCOT, an established prosthetics and orthotics training institute and at the time of the visit this was validated at national level with some courses recognised at ISPO Category I and II level. This has attracted different levels of funding over the years from a range of sponsors and the Tanzanian government now offers 80% student loans for training costs to Tanzanian candidates wishing to undergo pre-professional training as Orthopaedic Technologists or Prosthetist/Orthotists. Services in Tanzania employ TATCOT graduates.

Our impact assessment took us to the national referral centre at the KCMC staffed by personnel from the Good Samaritan Foundation and Ministry of Health. This referral centre is adjacent to TATCOT.

Departments

Our sample audit of graduates took us to 4 departments offering prosthetic and orthotic services:

- A national referral centre: the Department of Orthopaedic Technology. Kilimanjaro Christian Medical College, Moshi; and TATCOT, Moshi
- Two community rehabilitation centres: Monduli Rehabilitation Centre near Arusha; and USA River Rehabilitation Centre

We also interviewed managers of two additional facilities:

- Muhimbili Orthopaedic Institute (MOI), Dar Es Salaam
- Comprehensive Community Based Rehabilitation in Tanzania (CCBRT), Dar es Salaam

REFERRAL HOSPITAL: KCMC

Establishment and development: Before independence Muhimbili National Hospital in Dar es Salaam was the only consultant referral hospital in Tanzania and at that time the population was around 9 million people. There were other hospitals in the provinces before 1961. After independence in 1961 the former president Nyerere requested Bishops to establish medical training and hospitals. The Roman Catholic Bishop focussed upon the Mwanza zone and the Lutheran Bishop focussed on the Northern zone at Kilimanjaro. At that time churches had no funds so they requested funds from international aid. The Good Samaritan Foundation (GSF) was then founded to manage donations and acted as a focal point for communications with external funders. They began building a hospital which opened in March 1971 and established a training centre within the hospital. The objectives of GSF were to oversee the other medical schools – the mission schools, and to have flying services to other missionary hospitals in the country. The hospital was nationalised on the day it opened with the initial plan of training doctors to the highest level in every department in order to monitor hospitals in other parts of the country.

The hospital was taken over by the government for a time then returned to GSF in 1991 with a Memorandum of Understanding (MoU) between the government and GSF. Under this MoU the government paid salaries and other subsidies and GSF set down a capital investment. The government continues to pay salaries. In 1997 a medical school was founded starting with the faculty of medicine and 17 students. The school is doing well and now enrols 150 students each year. There are some bottlenecks: staff shortages; space for infrastructure; lack of specialities; and the provision of the services to meet the mission which is healing, teaching and research.

Prosthetics and orthotics as part of the scheme of service: KCMC created directorates to accommodate each of the allied schools including Prosthetics and Orthotics. It is incumbent on each directorate to plan their own scheme of service. KCMC provides medical services to all people regardless of religion, race or tribe etc.

Populations served and funding sources: Mwanza zone, Northern zone and some patients from Kenya. The funding comes from international aid and donated funds. The government patients/clients contribute a token amount.

KCMC Department of Orthopaedic Technology

Staff profile: 4 Prosthetists/Orthotists (ISPO Category I); 4 Orthopaedic Technologists (ISPO Category II); 1 Lower Limb Orthotic Technologist; 2 Lower Limb Prosthetic Technologists; 2 Shoemakers; 1 Bench worker; Cleaners, procurement, secretarial staff.

The Department is closely aligned with orthopaedics. The number of new patients each month ranges from 55 to 57. Facilities at KCMC are adjacent to the TATCOT Centre and students from TATCOT are exposed to clinical practice at KCMC. Upon graduation, TATCOT students move away to work in rehabilitation centres in different African countries. Tanzanian students tend to work in Tanzania after graduation. On visiting the facilities it was clear there were several obvious limitations relating to the facilities plus professional practices at KCMC that could be improved upon. The KCMC orthopaedic technology department could improve to become a benchmark standard for the East African region.

Figure 18: KCMC clinic area

Figure 18 shows a clinical room at the KCMC department. TATCOT is through the door to the left. The mutual benefits of having the orthopaedic technology department and the training centre in close proximity has helped to sustain both parties, and the relationship has the potential to become stronger to improve the quality of patient care. Facilities were clean but somewhat worn. The new manager of the Orthopaedic Technology Department, an ISPO Category I graduate, had recently started at the time of the field visit and is scoping the situation and beginning to plan changes to the functions of the department. It was anticipated that collaborative working with ICRC might affect improvements for the department.

Conversations with personnel during the visit revealed that graduates were taking a patient history, but then had to rely on memory as they destroyed the clinical note afterward. There is an urgent need to develop and maintain a clinical record keeping system to assist with patient care, clinical audit, data collection and quality management.

Figure 19: Current facilities at the Department of Orthopaedic Technology, KCMC.

KCMC Orthopaedic Technology Department not only delivers clinical and technical services but provides TATCOT students with exemplars of professional clinical and technical practice. These could be improved upon to ensure that theory taught is put into practice and skills are enhanced (see earlier sections) to better embed knowledge and develop skills. KCMC could become a benchmark of practice in East Africa.

Monduli Rehabilitation Centre (paediatric orthopaedics)

Staff profile: The centre has 32 employees including 0.4 Full Time Equivalent Prosthetists/Orthotist (ISPO Category I); 1 vacancy Orthopaedic Technologist (ISPO Category II); 3 Physiotherapists, 3 Nurses, 1 Social Worker.

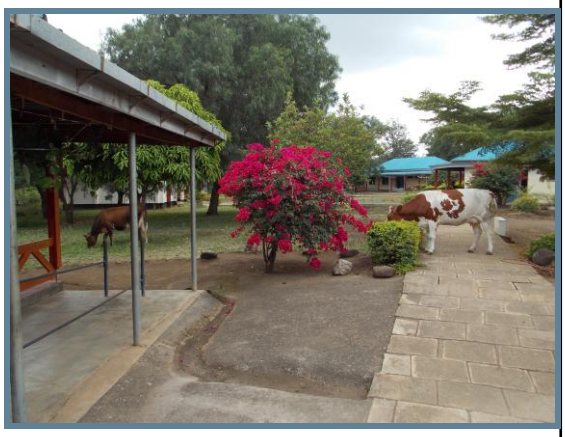


Figure 20. Monduli Rehabilitation Centre. This is a 30 bed unit where the needs of patients are well organized. Cows, goats and chickens are kept to provide produce for the kitchen. Up to 100 meals are needed each day.

Establishment and Development: Provision of outreach services has occurred since 1990 and the buildings were completed in 1998. The Centre's mission is to provide rehabilitation services to the most vulnerable societies with a focus on children with physical disabilities. An outreach program provides a program of visits 3 times a year to the local Maasai community. A dedicated car is used for outreach and their team is comprised of an orthopedic technologist, a physiotherapist and a nurse. Community health workers and village leaders identify people with disabilities and then the Monduli team organizes field visits and spends up to 5 days capturing information, identifying cases and later refers them to the Centre for rehabilitation. The coordinator of the Centre is a Prosthetist/Orthotist (ISPO Category I certified) who gradually took on more management duties as she became experienced. She continues with prosthetic and orthotic practice averaging 0.4 Full Time Equivalency.

Figure 21. Orthopaedic Technology Department clinic

Prosthetics and orthotics as part of the scheme of service: Complex surgical cases are referred to other clinics for further investigation and surgical intervention in Arusha City. Referrals to KCMC are cases for ENT, Orthopaedics and Burns. Clients in need of prosthetics and orthotics attend Monduli Rehabilitation Centre where complex cases are readily handled. There are three dormitories and each provides ten beds and a kitchen so that patients can stay within the centre while receiving treatment. There has never been a documented survey or patient follow up.

Considering employment conditions, salaries are being paid by the catholic missionary and orthopaedic technologists are engaged on a 2 year renewable contract basis. Salaries for ISPO Cat II personnel are around USD 285 per month plus 10% for housing and USD 556 for ISPO Category I personnel. There is not a well-established scheme of service, and no annual increment is paid.

Populations served and funding sources: Monduli Rehabilitation Centre serves six districts in rural areas within the community. The area has a water supply which contains fluoride and so a significant number of the children attending clinic on the day of the visit had boney deformities associated with skeletal fluorosis (and/or nutritional factors). This softens bones leading to problems of deformity exasperated by weight bearing activities of daily living. Other complex paediatric cases presenting for rehabilitation (including surgery) at the time of the visit, included infantile tibia vara and arthrogryposis multiplex congenita.

Figures 22. Child with skeletal fluorosis

The funding organization CARITAS Internationalis caters for salaries, transport expenses during outreach programs as well as other running costs. Ideally two orthopaedic technologists are needed, but Monduli faces budgetary constraints and this aim has not been realized. Mobile outreach clinics depend on the limited availability of time. Clients pay a contribution for food (1 USD /day) and contribute to surgical costs if required. Donor funders include mosques, churches and interested people who wish to give support to individual clients. Clients tend to find their own way to the Centre but transport is sometimes provided for vulnerable people. Orthopaedic technology materials are normally purchased from KCMC alongside some donations from Germany.

Planned developments:

- to have more personnel in orthopaedic technology: eventually, at least 3 ISPO Cat II full time orthopaedic technologists.
- material purchase direct from supplier. (Otto Bock, ICRC)
- to have more donors and an annual budget
- introduce a camp system to attend many patients within a specified time
- update of Journals/professional development from other sources to improve the current situation
- more regular contacts with KCMC

Usa River Rehabilitation Centre

Staff profile: 1 Orthopaedic Technologist (ISPO Category II) provides a small orthopaedic service in dedicated facilities as part of a vocational training centre for persons with a disability.

Figure 23. Usa River clinic room

Usa River has a motto "We believe in your ability" and up to 150 young people live, work and train together at the centre. Educational programs are 1 – 3 years in duration and aim to encourage independent living. The Department of Orthopaedic Technology is staffed by a single technologist. Facilities are modern with relatively new machinery, but supply chains are limited and there was evidence of only basic technologies being supplied.

In addition, the Centre offers physiotherapy and an orthopaedic technology service for around 20 to 30 patients per month as well as hosting visiting orthopaedic and plastic surgery consultations. Patients may be referred from Mount Meru Hospital. Employees are on pay roll 32, although there is no particular scheme of service for an orthopaedic technologist.

Figure 24. There was a very limited range of available materials and components for each patient category.

Populations served and funding sources: Services are targeted towards the Meru diocese (Arusha) and funding flows from the Evangelical Lutheran Church and from income generating activities such as a guest house, shop and café. Patients pay a contribution towards their treatment and may pay in full. Students pay fees (partial or full).

Planned developments: New equipment such as a vacuum pump, a compressor, an oven and improved materials supply.

We spoke with two additional service managers from the Dar es Salaam area:

Muhimbili Orthopaedic Institute:
Staff profile: 2 Prosthetists/Orthotists (ISPO Category I); 3 Orthopaedic Technologists (ISPO Category II); 1 orthotic technician 2 plaster technicians (doing Ponsetti for CTEV & fractures) 5 Shoemakers; 2 Cleaners, no admin staff.

Planned developments: The manager is planning to buy materials from ICRC and to introduce follow up clinics as an outreach programme.

Comprehensive Community Based Rehabilitation in Tanzania:
Staff profile: 4 Orthopaedic Technologists (ISPO Category II); 1 Lower Limb Prosthetics Technologist; 3 bench workers; 1 shoemaker.

Planned developments:
Continue to sustain services. The CCBRT workshop is well organized with various rooms and facilities. Colleagues can now see each other through a glass partition recently installed to improve communications.

Impact of graduates in Tanzanian services:

Prosthetics and orthotics service managers reported that:

- the TATCOT graduate personnel have a wider knowledge in handling patients.
- it is positive to have trained personnel as they handle cases in a more professional manner
- the personnel allow more senior clinical leads to be assigned to do other extra duties.
- they offer specialized treatment for upper limbs.
- graduates are good at resolving some incorrect prescriptions from doctors.
- having trained prosthetist/orthotists and orthopaedic technologists in the centre has a positive impact as they collaborate with others in the rehabilitation team such as physiotherapists, occupational therapists and doctors.
- graduates are involved in service development. They initiate progress and collaborate to develop services.
- one manager reported that they have weekly presentations every Friday morning with one graduate presenting a topic (schedule of 3 months).

Impact and persons with disabilities:

The following case stories illustrate the impact that prosthetic and orthotic devices have on the lives of persons with disabilities in Tanzania. The client participants in the graduate interviews consented to the study and are to be kept anonymous. Some of their quotes are shown in section 6 to illustrate impact. Additional clients were asked separately about the impact of the services on their lives and gave their permission to share their stories.

Figure 25. Yasin

Yasin, pictured left is 62 and is now retired from a successful career as a primary school teacher. He has a right leg weakness with an unstable leg subsequent to contracting polio at the age of 5. Although he was able to manage for many years, he found difficulty in walking. In 1973 he was advised to attend Muhimbili Hospital. Here he received a Knee Ankle Foot Orthosis to help support his leg. At that time he noticed that other people had a different kind of orthopaedic technology that allowed their knee to bend when sitting, but was unable to afford this kind of treatment until 1976 as it cost more than a month's salary.

Over the years he has been able to stand and walk helped by his orthosis. He was able to continue working until retirement age with the support of orthopaedic technology and since 1981 has attended the Orthopaedic Technology department at Kilimanjaro Christian Medical Centre to help maintain his mobility. This service has become even more important to him as he gets older because his left knee is painful and he relies more heavily on his right leg and orthosis to be independent.

Figure 26. Happiness

Happiness, 36, is a cook at Monduli District Hospital, Tanzania. She cooks up to a hundred meals a day for the children attending the hospital and supports her family of three young children from her earnings. Happiness contracted polio when she was 2 years old which led to a weakness of her knee. She managed with difficulty to stand and walk by pushing back on her knee with one hand to stop it collapsing. Since 1990 she has been using a Knee Ankle Foot Orthosis which supports her leg and leaves her hands free to be able to get on with her busy work and home life. She attends the Orthopaedic Technology Department at the hospital when she needs a repair or a replacement device.

Meet Severa, 44, who wears a Knee Ankle Foot Orthosis each day to support her weak knee and foot while she cleans her house, cuts grass for her animals and farms vegetables. Severa is able to walk 300m while carrying 10 liters of water on her head or in her hands. She explains that she experienced right leg weakness from about 3 years of age immediately after a polio vaccination. She has had to be self-sufficient and now she lives at home with her brother's 18 year old son. She says *"had I not had the orthosis I would not have been able to do all that I am able to do".*

Figure 27. Severa

Figure 28. John

John, 17, is a young man with big ambitions... Among other challenges, John was born with his hands and parts of his arms missing and also has a disarticulation of the left leg at the level of the knee. He is able to write using his arm stumps and wears a prosthetic leg to help him walk 2.5km to and from school every day and participate in activities he enjoys like football. John attends government secondary school and it is difficult for him to find the finances to do this.

John says *"without my prosthetic leg I could not attend school and I would be sitting at home. The prosthesis has changed a lot in my life".* Since John received his first prosthetic leg in 2004, he has had 4 prostheses. In the past John has had financial support to help pay for his prosthetic leg from his mother and also from various sponsors. At the time of the assessment John felt very comfortable in his prosthetic limb which he had received 6 months previously, but it was short because he had grown and the foot was a little loose. He said each of the series of prosthetics legs have lasted him about 2 years.

Despite all the challenges that John faces, he is doing well in class and dreams of one day becoming a lawyer to advocate for issues of people with disabilities.

Today, Yasin, Happiness, Severa and John each use orthopaedic technology that needs replacing every few years. The cost of orthopaedic technology is far outweighed by the benefits of a lifetime of participation and contribution to education, work and society.*

Treatment is provided by prosthetist/orthotist and orthopaedic technologist personnel trained to international standards ISPO Category I and ISPO Category II, who graduated from the Tanzania Training Centre for Orthopaedic Technology.

*a table of costs can be seen on page 43

Section 8: Impact in Kenya

COUNTRY CONTEXT:

Population = 39,802,000[1];
World Bank Country Classification = Low income (< US$1,025 Gross National Income per capita)[6];
Life expectancy = 57 years[5].

Figure 29. Baraka Munisi, Harold Shangali, Anne Marimba (MoH), Sandy Sexton, Kerio Raphael

In Kenya there is no particular data regarding the incidence of people with disabilities. The national system offers rehabilitation services at primary, secondary and tertiary level.

We met with the Deputy Chief Orthopaedic Technologist, Ministry of Health, Kenya, who explained that the Kenyan government has a national Council of People with Disabilities and there is a representative member in the Ministry of Health. All cadres of health professional have a representative in the Ministry of Health. There are hospital reforms country wide and improvement is foreseen for services to become uniform, however there are challenges such as funding for orthopaedic technology equipment, consumables and components.

Data collection is undertaken in the country for persons with different disabilities receiving assistive technologies. Although data was not published, we were given a copy of a blank data collection form indicating a minimum data set of information, listing types of device delivered by month and this is adapted in each centre/hospital. The major causes of amputation were also collected. The government is involved in significant campaigning to reduce road traffic accidents, a major cause of trauma related disabilities in Kenya.

The Ministry of Medical Services is responsible for Kenyan rehabilitation services and there are three associations of rehabilitation professionals: the National Association of Orthopaedic Technologists, the Kenya Occupational Therapists Association and the Kenya Society of Physiotherapists. There is a national Head of Orthopaedic Technology within the Ministry and there is also a specific plan for Orthopaedic Technology (AOP6).

Only one company is on the prosthetic component supplier purchasing authorities (Tender Board) list for Kenya, namely Ottobock. It is up to the departments of orthopaedic technology to specify what they need – to date people have specified Ottobock. Suppliers have to go through a supplier approval process which is clearly specified by government. The government procures the service which should be either free or carry a nominal charge.

PROSTHETICS & ORTHOTICS SERVICES WITHIN THE WIDER REHABILITATION SERVICES.

Kenya's prosthetics and orthotics services are positioned as part of assistive technology services (including wheelchairs) and are known as orthopaedic technology services. Indeed, the national referral hospital is closely aligned with orthopaedics although vascular, neurological and other cases are also served by the orthopaedic technology services.

The Ministry explained that there are 34 active centres in Kenya and 114 government employed orthopaedic technologists out of 200 in total. The map on page 29 (Figure 30) shows 53 services including ministry, faith based organisations, non-government organisations and private facilities, some of which are very small concerns). Most of the professionals who have trained in TATCOT have returned to Kenya but have to work for the government.

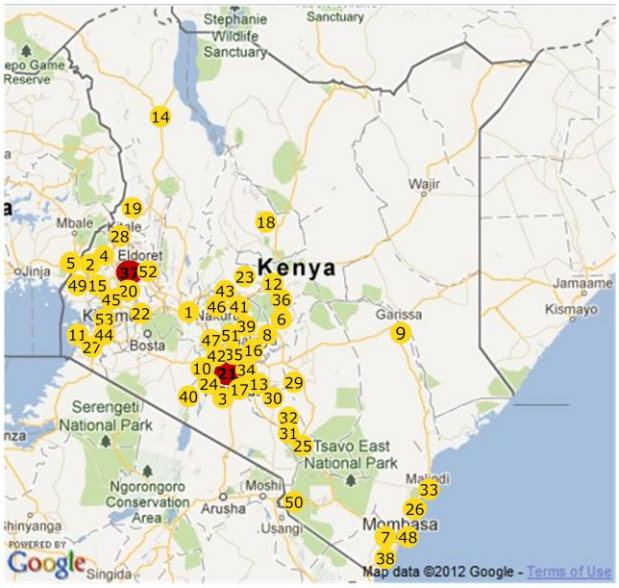
There is a scheme of service/career structure (unpublished) for personnel set up to higher levels, but there is no guarantee of TATCOT trained Kenyans achieving this. The scheme of service differs for government services, private services and non-government organisations. A new scheme of service has been created by government and is in draft form this may be completed around the end of 2012 depending on agreement.

Kenya has a national training for orthopaedic technologists at the Kenya Medical Training Centre (further information on page 34).

During discussions, the authors explained one USAID funded ISPO Category I Kenyan Graduate is practising in another country having graduated only last year. Despite agreeing a contract he became frustrated with his job position and monthly salary of 10,000 KES (115 USD) with a faith based organisation. We queried certainty of career structure for the three current USAID-ISPO scholarship students on a respectable salary level to help with motivation and retention of these trained professionals in Kenya. It would be helpful if the new Kenyan career structure could be published to assist with the establishment of in-country professional salary levels.

With regards to Kenyan entry to the degree program at Tumaini University, the Kenyan school system does not have "A" levels and so Kenyan applicants are not normally eligible for entry under University regulations unless they have already completed the diploma course at TATCOT whereby they could apply for year 2 entry to the 4 year degree. The Director of TATCOT undertook to seek ways to overcome this with Tumaini University.

Prosthetic and Orthotic Services in Kenya



Note: the national Diploma in Orthopaedic Technology is taught at KMTC, Nairobi

Key:

National Referral Centre Other Orthopaedic Technology clinics/workshops

1	AIC Cure, Kijabe	27	Kisii District Hospital
2	Alupe Leprosy Hospital, Busia	28	Kitale District Hospital
3	Association for the Physically Disabled, Nairobi	29	Kitui District Hospital
4	Bungoma District Hospital	30	Machakos Level 5 Hospital
5	Busia District Hospital	31	Makindu District Hospital
6	Chuka District Hospital	32	Makueni District Hospital
7	Coast Provincial General Hospital, Mombasa	33	Malindi District Hospital
8	Embu Provincial General Hospital	34	Mathari Mental Health Hospital, Nairobi
9	Garissa Provincial Hospital	35	Mbagathi District Hospital, Nairobi
10	Gateway Prosthetics & Orthotics, Nairobi	36	Meru District Hospital
11	Homa Bay District Hospital	37	MOI Teaching and Referral Hospital
12	Isiola District Hospital	38	Msambweni District Hospital
13	Jaipur Foot Project, Nairobi	39	Murang'a District Hospital
14	John Paul II Children's Home, Lodwar	40	Nakuru Provincial General Hospital
15	Kakamega Provincial General Hospital	41	Naru Moro Disabled Children's Home
16	Kamiti Prison Hospital, Nairobi	42	National Spinal Injury Hospital
17	Kangemi Rehabilitation Centre, Nairobi	43	Nyahururu District Hospital
18	Kangundo District Hospital	44	Nyamira District Hospital
19	Kapenguria District Hospital	45	Nyanza Provincial General Hospital, Kisumu
20	Kapsabet District Hospital	46	Nyeri Provincial General Hospital
21	Kenyatta National Hospital	47	PCEA Kikuyu Orthopaedic Centre
22	Kericho District Hospital	48	Port Reitz District Hospital, Mombasa
23	Kerugoya District Hospital	49	Siaya District Hospital
24	Kiambu District Hospital	50	Taveta District Hospital
25	Kibwezi Health Care Clinic	51	Thika District Hospital
26	Kilifi District Hospital	52	Uasin Gishu District Hospital
		53	Vihiga District Hospital

Figure 30. Prosthetic and Orthotic Services in Kenya

REFLECTIONS ON THE IMPACT OF ISPO RECOGNISED PROGRAMS

The number of TATCOT trained professionals in Kenya is relatively small compared to the amount of professionals trained at KMTC. The level of KMTC training in prosthetics and orthotics is lower than the TATCOT ISPO Category II recognised program meaning that at graduation the graduates could be expected to perform at different levels[5]. However graduates from both TATCOT and KMTC have the potential to improve and build their practice and gain experience after graduation, although mentorship and preceptors are limited in the country. The development of clinical practice is dependent upon the individual clinician, their environment

and the influence of more experienced colleagues. The result of this is a variability in the quality of treatment provided both in the same clinic and between different clinics.

The impact and influence of TATCOT on prosthetics and orthotics services in Kenya was evident and forms part of the history and future of the story of development of services for persons with disabilities in the country. There was also some historical tension between the training institutions that related to limited communications. Our visit revealed a willingness to explore future collaborative working which could result in a stronger East African professional and academic partnerships.

Departments

Our sample audit of graduates took us to 2 departments offering prosthetic and orthotic services:

- A national referral centre: the Department of Orthopaedic Technology. Kenyatta National Hospital, Nairobi; and KMTC, Nairobi;
- One community rehabilitation centre: AIC CURE, Kijabe
- We also interviewed managers of two additional orthopaedic technology departments:
  - Chuka District Hospital
  - Industrial Rehabilitation Centre, Nairobi

REFERRAL HOSPITAL KENYATTA NATIONAL HOSPITAL, KENYA

Kenyatta National Referral and Teaching Hospital was founded in 1901 and has grown from 40 beds to 1800 beds. The hospital has a research department and liaises on training issues with KMTC, Nairobi University and Agha Khan University.

We met with the Senior Assistant Director Special Programs (CEO, a new office initiating in September 2011 within the hospital with a brief to improve services.) The government has been lobbied for funds to pay for patients who cannot afford costs.
The director requested the advice of an ISPO consultant relating to assistive technology services to:

- expand the infrastructure (specifically the physical building),
- build capacity
- deliver short courses and seminars
- extend the scope of technology prescribed as Kenyatta National Hospital Orthopaedic technology officers have focussed on a few technologies

The hospital has significant challenges such as constraints on budget, liaison with corporate business and dissemination of information.

Department of Orthopaedic Technology, Kenyatta National Hospital

Staff profile: 1 Prosthetist/Orthotist (ISPO Category I); 2 Orthopaedic Technologists (ISPO Category II); 10 KMTC trained orthopaedic technologists; 3 technicians; 2 supporting attendants; 1 health records technician.

Figure 31. The Department is clearly located within the main hospital building and also offers a club foot service.

Prosthetics and Orthotics as part of the scheme of service: The Department at Kenyatta is clearly located within the main hospital building and is strongly aligned with the department of orthopaedics. It is a national referral service and works in support of consultant led services (10 orthopaedic surgeons and 3 neurosurgeons). Referrals are also received from other clinical officers, physiotherapists and an occupational therapist.

The authors experienced a real sense of enthusiasm and an urgency to develop services from the staff team. There were some compelling examples of good practice and problem solving in the types of services and devices offered by the department (a club foot clinic; locally sourced materials; more complex cases). The authors believe the service has a tremendous potential for change, expansion and leadership under the guidance of senior personnel who were constantly working on service development.

Figure 32. Jon Ondiege, Daniel Kariro, Harold Shangali and Kerio Raphael

Space was at a premium, although bright and maintained with clearly designated clinical and technical areas. The waiting and clinical areas were cramped, especially considering the current and potential client caseload.

Manufacturing facilities would benefit from some reorganisation, upgrading and better segregation from clinical spaces to reduce noise and dust.

Figure 33. The area in the workshop used for acrylic lamination requires local exhaust ventilation of irritant gases.

Populations served and funding sources: clients are predominantly from the Nairobi area, although referrals may be received from all over Kenya. An average of 280 patients are seen per month for either consultation or assistive device provision. This data was collected in May 2012 as it was required to be presented in the leadership development program held in June 2012 in Nyeri, Kenya. Feedback (word of mouth) from patients increases the activity in the department. Clients are thought to follow the centres that provide quality services.

Materials are purchased locally and also from an agent of Ottobock. This was also shown in the stores of plastics and off-the-shelf devices. The annual materials budget is USD 8,000. Additionally, patients incur a nominal service charge[6]. Staff salaries are paid by the government.

Figure 34. The limited stock in the department was from a single supplier, Otto Bock

Figure 35. More complex cases and technology is in evidence.

Planned developments:

- expansion of the service.
- training of more personnel to ISPO Category I and Category II level.
- an area of garden has been identified for expansion of the existing building to provide more space for orthopaedic technology services.
- international recognition of the services through improvements in quality.

Department of Orthopaedic Technology, Chukka District Hospital
Staff profile: 2 Orthopaedic Technologists (ISPO Category II); 2 KMTC trained orthopaedic technologists; 1 cleaner.

Planned developments: facilities development including a workshop move.

Industrial Rehabilitation Centre
Staff profile: 1 Prosthetist/Orthotist (ISPO Category I); 1 KMTC trained orthopaedic technologists; 1 technician

Planned developments: To look for appropriate quality materials. Advancement of technology. More personnel (both ISPO Categories I and III).

AIC Cure, Kijabe Department of Orthopaedic Technology
Staff profile: 4 KMTC trained orthopaedic technologists; 1 shoe technician.
We visited a rehabilitation centre with nationally trained personnel to provide a comparison to centres with ISPO certified personnel and to consider the development needs of such centres.

Figure 36. AIC Cure orthopaedic technology clinic room.

AIC CURE Kijabe opened in 1998 and specializes in the treatment of orthopaedic conditions. It is located along the Great Rift Valley and has partners in AIC Health Ministries and Christian Health Association of Kenya (CHAK). AIC Kijabe Hospital – has a 265 bed facility next door. AIC CURE Kijabe has a 30 bed general ward plus 4 beds in a private ward. There are 4 operating rooms, an Orthopaedic workshop and a play area.
There is a program of mobile clinics annually, although these are less frequent today due to limited resources. Common conditions seen are clubfoot, angular limb deformities, burns, spinal deformities. In 2011, 2,335 patients were seen.

The facilities were modern and well maintained. The orthopaedic technology workshop was relatively new, well planned and organised.


Figure 37. Alex King in the reception area.

Planned developments:
- staff development to handle complex cases.
- local exhaust ventilation in workshop.
- seeking funding to maintain facilities and deliver services including mobile clinics.

Impact of graduates in Kenyan services:

Prosthetics and orthotics service managers reported that:
- more complex patient cases are referred to the Centre where trained personnel are important.
- graduates impact on geographical decentralization of services through planning by the Chief Technologist at the Ministry who ensures personnel are placed in different provinces.
- graduates have skills around client evaluation.
- graduates have contributed to the professional development of others through mentoring, for example, handling of polypropylene and establishment of the centre to install the department.
- graduates enhance advocacy and promote awareness of the profession.
- graduates play a role in the dissemination of availability of services.

- graduates at Kenyatta liaise with medical doctors and specialists and also attend ward rounds and scientific presentations
- graduates teach students from referral hospitals as well as from KMTC.
- occasionally graduates have been consulted by hospital management on the progress of services.

Impact and persons with disabilities:

Figure 38. Elvin and Joyce

Elvin, age 3, and his mother Joyce are familiar faces at the AIC CURE International Children's Hospital, Kijabe, Kenya and have been attending for multi-disciplinary treatment since Elvin was 1 week old. Elvin was born with deformities of his hands and feet and underwent two leg amputations at 6 months plus surgery on his hands to separate and reshape his fingers. They drive for 3 hours to the centre, located along the Great Rift Valley in Kenya, or take a 5 hour bus journey.

Figure 39. Elvin is beginning to walk

Elvin received his first pair of prosthetic legs (artificial legs) at the age of two and like any toddler is getting better at walking all the time with practice. Elvin also likes to colour in pictures and will soon be able to write.

Joyce is very happy with Elvin's progress and is very hopeful for the future. As Elvin gets bigger and more proficient in the use of his prosthetic legs he will become more and more independent and able to participate in school and home life.

Elvin enjoys playing with his friends and exploring his surroundings. He really likes wearing his prosthetic legs and cries if he doesn't have them on.

Elvin receives his prosthetic legs from the Orthopaedic Technology department of the hospital from an Orthopaedic Technologist who has become more proficient in caring for children following support from AIC CURE. This professional wants to learn more and develop his practice in managing complex cases through further training.

Kenya national training:

Kenya Medical Training College:

Figure 40. Meeting with KMTC

The ISPO team expected a courtesy visit with the Head of Orthopaedic Technology at the College. However we were invited to a formal meeting with representatives of KMTC staff. A note of the meeting was sent to ISPO Head Office and a letter enclosing the WHO/ISPO training guidelines[3] were sent to the Registrar by the ISPO Grant Manager.

KMTC is the training arm for the health sector in the country. It is empowered by mandate and has 17 basic programs. Diplomas are 3 years in duration. Nursing is regulated by boards and it is expected that orthopaedic technology will have a regulatory board. KMTC is run by a board made up of school principals and the chairman is appointed by the President. There are 30 campuses in the country although a few courses are only delivered in Nairobi, including orthopaedic technology. The college is introducing a certificate course on plaster technicians (two years)

The department has collaborated with the University to raise the level of program from diploma to degree. This would require Masters level lecturers.

A "Situation analysis of the orthopaedic technologist training at KMTC Kenya" (authors Frederick Joyeux and Bernard Frank) was conducted November 21-25, 2011 to compare ISPO guidelines with the KMTC diploma in orthopaedic technology. A draft report has been produced and content includes barriers & gaps identified[7].

KMTC representatives said they tried to liaise with TATCOT around 10 years ago but this failed. KMTC requested alternatives in order to uplift the school status and work towards ISPO recognition. The Director of TATCOT was open to supporting KMTC in this regard. The registrar committed to submit a formal letter to ISPO inviting them to proceed with a consultation in the future.

Figure 41. The ISPO delegation briefly visits KMTC students of orthopaedic technology

Section 9: Impact in Uganda

COUNTRY CONTEXT:

Population = 34,509,205[5];
World Bank Country Classification = Low income (< US$1,025 Gross National Income per capita)[6];
Life expectancy = 54 years[5];

We initially met with the Minister and Director of Education Standards, Ministry of Education, Uganda. All policies in Uganda state that persons with disabilities have an equal right of accessing services. The objectives of this government department are to: set standards; publish quality indicators for all schools; ensure policy at institutional level is user friendly to persons with special needs from primary school though to the higher educational level. The director spoke about evaluation of Mulago Orthopaedic Technology school. The Minister discussed that generally, policy makers need to focus more on curative, preventative and rehabilitation services which should be cross cutting specifically for persons with special needs. The ministry officials noted that despite these policies, realization of the standards are often not met. Their challenge is now to work towards promoting standards through inspections and subsequent recommendations.

Further to this we met with the Secretary for Allied Health Professionals, the Head of Human Resource Development and a representative of the desk for Disability and Rehabilitation as well as representatives of the Mulago Training School to explain the purpose for our visit and to explore the commitment of government to persons with disabilities. Again, resourcing of disability services proves to be a significant challenge for Uganda.

PROSTHETICS & ORTHOTICS SERVICES WITHIN THE WIDER REHABILITATION SERVICES:

Prosthetic and Orthotic Services in Uganda

Key:

- National Referral Centre
- Other Orthopaedic Technology clinics/workshops

1	Arua Hospital
2	Buhinga Hospital, Fort Portal
3	Buluba Hospital
4	CORSU, Wakiso
5	Great Lakes Region, Kampala
6	Gulu Hospital
7	Holma Hospital
8	Kabale Hospital
9	Katalemwa Cheshire Home, Kampala
10	Kuluva Hospital, Arua
11	Kumi Hospital
12	Lira Hospital
13	Masaka Hospital
14	Mbale Hospital
15	Mbarara Hospital
16	Moyo Hospital
17	Mulago Hospital. Kampala
18	Orthotech & Physical Rehab, Kampala
19	UPDF Rehab Centre, Mubende

Notes:
- the national Diploma in Orthopaedic Technology is taught at the Paramedical School Mulago, Kampala
- an additional outreach clinic at the Dadaab refugee camp refers to Gulu

Figure 42. Prosthetic and Orthotic services in Uganda

There is no definitive information about the number of persons with disabilities in Uganda. The Ugandan Government has disability legislation such as the 2006 Persons with Disabilities Act and the 2004 National Council for Disability Act. The Department of Disability and Elderly, Ministry of Gender, Labour and Social Development takes the responsibility for disability and the Ministry of Health for assistive devices. Only a small proportion of persons with disabilities receive much needed assistive technologies and in general implementation of policy is limited by available resources. There was no principal post for Allied Health Professions in government. When discussing recognition of TATCOT graduates in Uganda, it transpired that degree level graduates (ISPO Category I) were not recognised, referencing Chapter 268 of the Allied Health Professionals Act. In order to recognise the TATCOT degree more fully, there would need to be a revision of the Act.

The government co-ordinates 12 orthopaedic technology services. Prosthetics and Orthotics Services in Uganda are strongly linked with the field or orthopaedics and services are positioned as orthopaedic technology departments.

Altman (1998) in a Uganda Prosthetic/Orthotic needs assessment, described a fragmented and uncoordinated national situation and recommended that an improved, coordinated, national approach to development of prosthetic and orthotic services in the country be taken[10]. The '98 report described 10 orthopaedic workshops across Uganda with a cohort of 12 students expected to graduate from the prosthetics diploma at the Mulago. Altman also recommended that the professional community working in prosthetics and orthotics should be developed.

Since the Altman report, progress has been slow, although the number of services has grown. Certainly the recognition of orthopaedic technologists as Allied Health Professionals provides a start in the development of the profession. Figure 42 shows the number and location of orthopaedic technology services in Uganda. We experienced a collegiate group of TATCOT alumni when the graduates were brought together, but we found little evidence that the professional community in prosthetics and orthotics is strongly engaged in professional development nationally as Altman had envisaged. One of the current difficulties for prosthetists/orthotists and orthopaedic technologists is that although personnel are recognized by the Disability Desk of the Allied Health Professional Council, they do not have a clear career structure and there is no specific scheme of service recognizing these professionals. This can present challenges of professionals achieving a living wage. More professionals trained at the ISPO recognized level could facilitate development of services for persons with physical disabilities, but recognition would be needed.

Furthermore, Uganda's disability services supply chain depends very heavily on numerous donors which lead to fragmented inconsistent supply as there is no strong national co-ordination of supply. The main need for services is to have a well-structured system for supply of materials/components so that existing trained personnel can build their assistive technology services.

During the graduate interviews it emerged that there is a national plan whereby the government wants to ensure availability of rehabilitation services in each of 72 districts. It is important for the central national referral service at Mulago to focus on improving the quality of its services and to then provide leadership for the establishment of any new services.

The ICRC Physical Rehabilitation Program Annual Report 2011 describes a central joint planning with the Ministry of Health of Uganda to create a national central store for materials and components as part of the National Medical store with a cost structure that could support all centres in the country[9]. This would certainly help open access to provision of prosthetic and orthotic devices and is an encouraging development.

REFLECTIONS ON THE IMPACT OF ISPO RECOGNISED PROGRAMS

Based on our observations of a national referral service, Uganda's current prosthetic and orthotic services appear to be struggling and are significantly under-resourced in terms of facilities, supply chains and also coordinating efforts.

It was noticeable that the leadership of Mulago Hospital are disappointed in the progress and development of the department of orthopaedic technology. Normally, it is expected that a national referral hospital provides leadership, guidance and is an exemplar to other services in the country, but it was difficult to envisage this for prosthetics and orthotics services in Uganda. One senior consultant surgeon described great strides in the development of orthopaedic surgical practice, but in prosthetics and orthotics services, development had been like "chicken flight", having demonstrated a strong trajectory in the past, but development has since stagnated.

In such circumstances it was difficult to differentiate the impact that TATCOT graduates had compared to nationally trained graduates. We were encouraged, however, when interviewing TATCOT graduates with clients to find that these were a group of professionals who cared greatly about their clients. They were able to present their clients, but some ISPO Category II professionals lacked confidence in this. These graduates had been working in adverse circumstances for a sustained period of time and need encouragement to strive to develop their services. One graduate reported that "this interview is long overdue" and appreciated discussion about professional development.

Facilities visited

NATIONAL REFERRAL HOSPITAL Mulago Hospital

Our visit took us to the Mulago National Hospital where the main objectives are service provision, training and research. Mulago is a 1500 bed capacity hospital. The hospital was born from service development in the late 1950's. Huckstep devised a program about tackling orthopaedic cases and polio. The first workers in the orthopaedic workshop were people with disabilities who were trained on the job. Health volunteers overseas in the 1950s began a project of rehabilitation including the orthopaedic workshop. During that time half of the patients were children and the caseload was 60% polio, 10% degenerative diseases, 30% trauma. In the 1960s the International Campaign on Disability Integration focussed on jobs for persons with disabilities. In the 1970s the orthopaedic workshop shifted to another ministry and all orthopaedic cases were treated in the surgical ward. There are currently 3 wards with one of these specifically for trauma and another for spinal orthopaedics (paraplegia due to road traffic accidents for example and also spinal fracture care).

Figure 43. Kampala traffic and boda boda

Currently 90% of orthopaedic cases are due to trauma. Within orthopaedics, trauma has reached an 'epidemic.' Children with other orthopaedic conditions are being pushed out of wards because of the incidence of road traffic accidents and there is even a ward nicknamed the "boda boda ward" to describe a ward filled with cases

Figure 44. Ponsetti treatment in the orthopaedic department

linked to motorbike incidents. Data from 2007 – 2011 reveals 600 amputations each year.

We visited a well organised and busy club foot clinic (CTEV) housed in the orthopaedic outpatient department run by orthopaedic personnel who adopted internationally accepted practice (Ponsetti) and had modern and professional posters promoting the technique. There has been an assessment of club foot treatment funded externally.

There was a marked difference between this environment and that of the Department of Orthopaedic Technology and the Mulago Training Centre.

Department of Orthopaedic Technology, Mulago Hospital

Staff profile: 2 Orthopaedic Technologists (ISPO Category II); 2 Mulago trained orthopaedic technologists; 6 Orthopaedic technology assistants (in training), 6 metal technicians, 4 wood technicians, 1 administrator, 1 office assistant.

Figure 45. contrasts between old teaching posters in Mulago and the ISPO data collection forms.

Prosthetics and Orthotics as part of the scheme of service: Being hosted by the Mulago Training Centre for Orthopaedic Technology which is co-located on the same piece of land as the Department of Orthopaedic Technology at Mulago National Referral Hospital, we were disappointed to find that the facilities were visibly different from the rest of the hospital and the buildings and infrastructure of both the training centre and the hospital service were of a lower standard internally and externally. The Department is comprised of a number of wooden and concrete buildings located in a corner of the main hospital site with its own gated entrance to the complex of buildings. It was last renovated in 1991 by the British Red Cross and USAID and today there are maintenance issues so that the clinical and technical working environments are less than satisfactory.

Figure 46. Historic signs of investment at Mulago

Orthopaedic technology students from the 3 year program at Mulago are involved in service provision and supervised by graduates of Mulago and TATCOT. A number of technical staff support the manufacture of assistive technologies, particularly wheelchairs, and the orthopaedic technologists also manufacture prostheses and orthoses. At the time of the visit an NGO visiting group were retro-fitting old donated orthopaedic devices for free and so it was difficult to determine the normal working practices of the clinic or workshop areas, however from devices seen worn by the local clients we interviewed and the general surroundings, it appears that there is little investment in the prosthetics and orthotics services at Mulago. Even maintenance of simple finishing machines on the site seemed to be problematic as no-one was skilled in this basic engineering task.

Figure 47. Obsolete SACH foot models and dysfunctional copy equipment resided in the workshop

A large store room had basic stock, but mainly for wheelchairs and there was extremely limited stock for custom made or off-the shelf prosthetics and orthotics supply.

Changes in funding and management regimes over the years in Uganda have perhaps caused service sustainability issues and development has been difficult. The concept of free services for persons with disabilities imposed by previous regimes has not proved to be a sustainable model for service provision in a country where there is very limited government investment in services for persons with disabilities.

The Department of Orthopaedic Technology and the Mulago Training Centre facilities were in need of maintenance and we met graduates and clients in a teaching room where the rain came in through the roof.

Populations served and funding sources: Clients with disabilities attending the service are mainly from the Kampala area, although orthopaedic cases may be referred from across Uganda.

Planned developments:

- improve the infrastructure of services
- personnel to have professional development
- increase the number of professionals to meet increasing demand

Mbwaza Regional Referral Orthopaedic Centre

Staff profile: 1 Orthopaedic Technologist (ISPO Category II); 2 Mulago trained orthopaedic technology assistants; 1 leather worker.

Planned developments:

- equip the infrastructure
- expand the infrastructure
- continuous training and exposure in technology
- increase manpower

Gulu Regional Referral Hospital

Staff profile: 2 Orthopaedic Technologists (ISPO Category II); 3 Mulago trained orthopaedic technologists; 5 physiotherapists; 2 occupational therapists; 2 social workers; 1 clerk; 2 attendants.

An assessment of persons with disabilities who received orthopaedic services was carried out in 2009 and found that 70% of these who were fitted with assistive devices were using them. 20% were not using and 10% were lost to follow up.

Planned developments:

- Continuous education to be updated on technology.
- Adequate supply of technical orthopaedic consumables, machines and equipment as those in use at present are very old.

Mbale Regional Orthopaedic Centre

Staff profile: 1 Prosthetist/Orthotist (ISPO Category I); 4 Mulago trained orthopaedic technologists; 1 physiotherapist; 2 artisans; 1 orthopaedic attendants.

There are no incoming external referrals, as all cases are handled at the centre. As a result the centre has been re-arranged to provide a better working environment.

It is intended to carry out an assessment on satisfaction of services to the client (with ICRC).

Continue to support studies where students are on clinical attachment.

Planned developments:

- The main need is to have a well-structured system for supply of materials/components as there is a heavy reliance on donors.
- Changing the centre to become a training centre as there is enough space.
- Continue to support students where they are on clinical attachment.

Impact of graduates in Ugandan services:

Prosthetics and orthotics service managers reported that:

- For the Category I graduate
  - the quality of service had improved along with acceptance of assistive devices.
  - in-service training on complex cases is undertaken with other staff.

...and generally...

- awareness has increased as an outreach programme was implemented in seven districts.
- trained personnel contributed to the service development: were appointed as Head of Department; established workshops; created awareness; provided fitting of devices.
- there is an outreach program for assessment – referring and follow up of the clients from the community.
- clients have embarked on their social and physical activities and walking independently. Clients have been able to go back to their homes and some have attended paid occupations.
- clients within the region access services which are within a manageable distance. This has resulted in a reduction of Tribalism tensions as people from the same area are uncomfortable with those from different regions.
- trained personnel serve a higher number of clients, 20 – 30 clients per month

Section 10: Summary and Recommendations

Figure 48. Client study participants at KMTC, Kenya

92% of the burden of disability globally relates to persons with conditions that could be treated by allied health professionals, including prosthetists/orthotists and orthopaedic technologists[11].

Persons with physical disabilities can be assisted to participate in society through the provision of technologies such as prosthetic limbs and orthotic bracing devices. In the East African countries of Tanzania, Kenya and Uganda persons with physical disabilities access services known as "Orthopaedic Technology" "services" or "workshops" which often provide a range of assistive technologies including prostheses, orthoses, wheelchairs and walking aids. Personnel who deliver these essential services include prosthetists/orthotists and orthopaedic technologists.

A number of prosthetists/orthotists (ISPO Category I) and orthopaedic technologists (ISPO Category II) who are graduates of TATCOT now work in Tanzania, Kenya and Uganda. We conducted a study to assess the impact of their training by following up on their practice and development needs. Our hypothesis was that *Training personnel to ISPO Category I and II standards provides basic knowledge, skills and experience to enable them to provide and/or improve prosthetic and orthotic services for persons with physical disabilities* and we believe that we have proven this utilising a causal model and framework for studying impact. This has resulted in the following conclusions and recommendations:

Impact on the establishment of services:

Our field visit to each country showed that prosthetic and orthotic clinical and technical services for persons with physical disabilities had been established and developed by both ISPO category I and II graduates. ISPO category I graduates demonstrated an ability to manage and lead clinical services or to develop their care of persons with complex mobility challenges. National referral orthopaedic services were well established, but had some way to go before they could become benchmark services for their countries; however, personnel certainly have the capacity to develop their services and are aware of areas of practice and quality that need improvement.

Impact on the appropriateness of prosthetic and orthotic service delivery:

Orthopaedic technology services and ISPO graduates: ISPO Category I and ISPO Category II certified personnel were in the main able to assess and present real or demonstration client cases and critique the appropriateness of prosthetic and orthotic provision. While it was positive to note that most graduates recognized aspects of the devices that needed improvement, most of these areas are within the gift of an orthopaedic technologist or prosthetist/orthotist to address. Issues of fit and alignment were most frequently reported as areas that could be improved upon and while some of these may have risen because of changes to the client or a deterioration of their device, they indicate that there are steps to be taken in improving care that should include better client assessment so that the graduates more fully understand client needs.

We found variability within and between the quality of orthopaedic technology services and professional practice across ISPO certified graduates and this was also reflected in the national referral services. Most graduates demonstrated a similar level of skills and knowledge expected at graduation. Some graduates (mainly ISPO

Category I) demonstrated an advancement in their knowledge, and progression of clinical skills and leadership and management skills. Two ISPO Category II graduates had weak anatomy knowledge.

RECOMMENDATION 1: Areas for professional development and clinical practice were identified for each graduate and this information should be used in future professional development planning including TATCOT course review, ISPO certified graduate personal development planning, consideration of national short courses, upgrading training, national conference topics and clinical interest groups.

National referral centres and ISPO graduates: We particularly considered national orthopaedic technology referral services where some ISPO certified graduates work. The 3 national referral orthopaedic workshops were all aligned with orthopaedics. The burden of orthopaedic disease appears to be stretching services, complicated by an apparently increasing incidence of road traffic related disabilities. This mirrors the reported incidence of orthopaedic disease in other developing countries[10].

We determined that each referral service has the potential to contribute much more in the way of clinical leadership to their national rehabilitation services to assist governments with the development of services and to provide more appropriate services to persons with physical disabilities.

RECOMMENDATION 2: The national referral services need to raise the standards and quality of their practice and services to become national benchmark services in prosthetics and orthotics. The priority for this with regard to ISPO certified personnel lies with the TATCOT associated services at KCMC, Tanzania, since this is the place where students observe and undertake their first experiences of prosthetic and orthotic practice and KCMC should offer exemplary clinical practice, publish their progress and initiatives and share good practice with TATCOT alumni.

Impact and clinical leadership: we witnessed greater clinical leadership from ISPO Category I personnel who were also taking on more senior management roles, teaching others, mentoring and/or handling more complex cases. However, we also noted similar traits in certain Category II personnel. Service managers share similar challenges in the delivery of their services and could share local solutions and promote quality standards through meeting together.

RECOMMENDATION 3: Orthopaedic technology service managers (including ISPO certified graduates) should form a professional network to discuss management issues and develop strategies to help support national rehabilitation plans.

Impact on professional communities: It was positive to find that some national activity, for example in Kenya, takes the form of national meetings, however the graduates could make better use of professional bodies as networks to share information and learn from each other. National professional communities have the potential to further develop and publish standards of practice in their countries.

RECOMMENDATION 4: ISPO certified graduates from TATCOT should actively engage in national professional communities in Tanzania, Kenya and Uganda.

Impact and Prosthetics and Orthotics and Orthopaedic Technology as a career: Although the ISPO certified graduates had been able to graduate as professionals and follow a career, their professional status was not always recognised in the workplace through an associated career and salary structure that provides an acceptable professional living wage. However, graduates could do more to implement the practices they had learned as students or could now develop (for example in clinical note keeping) to better prove

their practice in the way that they approach work. Professional recognition often follows the building of a track record of good practice where professionals are able to prove their efficacy.

RECOMMENDATION *5*: ISPO certified graduates should be encouraged to practice by building on their professional training and best available evidence. They should document their activity at least thorough problem oriented medical records that also records outcomes and they should support local and national data collection initiatives to better prove the effectiveness of their practice.

In some discussions it emerged that graduates were allocated to posts and vacant posts were not advertised. In other services, posts are beginning to be advertised. We were made aware of some examples where new graduates did not get jobs immediately upon graduation and had to wait several months for posts to be confirmed. We were also advised of a vacant post, but this was not advertised. An organized program of job adverts targeted at new graduates could help to fulfill vacant posts at the point of graduation.

RECOMMENDATION 6: More open competition in the employment market would certainly assist in the selection of graduates to vacant posts and is especially important for more senior roles, giving services greater surety that the best available candidate had been matched to and offered a post.

Provision of assistive technologies was shown to impact on the lives of persons with physical disabilities to help them achieve their potential to achieve better independence, participate in education, work, social activities and activities of daily living and contribute to the local economy. The case stories and client comments included in this report speak for themselves and they highlight the importance of orthopaedic technology services that provide prostheses and orthoses.

RECOMMENDATION 7: Ongoing training of professionals to the minimum ISPO standards should continue to enable persons with physical disabilities to achieve independence through the provision of prosthetic and orthotic devices.

Additional comments on cost and supply chains:

Cost has a very significant impact in Orthopaedic Technology services in Tanzania, Kenya and Uganda. All services in the study have serious constraints in the delivery of their services because of limited funding for supply chains, poor availability or choice of consumable or component stock and limited annual budgeting to support activity. There is a heavy reliance on International, Non-government and Faith based organizations to fund service provision, but it was good to find national coordinating efforts, for example with

Non-Private range of patient charges shared with authors - East Africa (to nearest USD)						
	KENYA[7]		TANZANIA		UGANDA	
Service/product	low	high	low	high	low	high
Orthopaedic surgery	40	463				
Physiotherapy session	1	6				
Occupational therapy session	1	3				
Speech therapy session	1	1				
Trans-tibial prosthesis	61	347	93	1,550	556	742
Trans-femoral prosthesis	75	139	310	1,550	927	1,854
Trans-radial prosthesis	61	2,083	527	744	1,483	2,039
Trans-humeral prosthesis			992			
Knee ankle foot orthosis	19	93			148	
Ankle foot orthosis	6	46			18	30
Upper limb orthosos	17	463				
Lumbo-sacral orthosis	40	139				
Orthopaedic shoes	29	116				
Pair of crutches	6	40				
Wheelchair	162	208				
Tricycle	162	208				
Notes :						
A. Tanzania: at KCMC people who cannot afford payment can get support through MENTO or CBM.						
B. Uganda: ICRC Orthopaedic workshops in Uganda provide services for free.						
B. Private charges are normaly 40-67% more than the non-private charges.						

Figure 49. Non-private charges for orthopaedic technology in East Africa

ICRC working closely with the Ugandan government. Donors should, wherever possible, co-ordinate their efforts via a Memorandum of Understanding directly with government or via government supported initiatives.

ISPO graduates should firstly focus on more cost effective practices, to improve capacity and reduce waste when using existing resources.

Most non private services charge clients a prescription charge for their orthopaedic technology provision. This influences prescription choice, limits client attendance for review and may put the cost of provision beyond the reach of many clients. However, models where services are free at the point of delivery have proven to be difficult to sustain (for example, the previous historical situation in Uganda). The cost of services to persons with disabilities in Tanzania, Kenya and Uganda is variable depending on the particular orthopaedic service provider and the normal range of non private charges we were advised of during the field visit is shown on page 43.

Models of more entrepreneurial service delivery have been mapped by researchers who suggest that health services could learn from the private sector[13] and that there is room for growth in service provision from social enterprises. Additional attention to supply of components and consumable materials to open up the market for orthopaedic technology in East Africa could also bring in healthy competition and drive down purchasing costs.

We were made aware of a number of private facilities and services that run alongside those provided by government or not-for-profit organizations, and while this is in some ways positive, we perceived some possible burdens on staff time if they were working across two services, or if private cases were seen in government services. Mixed models of service delivery could work if carefully managed and the private patient costs could help to offset costs for persons unable to pay for their care. In services where charges are made, it is important to have careful controls of the financial systems in order to prevent corruption.

RECOMMENDATION 8: ISPO graduates should firstly focus on more cost effective practices to improve capacity and reduce waste. ISPO graduates who are service managers should seek local and on-the-job management training and focus on cost effective practice. ISPO certified graduates should become more aware of national tendering and procurement systems and initiatives and utilize these to influence better prescription choice.

Section 11: References

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5. UNDP (2011) International Human Development Indicators.

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9. ICRC (2011). Physical Rehabilitation Program Annual report 2011

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11. Gupta et al (2011). Health-related rehabilitation services: assessing the global supply of need and human resources. Health Services Research. 11: 276.

12. Beveridge & Howard (2004). The Burden of Orthopaedic disease in Developing Countries. Journal of Bone and Joint Surgery. 86: 8. 1819 – 1822.

13. Bhattacharyya et al (2010). Innovative health service delivery models in low and middle income countries – what can we learn from the private sector? Health Research Policy and Systems. 8: 24.

APPENDICES

Impact assessment: Discussion Guides

Please use this guide as a suggestion of topics to cover in your meetings:

Courtesy visit with Ministry involved with delivery of P & O services

Discuss the commitment of government to develop services for persons with physical disabilities.

Meeting with Director of Hospital Services

Questions could include but not be limited to:

1. Please tell me about the history and development of your service and facility?

2. How do prosthetics and orthotics fit into your overall scheme of service (if not only a P & O service)?

3. What patient populations do you serve and what are your funding sources.

Meeting with Prosthetic/Orthotic Services Manager

With reference to prosthetics/orthotics personnel…

1. What is your staff profile?

- *How many people see patients on a regular basis? Include numbers and training background.*
- *Number of technical staff*
- *Number of administrative and support staff*

2. What is the impact of having graduate (certified) personnel working in your prosthetic/orthotic service?

- *How do these personnel impact on access to services?*
- *Is there a national rehabilitation plan?*
    - *If so, how do these personnel impact on supporting the plan?*
- *Do these personnel impact on geographical decentralisation of services?*
- *Have you assessed how people with disabilities have benefited from the services you have provided?*
    - *If so, how is that done and is this documented?*

3. Did the trained (certified) personnel contribute to your service development? *leadership and expertise*

4. Are these personnel recognised formally by your government?

5. Which ministry recognises the personnel (by whom) and what is the importance of this?

6. What are your needs and plans for service development?

7. How are you involving graduates in your service development?

8. How are the staff paid

9. Do the practitioners work from a prescription? If so, who writes it?

ISPO Certified Graduate Interview

Cover sheet:
A study of professional skills and development needs of clinical personnel in prosthetics and orthotics in lower income countries.

Please ask the graduate to complete pages 1 and 2 before each study interview. Each participant is assigned a study number to ensure anonymity during data analysis.

Study Participant Number _____ ***(admin use only)***

The cover sheet is to be removed and stored separately at the end of the interview.

GENERAL INFORMATION

Country and service visited:	Date:
Interviewer *(last name, first name):*	Person filling in the form if different from the interviewer:

GRADUATE INFORMATION

Graduate name: *(last, first)*	Current Employer and place of work:
Age: Year of Graduation:	P & O School:
Email (or post address if no email) for a copy of the final study report (optional)	
ISPO Category ☐ i ☐ ii ☐ other *(explain)*	Gender: ☐ male ☐ female

Work experience since graduation: *(please list your position, place of work and years or employment - continue on back of form if needed)*

Study Participant Number _____ *(admin use only)*

PROFESSIONAL PRACTICE

1. What is your scope of practice in terms of types of patients seen and scope of treatments? Describe lower limb, upper limb and/or spinal designs, conditions, components and materials

2. Do you specialise in any patient condition or treatment?

3. Estimate the percentage of time you spend in the following activities: *should add up to 100*

Direct patient care ____%
Supervising other as they provide patient care ____%
Administration in your Prosthetic/ Orthotic Centre ____%
Administrative work outside your Prosthetic/Orthotic Centre ____%

4. A. What percentage of your patient care is: *should add up to 100*

Lower Limb Prosthetics ____%
Upper Limb Prosthetics ____%
Lower Limb Orthotics ____%
Upper Limb Orthotics ____%
Spinal Orthotics ____%

B. Please note which of these do you consider most competent to provide:

5. A. If you have a complex case that you would like advice on, is there someone you can seek advice from? ☐ yes ☐ no

If yes, tick one or more of the following to describe this person:

☐ Prosthetics/orthotics professional (not Cat I) ☐ Category I Prosthetist/Orthotist

☐ Therapist ☐ Doctor

B. Do they work alongside you or somewhere else?

6. How do you keep up to date with information? (tick all that apply)

☐ website access from work ☐ website access from home ☐ website access from internet cafe

☐ workshops, seminars or short courses ☐ medical library ☐ full text scientific journal articles

7. Are you a member of a professional body or clinical interest group? *Please explain:*

PART A: LOWER LIMB PROSTHETICS

The interviewer should ask the graduate to tell them about their patient and note if the graduate has presented appropriate patient information for each section. It is not necessary to note the full patient history, but it is important to note any omissions or errors. **P**

THE CLINICAL RECORD

1. Is a referral prescription available? ☐ yes ☐ no

If yes, how complete is it?

Who wrote the prescription?

2. A. Are clinical records available? ☐ yes ☐ no

B. Are the records complete? ☐ yes ☐ no
Elaborate:

3. Is an adequate assessment recorded in the record? ☐ yes ☐ no
Elaborate:

PATIENT ASSESSMENT AND CLINICAL PRACTICE

4. Age: Gender: ☐ male ☐ female

Side affected: ☐ left ☐ right

5. Medical history *(chronological order)*

6. Social history *(including occupation, home, social activities and environment)*

7. Description of physical disability*:*

8. Previous prosthetic history *(including prescription, comfort, repairs, lifespan of previous device and affordability)*

9. What difference has the prosthetic service has made to the user's life? (Including education, employment, participating in society). If the graduate does not know, please ask them to ask their patient now and document their answer.

10. Comment on the graduate's evaluation of:
Residual limb:
Skin condition:
Range of motion:
Muscle strength:
Pain: (location and characteristics)
Level pelvis:
Sound side and upper limb function:

11. Did the graduate rate the functional grade of the client with the prosthesis? ☐ yes ☐ no
Elaborate:

Did they use a rating scale? ☐ yes ☐ no

12. Does the graduate think the prosthesis is meeting the client's needs? ☐ yes ☐ no ☐ partly
Elaborate:

13. Does the interviewer think the prosthesis is appropriate? ☐ yes ☐ no ☐ partly
Elaborate:

PROSTHETIC SPECIFICATION AND CONSTRUCTION

14. Describe the prosthesis: ☐ PF ☐ AD ☐ TT ☐ KD ☐ TF ☐ HD

Prosthesis Design	right	left
Exoskeletal		
Endoskeletal		
Total contact		
Open ended		

Socket Material	right	left
Thermoplastic		
Laminate resin		
Aluminium		
Wood		
Other		

Socket Design	right	left
Quadrilateral		
Ischial containment		
PTB		
PTS		
Other		

Foot	right	left
Single axis		
Multi axis		
SACH		
Moulded SACH		
Energy storing		
Other		

Suspension	right	left
Vacuum		
Vacuum/sleeve		
Supracondylar		
Cuff strap		
Waist belt/corset		
Other		

Knee Joint	right	left
Swing phase		
Stance phase		
Polycentric		
Uni-axial		
Side bars		
Locked		
Other		

15. Is there a liner? ☐ yes ☐ no
If so, describe:

16. Comment on the durability of the limb:

17. Did the graduate fabricate this prosthesis? ☐ yes ☐ no
If not, who did?

18. Age of prosthesis *(left and/or right)*	Using most recent device? *(left and/or right)*

19. Has there been any follow up since delivery? ☐ yes ☐ no
Explain:

20. Did the graduate identify treatment goals? ☐ yes ☐ no ☐ partly
Explain:

Interviewer to note if aspects of prescription and technical specification were adequate:
(tick and/or comment only if applicable)

Socket fit A/P	☐ yes ☐ no
Socket fit M/L	☐ yes ☐ no
Socket fit proximal	☐ yes ☐ no
Socket fit distal	☐ yes ☐ no
Socket suspension	☐ yes ☐ no
Trim lines	☐ yes ☐ no
Leg length	☐ yes ☐ no
Static alignment	☐ yes ☐ no
Dynamic alignment	☐ yes ☐ no
General construction	☐ yes ☐ no
General finish (edges/details)	☐ yes ☐ no
Material choices	☐ yes ☐ no
Appearance	☐ yes ☐ no
Foot selection	☐ yes ☐ no
Knee selection	☐ yes ☐ no
Hip selection	☐ yes ☐ no

21. Ask the graduate *"Could the prosthesis be improved in any way?"*
Note response:

End of Part A

Please thank the patient for their participation.
The patient can now leave and the interview continues with the graduate alone.

PART B EXTENDED GRADUATE INTERVIEW	
REVIEWING THE CASE	
Do you think your selection of materials and components was appropriate?	*Response:*
Are you happy with the prosthetic fit?	*Response:*
Did you achieve a good static alignment?	*Response:*
Are you happy with the foot position?	*Response:*
Are there any issues with dynamic alignment?	*Response:*
If a knee joint was used is it positioned correctly?	*Response*
If a hip joint was used was it positioned correctly?	*Response*
What are the gait deviations and how did you correct them?	*Response:*
Please comment on the quality of construction of the device.	*Response:*
Is this prosthesis appropriate for this patient?	*Response*
Note further comments if they are made:	
EDUCATION AND TRAINING	
22. What part of your professional training was most beneficial to you?	
23. Are there any topics you wish you had learned more about in your course? *Pathologies, etc*	
24. What kind of continuing education courses about specific conditions or skills would you like to be able to attend?	
25. What other techniques or technologies would you like to introduce to your centre?	
FEEDBACK AND PERSONAL DEVELOPMENT PLAN	
The interviewer will review the contents of this data collection form with the graduate and together identify at least 3 areas that require clinical practice development. Where graduates demonstrate consistent good practice, other development needs can be discussed. *SMART criteria should be used – Specific, Measurable, Attainable, Relevant and Timely* *1.* *2.* *3.*	

For ISPO initiated graduate audits, please pass, scan and email, or post this form to:
Mrs Sandra Sexton, ISPO Grant Manager
"Drumgelloch", 95 Dryburgh Road, Wishaw, Lanarkshire, Scotland, UK. ML2 7JH
E sandra@ispoint.org

Participant take home sheet

Dear ISPO Certified Graduate,

Thank you for your participation in this graduate follow up interview. The interview is part of a bigger study called “A study of professional skills and development needs of clinical personnel in prosthetics and orthotics in lower income countries”.

Please find below a note of the feedback given at the time of interview. If you have provided us with an email or postal address we will send you a copy of the final study report.

PART B: FEEDBACK AND PERSONAL DEVELOPMENT PLAN

As part of a graduate follow up plan, you have identified with the ISPO interviewer at least 3 areas for your own clinical practice development.
Put dates in your diary to review your own progress against each area.

1.

2.

3.

SMART criteria – Specific, Measurable, Attainable, Relevant and Timely.

Please visit www.ispoint.org for updates and information about the International Society for Prosthetics and Orthotics. We hope you will become a member of our professional community.

If you would like to contact us in the future about this study please contact:
Mrs Sandra Sexton
International Society of Prosthetics and Orthotics
ISPO Grant Manager
E: grant.admin@ispoint.org or ispo@ispoint.org
W: www.ispoint.org
ISPO Head Office: 22-24 Rue du Luxembourg, B-1000 Brussels – Belgium

To become a member of ISPO and become part of our network, receive regular e-newsletters and regular issues of the scientific journal *Prosthetics and Orthotics international* please submit membership fees annually to your ISPO National Member Society or ISPO Head Office.

ISPO Certified Graduate Interview

Cover sheet:
A study of professional skills and development needs of clinical personnel in prosthetics and orthotics in lower income countries.

Please ask the graduate to complete pages 1 and 2 before each study interview. Each participant is assigned a study number to ensure anonymity during data analysis.

Study Participant Number _____ ***(admin use only)***

The cover sheet is to be removed and stored separately at the end of the interview.

GENERAL INFORMATION

Country and service visited:	Date:
Interviewer *(last name, first name):*	Person filling in the form if different from the interviewer:

GRADUATE INFORMATION

Graduate name: *(last, first)*	Current Employer and place of work:
Age: Year of Graduation:	P & O School:
Email (or post address if no email) for a copy of the final study report (optional)	
ISPO Category ☐ i ☐ ii ☐ other *(explain)*	Gender: ☐ male ☐ female

Work experience since graduation: *(please list your position, place of work and years or employment - continue on back of form if needed)*

Study Participant Number _____ *(admin use only)*

PROFESSIONAL PRACTICE

1. What is your scope of practice in terms of types of patients seen and scope of treatments? Describe lower limb, upper limb and/or spinal designs, conditions, components and materials

2. Do you specialise in any patient condition or treatment?

3. Estimate the percentage of time you spend in the following activities: *should add up to 100*

Direct patient care ____%
Supervising other as they provide patient care ____%
Administration in your Prosthetic/ Orthotic Centre ____%
Administrative work outside your Prosthetic/Orthotic Centre ____%

4. A. What percentage of your patient care is: *should add up to 100*

Lower Limb Prosthetics ____%
Upper Limb Prosthetics ____%
Lower Limb Orthotics ____%
Upper Limb Orthotics ____%
Spinal Orthotics ____%

B. Please note which of these do you consider most competent to provide:

5. A. If you have a complex case that you would like advice on, is there someone you can seek advice from? ☐ yes ☐ no

If yes, tick one or more of the following to describe this person:

☐ Prosthetics/orthotics professional (not Cat I) ☐ Category I Prosthetist/Orthotist

☐ Therapist ☐ Doctor

B. Do they work alongside you or somewhere else?

6. How do you keep up to date with information? (tick all that apply)

☐ website access from work ☐ website access from home ☐ website access from internet cafe

☐ workshops, seminars or short courses ☐ medical library ☐ full text scientific journal articles

7. Are you a member of a professional body or clinical interest group? *Please explain:*

PART A: LOWER LIMB ORTHOTICS PATIENT ASSESSMENT

The interviewer should ask the graduate to tell them about their patient and note if the graduate has presented appropriate patient information for each section. It is not necessary to note the full patient history, but it is important to note any omissions or errors.

O

THE CLINICAL RECORD

1. Is a referral prescription available? ☐ yes ☐ no

If yes, how complete is it?

Who wrote the prescription?

2. A. Are clinical records available? ☐ yes ☐ no

B. Are the records complete? ☐ yes ☐ no
Elaborate:

3. Is an adequate assessment recorded in the record? ☐ yes ☐ no
Elaborate:

PATIENT ASSESSMENT AND CLINICAL PRACTICE

4. Age: Gender: ☐ male ☐ female

Side affected: ☐ left ☐ right

5. Medical history *(chronological order)*

6. Social history *(including occupation, home, social activities and environment)*

7. Description of physical disability

8. Previous orthotic history *(including prescription, comfort, repairs, lifespan of previous device and affordability)*

9. What difference has the orthotic service made to the user's life? (Including education, employment, participating in society). If the graduate does not know, please ask them to ask their patient now and document their answer.

10. Comment on the graduate's evaluation of:
Range of motion:
Muscle strength:
Leg Length:
Joint stability:
Deformity:
Pain: (location and characteristics)
Sound side and upper limb function:

11. Did the graduate rate the functional grade of the client with the orthosis? ☐ yes ☐ no
Elaborate:

Did they use a rating scale? ☐ yes ☐ no

12. Does the graduate think the orthosis meets the client's needs? ☐ yes ☐ no ☐ partly
Elaborate:

13. Does the interviewer think the orthosis is appropriate? ☐ yes ☐ no ☐ partly
Elaborate:

ORTHOTIC PRESCRIPTION AND CONSTRUCTION

14. Describe the orthosis:
☐ FO ☐ AFO ☐ KO ☐ KAFO ☐ HO ☐ HKAFO ☐ ortho-prosthesis

15. Specification *(materials, joints, trim lines, straps)*

16. Comment on the durability of the orthosis:

17. Did the graduate fabricate this orthosis? ☐ yes ☐ no
If not, who did?

18. Age of orthosis *(left and/or right)*	Using most recent device? *(left and/or right)*

19. Has there been any follow up since delivery? ☐ yes ☐ no
Explain:

20. Were the following needs/goals addressed? *(tick and/or comment only if applicable)*

Reduce deformity	☐ yes ☐ no
Reduce joint instability	☐ yes ☐ no
Distal weight relief	☐ yes ☐ no
Lower limb inequality	☐ yes ☐ no
Pain relief	☐ yes ☐ no
Improve gait (if applicable)	☐ yes ☐ no

Interviewer to note if aspects of prescription and technical specification were adequate: *(tick and/or comment only if applicable)*	
Foot position A/P	☐ yes ☐ no
Foot position M/L	☐ yes ☐ no
Foot plate	☐ yes ☐ no
Tibial angle (static)	☐ yes ☐ no
Knee position	☐ yes ☐ no
Trim lines	☐ yes ☐ no
Leg shell volume	☐ yes ☐ no
Thigh shell volume	☐ yes ☐ no
Strap placement	☐ yes ☐ no
Other fitting issues	☐ yes ☐ no
Padding	☐ yes ☐ no
General construction	☐ yes ☐ no
General finish (edges/details)	☐ yes ☐ no
Material choices	☐ yes ☐ no
Appearance	☐ yes ☐ no
Joint selection	☐ yes ☐ no
Joint placement	☐ yes ☐ no
Joint congruence	☐ yes ☐ no

21. Ask the graduate *"Could the orthosis be improved in any way?"*
Note response:

End of Part A

Please thank the patient for their participation.

The patient can now leave and the interview continues with the graduate alone.

PART B: EXTENDED GRADUATE INTERVIEW	
REVIEWING THE CASE	
Do you think your selection of materials and components was appropriate?	*Response:*
Are you happy with the orthotic fit?	*Response:*
Did you achieve a good foot position and foot control?	*Response:*
Are there any issues with static and dynamic alignment?	*Response:*
If an orthotic joint was used is it positioned correctly?	*Response*
What are the gait deviations and how did you correct them?	*Response:*
Please comment on the quality of construction of the device.	*Response:*
Is this orthosis appropriate for this patient?	*Response*
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1.

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E: grant.admin@ispoint.org or ispo@ispoint.org
W: www.ispoint.org
ISPO Head Office: 22-24 Rue du Luxembourg, B-1000 Brussels – Belgium

To become a member of ISPO and become part of our network, receive regular e-newsletters and regular issues of the scientific journal *Prosthetics and Orthotics international* please submit membership fees annually to your ISPO National Member Society or ISPO Head Office.

Participant Information Sheet – ISPO Certified Graduates

Title of the study: A study of professional skills and development needs of clinical personnel in prosthetics and orthotics in lower income countries.

Introduction: The International Society for Prosthetics and Orthotics (ISPO) certifies prosthetists/orthotists (ISPO Category I) or orthopaedic technologists (ISPO Category II) graduating from ISPO evaluated courses of study. ISPO has a program of activity grant funded by USAID named "Rehabilitation of physically disabled people in developing countries". One of the objectives of the grant is to assess the impact of ISPO recognised Category I and II training.

What is the purpose of this study? This Graduate Audit survey aims to audit graduate skills and help determine the professional development needs of the graduate. It focusses on the patient/clinician experience and aims to assess the impact of ISPO Category I or II training on:

- the end user of prosthetic and orthotic devices
- the quality of prosthetic/orthotic treatment

Is taking part compulsory? It is up to you to decide whether or not you wish to take part. Taking part or not does not influence your certification with ISPO. Participation in this study is voluntary. Unique identifiers will not be part of published data.

What will you do in the study? Each participating graduate will be interviewed by an experienced clinician or educator about lower limb clinical care at the end of a patient review appointment both with their patient (PART A) and then without their patient present (PART B).
Prior to commencement of the interview you will be asked to note demographic data about yourself and the patient on a form and also to note answers to questions about your professional practice.
PART A: with the patient present, the interviewer will ask the graduate to present their patient case. The interviewer will take notes on a form during the interview. It is estimated that this interview will take about 30 minutes to complete.
PART B: once the patient has left, the interviewer will review the interview form with the graduate and then will identify at least 3 areas for clinical practice development that the graduate can work on alone. Where graduates demonstrate consistent good practice, other development needs can be discussed. This will take up to 30 minutes. At the end of the interview you will be given a note of feedback and a personal development plan.

Why have you been invited to take part? You have been identified to take part because you are a graduate of an ISPO recognised program working in a lower income country.

What are the potential risks to you in taking part? No risks have been identified. Should you have any concerns about the study, please contact the ISPO Grant Manager.

What happens to the information in the study? All forms will be coded and no identifying information will be provided in any study report.

What happens next? If you are able and wish to participate in this study you will be asked to sign a consent form before proceeding with the interview.

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Questions or concerns?
Contact Sandra Sexton, ISPO Grant Manager
95 Dryburgh Road, Wishaw, Scotland, UK
Email grant.admn@ispoint.org Phone 0044 (0)1698 296655
Or ISPO Head Office: 22-24 Rue du Luxembourg, B-1000 Brussels, Belgium

Consent Form

International Society for Prosthetics and Orthotics

Title of the study: A study of professional skills and development needs of clinical personnel in prosthetics and orthotics in lower income countries

- I confirm that I have read and understood the information sheet for the above project and the researcher has answered any queries to my satisfaction.
- I understand that my participation is voluntary and that I am free to withdraw from the project at any time, without having to give a reason and without any consequences.
- I understand that I can withdraw my data from the study at any time.
- I understand that any information recorded in the investigation will remain confidential and no information that identifies me will be made publicly available.
- I consent to being a participant in the project

(PRINT NAME)	Hereby agrees to take part in the above project
Signature of Participant:	Date

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GRADUATE TO READ:
Information for your clients

Title of the study: A study of professional skills and development needs of clinical personnel in prosthetics and orthotics in lower income countries.

Please explain the study to patients in the local language, or English if your client understands English, using the guide below:

- I was trained at a training program that is recognised by an organisation called the International Society for Prosthetics and Orthotics. I have agreed to take part in a study about my skills and want to ask you to take part as well.

- **The purpose of the study**: the study looks into the skills of your health professional. We want to find out about their skills and any areas for development.

- **Taking part in the study:** Taking part or not taking part does not influence your treatment. Participation in this study is voluntary and the decision is yours alone

- **What will you do in the study?** Your health professional will be asked to explain your situation and treatment to an interviewer who is an experienced clinician or clinical teacher. The interviewer will take notes on a form during the interview which will take about 30 minutes. That is the end of your participation in the study.

- **Why have you been invited to take part?** You have been invited to take part because you have received treatment from your health professional who attended a specific training program.

- **Are there any risks to you in taking part?** No risks have been identified. Should you have any questions about the study, please talk to your health professional.

- **What happens to the information in the study?** All forms will be coded and no patients can be identified in any study report.

- **What happens next?** If you are able and wish to participate in this study you will be asked to tell us that you agree to take part before proceeding with the interview during a review/check-up appointment. Travel expenses will be covered and also expenses for a drink and snack will be provided for people away from home over 2 hours.

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Appendix 7 Impact assessment field visit schedule

Planning for the impact assessment took place in the weeks prior to the field visit.

Date	Activity
Saturday 16th June 2012 Tanzania	Arrival of impact assessment team at Kilimanjaro Airport, Tanzania
Sunday 17th June 2012 Tanzania	Briefing meeting of assessment team Tanzania (authors)
Monday 18th June 2012 Tanzania	Discussion with KCMC Head of Hospital Service Discussion with KCMC Head of Orthopaedic Technology Visit KCMC Department of Orthopaedic Technology Additional Heads of Orthopaedic Technology Interviews Graduate interviews in TATCOT (with clients) Case story interviews
Tuesday 19th June 2012 Tanzania	Visit to Monduli Department of Orthopaedic Technology Graduate interviews (with clients) Case story interview
Wednesday 20th June 2012 Tanzania and Kenya	Visit to Usa River Department of Orthopaedic Technology Graduate Interviews Travel to Nairobi, Kenya Briefing meeting of assessment team Kenya
Thursday 21st June 2012 Kenya	Discussion with Ministry Discussion with Kenyatta Hospital Service Manager Discussion with Kenyatta Head of Orthopaedic Technology Visit Kenyatta Department of Orthopaedic Technology Visit HI office
Friday 22nd June 2012 Kenya	Graduate interviews (with clients) Visit Kijabe Department of Orthopaedic Technology Discussion with KMTC team Meeting of assessment team Kenya
Saturday 23th June 2012 Kenya	Discussions among team, collate & share information Debrief meeting of assessment team Kenya
Sunday 24th June 2012 Kenya and Uganda	Travel to Kampala, Uganda
Monday 25th June 2012	Discussion with Ministry Discussion with deputy Head of Mulago Hospital and tour Discussion with Mulago Hospital Head of Orthopeadics Discussion with Mulago Head of Orthopaedic Technology Visit Mulago Department of Orthopaedic Technology Additional Heads of Orthopaedic Technology Interviews
Tuesday 26th June 2012	Discussion with Ministry Graduate interviews (with clients) Debrief meeting of assessment team East Africa
Wednesday 27th June 2012	Impact assessment team return home.