

## Current position and challenges in prosthetics and orthotics education in Ghana

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### Abstract

There are limited publications concerning rehabilitation services in the sub-Saharan African countries. Therefore, identifying and understanding the challenges in prosthetics and orthotics (P&O) practice and education is very important. A survey was carried out in Ghana to identify the current situation in the field of prosthetics and orthotics. Thirteen technicians and seven students responded to the questionnaire. The results showed that prosthetics and orthotics face many challenges, mainly related to the lack of trained professionals, lack of infrastructure, lack of materials and machines including motions analysis devices for outcome measurements for the devices provided. Educational and technical reforms need to be established for effective services. Furthermore, an understanding of the current position and challenges in P&O in Ghana can contribute to the development of strategies for a sustainable rehabilitation service expansion in the African sub region.

### Introduction

The UN (United Nations) sustainable development

millennium goals has stated in goal 8.5 that “by 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value”[1]. Therefore it is important to improve the education systems in the current training facilities in order to maintain a sustainable education and practice in the Prosthetics and Orthotics (P&O) in developing African countries. The rate of people with disabilities in African countries is closely related to the poverty where there is little or virtually no access to education in the field of P&O. It is estimated that the population of people with disability in the low-resource countries that will require rehabilitation service will reach 125 million by 2035 [2]. For example, individuals with disabilities in Sub-Saharan Africa is estimated at 78 million [3]. Thus, the physically handicapped people do not have adequate and proper rehabilitative services.

The developed countries like Japan has a sustainable education mechanism in P&O. In Japan, Colleges and Universities graduate 313 P&O students in average annually with more than

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two thousand regular registered P&O technicians [4]. There is approximately over 600 registered P&O manufacturing companies across Japan.

One of the authors of this paper has worked as a volunteer in P&O in Ghana in the past and has experienced some of challenges in the field. In Ghana, the Br. Tarcisius Prosthetics and Orthotics Training College (BTPOTC) is the only institution that offer Diploma course in P&O. It was established in 2013 with the first batch of eleven P&O who graduated in June 2016. Presently the college has twenty students. Ghana has more than five million people with disability compared to Togo who has approximately 630 thousand people with disability [5, 6]. Those who are in need of assistive technology devices are approximately more than one million in Ghana. The provision of orthopedic devices is mostly done at the national centre and other centers located in other regions. There is approximately six centres providing P&O services in Ghana compared to the neighboring country Togo which has eight operating centres across the country with 89 P&O technicians (50 were certified by ISPO category II) [7]. Assuming that 0.5% of the population is in need of P&O services [8], it is estimated that Ghana requires about 148 P&O technicians to meet the current need. To date there is approximately 22 members of P&O technicians in GhAPO (Ghana Association of Prosthetics and Orthotics). A recent Prosthetics & Orthotic impact assessment in West Africa reported by ISPO and USAID (United States Agency for International Development) highlighted the service provision and personnel credentials in Benin and Togo [7]. But no data available in the neighboring country Ghana for comparison. Ghana has ratified the Convention on the Rights of Persons with disabilities in 2012 [5]. However little attention was paid to the people with disabilities rehabilitation. The national government is more focused on the emergencies diseases such as malaria, HIV/AIDS, yellow fever, infant mortality under age of 5, and maternal

mortality [9].

In general, little publications exist on the rehabilitation medicine in low-resource countries including Ghana [10-15]. Previous studies stated that only 5% of the population of people with disabilities received rehabilitation services in Ghana [16]. Other studies also showed that persons with physical disabilities cannot have access to some public buildings due to lack of assistive technology in the country [17].

Currently no studies have specifically explored the challenges of prosthetics and orthotics practice and education in Ghana. To get deep knowledge of the situation, a survey is then necessary in these countries especially in Africa. Therefore the aim of this study is to acknowledge the challenges in P&O education from the perspective of the practitioners and students in Ghana. While all African countries are not the same in P&O rehabilitation services, the survey of the current situation in Ghana will provide necessary key elements that may be useful to other countries. Therefore, the overall goal of this study is to help develop assistive technology service and research development for better P&O rehabilitation in Ghana.

## Methods

In this qualitative study, the focus group composed of technicians and students in Prosthetics and Orthotics was visited in April 2016 to answer a survey. Two types of questionnaire were designed: one for the practitioners and other one for the students in their final year (see Appendix). The questionnaires were distributed on hard copy to the technicians at National Prosthetics and Orthotics Centre (NPOC) which is the main centre in the capital city Accra and students of BTPOTC located in the eastern region. The content consisted of information on educational background, country of training, years of practice and then the participants were oriented towards the central question: what are the major challenges for prosthetics and orthotics practice

and education in the country?

### **Ethical considerations**

Participants were informed verbally with the contents and purpose of the study and were free to answer the questionnaire. We obtained permission from the administration office of the samples sites before conducting the survey. This study was approved by the ethical committee of the Niigata University of Health and Welfare (reference number 17726-160902).

### **Results**

Out of sixteen questionnaires distributed to the NPOC technicians, thirteen participants (seven males and six females) responded to the survey in a week time. This represents an 81.2% response rate. The respondents' characteristics are shown in Table 1.

In terms of credentials, nearly half (46.2%) of all respondents were physiotherapists and less than one third (23.1%) reported having the ISPO (see appendix) category II certificates. These P&O technicians were trained in Tanzania while some others had certificate courses from Iran (see Table 1).

Only three respondents (23.1%) reported having further training either in rehabilitation course, physiotherapy assistant course and WHO wheelchair training programme. Moreover 77% of all respondents never participated in any P&O seminars or workshops. None of the respondents earned an ISPO category I certificate or Master degree and above.

A slight majority (53.8%) of technicians were relatively novice in the field with less than five years working experience (Table 1).

The challenges reported by the participants were mainly related to the lack of trained professionals, lack of materials, and lack of patient's awareness of the availability of P&O services (Table 2).

Eleven questionnaires were distributed to the students in P&O at BTPOTC and seven responded

to the survey which represented 63.6% of the response rate. Though some decided to work in the P&O centres after graduation, nearly all the respondents had a desire to continue to higher level of education in the field. The students have reported challenges related to lack of teaching materials in P&O and biomechanics (Table 2).

### **Discussion**

This qualitative study explored the current status and challenges in P&O in Ghana. This study represents the first attempts to evaluate the current practice and education in P&O from technicians' perspective and students in the country. Also this study reported that nearly half (46.2%) of the respondents were physiotherapists despite the fact that the centre did not have any physiotherapy facilities for patients. This shows that due to lack of qualified prosthetists and orthotists, the available physiotherapists are working on behalf of prosthetists and orthotists.

Moreover there are no established outcome measurement methods to evaluate the orthopedic devices provided for the patients. This demonstrates the necessity of further education and continuous development of the staff. For example, the development of local graduate programs could contribute to the quality care of persons with physical disability.

In addition none of the respondents have presented or participated in national or international conference in P&O. Thus, scientific meetings in P&O and initiative development to establish research facilities in the country were very important.

The majority of the respondents (53.8%) were in their middle age and had a strong desire to upgrade their knowledge in the P&O field. However lack of financial support and the absence of local graduate programs in the country remained a challenge for them to upgrade their skills. Ghana was not yet accredited by ISPO. Though the neighboring country Togo also has a

three year diploma programme, it was accredited by ISPO. This system needed to be established in Ghana as well. Then a graduate level in future might be established in order to meet the need of the country.

The findings in this study are not exclusive in the P&O in the developing countries. Similar studies in the African countries like Sierra Leone and Malawi [7, 18-19] have reported the need for education to higher level in the P&O and availability of materials for better rehabilitation services.

From Table 1, it can be inferred that none of the respondents have knowledge of silicone prosthesis fabrication. This demonstrates a necessity of technology transfer in order to render a quality service to the patients. A study in Togo and Benin has also reported that graduates wished to introduce new technologies in their practice including silicone technology [7].

The students reported to many challenges including lack of professionals and teaching materials including biomechanics books and motion analysis device. The biomechanics field

Table 1. Participants' profile considering educational background, country of training and years of practice

		Number (n=13)	%
<b>Sex</b>	Male	7	53.8%
	Female	6	46.2%
<b>Age (years)</b>	<30	7	53.8%
	30-40	5	38.5%
	40-49	-	
	>50	1	7.7%
<b>Educational background</b>	Master degree and above	-	
	ISPOI (University Level)	-	
	ISPOII (Diploma course)	3	23.1%
	ISPO III (Technician)	-	
	Short Course in P&O	4	30.7%
	Physiotherapist	6	46.2%
	Further training	3	23.1%
	Seminars/workshops in P&O		
	None	10	77%
	Once	3	23%
	Silicone technology		
	Yes	-	
	No	13	100%
Participation in conferences in P&O			
Yes	-		
No	13	100%	
Member of professional organization			
Yes	5	38.5%	
No	8	61.5%	
<b>Country of training</b>	Ghana	8	61.5%
	Tanzania	3	23.1%
	Iran	2	15.4%
<b>Years of practice</b>	<5	7	53.8%
	5-10	5	38.5%
	10-15	-	
	15-20	-	
	>20	1	7.7%

in low resource countries needed to be improved. Previous studies in limited resources countries including Pakistan [20] have also reported the lack of biomechanics facilities in P&O schools as the courses were perceived as substandard. Also there was a necessity to implement affordable clinical gait analysis devices in the education program such as: foot switch, 2D camera, webcam, low-cost optical 3D motion analysis system as described in the previous studies [21-24].

The findings highlighted in this study were not exclusive to other related medical fields in Ghana. Previous researches in rehabilitation and nursing field [25-28] have also reported a number of challenges concerning human resources, lack of financial support, lack of infrastructure and lack of materials. Thus in order to bring the healthcare service to a standard level, a new multidisciplinary team approach needs to be implemented with a constant support of government.

This study has only explored the challenges the practitioners and the students are facing in Ghana. The survey was only conducted at the National Prosthetics and Orthotics Centre situated in the capital city of Ghana, Accra. Centres located in other regions need to be visited for better understanding of the current situation of P&O service at the national level. Moreover the total available P&O practicing in Ghana need to be investigated.

However some recommendations and future perspectives are suggested:

- The constant support from the government
- Autonomy of the management of the resource fund
- Train more P&O technicians and build multidisciplinary team
- Organize seminars/workshops to upgrade the technician knowledge and skills
- Private institution intervention
- Create satellite centres in the remote areas and conduct outreach program (Table 3).

Table 2. Challenges outlined in prosthetics and orthotics practice and education in Ghana

Challenges
<b>Practice</b>
Unavailability of materials
Financial aspects (lack of funding, lack of sponsorship)
Lack of infrastructure and facilities
Lack of machines
Lack of professionals
Lack of patients awareness of the availability of P&O services
Lack of workshops training
Lack of experienced workers
Lack of information concerning P&O services
<b>Education</b>
Lack of professionals
Lack of teaching material in biomechanics and P&O
Access to prosthetic books and journals

Table 3. Solutions proposed in view of challenges in P&O in Ghana

Solutions
1. Financial autonomy (permanent supply)
2. Elaboration of annual seminar/workshop between schools and services
3. Creation of degree program in the existing university
4. P&O promotion service in the community (mobile clinic in rural areas)
5. Professional development /continuing education
6. Elaboration of cooperation protocols between the P&O schools in the neighboring countries
7. Collaboration with international organizations
8. Search for strategies to improve teaching quality for ISPO recognition
9. Elaboration and establishment of research centres in the P&O services
10. Elaboration of outcome measurements methods for the P&O device for the patients
11. Using 3D printable prostheses for children
12. Using simple motion analysis devices

## Conclusion

This study highlighted the current status of P&O and the challenges the practitioners and students are facing in Ghana. The results showed that there was a need to train more professionals in the P&O field and continuous education for the present local staff. In addition the students in the P&O field are challenged with lack of teaching materials including biomechanics books. Therefore a collaboration between international organization and universities was very important to transfer the P&O technology. Advanced research in low-cost technology for P&O and motion analysis were also very important. Though major challenges were shown in this study, the patients' assessment methods and the satisfaction of P&O device users needed to be investigated. Also the status of amputees in sport leisure activities needed to be investigated. Moreover key conditions associated with limb deficiencies in the country also needed to be investigated in order to provide effective service. An understanding of the current position and challenges in the P&O practices and education in Ghana could contribute to the development of strategies for rehabilitation service expansion in the African sub region.

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## References

1. UN. Transforming our world: the 2030 Agenda for Sustainable Development. UN General Assembly 25th September 2015.
2. Helander E, editor. United Nations Development Programs (UNDP); 1993. Prejudice & Dignity: An Introduction to Community-Based Rehabilitation. 2nd, 1999 edition.
3. Kassah AK. Community-based rehabilitation and stigma management by physically disabled people in Ghana. *Disability and Rehabilitation*. 1998; 20(2):66-73.
4. Japanese Academy of Prosthetists and Orthotists. <http://www.japo.jp/guide/aboutus.html> (accessed December 2, 2016).
5. Human Rights Watch. Ghana: Disability Rights Convention Ratified. <https://www.hrw.org/news/2012/08/22/ghana-disability-rights-convention-ratified> (assessed December 2, 2016).
6. UN Partnership to Promote the Rights of Persons with Disabilities: Promoting The Rights of Children Living With Disabilities In Togo. [mptf.undp.org/document/download/10074\\_UNPRD\\_Togo.pdf](http://mptf.undp.org/document/download/10074_UNPRD_Togo.pdf)
7. Claude T, Masse N, Adama A. Prosthetics & Orthotics impact assessment West Africa: Togo and Benin, March 2016. Available from: [http://www.ispoint.org/sites/default/files/benin\\_and\\_togo\\_ispo\\_impact\\_assessment\\_report\\_low\\_resolution\\_english.pdf](http://www.ispoint.org/sites/default/files/benin_and_togo_ispo_impact_assessment_report_low_resolution_english.pdf) (accessed July 25, 2016).
8. WHO & ISPO Guidelines for training personnel in developing countries for prosthetics and orthotics services 2005.
9. USAID/GHANA Health Strategic Objective (SO 7). Improved Health Status paper. 2003; 63-78.
10. Haig AJ, Im J, Adewole A, Nelson VS, Krabek B. The practice of physical medicine and rehabilitation in sub-saharan Africa and Antarctica: A white paper or a black mark? *Disability and Rehabilitation*. 2009; 31(13):1031-1037.
11. Mock CN, Quansah R, Addae-Mensah L, Donkor P. The development of continuing education for trauma care in an African nation. *Injury*. 2005; 36 (6):725-732.
12. May-Teerink T. A survey of rehabilitation services and people coping with physical disabilities in Uganda, East Africa. *International Journal of Rehabilitation Research*. 1999; 22:311-316.



13. Frye BA. Review of the World Health Organization's report on disability prevention and rehabilitation. *Rehabilitation Nursing*. 1993; 18:43-44.
14. Bowe FG. Disabled and elderly people in the First, Second, and Third Worlds. *International Journal Rehabilitation Research*. 1990; 13:1-14.
15. Greza G. The right to prevention, early detection and medical rehabilitation under national and international aspects. *International Journal Rehabilitation Research* 1987; 10:267-275.
16. Tinney MJ, Chiodo A., Haig A, Wiredu E. Medical rehabilitation in Ghana. *Disability and Rehabilitation*. 2007; 29 (11-12): 921-927.
17. Danso AK, Ayarkwa J, Dansoh A. State of accessibility for the disabled in selected monumental public buildings in Accra, Ghana. *The Ghana Surveyor* 2011. Available from: <http://ir.knust.edu.gh/bitstream/123456789/3406/1/Surveyor%20Journal%201.pdf> (accessed June 10, 2016).
18. Lina M, Gerd A. Experiences of providing prosthetic and orthotic services in Sierra Leone-the local staff's perspective. *Disability & Rehabilitation*. 2012; 34(24-26):2111-2118.
19. Lina M, Gerd A, Nerrollyn R, Eleonor IF. Malawian prosthetic and orthotic users' mobility and satisfaction with their lower limb assistive device. *Journal Rehabilitation Medicine*. 2013; 45:385-391.
20. Lina M, Nerrollyn R. Prosthetist/orthotist educational experience & professional development in Pakistan. *Disability and Rehabilitation: Assistive Technology*. 2009; 4(6):385-392.
21. Hiroyuki I. Development of simple motion measurement and analysis system. *Journal of Physical Therapy Sciences*. 2006; 18:89-95.
22. Chris UU, Enrica P, Konstantinos TK, Andrew K, Leo E, Valerie MP et al. The evaluation of an inexpensive, 2D, video based gait assessment system for clinical use. *Gait & Posture*. 2013; 38: 483-489.
23. Chandramouli K, Edward PW, Yogesh S. A low cost real-time motion tracking approach using webcam technology. *Journal of Biomechanics*. 2015; 48: 544-548.
24. Bruce C, Barry M, Roy B, Philip R. Affordable clinical gait analysis: An assessment of the marker tracking accuracy of a new low-cost optical 3D motion analysis system. *Physiotherapy*. 2013; 99:347-351.
25. Asare C, Gonzalez-Fernandez M, Robert SM, Andrew JH. Rehabilitation needs of persons discharged from an African trauma center. *Pan African Medical Journal*. 2011; 10:32. Epub 2011 Nov 7.
26. Mandy MT, Huib C, Anthony KE. Welcome to my life! Photovoice: needs assessment of, and by, persons with physical disabilities in the Kumasi metropolis, Ghana. *Disability, CBR and Inclusive development*. 2011; 22(1):55-72.
27. Yawson AE, Nimo KP, Biritwum RB. Challenges of health care delivery at a municipal health facility under Ghana's national health insurance scheme. *Postgraduate medical Journal of Ghana*. 2013; 2(2):56-64.
28. Bell SA, Rominski S, Bam V, Donkor E, Lori J. Analysis of nursing education in Ghana: Priorities for scaling-up the nursing workforce. *Nursing and Health Sciences*. 2013; 15(2):244-249.

## Appendix 1

### ISPO Categories certificates

To evaluate P&O education level, the World Health Organization (WHO) and International Society for Prosthetics and Orthotics (ISPO) developed the prosthetist and orthotist professional training into three categories. Category I, university level prosthetist/orthotist, category II orthopaedic technologist and category III technician/bench workers. In order to investigate the level of the

P&O practitioners in the country, these ISPO categories were added to the survey.

**Appendix 2**

Questionnaire for practitioners

The challenges for prosthetics and orthotics practice in Ghana.

Please answer this questionnaire to the best of your knowledge as it will be treated with confidentiality! The results will be presented as part of graduate study project.

Gender: Age: Date: ..... 2016

1. Where were you trained in the PO field?
2. Educational level and qualification
  - Undergraduate/Diploma/Certificate
  - ISPO category I
  - ISPO category II
  - ISPO category III
  - Specialization degree
  - Physiotherapist
  - Master degree
  - Doctoral degree
  - Other (Please specify)
3. Have you taken additional training since you left school? If yes which course did you upgrade in?
4. What is your current role in the Centre/ Institution?
  - Prosthetic/Orthotic technician
  - shoes technician
  - Lecturer
  - Unit management or Department head
  - Other (Please specify)
5. How long have you been practicing?
  - 1to 5 years
  - 6 to 10 years
  - 11 to 15 years
  - 16 to 20 years
  - 20 years above
6. Do you belong to any Prosthetics and Orthotics Association? If yes please specify
7. Do you have access to biomechanics facilities at your Centre/Institution?
8. Do you have a video type of motion analysis or simple motion analysis system in your center/school?
9. What are the outcome measurement tools do you use for the assistive device provided at your Centre?
10. If you are to upgrade your professional skill, which field will you prefer to upgrade in?
11. How many P&O seminars do you hold or participate locally in a year?
  - None
  - Once
  - Twice or more
12. How many times did you present at national/ international conference related to P&O/ Rehabilitation?
  - None
  - Once
  - Twice or more
13. Do you have access to scientific articles related to P&O in your school/center?
14. Do you have difficulties in constructing sockets due to the state of the stump?
15. What type of amputee patients do you usually see?
  - Congenital
  - Traumatic
  - Disease

Which are the group do they belong in:  
 Upper limb/lower limb: Children  
 Adults;  
 Amputation level: Symes  
 Transtibial  
 Transfemoral  
 Other (Please specify)
16. In your practice, what is the most common cause of limb deficiency that you see?
17. Do you have equipment for silicon prostheses technology?
18. What are the factors limiting Prosthetics and Orthotics research and development in the country?
19. What are the current major challenges for



prosthetics and orthotics practice?

20. Please give your opinion on what should be done to improve the prosthetics and orthotics practice.
21. General feedback
  - What do you think about this survey?

### Appendix 3

Questionnaire for students

Challenges for Prosthetics and Orthotics education in Ghana

Please answer this questionnaire to the best of your knowledge as it will be treated with confidentiality! The results will be presented as part of graduate study project.

Gender: Age: Nationality: Date: ..... 2016

1. Why did you choose to be trained as Prosthetist/Orthotist? What grade are you in?
  - First grade
  - Second grade
  - Third grade
3. What is your plan after graduation?
  - Work at prosthetic /orthotic centre
  - Go for graduate school in prosthetics and orthotics
  - Not yet decided
4. What are the difficulties do you find in the following areas:
  - in prosthetics course
  - in orthotics course
  - in biomechanics course
5. How often do you do P&O practical?
6. Do you have access to motion analysis device for biomechanics practical course?
7. Do you have access to books or articles of biomechanics in the school library? If yes how frequently do you use them?
8. Do you belong to any prosthetics/orthotics organization?
9. How frequent do you participate to prosthetic/orthotic conference or seminar annually?
  - none
  - once

-twice or more

10. What are the difficulties do you find in doing your graduation project work? (Final year student only)
11. What is your area topic of research?
  - Prosthetics
  - Orthotics
  - Orthopaedic shoes
  - Biomechanics
12. Please describe in a few words the content of your graduation project work.
13. What area in the prosthetic/orthotic course should be improved?
14. What is your general opinion about this survey?