



International Society for Prosthetics and Orthotics

REPORT OF THE EUROPEAN CONFERENCE FOR EDUCATION IN PROSTHETICS AND ORTHOTICS (PART 1)

Conference Proceedings

April 2004

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This report is a compilation of keynote presentations and notes from forum and group discussions that took place during the conference. Every attempt has been made to ensure that the information presented in this text accurately reflects that which was presented and discussed at the time of the conference

1. EXECUTIVE SUMMARY

Context

In geographical Europe, the professional profile of a clinician working in prosthetics and orthotics differs from country to country. The forthcoming enlargement of the European Union in May 2004 and the associated trends and changes in legislation which enable freedom of movement for professionals between member states highlighted a need to look for commonalities in these professional groups.

The International Society for Prosthetics and Orthotics (ISPO) sought to bring together, from all countries in Europe, educational experts representing schools offering professional education and training for clinicians involved in patient care in the field of prosthetics and orthotics. The aims of the resulting *European Conference for Education in Prosthetics and Orthotics* were:

to define professional competencies for a clinician working in prosthetics and orthotics;
to develop quality standards of education in Europe.

The conference, held in the Bundesfachschule für Orthopädie Technik (BUFA), Dortmund, Germany, in March/April 2004 was augmented by the administration of a survey (online and paper based) designed to increase understanding of prosthetists/orthotists in Europe. This has been published as Part 2 of this conference report as *An investigation into the professional profile and education of prosthetists and orthotist in Europe*.

Findings

It was apparent early in the conference and from the survey returns that a great deal of similarities exist between prosthetics and orthotics practitioners both in terms of professional competencies and educational needs. These similarities indicated that these professionals work in a recognised and defined way in providing prosthetics and orthotics care to patients in many countries in Europe and thus should be recognised as a single professional group, known as prosthetists and orthotists.

Whilst a number of differences in models and pathways of education existed between the countries represented, delegates agreed upon the need for a common set of learning objectives and standards of education for student prosthetists and orthotists in Europe. This was seen as important in ensuring appropriate care for persons using prosthetic and orthotic devices.

Recommendations for future work

An important next step would be the recognition of prosthetists and orthotists as health care professionals across the European Union. Individuals, Educational Institutions, and Professional Groups can all contribute to this recognition by opening a dialogue with policy makers and continuing to lobby for change.

This recognition should go hand in hand with ongoing work to help define and set the standard for the knowledge, skills and understanding for the prosthetist/orthotist so that the patient requiring a prosthesis or orthosis can be assured of a basic level of care from a competent practitioner.

The following recommendations were made by the conference:

1. *ISPO should alter the professional profile for Category-I professionals and encourage its adoption following consultation. A time limit should be put on this activity.*
2. *ISPO should develop guidelines on graduate performance. Information on existing programmes to measure graduate performance should be to the Chairman of the ISPO Education Committee.*

3. *ISPO should revise the learning objectives in the Category-I guidelines following the discussions in the conference. In particular they should be reorganised into core and secondary subjects and consideration should be given to the removal of some subjects. The revised guidelines should be sent out for comment.*
4. *There is a need for ISPO to become more pro active in Europe on matters related to prosthetics and orthotics education by:*
 - *forming a group for the purpose of lobbying the Europe;*
 - *having direct contact with Brussels administration;*
 - *making contact with national members of the European Parliament;*
 - *increasing contact with user groups to gain their assistance in contacting the European Parliament;*
 - *contacting universities' international offices to obtain information regarding contacts in the Europe; and*
 - *involving national associations (professional bodies, etc) and gaining their support in lobbying the European Parliament.*

Acknowledgements

The success of this conference is due to the enthusiasm of a wide range of dedicated people who attended the conference, completed the conference survey and shared their expertise. Special thanks are extended to the staff of the Bundesfachschule für Orthopädie Technik (BUFA), Dortmund, Germany who proved to be excellent hosts for the conference and to the team at the National Centre for Training and Education in Prosthetics and Orthotics, University of Strathclyde, Glasgow, Scotland for administrative support.

2. BACKGROUND AND AIMS OF THE CONFERENCE

Sepp Heim

The need to define the standard and harmonisation of training and education related to the prosthetics and orthotics profession has long been considered as necessary. In the face of European integration and the associated transfer of education and knowledge, as well as the right of professional practice in the countries of the community, it is more important than ever to define the position of the profession. This raises the question: *Which tasks are expected of prosthetics and orthotics professionals?*

The International Society for Prosthetics and Orthotics (ISPO) has taken note of this problem for some time. This conference has been organised with the hope of contributing to a better standing of the prosthetic and orthotic sector by:

- defining the professional profile;
- clarifying the position of prosthetic and orthotic clinicians within the allied health sector;
- agreeing upon the necessary learning objectives; and
- assuring the competence of the prosthetic and orthotic professional.

These are all issues that affect or trouble all the participants of this conference. I am therefore particularly pleased to open today's conference of established and planned European schools and training centres and to welcome the numerous participants. I also welcome with pleasure all representatives from countries embracing future affiliation to the European Union.

I hope and wish that this conference will clarify the standard of training and education in the prosthetics and orthotics sector and that a common denominator for the content and standard of training will be found. Since the Inter-Regional United Nations Seminar on Standards for the Training of Prosthetists in 1968 in Holte, Denmark, ISPO has been trying to improve and realise standards of training and education in the profession. Various seminars and conferences since then have led to the development and improvement of prosthetics and orthotics professional education. The basic concepts of the Holte report are true today. Training and Education Centres such as the University of New York, the University of Strathclyde (National Centre for Training and Education in Prosthetics and Orthotics, NCTEPO), and the Bundesfachschule für Orthopädie Technik (BUFA), Germany have all aligned their training to the outcome of Holte.

Previous developments in Europe had distinct influence from both government and tradition. Germany, for example, shows the origins of technical orthopaedics evolving from the barber-surgeons and armourers, progressing to the area of healthcare early in the 20th century. A harmonisation of this profession in Europe seems to be very difficult.

We see ourselves as a paramedical profession and the prosthetist/orthotist professional should be a full member of the rehabilitation team, but opinions differ significantly in this interpretation depending on the positions of interest. The prosthetics and orthotics professional is not seen as a paramedical expert in all countries, but in some is rather seen as an artisan and independent from medicine. Cooperation is considered to be important, but no mutual dependence of classification is wanted. Accordingly the training guidelines, contents and requirements of this profession grew differently. Training, education and accreditation differ from country to country. The organisations ISPO and INTERBOR tried for the first time in 1978 in Paris to find a combined position on this area. Over the years the two organisations had a common Joint Education Committee with the aim of agreeing standards of training and education. Despite some incremental progress and agreement, a final standard remains elusive. It is assumed that this situation contributes to the absence of European regulation of the prosthetics and orthotics professional. This situation should not persist indefinitely. It makes harmonisation very difficult and therefore inhibits a free movement of professionals in European countries.

The trend of the profession toward the paramedical direction should be taken as a basis for the work here during the next few days. In order to find a clear picture and common ground it is suggested that the job description, or the professional profile, should form the basis for discussion. It is perceived that

task description of the prosthetics and orthotics Category-I professional would be a useful framework to define the course contents as well as the knowledge and skills that this professional should acquire.

ISPO has been working for many years with a 'Professional Profile' which can be found in the reference material. This template should serve as a platform for discussion. It is arranged in such a way so that all participants should be able to identify themselves with this profile. It is hoped that participants will be able to consider their individual national interests as much as possible.

The plenary discussions along with the different working groups give enough scope to address the problem from all angles and to arrive at a final conclusion. Only with a consensus on the description of the prosthetic and orthotic professional and the associated tasks will it be possible to evaluate the quality standards for education and training.

When training and education standards are considered there are very important component parts such as:

- level of training;
- entry qualifications;
- academic and practical content; and
- continuous and final assessment and examination.

In Europe various types of training exists that produce prosthetics and orthotics professionals; these are not entirely comparable. It appears, therefore, more important to attempt to compare the graduating professionals; the products of the training programmes.

ISPO is orienting itself to the 'Guidelines of Category-I' (this is the training for industrialised countries and is the fundamental training required to train a prosthetics and orthotics professional). ISPO has now used these guidelines to evaluate two very different training systems following the requests from BUFA, Dortmund, Germany and NCTEPO, Glasgow, United Kingdom. The outcome is a result that was possibly expected, but in any case the degree of concordance is surprising. This shows that the outcome of training and education is assessable and comparable despite differences in the pathways of training. In the forthcoming days there will be discussions and assessments for Category-I training programmes from this perspective so that it will lead to a harmonisation in prosthetics and orthotics training and a free choice of workplace in Europe without any barriers.

We have a very interesting programme for the next few days which will give each participant the opportunity to actively participate. Dividing the participants into smaller working groups will make it as easier for individuals to give their opinions more effectively. Working groups sessions will be followed by presentation and discussion in the plenary sessions allowing for a wide variety of information to be exchanged and, if possible, a consensus to be reached. The summary on Saturday morning is of great importance and all participants are requested to programme their departure to facilitate involvement until the end of the conference. The results will be summarised in a report and this will be published through ISPO. Every participant will be asked to comment on the final version and will receive a copy after completion.

I wish you all a successful conference with a pleasant ambience. The intensive preparations of the steering group and the BUFA team, to whom I express my thanks, shows promise for a successful outcome.

3. PARTICIPANT EXPECTATIONS

At the start of the conference participants were asked to discuss their expectations regarding the conference during an open session. The general aims of the conference had been publicised as to:

- *define professional competencies for a clinician working in prosthetics and orthotics,*
- *develop quality standards of education in Europe.*

This brainstorming session resulted in a list of topics and headings as follows;

- certification programmes and accreditation;
- framework for Bachelor and Master courses;
- teaching and research;
- overview of educational models;
- clarification of titles/names in education;
- harmonisation of education; and
- variety of programmes

This list was revisited by the Steering Group throughout the conference to ensure that the direction and content of the conference met as many expectations as possible. In line with this philosophy of ensuring that time was spent in discussing the most topical issues, the conference programme included in Section 13 of this report was amended for the final two days to ensure that additional working group discussion took place around agreed learning objectives in the light of the ISPO Category I guideline document (ISPO, 2002).

4. OVERVIEW OF REFERENCE MATERIAL

A number of reference documents were provided to participants prior to the conference and were intended to provide background information regarding specific areas chosen for discussion during the conference, namely: the professional profile of the prosthetist/orthotist; an internationally agreed standard of education; the proceedings of a previous prosthetics and orthotics educators meeting; and an example of European law pertinent to education and the transfer of labour force between member states of the European Union.

Reference documents for the conference are listed in Section 14 of the report.

4.1 Learning objectives

An overview of the current ISPO learning objectives was presented to conference delegates. This overview generated much discussion among delegates. Points of discussion focused largely upon the relevance of specific topics included within the ISPO objectives. Delegate comments regarding specific topics are summarised as follows:

Discussion following presentation	
Topic	Discussion
Graphical communication	This topic has been reduced in most curricula. Most schools do not think this a priority subject and there was comment in agreement with this sentiment.
Computer studies	Students have basic computer skills when they enter the programme. Students need to be introduced to CAD/CAM systems and other such technology.
Students will understand biomechanics	The words “students will understand and apply” should be added.
Foot orthotics	Change terminology to orthoses.
Anatomy and physiology	Include surface anatomy and methods of palpation.
Mathematics and statistics	Include methods of scientific research.
Management and local legislation	To be emphasised.
All subjects	<i>Understand, apply and communicate</i> could be used as a general philosophy. For example biomechanics/biomechanics-understanding in one area and applied in another.
Psychology	To be expanded in curricula.
Learning objectives	It was agreed that all participants submit suggested changes to organisers.

Due to the strength of response, discussion of the ISPO learning objectives was taken up in additional working group discussions. A summary of these discussions is presented below:

The question addressed by the working groups was:

With regard to the ISPO learning objectives, and in light of other presentations, comment on the structure and content of the ISPO learning objectives:

- *Identify any areas which are not essential*
- *Identify any additional areas for inclusion*

Group 1 Feedback
General comments <ul style="list-style-type: none"> • Learning objectives, or learning outcomes should be used and not learning subjects • Under each subject, note achievable learning objectives, e.g. "...should be able to perform" • Subjects/objectives should be listed in priority as primary/core competence and secondary competence
Anatomy and Physiology <ul style="list-style-type: none"> • To be prosthetics and orthotics specific • Include surface anatomy and identifying landmarks • Ensure that the level of proficiency is stated
Pathology <ul style="list-style-type: none"> • Query in the introduction orthotics and <i>mobility aids</i>?
Mechanics and Biomechanics <ul style="list-style-type: none"> • Add rigid body system - multibody systems • Include kinematic/kinetic chains • Check layout. Bullet marking a bit confusing
Mathematics and Statistics <ul style="list-style-type: none"> • Some subjects covered in high schools? • Some subjects are represented in courses - not necessarily taught • Query is numeracy implicit?
Materials Technology <ul style="list-style-type: none"> • Split composites • Include thermoforming/thermosetting materials
Workshop Technology <ul style="list-style-type: none"> • Too ISPO Category-II influenced • Metal welding, installation – not essential • Query if this is a logical list? Need of updating the selection of machines, instruments, etc. • Health and safety important and needs emphasised
Clinic, Workshop and Business Management <ul style="list-style-type: none"> • The importance of these subjects varies in different countries
Graphical Communication <ul style="list-style-type: none"> • This was not seen as a core competence
Prosthetic and Orthotics Science <ul style="list-style-type: none"> • This is essential • Introduction: should contain prescription (materials, etc) • Introduction: principles for prosthetics and orthotics as applied to (should also contain the paediatric field) • Include: thoraco-lumbar orthoses; cervico-thoraco-lumbo-sacral orthoses; paediatric devices.
Clinical Studies <ul style="list-style-type: none"> • Some subjects are general and some specific. This is a strange grouping and needs to be reorganised • Use diagnostic interpretation and not x-rays interpretation • Ethics: consider this with research methodology or emphasise by setting this in its own section
Electrotechnology <ul style="list-style-type: none"> • List as a secondary competence
Computer Studies <ul style="list-style-type: none"> • Ensure inclusion as communication skills presentations • Describe computer skills related to prosthetics and orthotics
Prosthetics and Orthotics Practice <ul style="list-style-type: none"> • Reflects/same comments as for prosthetics and orthotics science
Clinical Practice <ul style="list-style-type: none"> • Essential • Assessment and prescription should be included in 4.13 (Prosthetics and Orthotics Practice). Students have to learn Assessment and prescription in Prosthetics and Orthotics Practice and use the skills and gain experience in Clinical Practice

Plenary discussion about Group 1 Feedback	
Topic	Discussion
Query if suggested changes are only editing or more?	<ul style="list-style-type: none"> Core competencies need to be brought out. Need to separate primary and secondary items.
Why are we only discussing the text? What happens next?	<ul style="list-style-type: none"> Need to look at the models of education. Revision will result in a modified text. This will always need to be revised and updated. After the meeting the guidelines will be altered and published No schools currently ISPO Category I accredited, but 2 schools have been recently inspected and are awaiting the inspection reports

Group 2 Feedback
General comments Text is not written as learning outcomes <ul style="list-style-type: none"> Do not know what a student is supposed to learn under each of the subheadings Does not show the depth of knowledge (e.g. Bloom and Biggs)
We are required to teach knowledge, skills and understanding this should be demonstrated in the document <ul style="list-style-type: none"> Consider updating text according to current educational theories Objectives should address the whole framework not the details
Anatomy and Physiology <ul style="list-style-type: none"> Is it appropriate to talk about functional anatomy or detailed anatomy? Need to include three areas: detailed; functional and gross anatomy Consider: trunk/spine; more upper limb detail; pathology Feel that disorders of the endocrine system are missing Include information about tumours
Future developments <ul style="list-style-type: none"> Consider adding cosmetic surgeries and complications
Mechanics and Biomechanics <ul style="list-style-type: none"> Add kinematics and kinetics as applied to prosthetics and orthotics
Mathematics <ul style="list-style-type: none"> Statistics poorly defined: introduction to qualitative and quantitative research methods would be more descriptive; need to describe the level
Materials <ul style="list-style-type: none"> Would like to see comment on the current trends of materials use Can we combine steel and non-ferrous metals and their alloys together? These are becoming less important Inclusion of carbons and hydrocarbons Add silicones and foams
Workshop Technology <ul style="list-style-type: none"> Feel like we are looking at a Category-II document Should be much more generic Would like to combine many of the elements Operations management instead of 'workshop layout'
Clinic, Workshop and Business Management <ul style="list-style-type: none"> Level of business knowledge is influenced by the system in which one works Need to understand service provision in country of practice Some disagreement regarding knowledge of management Basic knowledge appropriate to the country of practice
Graphical Communication <ul style="list-style-type: none"> Do not see the sense in the extent of graphical communication
Other comments <ul style="list-style-type: none"> Query computer studies Query electrotechnology
Recommendations from Group <ul style="list-style-type: none"> Revised document must be put out for comment Schools present agreed to comment on revisions

Plenary discussion about Group 2 Feedback	
Topic	Discussion
Identification of key skills	<ul style="list-style-type: none"> • Instead of having separate sections for computing why not identify where in the programme computers are used? • Are special courses in computers necessary? (Some disagreement, feeling of groups and some individuals that it was not).
Inclusion of business studies	<ul style="list-style-type: none"> • There is a need to include some business throughout the programme rather than specific modules.
Documentation of clinical findings	<ul style="list-style-type: none"> • Include clinical note keeping in clinical practice.
Recent or future developments	<ul style="list-style-type: none"> • Good to include comments on this in the learning objectives. • Section on the importance to have curriculum review on a regular basis.
Orthotic science/practice	<ul style="list-style-type: none"> • Include cranial orthoses/helmets. • Could we consider it under cervical orthoses or head and neck orthoses? • Provision increasing in some countries and none at all in others.
Who is the document for?	<ul style="list-style-type: none"> • Inside or outside? • Level of detail needs to fit different situations.

Summary of comments from Group Feedback:

- There are a number of detailed comments for editing.
- The guideline needs revising in terms of language of learning outcomes and some other general editing.
- The guideline needs to be revised and sent out for comment.

5. PROFESSIONAL PROFILES

It was considered that the published ISPO professional profiles were an important issue for discussion during the conference. As an introduction to the topic Professor Norman A Jacobs provided delegates with a general introduction to the guidelines. This was followed by a presentation of the results of a delegate survey that aimed to investigate the current profile of clinicians representing different countries in Europe and specific presentations by representatives from four different countries. Working group discussions focussing on questions surrounding the ISPO professional profiles concluded proceedings.

5.1 Keynote address: ISPO guidelines: professional profile

Norman A Jacobs

ISPO categorisation

Over the years ISPO has developed a categorisation system to help describe the different types of personnel working in the field of prosthetics and orthotics. The reason for choosing such a system was to avoid the confusion in interpreting the different titles used in different countries. For example a technician in one country may be a fully trained professional with the responsibility of treating patients whereas in another country the technician may be a bench worker who only fabricates and manufactures devices with no patient contact. The use of such a categorisation helps reduce any such confusion.

The ISPO categorisation is outlined as follows:

- *Category-I*
 - Prosthetist/Orthotist (or equivalent term)
 - Entry requirement: University entry level (or equivalent, 12/13 years schooling)
 - Training: 3/4 years formal structured leading to University Degree (or equivalent)
- *Category-II*
 - Orthopaedic Technologist (or equivalent term)
 - Entry requirement: 'O' level (or equivalent - the usual requirement for paramedical education in developing countries – normally 11 years schooling)
 - Training: 3 years formal structured - lower than degree level
- *Category-III*
 - Prosthetic/Orthotic Technician (or equivalent term)
 - Entry requirement: Elementary school diploma
 - Training: on the job

This categorisation has been accepted by the World Health Organization and by many governmental and non-governmental agencies working in prosthetics and orthotics education. It is the result of wide consultation by ISPO through its collaborators and associates.

ISPO educational philosophy

The Society's education philosophy encompasses the above three categories. Category-I and II professionals take part in patient care activities while Category-III workers are only involved in manufacture and assembly.

It must be emphasised that this is not an attempt to describe all of those who work in this field. It is a description of the levels of education and training which the Society believes represent the desirable levels at this time for those involved in patient care in the industrial and the low-income world respectively and in the support function of manufacture and assembly.

The Society believes that the Category-I professional prosthetist/orthotist should, for the future, be educated and trained at University Degree level or equivalent.

It further believes that although there are many different approaches that can lead to this level of training and education any such course must consist of three essential elements:

- teaching of theoretical subjects;
- closely supervised practical instruction; and
- structured and controlled clinical experience.

For the industrial world Category-I should be the level aimed for. This level is attainable although many industrial countries do not at present satisfy this goal.

The concept of the Category-II professional is regarded as an interim solution for low-income countries. However, it is recognised that this is a changing situation and the long-term goal in low-income countries should also be Category-I. This is already happening in some countries, for example in Tanzania and El Salvador.

Category-I education and training

There are clearly different approaches which will satisfy the requirements of Category-I education and training. However, no matter how they are delivered they must contain the same elements and education and training courses should be based on a comprehensive professional profile that covers all aspects of job required to be carried out. Why have a professional profile? A professional profile is necessary:

- order to define the job that is expected of the individual;
- it will help to determine the educational and training requirements for entry to the profession;
- it will help regulate the profession at a suitable standard; and
- to help raise the quality of service provided to patients in the long term.

Professional profile: Category-I

The following professional profile has been developed by ISPO over a number of years. It was based on the report of the United Nations Inter-Regional Seminar on Standards for the Training of Prosthetists (UN, 1968) - the so-called Holte Report. It was modified to comply with Guidelines for Training Personnel in Developing Countries for Prosthetic and Orthotic Services (WHO, 1990). It was further refined by the Education Committee of ISPO after a period of consultation (ISPO, 1998). Lastly, it was updated at the WHO/ISPO Consultation for Training Personnel in Developing Countries for Prosthetics and Orthotics Services (2003)

The profile covers the role of the Category-I Professional. It describes the Category-I professionals work in:

- patient care:
 - formulation of treatment for individual patients
 - fitting, fabrication and treatment
 - evaluation and follow-up
- management and supervision
- training and education
- community services
- research and development
- medical, legal and ethical requirements

Patient care

With regards the formulation of treatment the Category-I professional:

- participates as full member of the clinic team; takes part in the examination and prescription; and advises on the design of the prosthetic/orthotic device, including the socket or body/device interface, suspension and selection of proper components;
- assists and advises on relevant aspects of pre-surgical, post-surgical, medical and therapeutic management of individuals requiring prosthetic/orthotic devices;
- records and reports any pertinent information regarding patients and patients' families, including a determination of expectations and needs; and
- Communicates appropriate information to the patients and their families.

With regards fitting, fabrication and treatment the Category-I professional:

- supervises and directs the activities of individuals in Category-II (orthopaedic technologist) and Category-III (orthopaedic technician) in fitting and fabrication;
- identifies physical and other relevant characteristics of the patient;
- formulates prosthetic or orthotic designs, including selection of materials, components and additional aids;
- takes all casts and measurements required for proper fabrication and fitting;
- modifies positive and/or negative models and/or layout of design to obtain optimal fit and alignment;
- carries out fitting, static and dynamic alignment and, where appropriate, preliminary training and initial check-out; and
- performs and/or supervises fabrication of the prosthesis or orthosis.

With regards evaluation and follow-up the Category I professional:

- advises the team and participates directly in final check-out and evaluation of fit, function and cosmesis;
- instructs the patient or family in the use and care of the device;
- takes part in follow-up procedures as well as maintenance, repairs and replacement of the appliance; and
- recognises the need to repeat any of the identified steps in order to optimise fit and function.

Management and supervision

In management and supervision the Category-I professional:

- collaborates and consults with others engaged in the management of the patient;
- supervises the activity of supporting staff as appropriate;
- manages clinical and laboratory/workshop activities assigned to him/her, including:
 - use and maintenance of tools and equipment;
 - maintenance of safe working environment and procedures;
 - inventory and stock control;
 - personnel matters;
 - financial matters;
 - appropriate record keeping;
 - total quality management;
- devises improved job methods for increasing efficiency;
- interacts with professional groups and, where appropriate, governmental and non-governmental agencies; and
- takes part in planning and implementation of technical orthopaedic care systems.

Training and education

In the matters related to education and training the Category-I professional:

- supervises and conducts the education and training of individuals in Category-I (prosthetists/orthotists), Category-II (orthopaedic technologists) and Category-III (technicians);

- lectures and demonstrates to colleagues in his/her profession and other professionals concerned with prosthetics/orthotics and also to other interested groups;
- is required to take part in and contribute to the process of continuing professional development; and
- keeps abreast of new developments concerning prosthetics/orthotics and teaching techniques.

Community services

In relationship to community services the Category-I professional takes a professional contribution to, and takes part in, community rehabilitation programmes

Research and development

With regards to research and development the Category-I professional;

- conducts continuing evaluation of his/her activities;
- participates in formal evaluation and research programmes; and
- participates in scientific/professional meetings and contributes papers to scientific/professional journals.

Medical, legal and ethical requirements

With regards to matters related to medical, legal and ethical requirements the Category-I professional:

- provides patient care within a recognised prosthetics/orthotics code of ethics; and
- provides patient care which complies with medical/legal requirements.

Code of ethics

An appropriate code of ethical behaviour is an essential framework for the activities of any professional responsible for the treatment of patients. The following code of ethics is based the one suggested in the Report of the United Nations Inter-regional Seminar on Standards for the Training of Prosthetists (UN, 1969).

Ethical code for the prosthetist/orthotist:

- he/she shall observe loyal relations with his/her colleagues and with other members of the clinic team without assuming roles outside his/her own profession;
- he/she shall practise absolute discretion regarding personal matters or knowledge he/she might acquire in his/her professional work;
- he/she, like all other members of the clinic team, should supply service only as a member of that team and respect its conclusions;
- he/she shall collaborate freely in the necessary exchange of information between colleagues and others in the different but related disciplines;
- he/she shall strive to perform to the highest possible standard of his/her professional skill;
- he/she shall provide services to patients in a professional manner; personal, financial or commercial interests shall be secondary;
- he/she shall always honestly represent himself/herself as well as his/her services to the patient and all others concerned; and
- he/she shall observe similar restrictions in his/her personal relations with patients as are normally accepted by the medical profession.

The above code is only an example which satisfies the minimal requirements of such a code. It may require elaboration in different cultural, ethnic or religious settings.

Concluding remarks

- The professional profile outlined is only intended as a guideline for the development of such a profile.
- It is expected that each country or region would modify it to suit the particular needs found there.
- The development of professional profile is fundamental to establishing the correct level of education and training required and the regulation of the prosthetics and orthotics profession within a country or region.

References

ISPO (1998). Category-II professional – orthopaedic technologist: information package.- Copenhagen, Denmark. International Society for Prosthetics and Orthotics.

ISPO (2002). Category-I professional – prosthetist/orthotist, orthopaedic engineer, orthopaedic meister: information package. - Copenhagen, Denmark. International Society for Prosthetics and Orthotics.

ISPO (2002). Category-III professional – prosthetic/orthotic technician: information package.- Copenhagen, Denmark. International Society for Prosthetics and Orthotics.

UN (1969). Report of the United Nations interregional seminar on standards for the training of prosthetists, Holte, Denmark, 1-19-July 1968.ST/TAO/SER.C/111.- New York: UN.

WHO (1990). Guidelines for training personnel in developing countries for prosthetic and orthotic services. WHO/RHB/90.1. - Geneva, Switzerland: WHO.

5.2 Overview of survey results

Nerrolyn Ford

In the early stages of planning this conference the steering group had considered holding a discussion surrounding the free transfer of labour force across Europe. It was quickly realised that this would be an impossible task without an initial understanding of the similarities and importantly the differences in work practices across various countries.

It was decided that attempting to define similarities and difference in the professional profile of prosthetists and orthotists would be an appropriate initial step to take and that the pre-conference survey would be beneficial as a means of providing information to delegates and stimulating discussion.

The purpose this element of the survey was to:

1. begin to define the profession profile of clinical prosthetists and orthotists in Europe;
2. identify the major differences and similarities in practice; and
3. determine if the professional profile published by ISPO is consistent with current practice.

The results of the survey highlight the major similarities and differences in clinical practice across geographical Europe as indicated by survey responses. From the data collated it can be seen that clinicians in Europe are most similar in those aspects of clinical care related to casting, fabrication and fit of specific prosthetic and orthotic devices. The major differences identified are those related to administrative duties, training of patients, referral of patients, strategic planning and maintenance of medical records.

Part 2 of this report, an investigation into the professional profile and education of prosthetists and orthotists in Europe, presents the conference survey results.

5.3 Professional profile: Belgium

Dirk Vermetten

The social security system in Belgium is structurally embedded in society. Anyone contributing to the 'mutualiteiten' (non-profit medical insurance institutes under strict national legislation (in Germany the 'Krankenkasse', in UK the 'NHS')) is refunded for a wide variety of medical treatment. Also, orthopaedic aids are refunded by the 'mutualiteiten' via RIZIV, a national committee that stipulates the amount of a patient's refund for a certain medical treatment. Five orthopaedic categories are in use: bandages, orthoses, prostheses, wheelchairs and orthopaedic shoes.

Refunds are only granted by RIZIV if the aid has been issued by an orthopaedic technician acknowledged by RIZIV. Clinicians (known as technicians in Belgium) are acknowledged for one or more of the five categories mentioned above, and are allowed to undertake any action necessary to equip a patient with orthopaedic devices. Their activity is always triggered by a physician's prescription and so without this prescription, patients cannot apply for refunds. As a rule, the prescription will only stipulate the desired orthopaedic effect (so-called 'open prescription'), and not the methodical aspects of it such as choice of materials or application methods). Some doctors, however, do specify choice of materials or devices.

The RIZIV admission examination for orthopaedic technicians is a national one in which candidates have to testify to their medical and technical knowledge in one of the five categories. The examination consists of a medical and a technical component. The members of the examination board examining the technical aspects are representatives of acknowledged orthopaedic companies in Belgium, appointed by the BBOB, the Belgian professional federation of bandagers and orthopaedists. No independent observer to prevent mixing of interests on behalf of the members of the jury is present, nor is there a balance between the different parties involved (bandagers, orthopaedists, Flemish people, Walloon people, 'mutualiteiten', patients' representatives). In contrast with examination in university colleges and universities, they are not open to the public.

All paramedical professions in Belgium receive acknowledgement of their professional standing immediately or some time after obtaining the appropriate degree in higher education (university college or university), without further due; only the orthopaedic profession has an admission examination imposed by the BBOB.

Candidates can apply for the orthopaedic professional admission examination if they meet one of the following four conditions:

- degree of higher education in orthopaedics and two years of working experience in an orthopaedic company
- degree from a local training centre for small businesses (5 days work, 1 day training) and two years of working experience in an orthopaedic company;
- degree of secondary education in orthopaedics and five years of working experience in an orthopaedic company; or
- no specific degree and five years of working experience in an orthopaedic company

According to the latest rumours, RIZIV is now only admitting candidates that meet the first condition if they aspire to the highest form of acknowledgement (Category-I). This form of acknowledgement lasts for the total career period of the orthopaedic clinician. Acknowledged clinicians are not required to keep ahead of new developments. Of course, most of them do so within their company and during training activities by orthopaedic suppliers and societies. Nevertheless, an independent frame for accreditation would be in order for the foreseeable future.

The Katholieke Hogeschool Kempen from Geel, Flanders, Belgium and the Fontys-Hogeschool from Eindhoven, The Netherlands offer the only degree of higher education in orthopaedics in the Dutch language zone. Courses are offered to the combined group of students. The placement and the preliminary year (only in Fontys-hogeschool) are organised by the two university colleges separately. Every student graduates with a degree issued by his or her own country (no mutually issued degree), and receives a Bachelor degree.

5.4 Professional profile: Germany

Detlef Kokegei

The professional profile of the prosthetics/orthotics practitioner in Germany is varied. The prosthetics and orthotics industry is very active and the following statistics about the structure of German enterprises reflects a unique system of service provision for the patient. At the time of the study, 32,000 employees work within 1838 enterprises. 12,000 of them are professionals in the field of prosthetics and orthotics (ISPO Category-I and II)

The structure of the German enterprises in prosthetics and orthotics (1999) was as follows:

1-5 employees:	19.5%
6-10 employees:	27.6%
10-20 employees:	17.0%
20-30 employees:	12.7%
30-40 employees:	16.5%
more than 40 employees:	7.0%

This thriving industry is supported by a complex system of training known as the dual system. A German Meister qualification is seen as the highest level of professional working in the field in a supervisory and practitioner capacity. The award of Dipl. Ing for Orthopaedic and Rehabilitation Technology is currently offered in a collaborative arrangement between the University of Applied Science in Giessen and BUFA, for example. One of the entry requirements for student is the graduation as an Orthopaedic Technologist (ISPO Category-II).

Categories of personnel working in the field of prosthetics and orthotics are:

- ISPO Category-I: Meister
- ISPO Category-II: Geselle
- Trainees: Auszubildende

The Meister practitioner often offers professional expertise and training to their colleagues. The most important activities today for prosthetics and orthotics practitioners with Category-I status are diagnosis, technical indication, adaptation and fitting, validation and evaluation and management.

The dual system of vocational training and education encompasses both scholastic and vocational training. The Education Ministry and Ministry of Economic Affairs authorise the education curriculum, the framework and syllabus, and examination regulations. There is therefore strong regulation of the education and training which impacts on the expertise of the profession.

Training and education at the first level follows the format:

- Successfully completed secondary education (10 –13 years of schooling)
- Contract of apprenticeship
- Duration: 3.5 years
- 2 days vocational school
- 3 days company training

Regulation of the examination (ISPO Category-II) is by the examination board and governmental examination committee. The essential points of training in this first level aim to ensure a basic theoretical knowledge plus hands on training in typical working situations. Current technologies and developments are learned within a uniform structure for quality standards for education and examination. Following this, the candidate can progress to the trade examination and Meister.

Professionals working in prosthetics and orthotics are encouraged to enter into the philosophy of life long learning with a patient centred approach.

Prosthetics and orthotics personnel are facilitated in their learning through government support of their training. This helps to ensure competence in elements of social skills, planning, responsibility, implementation of skills and assessment of work and results. Some 'added value competencies of the Category-I professional are therefore management, administration, insurance, research, testing and therapeutic evaluation.

5.5 Professional profile: Turkey

Serap Alsancak

The first prosthetics and orthotics workshop in Turkey was founded in the 1890s. Manufacturing in prosthetics and orthotics was accelerated by Turkish technicians educated in Germany. The number of private workshops which deliver prosthetics and orthotics services in Turkey have reached to 250 so far.

Apart from these, service is given to patients at workshops such as those of University Prosthetics and Orthotics Departments, specialist Centres of Military Hospitals and some of the government Physical Therapy and Rehabilitation Centres. This service is mostly provided by prosthetics and orthotics technicians, orthopaedic technicians, physiotherapists, orthopaedic surgeons and physical therapy physicians.

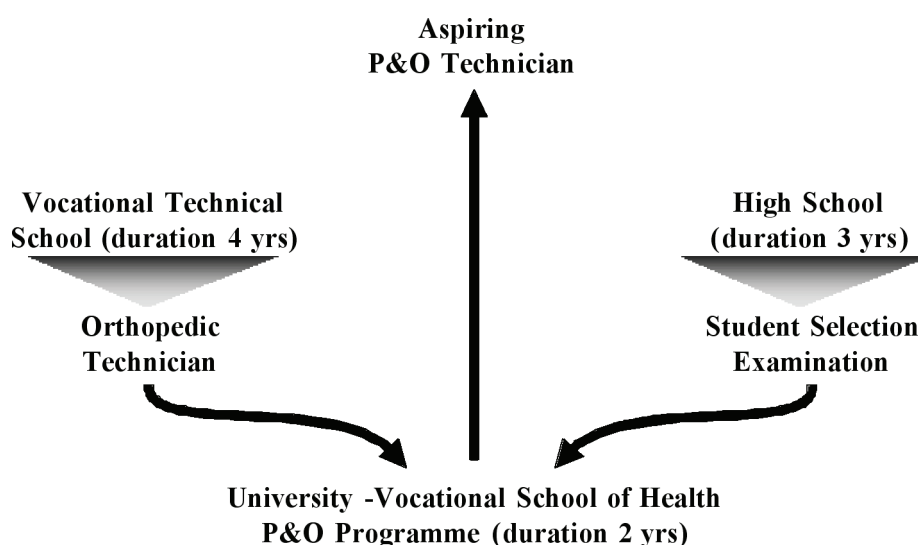
A prosthetics and orthotics practitioner works in conjunction with physicians, surgeons and physiotherapists to evaluate the prosthetic and orthotic needs of patients. He/she designs, manufactures and fits the appropriate device for each patient. The essential knowledge and skills are acquired during a two-year university educational programme.

Education

There are two Vocational Schools in Turkey which train students in the field of prosthetics and orthotics at the second educational level. The first, Istanbul-Orthopaedic Technician School, was established in 1988 with the support of GTZ, as part of Turkish-German collaboration. The second one, Egirdir-Orthopaedic Technician School, was established in 1996 but closed in 2003. The duration of the programme is 4 years. These schools started out with 20 students the first year, increasing to 30 students today. The schools have produced a total of 360 graduates so far.

Also, prosthetics and orthotics programmes have been established at five universities in Turkey (University of Ankara, Hacettepe University, Afyon Kocatepe University, Osmangazi University and Trakya University) providing 2-year training programmes. The first was established in 1985 and the last one at the end of 1999. These programmes started out by training 12 students the first year, slightly increasing to 20 students today. The number of graduates from these 2-year programmes has reached 650 today.

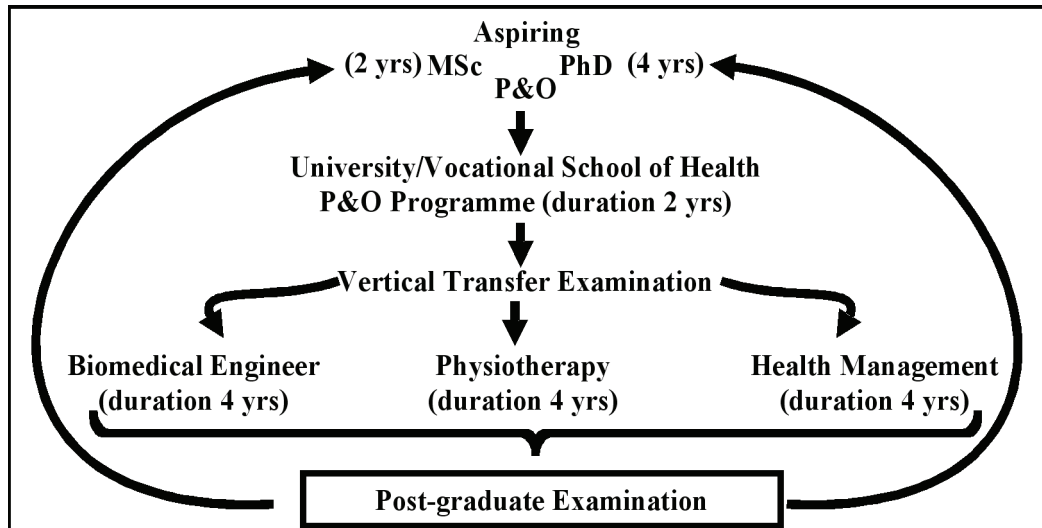
The entry requirement for applicants is Vocational Technical School Diploma (Orthopaedic Technician School Diploma) or High School Diploma.



Since 2002 the students have been enrolled in the Prosthetics and Orthotics Programme of Universities from Vocational Technical Schools (Orthopaedic Technician Schools) without taking any examination and from High Schools on condition that they take entry examinations.

Postgraduate education

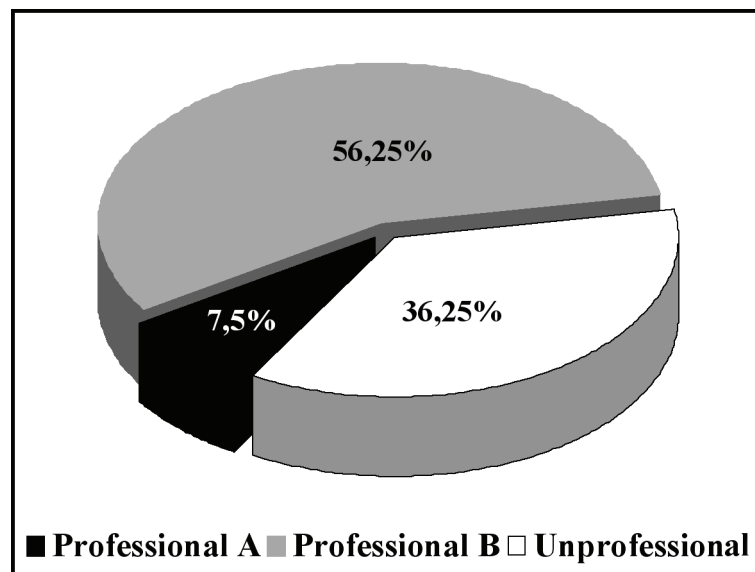
Students who graduate from a two-year vocational higher school can continue their education in four-year programme such as biomedical engineering, physiotherapy and health management based on the quotas available and their scores on a vertical transfer examination.



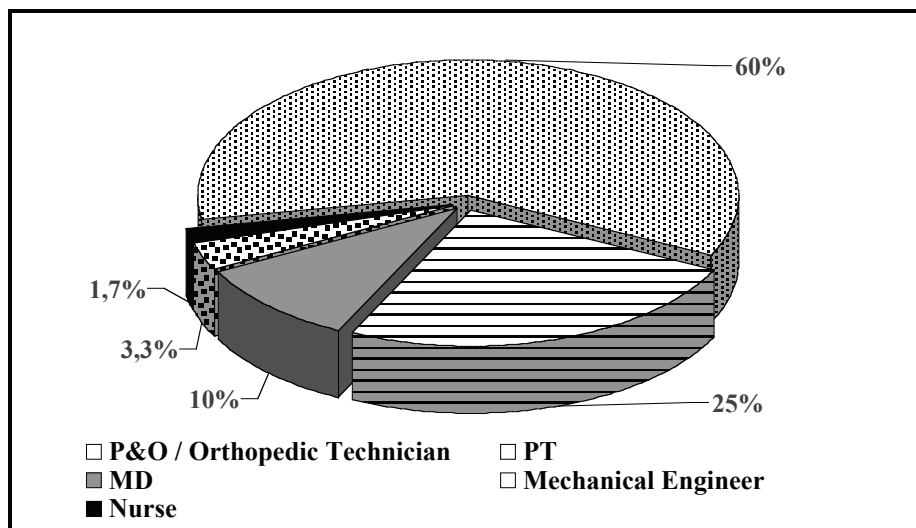
Professional profile

There are about 800 people interested in prosthetics and orthotics. Their professional levels are summarized as Professional A (7.5%), Professional B (56.25%) and Unprofessional (36.25%). Professional A includes 60 persons. Their occupational distributions are Prosthetics/Orthotics and Orthopaedic Technicians (60%), Physiotherapists (25%), Orthopaedic Surgeons and Physicians (10%), Mechanical Engineers (3.3%) and Nurses (1.7%). All of them have participated in postgraduate training courses for prosthetics and orthotics staff in some developed countries. Most of them deal with association/committee work. Three of them have an MSc and PhD in prosthetics and orthotics. Fifteen of them have an MSc and PhD in physiotherapy but they their theses specialized in prostheses and orthoses. Professional B consists of about 450 persons who are Prosthetics/Orthotics and Orthopaedic Technicians. They have participated in national postgraduate training courses for technicians. These courses are given by different companies. Their unprofessional group is made up of about 290 people who are Prosthetics/Orthotics and Orthopaedic Technicians. They produce prostheses and orthoses and do not participate in postgraduate training courses and the other scientific activities.

Distribution of professions



Occupational distribution of professional A



Device provision

All medical devices except facial/ocular prostheses, orthopaedic shoes, shoe repairs, cranial helmets, and custom moulded and modular seating are made by the majority of prosthetics/orthotics practitioners. A few prosthetics/orthotics professionals have recently begun to make facial/ocular prostheses and custom moulded seats.

So, how do we address the identity of the profession? If we assess the patient, define the patient's requirement and the goal of treatment, use measurement chart for measuring/casting, consider biomechanical principles, consider material science for component selection, use new technology for manufacturing, assess the functionality of prostheses and orthoses, follow-up the patient and solve the problems, assess the patient satisfaction, communicate with the other professional, accept life-long learning as an habit, we are called professionals.

The majority of prosthetics/orthotics practitioners are responsible for managing their own finances, maintaining patient records and making patient appointments. Also a minority of prosthetics/orthotics practitioners who work alone have to complete some of the patient assessments such as history taking, examining range of movement, testing muscles and performing basic neurological tests. Prosthetics/orthotics practitioners and other health professionals also supervise prosthetics/orthotics students and other support staff in workshops or clinics.

On the other hand instrumental gait analysis is conducted by physicians and physiotherapists who have attended specific gait courses.

Prescription of all medical devices is completed by specialist physicians such as orthopaedic surgeons, physical therapy physicians, neurosurgeons and neurologists. This is mandatory for charging the cost of medical devices from the government. In fact, physicians mostly take the advice of prosthetics/orthotics practitioners and the other prosthetics/orthotics professionals' suggestions for prescription. Prosthetics/orthotics clinicians are certainly competent to prescribe but they do not have authority of prescription.

Research and publication

Prosthetics/orthotics professionals have contributed much in Turkey to research activity. The following table shows 10 papers published in Prosthetics and Orthotics International and 22 papers published in various National Journals within the last five years.

Year	Journal	Paper
2003	POI	3
2002	POI	2
2001	POI	2
2000	POI	1
1999	POI	2

These professionals are also authors of chapters in national books on orthopaedic surgery and physical medicine and rehabilitation within this period. In addition there are two national books on prosthetics and one booklet on prosthetics and orthotics terminology.

Multidisciplinary team work plays an important part in making these researches and publications.

Scientific activities

Scientific activities in the field have grown through university programmes in Turkey. Four national congresses, many conferences, seminars, symposia and instructional courses have been organised since 1994.

Congress	Date	Duration	Place	Attendance
1 st National Prosthetics and Orthotics Congress	23-27 October 1994	5 days	Ankara	500
2 nd National Prosthetics and Orthotics Congress	10-13 October 1999	4 days	Ankara	370
3 rd National Prosthetics and Orthotics Congress	13-15 November 2001	3 days	Ankara	450
4 th National Prosthetics and Orthotics Congress	15-18 October 2003	4 days	Ankara	470

Most practitioners participate in scientific activities. The majority of the delegates and half of the speakers are prosthetics/orthotics professionals.

In addition to this Otto Bock has periodically given instructional courses on different topics for five years in Istanbul. A computer aided design system has been used for amputees in Diyarbakır for three year. Also, many instructional courses have been given by different companies such as Hangers, Endolite, Vessa, Össur etc. at universities during different periods over the years.

Association and committee work

There are three associations in the field of Prosthetics and Orthotics in Turkey with a total membership of 400:

- a) Turkish Scientific Association of Prosthetics and Orthotics (TSAPO). Established in 1998, this association is the only association having national status and is located in Ankara. Members are surgeons, physicians, physiotherapists, mechanical engineers and prosthetics/orthotics practitioners.
- b) Association of Prosthetics and Orthotics Technicians. Established in 1994 and located in Ankara. Members are prosthetics/orthotics technicians who graduated from the prosthetics/orthotics programme of the Vocational Schools of Health at Universities.
- c) Orthotics and Prosthetics Association. Established in 1992, it is located in Istanbul. Mostly, members are technicians in orthotics or prosthetics who graduated from Vocational Technical Orthopaedics Schools at the second level education and run their own workshops.

These Associations work together in with the members/staff of the Ministry of Health, Turkish Standardization Institute, Disabled Confederation, Military Hospitals, State Hospitals and Lecturers of Universities in some committees such as The Regulations Committees, The Standardization Committees, The Terminology Committees, The Social Relations and Ethics Committees and the Congress Committees. Half of the committee members are prosthetics/orthotics practitioners.

Future aims

- Bring responsibility and authority together
- Find a solution to the lack of resources
- Develop tools for assessment
- Develop new methods and products
- Improve prosthetics and orthotics technologies
- Transfer new technologies
- Improve domestic technologies
- Increase use of material technologies
- Encourage life-long learning
- Increase the duration of professional training in university
- Increase academic research
- Improve level of ethics
- Develop standardization

5.6 Professional Profile: United Kingdom

Elaine Figgins

Prosthetists /orthotists education in the United Kingdom (UK)

There are two schools for training Prosthetists and Orthotists in the UK both at University level. The two Universities, Strathclyde and Salford, both have intakes of around 28-32 students per course each year. Thus they are producing a total UK number of graduates of around 40-58 per year.

At graduation State Registration is compulsory for all allied health professionals to work in the UK and this is conducted through the Health Professions Council (HPC). This is Government legislation. International and EU applicants wishing to work in the UK must apply for registration from the HPC where comparability of qualifications and standards will be assessed to check it is suitable before registration is granted.

The Health Professions Council (HPC)

There are 12 professional groups registered with the HPC (prosthetist/orthotist, physiotherapist, occupational therapist, chiropodist/podiatrist, radiographer, orthoptist, dietician, speech and language therapist, art and drama therapists, clinical & biomedical scientists, paramedic). Previously this registration for allied health professional groups was overseen by the Council for the Professions Supplementary to Medicine (CPSM), however, this was replaced by the new Health Professions Council in April 2002 by an Act of Parliament. The HPC's role is firstly to protect the public. It also allows the protection of each of the titles of the professional groups. Lastly it seeks to maintain standards of proficiency within the National Health Service for which there are written standards of proficiencies, both generic and profession specific. This is all available on the website <http://www.hpc-uk.org>.

The HPC states that it aims to achieve five principles of good regulation:

1. Proportionality
Remedies appropriate to risk posed
2. Accountability
Justify decisions and subject to public scrutiny
3. Consistency
Fairly implemented rules and standards
4. Transparency
Open, simple and user friendly
5. Targeting
Focused on problem and minimise side effects

The HPC has four statutory committees which include:

1. Education and Training Committee
2. Investigating Committee
3. Health Committee
4. Conduct and Competency Committee

The conduct and competency committees comment in the 2003 annual report of the HPC states that
"When we say someone is fit to practice we mean that they have the skill, knowledge, character and health to do their job safely and effectively"

From the generic standards of proficiency a prosthetist/orthotist has a responsibility to maintain their own clinical competency and ensure they stay within their own scope of practice. As the standard states: *"You must make sure that your knowledge, skills and performance are of a high quality, up to date, and relevant to your field of practice."*

"You must keep within your scope of practice. This means that you should only practice in those fields in which you have appropriate education, training and experience."

The profession specific standards state that professional prosthetists/orthotists need to keep their clinical practice current and they must be competent in all the practices they undertake. The standards of proficiency for prosthetists and orthotists (July 2003) states this throughout. Examples of this include:

- 1a *“Professional autonomy and accountability”*
- 2.a *“be able to use appropriate assessment techniques”*
- 2.a.2 *“be able to prescribe orthoses or prostheses including, where necessary, the specification for manufacture, and recognise the need to carry out risk analyses when prescribing a non-approved combination of components from differing manufacturers”*

The professional body for prosthetists and orthotists in the UK is the British Association of Prosthetists and Orthotists (BAPO). BAPO are writing “Guidelines for Best Practice”. Currently five of the have been written and published and a sixth is being drafted currently. These are:

1. The role of the prosthetist/orthotist
2. Communication and teamwork
3. Clinical records
4. Assessment and review
5. The clinical environment
6. Clinical effectiveness

They can be found on the BAPO website www.bapo.com/publications/html. In the first of the guidelines for the role of the prosthetist/orthotist it states:

“The practitioner will give advice to the team regarding appropriate prosthetic and orthotic prescription, specification, design and sourcing”

“The practitioner be committed to continuing professional development and the maintenance of a high standard CPD Portfolio”

BAPO also have an Ethical Code which all full members are asked to adhere to (it can be found on the website). It states that:

“The objectives of the Association, as given in the BAPO Constitution are, “to represent and protect the prosthetics and orthotics profession with regard to its status and interests”. As part of our realisation of this objective, we as an Association must produce and keep an up-to-date ethical code. The latest update (August 2002) has been produced to take into account changes in regulation and governance. ”

BAPO membership is not mandatory and renewal is annually. However the majority of prosthetists/orthotists in the UK are members. BAPO asks its members to practice within a clinical governance framework and adhere by its ethical code and its code of practice within the guidelines as mentioned earlier.

If we look purely at part one of the ISPO questionnaire then the clinical governance of UK prosthetist/orthotist means that they all have to undertake the following as part of their professional practice:

- Collect patient medical history
- Examine ROM
- Examine Muscle strength (MRC Scale)
- Perform neurological tests
- Perform tests of joint integrity
- Observational gait analysis (& some instrumented analysis)
- Document findings of examination
- Refer to other health care professionals
- Prescribe a prosthesis or orthosis
- Capture an image of a body segment (plaster/tracings/measurements/igital)
- Modification of data capture/image
- Determine materials/components

- Instruct and supervise fabrication
- Fit, static and dynamic alignment of device
- Modify device as necessary
- Document fabrication and fitting
- Review fit of device
- Determine when new device necessary
- Maintain medical records
- Oversee schedule of appointments

Since, at graduation, a clinician can automatically register with HPC and become a member of BAPO from either of the UK Universities it is important that all Higher Education Institutions (HEIs) that offer prosthetics and orthotics courses now and in the future are to a similar level. To ensure the education of prosthetists and orthotists is appropriate within the HEI framework the overseeing body for this is the Quality Assurance Agency (QAA).

QAA were established in 1997 and are an independent body funded by subscriptions from universities and colleges of higher education, and through contracts with the main higher education funding bodies. Their website is <http://www.qaa.ac.uk>. Here, it states that *“the Agency's mission is to safeguard the public interest in sound standards of higher education qualifications and to encourage continuous improvement in the management of the quality of higher education”*. Within the QAA benchmark statement it states that all UK training establishments training prosthetists and orthotists should and must cover the following areas:

Categories of prostheses to be assessed and prescribed

Lower limb:

Partial foot, ankle disarticulation, trans-tibial, knee disarticulation, trans-femoral, hip disarticulation, trans-pelvic, trans-lumbar, extension prostheses

Upper limb:

Partial hand, wrist disarticulation, trans-radial, elbow disarticulation, trans-humeral, shoulder disarticulation, forequarter prostheses

Categories of orthoses to be assessed and prescribed

- | | | |
|------------|---|---|
| Upper limb | - | Elbow, wrist, hand orthoses |
| Spinal | - | Cervical, thoracic, lumbar, sacral orthoses |
| | | Halos and helmets |
| Lower Limb | - | Hip, knee, ankle, foot orthoses |
| | | FO, AFO, KAFO, HKAFO, HGO and RGO |
| | | Shoes, shoe adaptations and repairs |

In the QAA benchmarking statement it says of the categories of devices prescribed by prosthetists and orthotists that the clinician must have the *“knowledge and understanding of patient/client prosthetic/orthotic management (including details of patient/client assessment, casting, measuring, rectification, manufacture, fitting, alignment, supply, review, appropriate care planning and note keeping).”* As well as the *“Expertise in the appropriate role of stock, customisation of stock and custom made prosthesis and orthoses.”* This benchmark statement was written in July 2000 by an evenly mixed group of clinicians and educationalists who themselves were all prosthetists/orthotists.

Evidence based practice

This is becoming the standard of care that is felt appropriate when evidence is available to support clinical practice. In the UK group have been formed to evaluate the evidence and document it. One such group is the SIGN Guidelines (Scottish Intercollegiate Guidelines Network). What is SIGN? It defines itself by saying *“The Scottish Intercollegiate Guidelines Network (SIGN) was formed in 1993. Our objective is to improve the quality of health care for patients in Scotland by reducing variation in practice and outcome, through the development and dissemination of national clinical guidelines*

containing recommendations for effective practice based on current evidence.” These guidelines are available online for all UK allied health professionals at <http://www.sign.ac.uk/guidelines/> .

It also needs to be noted that within the UK the National Health Service has some partial subdivisions with the NHS (Scotland) north of the border and the Department of Health (DoH) for England and Wales. The corresponding websites are <http://www.show.scot.nhs.uk/> and <http://www.dh.gov.uk>

Within the overarching framework of the NHS new roles and responsibilities are being mapped out. Most notable is the Clinical Specialist Roles being developed for AHP of which prosthetists/orthotists must be willing to take on within their own professional area.

The NHS (Scotland) has formed in recent years both the NHS Education Scotland (NES) and NHS Quality Improvement Scotland (NQIS). Interestingly both of which have had AHP Officers appointed. The DoH has a Joint Futures Initiative which is endeavouring to develop closer team working between the NHS and the Social Services.

Finally, to practice as a prosthetist/orthotist in the UK, HPC registration is compulsory and its legislation is for the protection of the UK public. Online registration means that everyone can check that an individual's registration is valid and current. Re-registration is required every 2 years. When the registration fee is paid, a signed declaration ensures that the registrant has maintained his/her clinical competence through continuing professional development and that they remain free from criminal convictions, thus affording the protection of the public and a high clinical standard throughout all the UK National Health Service allied health professionals.

5.7 Working Groups feedback and discussion: Professional profile

The question addressed by the working groups was:

With regard to the ISPO professional profile, and in light of other presentations, comment on the structure and content of the ISPO professional profile:

- *Identify any areas which are not essential*
- *Identify additional areas for inclusion*

Group 1	
Topic	Discussion
General comments	<ul style="list-style-type: none"> • Group generally agreed with points raised in the profile. • Suggestions made to clarify terms and words and change the order of presentation of certain elements. • Question was raised if ISPO needed to further strengthen the research and education elements within the profile. • Some difficulties linking the profile to levels of education (bachelor/master) structures. • Questions related to the amount of theoretical education to include in school curriculum in order to help graduates meet this profile.
Professional profile	<ul style="list-style-type: none"> • Patient care • Formulation of treatment for individual patients • Fitting, fabrication and treatment • Evaluation and follow-up • Management and supervision • Training and education • Community services • Research and development • Medical, legal and ethical requirements
Patient care	<ul style="list-style-type: none"> • Formulation of treatment • Participates as full (equal) member of the clinic team; takes part in the examination and prescription; and advises on the design of the prosthetic/orthotic device, including the socket or body/device interface, suspension and selection of proper components • Assists and advises on relevant aspects of pre-surgical, post-surgical, medical and therapeutic management of individuals requiring prosthetic/orthotic devices • Records and reports any pertinent information regarding patients and patients' families, including a determination of expectations and needs • Communicates appropriate information to the patients and their families • Fitting, fabrication and treatment • Identifies physical and other relevant characteristics (that may affect treatment) of the patient • Formulates prosthetic or orthotic designs, including selection of materials and components and mobility (assistive) (devices) aids. • Takes all casts and measurements that are necessary required for proper fabrication and fitting • Fitting, fabrication and treatment • Modifies positive and/or negative models and/or layout of design to obtain optimal fit and alignment • Carries out fitting, static and dynamic alignment and, where appropriate, preliminary training and initial check-out • Performs and/or supervises fabrication of the prosthesis or orthosis • Supervises and directs the activities of individuals in Category-II (orthopaedic technologist) and Category-III (orthopaedic technician) in fitting and fabrication • Evaluation and follow-up • Advises the team and participates directly in final check-out and

	<ul style="list-style-type: none"> evaluation of fit, function and cosmesis Instructs the patient or family in the use and care of the device Takes part in follow-up procedures as well as maintenance, repairs and replacement of the appliance Recognises the need to repeat any of the identified steps in order to optimise fit and function
Management and supervision	<ul style="list-style-type: none"> Collaborates and consults with others engaged in the ongoing management of the patient Manages clinical and laboratory/workshop activities assigned to him/her, including : <ul style="list-style-type: none"> use and maintenance of tools and equipment maintenance of safe working environment and procedures inventory and stock control personnel matters financial matters appropriate record keeping total quality management Supervises the activity of supporting staff as appropriate. Identifies and introduces Devises improved processes job methods for improving increasing efficiency Interacts with professional groups and, where appropriate, governmental and non-governmental agencies Takes part in planning and development implementation of technical orthopaedic care systems Training and education Conducts and supervises the education and training of individuals in Category-I (prosthetists/orthotists), Category-II (orthopaedic technologists) and Category-III (technicians) Lectures and demonstrates to colleagues in his/her profession and other professionals concerned with prosthetics/orthotics and also to other interested groups Is required to take part in and contributes to the process of continuing professional development Critically evaluates new developments concerning prosthetics/orthotics and teaching techniques Research and development Conducts continuing evaluation of his/her activities Participates in formal evaluation and research programmes Participates in scientific/professional meetings and contributes papers to scientific/professional journals
<i>Medical, legal and ethical requirements</i>	<i>Not discussed</i>
<i>Conclusions</i>	<ul style="list-style-type: none"> <i>Generally happy with the profile but would like to ensure that all points can be understood by people representing different professions</i> <i>Is it possible to include a statement relating to evidence based practice?</i>
Additional areas for inclusion	<ul style="list-style-type: none"> Changes to the profile <ul style="list-style-type: none"> Needs clarification of terms to aid understanding
	<ul style="list-style-type: none"> Query fitting/fabrication removal of “aids” <ul style="list-style-type: none"> Additional aids necessary? Walking sticks/crutches It was verified that additional aids mean walkers and sticks Comment – should avoid the word “aid” – suggest using assistive technology or device General question of functions – <ul style="list-style-type: none"> Professional profile misses patient relationship and needs improvement

Group 2	
Topic	Discussion
Patient Care	<ul style="list-style-type: none"> Part of multi-professional team (MPT) in Norway, Finland, Denmark, Sweden, France, Latvia, UK, Slovenia, Germany, Netherlands In some countries the individual prosthetics and orthotics clinicians are legally responsible for prosthetic/orthotics management Being a member of the MPT was seen as an essential requirement and we must educate the rest of the team in what we do. This education is happening in some educational programmes. Advice to other health professionals, seen as essential but due to working constraints it may not always be possible. Medical doctor = diagnosis of condition prosthetist/orthotist = prosthetics and orthotics management (identification of needs, prescription etc)
Fitting, Fabrication and Treatment	<ul style="list-style-type: none"> In some countries there are lots of technicians with good education, in others little education for this level Also need prosthetics and orthotics specialists who require education With the exception of the UK the patients can choose which prosthetics and orthotics clinic to attend
Management and supervision	
Training and Education	<ul style="list-style-type: none"> Sharing of teaching experience/collaboration viewed as good practice
Research and Development	<ul style="list-style-type: none"> The ability to undertake clinical research may be affected by prosthetics and orthotics system of country Need to use reflective and evidence based practice
Medical, Legal and Ethical Requirements	<ul style="list-style-type: none"> Need to provide patients with written information and provide system for reviewing prosthetics/orthotics management, in some countries this is now a legal requirement
Conclusions	<ul style="list-style-type: none"> <i>ISPO guidelines provide enough scope for interpretation in different ways</i> <i>European legislation states that everyone must be considered individually, and there must be recognition of experience/qualifications but is there a lack of trust between countries</i>

Group 3	
Topic	Discussion
General comments	<ul style="list-style-type: none"> It was felt that an individual with a Category-I professional profile should have the ability and tools to perform tasks specific to each recognized domain, but not necessarily be required of that individual.
Patient Care	<ul style="list-style-type: none"> With regard to Formulation of Treatment: participants felt that all four items in this category were essential for the professional profile Category-I. It was recommended by the group to modify the language for 2.1.1 Participates as full member of the clinic team; takes part in the examination and prescription; and <i>advises (recommended change: guides or has responsibility for prescription and design)</i> of the prosthetic/orthotic devices .
Management and Supervision	<ul style="list-style-type: none"> Participants agreed that all elements of this section are essential.
Training and Education	<ul style="list-style-type: none"> There was some discussion about separating training (2.3.1 and 2.3.2) from education (2.3.3 and 2.3.4) and having two domains rather than one. The first domain (training) appears to focus on the training and education of others while the second domain (education) refers to personal professional development.

Community Services	<ul style="list-style-type: none"> Most participants felt this domain to be essential. A recommendation was made to change the language to include: 2.4.1. Makes a professional contribution to and takes part in community based rehabilitation programs <i>related to prosthetics and orthotics</i>.
Research and Development	<ul style="list-style-type: none"> The participants found that 2.5.1 and 2.5.3 are essential and recommended no change. Majority of the group felt that the language for 2.5.2 needed to be stronger. Participates (omit) <i>Develop</i> formal evaluation and research programmes.
Medical, Legal and Ethical Requirements	<ul style="list-style-type: none"> All participants agreed that the two items are essential under this domain.
Suggested as domains/topics to consider as essential	<ul style="list-style-type: none"> Seating/wheelchairs? (learning objective for Category-I curriculum) Quality assurance for orthotic/prosthetic devices?
Additional areas for inclusion	<ul style="list-style-type: none"> Evidence based practice <ul style="list-style-type: none"> The guidelines describe the tools of Evidence Based Practice and should include critical analysis Seating and wheelchairs <ul style="list-style-type: none"> Discussion in addition to profile - for further discussion.

Group 4	
Topic	Discussion
General comments	<ul style="list-style-type: none"> All areas were considered essential in the context they were written. Much discussion took place around the clarification
Patient care	<ul style="list-style-type: none"> <i>Formulation of treatment</i> <ul style="list-style-type: none"> Participates as full member of the clinic team; takes part in the examination and prescription; and advises on the design of the prosthetic/orthotic device, including the socket or body/device interface, suspension and selection of proper components. <i>Group supports this</i> involved in the decision making of the team (<i>important</i>) Prosthetist/orthotist will be responsible for the ongoing prosthetics/orthotics care so therefore inclusion is important UK and Holland: involved more in prescription of prosthetics/orthotics treatment aspects Norway: for 5 years after initial prescription the prosthetist/orthotist carries on with care until the time is lapsed and then referral back to clinic team/physician Denmark: after initial prescription the prosthetist/orthotist have responsibility for most procedures Lithuania: physician decides as prosthetist/ orthotist not at Category- I level. See further notes. Assists and advises on relevant aspects of pre-surgical, post-surgical, medical and therapeutic management of individuals requiring prosthetic/ orthotic devices. <ul style="list-style-type: none"> <i>Group supports this</i> Able to recognize conditions requiring other interventions and make contact with the appropriate health professional Advise on what level of amputation would be best Lithuania: team treatment applied therefore this is essential Broader scope than prosthetic/orthotic devices, such as wheelchairs, aids, etc. In some areas the scope of prosthetic/orthotic devices may vary.

	<ul style="list-style-type: none"> • information regarding patients and patients' families, including a determination of expectations and needs. <ul style="list-style-type: none"> ○ <i>All agree</i> ○ Legislated in some areas – so no choice • Communicates appropriate information to the patients and their families. <ul style="list-style-type: none"> ○ <i>All agree</i> ○ Advise on continued care of device, upkeep, etc. ○ Instruct in use of device in terms of function
Fitting, fabrication and treatment	<ul style="list-style-type: none"> • Supervises and directs the activities of individuals in Category-II (orthopaedic technologist) and Category-III (orthopaedic technician) in fitting and fabrication. <ul style="list-style-type: none"> ○ Overall the group felt this is true ○ Also those in phase leading up to Category-I, i.e.: interns, residents, etc. (2.3.1) ○ Others who may be concerned with fitting and fabrication with prosthetic/orthotic devices. ○ Could be evolving in some ways as technical and clinical demands change. ○ Overall though the Category-I professional is responsible • Identifies physical and other relevant characteristics of the patient. <ul style="list-style-type: none"> ○ <i>Include:</i> Formulates prosthetics or orthotics designs, including selection of materials, components and additional aids. • 2.1.6 and 2.1.7: go together • Modifies positive and/or negative models and/or layout of design to obtain optimal fit and alignment. <ul style="list-style-type: none"> ○ Should include digital capture and manipulation ○ Comment about other individuals rectifying casts. When there is a more simple modification then a lower qualified person is modifying in the field ○ Some modifications carried out by other personnel. Numbers of practitioners is creating this situation also. ○ Ideal world what is best practise: Ideally a Category I individual should be carrying out this function. ○ <i>GOOD POINT OF DISCUSSION!!</i> • Performs and/or supervises fabrication of the prosthesis or orthosis. <ul style="list-style-type: none"> ○ Category-I is ultimately responsible to the patient ○ Issue raised: should this be looked at in terms of “performs” ○ Should the Category-I also have Category-III and II backgrounds information
Evaluation and follow-up	<ul style="list-style-type: none"> • Advises the team and participates directly in final check-out and evaluation of fit, function and cosmesis. <ul style="list-style-type: none"> ○ Many times there is no team, then the responsibility lies with the prosthetics/orthotics professional • Takes part in follow-up procedures as well as maintenance, repairs and replacement of the appliance. <ul style="list-style-type: none"> ○ Recognises the need to repeat any of the identified steps in order to optimise fit and function. ○ Collaborates and consults with others engaged in the management of the patient.
Management and supervision	<ul style="list-style-type: none"> • Manages clinical and laboratory/workshop activities which are assigned to him, such as: <ul style="list-style-type: none"> ○ use and maintenance of tools and equipment ○ maintenance of safe working environment and procedures

	<ul style="list-style-type: none"> ○ inventory and stock control ○ personnel matters ○ financial matters ○ appropriate record keeping ○ total quality management • Interacts with professional groups and, where appropriate, governmental and non-governmental agencies. <ul style="list-style-type: none"> ○ Involved in negotiation of fees and fee structure- Category-I responsibility ○ This could be with insurers besides government funders. ○ Should curriculum involve this in some way?
Training and education	<ul style="list-style-type: none"> • Supervises and conducts the education and training of individuals in Category-I (prosthetists/orthotists), Category-II (orthopaedic technologists) and Category-III (technicians). <ul style="list-style-type: none"> ○ Make more general – to be worked on.
Research and development	<ul style="list-style-type: none"> • Conducts continuing evaluation of <i>his/her</i> activities. • Participates in formal evaluation and research programmes. Include: <ul style="list-style-type: none"> ○ Participate in activities in work related environment ○ Add issue around developing evidence based practise.
Medical, legal and ethical requirements	<ul style="list-style-type: none"> • Provides patient care within a recognised prosthetics/orthotics code of ethics. • Provides patient care which complies with medical/legal requirements.
<i>Additional areas for inclusion</i>	<ul style="list-style-type: none"> • Records from patients: <ul style="list-style-type: none"> ○ Should be records about the patient <i>and</i> the device. ○ EU medical directive requires recording of info according to law. ○ In UK this is also data about wearing the device.

General forum discussion

Topic	Discussion
In general	<ul style="list-style-type: none"> In general group support profile, but needs clarification to allow better international understanding.
Profile very vertical structure	<ul style="list-style-type: none"> Need to communicate the profile outwith the ISPO system. Category-I professionals have a higher level of education and training than Category-II professionals and are better qualified to treat patients. Profile has plenty of areas where the profession is leading to the outside. The profession can influence other agencies. Not just vertical, but horizontal. Not possible for everyone to be expert of all points. Profession as whole can cover profile. Eventually must enlarge the introduction of profile to give information about what the profile is for. This could be added to give clearer identification of the profile. Use a certain language in the profile – the functions of the professional. If we look at the whole service and need what are the skills to do this? Two areas cover this: “participate in clinic team” and “training and education”. Relationship with other medical professionals. Profession should be responsible for education The patient parameter is missing.. The central point should be the patient not the professional. The code of ethics should state clearly the central interests of the patient.
Evidence Based Practice	<ul style="list-style-type: none"> Is there a system to set standards for evidence based practice? Description of the evidence Does that need to be in the guidelines? Perhaps not in the professional profile
Change of activity of prosthetists/orthotists in rehabilitation techniques	<ul style="list-style-type: none"> There is a change in the profession and this is not strongly enough reflected in the profile. Perhaps rehabilitation techniques should be added <ul style="list-style-type: none"> What is meant by this? Pre-fabricated hand orthoses? These are part of prosthetics and orthotics Types of devices should be discussed as a separate exercise. Different groups of people do different things.
New developments in prosthetics and orthotics	<ul style="list-style-type: none"> Problem of concentrating on devices – the emphasis should be to treat patients. Rehabilitation and evidence – need to develop tools in the process of treating the patient. Must involve active patients in process. Need professional feedback tools. This is an important next step. Professional profile of Category-I should have training covering the work of Categories-III and II to have all the qualifications necessary. Normally Category I individual can do everything. Not necessarily the best way of running a service. Category-I should know about this knowledge to control the process.
Prescription	<ul style="list-style-type: none"> In some countries there is not the possibility to prescribe. Need to define the difference between medical and technical prescription. Important in the profile and this needs to be written in the profile and “responsible to technically prescribe”

	<ul style="list-style-type: none"> • Category-I would be able to input into technical prescription. • In UK doctor/surgeon make medical and technical prescription. This has changed slowly over time. • We have to make clear that the prosthetist/orthotist is responsible for the technical prescription.
Category I professional not only makes device but also provides the orthopaedic solution	<ul style="list-style-type: none"> • Profile can take care of this. • Suggestions made can only improve the profile. • No suggestions that profile is wrong; most people accept profile subject to modifications. • Category I should be able to organise complex treatment and communicate with other Category-I as well as Category-II and III personnel. This person has to have project management. • Do we all accept this profile? It would be helpful to accept it in Europe. • Rehabilitation technology should be added as an annex. Not only prosthetic and orthotic devices but also other technical aids. Gives more scope and value to have this scope of knowledge. • This is a new discussion outside the scope of this meeting. Not an area which can be ignored. • Other professionals can take this role. • This may also be a good way of practice. • Seating should be included. Seating is extended spinal orthotics. • Should not give this up if country specific. • This may be some time away.
Technical aspects of profile	<ul style="list-style-type: none"> • Profile does not fully address the treatment aspects for the patient. • Emphasise that the patient area should be concentrated on. • In the first section of patient care there needs to be a better description to place the patient centrally.
Full member and equal member	<ul style="list-style-type: none"> • People are not always equal in a team. Full and equal are defensive. Why not just put in “member of clinic team”. • Not so defensive now.
What will happen with the profile	<ul style="list-style-type: none"> • Editing group to modify profile to absorb as much information as possible. Will go out for comment to the delegates and then modified accordingly. The profile can then be improved for use in Europe and elsewhere.

6. KEYNOTE ADDRESS: PROSTHETIC AND ORTHOTIC EDUCATORS MEETING (POEM) 2002

Nerrolyn Ford

The Prosthetic and Orthotic Educators Meeting (POEM) report has been provided as a reference document for this conference. This presentation will discuss the content, direction and findings of the meeting which was held in 2002. The meeting was initiated to address issues regarding the development of competencies for the future of prosthetics and orthotics university education.

Common problems raised at POEM related to curriculum development, clinical education and staff recruitment for university level education. There was a common interest in educational models, research and the development of the profession. POEM aimed to facilitate discussion among educators involved in university education and discuss and debate key issues related to curriculum development and delivery. It also aimed to consider strategies for advancing university level education in prosthetics and orthotics.

The meeting structure was similar to this conference with keynote presentations related to themes, break-out groups with discussion of theme related questions. The themes for POEM were:

1. *Professional identity*
2. *Entry-level curriculum*
3. *Mode of delivery*
4. *Practical/applied/clinical curriculum*
5. *Postgraduate education*
6. *Collaboration*

Theme 1: Professional identity

This addressed the questions:

- Does the prosthetics and orthotics profession have a professional identity?
- What role do educational institutions have in developing professional identity?

Keynote address

Tina Löwenadler described the difference between internal and external perceptions of the profession and the differences in how we name our profession. There was an identified need to define the scope for our profession, develop quality systems and create a professional identity. People from within the profession need to take responsibility for its development.

Schools can play a role in shaping professional identity but we need to first agree upon what the profession is. There is doubt about whether this is the role of the school or the professional associations, but schools can positively influence this by encouraging more involvement with other health professions. Schools must equip graduates with the tools necessary to move the profession forward. Curricular elements are needed to allow graduates to play a leading role in developing a professional identity and these include:

Business, marketing and communication skills
Transferable knowledge
Evidence based research and teaching
Identify skills that make us unique (biomechanical analysis/materials science)

Theme 2: Entry level curriculum

This addressed the questions:

- What educational level should be required to enter the prosthetics and orthotics profession?
- How much experience with real patients should students in an entry level programme have?

Keynote address

Mark Edwards described a certificate programme and Elaine Figgins a BSc (Honours) programme. The educational level required for to entry to the prosthetics and orthotics profession was described and discussed. It was agreed that education cannot produce experienced clinicians and that programme content is more important than educational level so that the focus of learning would be on learning outcomes and competencies. Training should focus on key elements and lifelong learning so that the learning process is continuous, but also so that students are aware of their limitations.

Education is often influenced by government. The transfer of labour force is made easier by having equivalent levels of education.

The question *How much experience with “real” patients should students in an entry level programme have?* was raised and it was determined that patient experience is vital for students. The clinical competencies should be examined to measure the relative effects. Patient interaction is more important than technical work and this is a powerful mode of learning. Although necessary, there are many difficulties in ensuring patient contact for students. For example it is very difficult to access patients (especially in orthotics). There are also economic limitations in terms of staff resource and there may be role reversal, with experienced patient and nervous student clinicians.

Theme 3: Mode of delivery

This addressed the questions:

- How do modes of delivery influence the students’ ability to learn?
- How do we prepare students and staff to accept different modes of delivery of prosthetic and orthotic curriculum?

Keynote address

Tommy Öberg spoke about problem based learning (PBL). Learning is more effective if it takes place in a situation similar to the situation where the knowledge will be used. Teaching is student oriented rather than teacher oriented. Assessment must address the student’s ability to understand the relation between facts and how to use the knowledge in practical “real life situations”.

Certain modes of delivery encourage independent and self-directed learning which motivate the student. Certain modes encourage a deep approach to learning and different subjects or skills are suited to different modes of delivery.

Using PBL effectively requires faculty motivation and education. It is important that all staff must collaborate and cooperate and evaluate their own and the students performance. Students must be taught to learn.

Theme 4: Practical, applied and clinical curriculum

This addressed the question:

- How can and should prosthetics and orthotics educators balance practical/applied and clinical elements of the curriculum?

Keynote address

Aaron Leung described a curricula model. The Holte report (1968) suggested programme objectives should meet local needs and so instruction for basic knowledge and technical skills was coordinated with adequate instruction in medicine, engineering and social sciences. Too much practical training is simply job training and too little can leave graduates naive with poor problem solving skills.

Dan Blocka discussed pathways utilised by the profession for training and for recognition to practice. Internship (residency) and certification processes were considered as well as practical, applied and clinical curriculum. How should a school determine what emphasis should be placed on technical, clinical and theoretical knowledge? This can be imposed by regulatory bodies or university administration, but the decision process requires collaboration with the profession. The equation is affected by class size and resources.

Schools must anticipate future changes in practice. So, how should university curricula relate to the learning associated with an independent post-graduate internship? Schools should not teach to a certification exam but beyond this to equip student for professional life and they should continually evaluate the relevance of curricula in discussion with certification body.

Certification examinations and internships could be included in the curriculum since these test minimal levels of the competence of the student to practice independently. If these are external to the school, then the schools should be aware of content so that the curriculum is compatible and guidelines should be developed for the internship.

Theme 5: Postgraduate education

This addressed the question:

What are the potential contributions of postgraduate educational programmes in prosthetics and orthotics?

Keynote address

Christopher Hovorka described a postgraduate approach to education. There are a number of models available:

3+2 (3 year bachelor + 2 year single discipline)

4+2 (four year bachelor + 2 year prosthetics and orthotics masters)

Post-professional (coursework and/or thesis)

The influence of postgraduate education on the quality of patient care as well as on the prosthetics and rehabilitation sciences was discussed. Evidence based practice relies on critical thinking and research that will improve the quality of care thus postgraduate education was seen to be important. An opposing view is that this would have no benefit to entry level training and the skills required for clinical care should be taught at the undergraduate level.

What important knowledge and skills could be taught at the postgraduate level rather than the baccalaureate? The following areas were considered to be more effectively taught at postgraduate level: Research methods; ethics and philosophy; analytical and critical thinking; quality management; business and marketing; prosthetics and orthotics specific subjects in greater depth.

The purpose of postgraduate education should be a higher level understanding including research activities. Research must be targeted at the appropriate academic level and must include significant contributions to a prosthetic/orthotic related area.

Delegates were posed a question from David Boone: *What steps can be taken to encourage collaboration between prosthetics and orthotics educational institutions?*

Collaboration may be academic or clinical and involve staff or students. Academic exchange broadens students and staff, as well as benefiting the home country. Exchange agreements should be flexible and must accept that there will be differences. Student exchange raises the potential for accreditation issues but if possible bilateral exchange agreements involving student and staff exchanges are set up they can be very positive experiences.

Other forms of collaboration include experience, materials, joint publication and joint research.

The future of POEM is to continue to share the outcomes of the meeting, to identify and include more institutions and to consider future meetings. A number of collaborations of staff and student exchanges have taken place since the meeting.

7 EUROPEAN LEGISLATION AND EDUCATION

7.1 Keynote address: European legislation and education

Sandra Sexton

This presentation aims to describe some of the history and developments in European legislation which relate to the training and education of clinicians involved in the care of people who require prostheses and orthoses. The presentation will include general information about legislation rather than specific information about prosthetics and orthotics, and will occasionally make comparisons to prosthetics and orthotics. For the purpose of this presentation clinicians will be referred to as prosthetists/orthotists.

A number of the participants here at this conference may have specialist knowledge about areas of European legislation. Also, they may have opinions on this legislation and how it relates to prosthetics and orthotics and this should contribute to discussion during the conference and help to improve knowledge in this area. When preparing for this presentation the kind assistance of a lawyer colleague has guided the understanding of this specialist area of legal knowledge, European Union Law.

By looking at the history of the European Union (EU), or community, it is possible to consider some of the aims of this union. There are a range of views about these aims among the people who make up this community as well as a number of political and historical forces which have shaped and moulded the European Union and which continue to influence it today.

The early approach used in the history of the European Union was the creation of a framework for community integration. This functional approach, known as the theory of functionalism, emphasised the common index of need. It was thought that there were areas of common need across country boundaries and that this need could be met by joint government policy and initiative. One such example of early work in this area can be found in agriculture

Dominating the process of European unification, the concepts of integration and cooperation have continued to be upheld throughout the history of creation of the European Union.

Much of the activities in creating a European Union have occurred in the last 60 years, although there are, of course, earlier events which have contributed to the process. The Treaty establishing the European Economic Community (EEC) was signed in Rome (25 March 1957) and adopted in 1 January 1958. The provisions on freedom of movement of workers, and freedom of establishment and to provide services are fundamental to one of the earliest central aims of the Treaty – the establishment of the common market.

The Treaty on European Union signed in Maastricht (7 February 1992) and adopted 1 November 1993, the Maastricht Treaty, changed the name of the European Economic Community to European Community. This also marked an evolution of cooperation between the Member States governments and a new structure which is political as well as economic. This is the European Union.

There are a number of council directives which are relevant to education. Council directive 92/51/EEC will be described as this has been provided as a reference document. This is based on council directive 89/48/EEC (please note the sequence of any legislation discussed with the first number relating to the year of publication). Further to this the Council Recommendation 98/561/EC provides useful advice regarding quality of education. The presentation will then move onto describing the Bologna declaration and beyond to consider current trends in education and professional recognition.

The document provided as a reference document is an example of a relevant document, rather than a single central document to the concepts and ideas of changes in education policy in the European Union. It does not stand alone in informing and guiding us in the law relating to education, but forms part of a series of directives and recommendations. As already mentioned, this directive supplements a

previous directive. It provides an opportunity for study of its content as an example of European legislation. The document will be presented in some detail to consider the concepts and themes which run as a thread through a number of directives, recommendations and themes relating to education.

This presentation contains general information about European legislation. The way in which this legislation is written is difficult to understand as it uses complex legal English language. More recently published documents of this type from the European Union are written in a clearer and more easily interpreted English language. The term Member State is often referred to meaning a country which is a member of the European Union.

This Council Directive 92/51/EEC refers to a system for the recognition of professional education and training and describes this system in an area without internal frontiers, or boundaries. According to the Treaty of Rome, this means the right to move freely in member states.

During this presentation the numbering as a subscript (for example ₁) will refer to the section of the directive referred to. Phrases from the directive will be written in italics. The phrases are often quoted word for word from the directive but are sometimes written in similar words to aid understanding.

The directive describes that one of the objectives of the European community is *the abolition of obstacles to freedom of movement for persons and services (Article 3c of the Treaty of Rome). This means in particular the possibility of pursuing a profession...in a Member State other than that in which they acquired their professional qualifications* ₁

*For those professions where the Community has not laid down the minimum qualifications, Member States reserve the option of fixing such a level...to guarantee the quality of services provided in their territory*₂

The theme of “quality” is one which is often found in documents from the European Union. It is clearly important in this directive and we will look at further documents in which quality of services and education are important considerations. In this directive, a Member State is advised on how the qualifications of a professional coming from another Member State should be viewed:

*They may not, however, require a national of a Member State to obtain those qualifications normally issued under their own national education where the person has already part or all of those qualifications in another Member State*₂

*Any host Member State in which a profession is regulated is required to take account of qualifications acquired in another Member state and to determine if those qualifications correspond to the qualifications which the Member State concerned requires*₂

The Directive 92/51/EEC was written after and supplements another Council Directive 89/48/EEC.

This initial directive *describes a general system for the recognition of higher education diplomas awarded on completion of professional education and training of at least three years' duration.*

*It is limited to higher education*₃

*Where certain Member States require the possession of a diploma (89/48/EEC) and others require completion of professional education or training with a different structure resulting in a comparable professional level and prepare the person for similar responsibilities and activities, such education and training should therefore be classed in the same category as the diploma*₁₅

So the professional profile of the person is particularly important. This has evident implications for prosthetists/orthotists – we have considered the professional profile of the prosthetists/orthotists and have found both similarities and differences from country to country in the way that these professionals practice in their clinical role. We need to consider how professional recognition of prosthetists/orthotists relates to the quality of services as well as freedom of movement in Europe.

Since it covers occupations which depend on the possession of professional or vocational education and training qualifications of secondary level and generally requires manual skills, ...the system must also provide for the recognition of such qualifications even where they have been acquired solely through professional experience in a Member State which does not regulate such professions¹⁷

This statement appears to take account of grand-parenting activities. Such a system has proven to have worked in the United Kingdom with the state regulation of prosthetists/orthotists which included all professionals working in the country in this role whether formally educated or not.

The aim of this general system is to eliminate obstacles to the taking up and pursuit of regulated professions.

Another Council Decision 85/366/EEC has a different objective of improving the transparency of the labour market and must be used, where appropriate, in the application of this Directive particularly where it could provide information on the subject, content and duration of professional training¹⁸

Professional bodies and professional educational and training establishments should, where appropriate, be consulted or be involved in an appropriate way in the decision-making process¹⁹

Such a system, by strengthening the right of a community national to use his occupational skills in any Member State, supplements and reinforces his right to acquire such skills wherever he wishes²⁰

So we cannot insist that a professional is accredited only by attending OUR particular course!

The directive gives a number of definitions:

DIPLOMA

= any evidence of education and training or any set of such evidence...which has been awarded by a competent authority in a member state, designated in accordance with the laws, regulations or administrative provisions of that State.

ATTESTATION OF COMPETENCE

= Any evidence of qualifications attesting to education or training, or, awarded following an assessment of the personal qualities, aptitudes or knowledge which it considered essential
Competence is an important issue which will be revisited in a variety of presentations and discussions in this conference.

REGULATED PROFESSION

= the regulated professional activity, or range of activities which constitute this profession in a member state

REGULATED PROFESSIONAL ACTIVITY

= a professional activity subject to the possession of evidence of education and training or an attestation of competence. The following in particular shall constitute a regulated professional activity:
= pursuit of an activity under a professional title where the title is reserved for the holders of evidence of education and training or an attestation of competence governed by laws, regulations or administrative provisions
= pursuit of an activity relating to health, in so far as remuneration and/or reimbursement for such an activity is subject by virtue of national social security arrangements to the possession of evidence of education and training or an attestation of competence

This may reflect your county specific situation relating to prosthetics and orthotics.

In cases where no system of regulation is in place

REGULATED PROFESSIONAL ACTIVITY = a professional activity shall be deemed to be a regulated professional activity if it is pursued by the members of an association or organization the purpose of which is, in particular, to promote and maintain a high standard in the professional field concerned and which, to achieve that purpose, is recognized in a special form by a Member State and awards evidence of education and training to its members

It ensures that its members respect the rules of professional conduct which it prescribes and confers on them the right to use a professional title or designatory letters from a status corresponding to that education and training.

This section is particularly interesting to this conference and perhaps could be debated in relation to the ISPO guidelines on education. Additionally,

REGULATED PROFESSIONAL ACTIVITY = whenever a Member state grants the recognition... to an association or organisation it shall inform the commission of:

*regulated education and training
professional experience
adaptation period*

Quality issues surrounding education will now be addressed by reference to Council Recommendation 98/561/EC. The language of this document is much clearer than the previous one. This document will be quoted from to illustrate its content.

A high quality of education and training is an objective for all Member States. The community is called on to contribute to their ongoing efforts by promoting cooperation between member states and, if necessary, by supporting and supplementing their action while fully respecting their responsibility for the content of teaching and the organization of education and training systems and their cultural and linguistic diversity₁

The council recommended that Member States ensure that follow-up measures are taken at national or regional level so the higher education institutions make plans and take action for quality improvement and for integrating graduates more effectively into the labour market.

The Council stated that improving the quality of higher education was a concern shared by each Member State and by every institution of higher education within the European Community.

In view of the diversity of methods used at national level, national experience could be complemented by European experience acquired, in particular, through pilot projects aimed at establishing cooperation in this area or at strengthening existing cooperation₂

The idea of a pilot project will be explored in the presentation, workshop and discussion about Professional Recognition in Europe later in the conference.

The replies to the commission memorandum on higher education stress that quality should be guaranteed at all levels and in all sectors, with differences between institutions only in terms of objectives, methods and educational demand. There is general support for the introduction of efficient and acceptable methods of quality assurance which take into account European and international experience and the possibility of cooperation₃

In view of the great diversity of education systems in the community, the definition of the term "higher education institution" to which the recommendation refers includes all the types of institutions which confer qualifications or degrees at this level irrespective of how they are described in the Member States₅

It is important to note that the recommendation emphasises a need for mutual respect and recognition between Member States in the area of education.

Higher education institutions have to meet the new educational and social requirements of a world-wide "knowledge society" and the resulting developments will endeavour to improve the required attributes of the services they provide by developing, where appropriate, new initiatives (individually or on a collaborative basis within higher education associations), aimed at increasing the quality of teaching and learning₆

The technological and economic changes and their consequences for the labour market pose new challenges for higher education institutions and in view of the challenges of global competition as well as the ever increasing influx of students into higher education institutions, member states face the task of organising their higher education systems and their relationships in ways which respect existing academic standards, training objectives, quality standards, the autonomy and/or independence of higher education institutions, and the need to be accountable to and to inform the public

The commission white paper on “Growth, competitiveness and Employment”, the White Paper on “Teaching and Learning: towards the Learning Society” and the Green Paper on Education-Training-Research The obstacles to trans-national mobility” indicate how important high-quality education is for employment and growth within the community...it is clear that transparent educational systems are required for trans-national mobility

The Recommendations of 98/561/EC include:

- Member states support and establish transparent quality assurance systems
- Member States call upon the competent authorities and higher education institutions to attach special importance to the exchange of experience and cooperation regarding quality assurance with other Member states, as well as with international organisations and associations active in the field of higher education
- Member states promote cooperation between the authorities responsible for quality assessment or quality assurance in higher education and promote networking

This cooperation could cover some or all of the following areas:

- *Encouraging and developing the exchange of information and experience, in particular on methodological developments and examples of good practice*
- *Fulfilling the requests for expertise and advice from the authorities concerned in the Member States*
- *Supporting higher education institutions which wish to cooperate in the field of quality assurance on a trans-national basis*
- *Promoting contacts with international experts*

In pursuing these objectives the developing links between quality assurance and other existing community activities in particular in the framework of the Socrates and Leonardo da Vinci programmes should be taken into account, as should recognition of qualifications for professional purposes.

In 1999, 29 education ministers agreed on coordinating their policies towards achieving a number of objectives to establish a European area of higher education and promoting this system worldwide. This in turn led to the Trans-national European Evaluation project, the results of this will be presented later in conference in the session entitled Professional Recognition in Europe.

An important legal notice regarding a European area of lifelong learning was communicated from the Commission in 2001. The idea of a European area of lifelong learning focuses on all forms of education, from pre-school education to retirement and covers both formal and informal education. The Commission reported in 2001 on concrete future objectives of education systems in order to meet the brief of the Lisbon European Council; to be the most competitive and dynamic knowledge-based economy in the world. The approach is based on three objectives and included a number of work programmes (listed as bullet points below):

1. Improving the quality and effectiveness of education and training systems in the EU
Work programmes;
 - Improving education and training for teachers and trainers
 - Developing skills for the knowledge society
 - Ensuring access to Information Communication Technology for everyone
 - Increasing recruitment to scientific and technical studies
 - Making the best use of resources

2. Facilitating the access to all for “lifelong” education and training and making access to education easier
Work programmes;
 - Open learning environment
 - Making learning more attractive
 - Supporting active citizenship, equal opportunities and social cohesion
3. Opening up education and training systems to the wider world
Work programmes;
 - Strengthening the links with working life and research, and society at large
 - Developing the spirit of enterprise
 - Improving foreign language learning
 - Increasing mobility and exchange
 - Strengthening European cooperation

The follow-up work for the concrete future objectives of education systems resulted in a council resolution on the promotion of enhanced European cooperation in vocational education and training.

In response to the council recommendation described (91/561/EC), in 2002, a European Network for Quality Assurance in Higher Education (ENQA) has been established to promote European cooperation in the field of quality assessment and quality assurance. Reference <http://www.enqa.net>

In 2003 a communication from the Commission regarding initiating a debate on the role of the universities in the knowledge society and economies emerged. The universities have a strategic role to play in achieving the goal set at the Lisbon European council, namely to make the European Union the most competitive and dynamic knowledge-based economy in the world.

This is a great opportunity, but also a huge challenge. The debate is especially topical as enlargement of the European draws near, considering the often difficult circumstances of universities in the accession countries with regard to human and financial resources.

The need for change in the universities is in response to the following:

- There is an increased demand for higher education
- The internationalisation of education and research
- The need for closer co-operation between universities and industry
- The proliferation of places where knowledge is produced means that universities have to consider competition
- The reorganisation of knowledge. This is linked to increasing specialist research and teaching and also to the challenges of society such as sustainable development.
- The emergence of new expectations which stem from the knowledge based economy.
- This calls for greater flexibility between the levels of education and training systems.

An example of a current initiative run by the European Union is the Programme to promote bodies active at European level and support specific activities. The objective of the Programme is to establish a legal basis for awarding grants to promote bodies active at European level and support specific activities in the field of education and training, for a period of five years.

This initiative illustrates the purpose and drive of the European Union in the area of education.

In summary, a number of important aspects of European legislation relevant to education have been presented which will help to spark discussion on a number of elements which relate to education in the field of prosthetics and orthotics.

Enlargement of the European Union is likely to increase, rather than decrease momentum in this area. As educators we need to prepare ourselves to meet the challenges of wider access and improvements to education and training with the central aim of improving patient care.

One of our greatest challenges in Europe is to increase the numbers of professionals educated as prosthetists and orthotists so that they can properly meet the needs of persons with disabilities who require to use prostheses and orthoses.

7.2 Working Group feedback and discussion: European legislation and education

The question addressed by the working groups was:

- How does EU legislation influence your curriculum?

Consider;

- Improving education and training for teachers and trainers
- Developing skills for the knowledge society
- Ensuring access to Information Communication technology for everyone
- Increasing recruitment to scientific and technical studies
- Making the best use of resources

Group 1	
Topic	Discussion
Improving Education	<ul style="list-style-type: none"> • Slovenia - Follow directives in accordance with new programme to be produced. • Germany - No immediate influences but may occur in the future. • France - To become more paramedical and members of a clinical team. • Sweden - Training Medical Directive (European) <p>Keeping of medical records</p> <ul style="list-style-type: none"> • Influence from the community progressively. • Evolves from shared commonalities. Common index of needs. • Improving Education and Training for Teachers • Netherlands - Own country directives on education and training • Own countries pedagogical training • France - Not current training, but training available. <p>Consensus that teaching and learning programmes are needed to forward the profession.</p> <ul style="list-style-type: none"> • Poland - Internal changes to increase the breadth of the topics covered within their programmes; Biomedical Engineering included within the course.
Information Communication	<ul style="list-style-type: none"> • Specific information and information searching techniques Re: quote knowledge based economy • Evidence based practice and sharing learning through this

Group 2	
Topic	Discussion
Training teachers	<ul style="list-style-type: none"> • German experience; <ul style="list-style-type: none"> - Lessons on pedagogies and teaching scopes - Profession development - Need contact with clinicians/practitioners - Clinical interests specialist of teachers - Ministry of Labour <u>not</u> Education - German Schools recognition - Recognition approval from Government directive of Ministry of Science and Research - Local authority in charge of individual courses differs between federal states - Large variety of different approaches from different member states - <i>How EU legislation can be used to improve the curriculum?</i> Should be the question to be answered? - The aim is to solve the problem of prosthetists and orthotists being a non-regulated profession in Europe <p>85/366/EEC</p> <p>A problem for EU regulation of:</p> <ul style="list-style-type: none"> - Prosthetists/orthotist different directives in different states - Paramedical - Technical (handicraft) <ul style="list-style-type: none"> • Belgium experience:

	<ul style="list-style-type: none"> - Prosthetics/orthotics courses have to be bound to Colleges or Universities (3 years Bachelor) - Course reviewed every 5 years by commission - Educationalist/professional body/ Ministry of Education (up to 9 people on panel) - Interview a range of staff/students/clinics - EFQM European Federation of Quality Management - Staff reviewed every 3 years by college commission qualified in educational issues (3 strikes then out) - Recruitment mandatory for research and technical work - Financed per head of student - Progression rates Belgium course - Since 1991 3 year programme - Since 1996 Quality Assurance - First year 50-60%, Second year 90%, Third 99% - Need approved mandatory content of training for all EU member states - With professional input of quality which is equal to all member states - To allow acceptance and movement of students - Universities Framework - Easier translation of credits and students
General	<ul style="list-style-type: none"> • Specific directive for prosthetists/orthotists needed • In past more generic so were not interested in being specific at that time • NOW the aim is to improve standards of patient care and transfer of staff and students among EU • Discussion: <ul style="list-style-type: none"> - Need to lobby European Union - Or need to work within framework of general - Need a voluntary “optimal” standard - For some new states EU legislation is making courses more intensive and students have more hours - At present education free - Clear picture of profession profile agreed this morning (few amendments) - This indicates level of training - Commission need to be consulted to inform them of the profession and what to expect in the training of these professionals. - EU will take decision if we are not pro active - Who is the professional leader? - ISPO or Interbor? One voice in future
Conclusions	<ul style="list-style-type: none"> • Need to work within framework of EU directive. • ISPO learning objectives need to be accepted by EU • <u>We must</u> present as <u>one body</u> of all national schools

Group 3	
Topic	Discussion
Improving education and training for teachers and trainers	<ul style="list-style-type: none"> • It is important to develop the skills for teachers and trainers • There is a need to identify the role of the teacher and trainer • There should be formalised courses for teaching and training skills • Teacher exchange and collaboration amongst schools • Postgraduate education • Continued professional development
Developing skills for the knowledge society	<ul style="list-style-type: none"> • Improving standards of education and training • Utilise modern methods of information retrieval • Postgraduate education • Continued professional development
Ensuring access to Information	<ul style="list-style-type: none"> • Need to provide/ensure access to information communications technology to teachers and students

communications technology for everyone	<ul style="list-style-type: none"> • Provide training in its use and how to be more critical of the information found • Schools and departments should make use of information communications technology in teaching and learning
Increasing recruitment to scientific and technical studies	<ul style="list-style-type: none"> • Publicise the profession
Making best use of resources	<ul style="list-style-type: none"> • Share resources

Group 4

Topic	Discussion
Improving education and training for teachers and trainers	<ul style="list-style-type: none"> • Not sure what legislation means. Is it a recommendation or is this legislated? • Development of quality systems for education • Currently universities require new instructors to take appropriate course to ensure standard • In France, depends on the type of education • It is felt that this should be implemented
General Comments	<ul style="list-style-type: none"> • Benchmark (core competencies) indicates what is needed in a prosthetics/orthotics course below a more general benchmark statement • Applied to graduates or those ready to stand for qualification. Council for examination/ qualification or similar created – so recognition can be facilitated and this could occur in each country • French regulation – has an examination or accreditation process also by the government (worked between schools and profession) • Comment – a possible EU examination would be a solution
Developing skills for the knowledge society	<ul style="list-style-type: none"> • To be able to adapt to a changing knowledge base and therefore there is a need to develop life long learners. <ul style="list-style-type: none"> - How to acquire/source knowledge - Give the students the tools to be able to accomplish this - Critical thinking - Not how you do it – but “why do you do it” - Educate individuals how to use the knowledge and apply it - A broader education, i.e.: general education? • This seems to be the current approach in all schools.
Ensuring access to information communication technology	<ul style="list-style-type: none"> • What tools do you have? This will influence the ability to do this along with the funding available. • International projects could help facilitate this. • Funding access important due to costs • We need to know what is available • Ensure the knowledge of other countries. ISPO has a role to play in coordinating, identifying this activity • This could facilitate outside the school – to make more consistent • Practical – still difficult to accomplish with technologies available • Some areas of curriculum need “face to face” contact – psychology/social skills leading to patient management skills • This has to be implemented carefully
Increasing recruitment to scientific and technical studies	<ul style="list-style-type: none"> • Small profession, therefore tools for increasing recruitment are difficult. Why not develop a coordinated effort towards this. • Some areas have a high number of applicants for places available. Therefore the quality is high due to demand • What numbers are needed? Need to perform demographic studies. • Other ways: <ul style="list-style-type: none"> - Lithuania: first process 2 years in technical area (O- level). Practical work one year then Category-II after this (2 years). If complete then they can qualify at university level after 1.5 to 2 years. This way the best specialists can be streamed to this end. - Latvia: Step 1 - 2.5 years technician-orthopaedist (technical level). Engineering science training in College. Step 2 - 2.5 years engineering in Bionics and Prosthetics (practitioner level), Riga

	<p>Technical University. Step 3 - 2 years MSc in Bionics and Prosthetics. Step 4 - 3 years, Doctor of Engineering Science</p> <p>ASIDES:</p> <ul style="list-style-type: none"> • Bologna Declaration - how will this affect things? <ul style="list-style-type: none"> - Develop ETCs - Could start a process to collaborate and find a way to identify commonalities • Try solve qualification issues between countries
Making the best use of resources	<ul style="list-style-type: none"> • Entrance qualifications: important to determine best candidates • Selection process important to attain higher quality: i.e., knowledge of prosthetics/orthotics

General forum discussion

Topic	Discussion
How to publicise the profession	<p>Despite the fact that various paramedical professions are trained in the same school, they still know very little about each other. We should promote/inform more about our competencies to the other professions. What is the minimum content that the other team members should have included in their training?</p>

8. QUALITY IN PROSTHETICS AND ORTHOTICS EDUCATION

8.1 Keynote address: Quality in prosthetics and orthotics education

Fred Holtcamp

Introduction: the design process

In 1998 the Knowledge Centre Medical Engineering of the Fontys University was invited to research the possibility in developing a four-year full time Bachelor course in cooperation with a foreign institute, The Katholieke Hogeschool Kempen (KHKempen) in Geel Belgium. It should be noted that the KHKempen already offered a prosthetics and orthotics course Higher Vocational Education level since 1994. This research study has been made possible by TRIS (Trans Regionale Institutionele Samenwerking: Trans-Regional Institutional Cooperation for Border Regions). Fontys University in Eindhoven (the Netherlands) and the Katholieke Hogeschool Kempen in Geel are at a distance of 45 kilometres from each other. (Belgium TRIS offered the financial possibility to investigate the possibilities in cooperation, between the two Universities.

The design brief therefore became very clear and concrete. Investigate the possibilities in cooperation and if there are possibilities, develop a Croho document (central register for university studies leading to a Bachelor level degree) and design the course as a whole. In this formulation three phases can be determined. A feasibility study, a concept design described in a Croho document, and a final course design after a formal approval.

From the beginning of the feasibility study and later during the design process a round-table conference was organised every two months. This round-table conference was formed by members of the profession such as Orthobanda (Nederlandse Vereniging van Orthopaedisten en Bandagisten), BBOB (Belgische Beroepsvereniging van Orthopedisten en Bandagisten), and ISPO (International Society of Prosthetics and Orthotics, Netherlands and Belgium), Ministry of Health, assurance companies, the KHKempen and Fontys University. This round-table conference has been very helpful during the whole process, on the one hand because it was a very effective communication channel of all the parties, so everyone knew what was going on, and on the other hand it was very helpful in putting the minds together to find all kinds of solutions for problems which were faced on a regular basis.

Feasibility study to a prosthetics and orthotics course at Bachelor level

Is there a need for a Higher Vocational Education in prosthetics and orthotics? Although it seems a bit strange to answer a question like this, it had to be answered in order to get official approval by the government at the end. In order to find this answer, several topics had to be researched:

- the needs of society for this type of graduate;
- the numbers of graduates needed for the profession in the short and the long term;
- appropriate expenditure of government funds;
- the content framework of the course;
- the Institutional profile.

These questions are answered in the Croho document 'Hogere Beroepsopleiding Orthopedische Technologie', a necessary application document for new courses needed by the Ministry of Education. Two other preconditions not mentioned before which are of great importance in succeeding the realisation of the curriculum are the following:

- meeting the requirements of two school systems from different countries; and
- organizational conditions

Starting with the first the curriculum will be offered in two different places, the Netherlands and Belgium. A major difference between both Universities is the way of teaching. In Belgium, more specific at the KHKempen, a more conservative way of teaching is used in transferring knowledge from lecturers to the students.

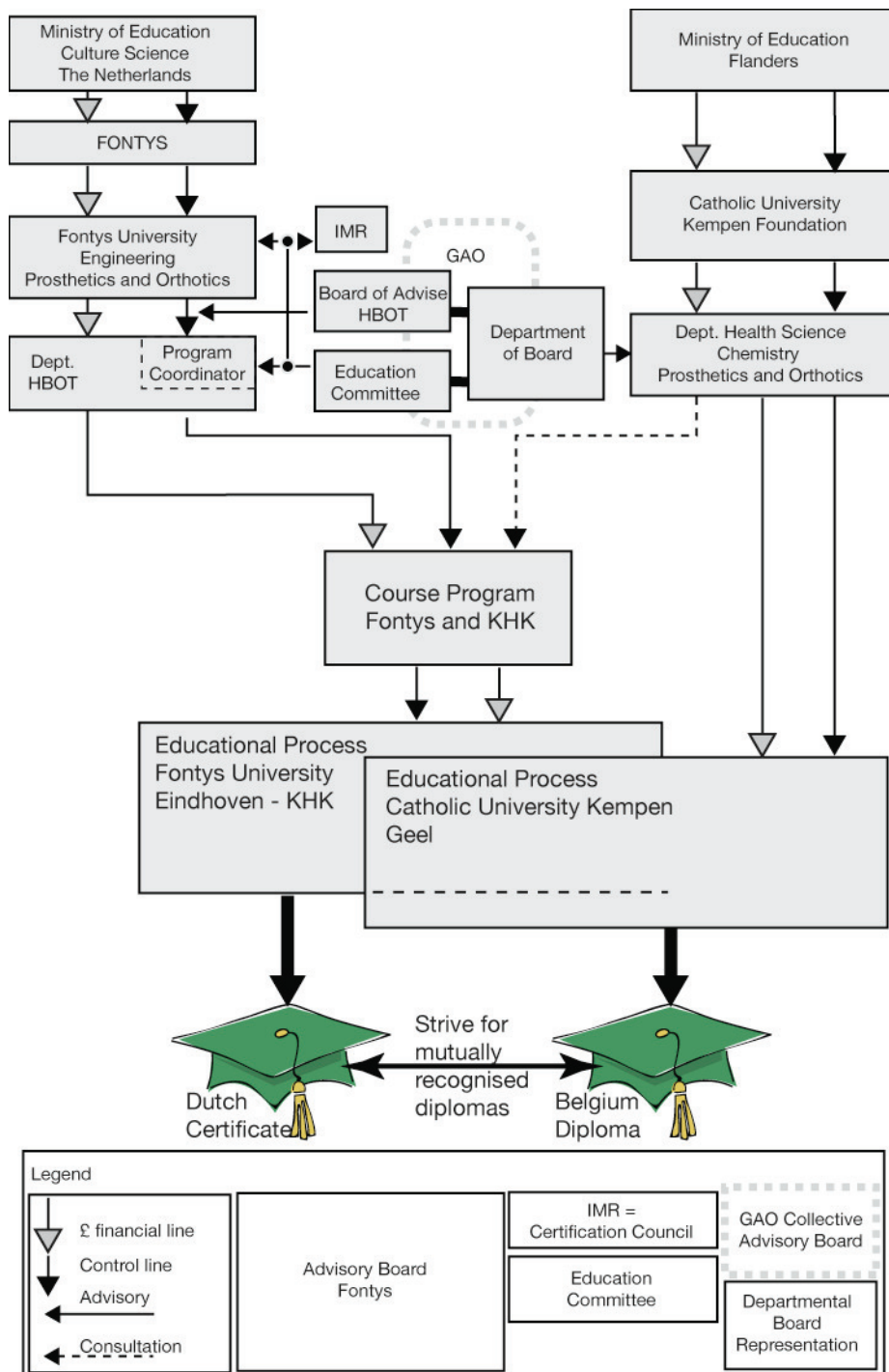


Figure: 1

A second precondition is a grasp of all the things that are necessary to be able to offer a course, such as the Advisory Board, Board of Examiners, Examinations Regulations, student facilities such as student organisations, tutoring, etc. Together with issues raised with diplomas or certificates from different universities and how they can be satisfied are the major problems that must be solved before cooperation is possible.

The solution to all these problems was the design of a cooperation model in which both universities are able to account for their own responsibilities and are able to cooperate in the establishment of the common parts of the curriculum. This cooperation model or organizational model is shown in Figure 1. This model shows clearly the connection of the two universities with their departments of education. Also the connection of both individual universities with all the organisation of the course is shown as well as the connecting parts, e.g. the GAO (Gemeenschappelijk Advies Orgaan, the Joint

Advisory Council). Clearly shown is the result after graduation, the Dutch Certificate and the Belgium Diploma. The Certificate is reserved for Dutch students and the Diploma for Belgium students, both according to the national law. In the coming years, however, effort will be put in to harmonization of both awards, i.e. one common award.

In conclusion a major problem has been solved by introducing this organizational model. This model shows precisely who is responsible for what part of the organisation. Also a solution for the difference in curriculum duration has been found. The differences in preliminary training and age differences have been made visible. The section on 'Design principle' will go into the detail of the educational model (Fig. 1).

DESIGN PRINCIPLE, DESIGNING FROM A FORM-PERSPECTIVE

A central issue in designing the prosthetics and orthotics Bachelor curriculum, although it is never made explicit, is the choice of perspective from which the design process will take place. At first sight is the development of a higher educated workforce with a lot of new knowledge. It is acknowledged that outside universities and research centres a lot of experience and knowledge is available. In this connection the common production of knowledge inside universities and laboratories is indicated as a 'mode I'-knowledge practice (Gibbons *et al.*, 1994). In the 'mode II'-practice it is context related knowledge production characterized among other things by trans-disciplinary, heterogeneity, and context and application alignment. It is this growth of knowledge, which can be interpreted as a major driving force behind the design of new curricula; a lot of latent knowledge is already there. It only needs to be processed to make it available. In the curriculum design of the prosthetics/orthotics course, this was exactly the case. A lot of knowledge was and is available, also new developed knowledge, which now had to be converted into the format of a four-year curriculum.

Because of the fact that a lot of knowledge, skills, facilities and regulations are known and available, the only problem was how to implement it, in order to make a feasible, high quality curriculum that can be studied by students in two different universities. It is these reason why the design process took place from a form-perspective point of view. Lecturers and tutors had to meet specific requirements. Their reputation must be in order and exhibit 'a right of speech', be a role model, show commitment to the profession, etc.

At Fontys University a process about quality, quality assurance and study ability has been going on, aimed at the educational paradigm 'Higher Education'. A number of examples are given below:

- interdisciplinary and multidisciplinary learning is used instead of knowledge transfer in a conventional way;
- education is becoming more and more aimed at independent and self-activities by the students, with competence as a basic assumption. From these competences, objectives and final attainment levels can be formulated;
- the content of the curriculum is becoming more and more determined by the dynamics of professional profiles and rapidly changing professional demands;
- learning is aimed at professional practice; and
- higher education demands modern study facilities connected to national and international communication networks.

These innovative changes together with the basic assumptions and the facilities offered by the partner university, combined with the fact that the curriculum is offered at two Universities justify this choice.

CONCEPT AND PROTOTYPE

Taking all the above-mentioned considerations into account there is more than enough material to design the curriculum according to the Dutch law and to accommodate the profession of prosthetics and orthotics. In concept and prototyping the educational model, the designation of graduates and curriculum content has to be taken into account.

Two questions remained:

- 1) How to determine the amount of hours spent on a certain subject?
- 2) How to deal with new insights in education, especially the matter about competences?

Curriculum content

The answers are of course not easy to give. Based again on experience, an idea of how many hours must be spent in order to master a certain skill is directly related to the number of laboratory hours. This is according to the personal experience of Belgian and Dutch professionals and related to the amount of means that is available. The amount of time spent on a diversity of educational subjects, skills and even clinical placement differs in the individual educational institutes. Educational and cultural backgrounds look to be valid arguments for these differences.

For this curriculum in particular it means (partly) fitting into the first year of a Dutch engineering curriculum, combined with fitting into the Belgium curriculum. In this way an efficient use of available means is achieved.

Competences

What makes an Orthopaedic engineer an orthopaedic engineer? In other words what kind of (distinguishable) competences must an orthopaedic engineer have?

These general and profession-specific competences must be defined and implemented in the orthopaedic engineering curriculum. This process started two years ago and is still in progress; in fact it is a never ending process due to new insights and knowledge.

A competence is an ability obtained from the collective learning process, made available by the group realising a specific common objective (Weggeman, 1997)

Within the development of designing the orthopaedic engineering curriculum the group mentioned above could be seen as a compilation of orthopaedic workshops, institutions, rehabilitation centres and industry that have a need for orthopaedic engineering staff educated at university level. The common objectives that need to be realised will be reviewed so that this professional group can formulate a realistic strategy to cope with the future. Below, an explanation is given how to come from these company objectives via the general esteemed competences of the orthopaedic engineers, which will be further explored towards final attainment levels and learning objectives. By means of an example it will be shown how to go through this process.

One of the main objectives of a business, namely; generation of profit and continuity is initially taken as a basic assumption. Generation of profit, continuity and a cost-effective process is a major rule in making the business survive, even if this business a part of the healthcare sector. From these business objectives, designing lectures, lessons, and laboratory sessions will be further explored.

An example will follow, in analysing a number of learning objectives which have to be set up to be able to educate a orthopaedic engineer whom has the knowledge to realise the mentioned business objectives. In order to realise continuity of the orthopaedic workshop, it is of importance to be able to work on product development in order to introduce new products. This new products need an innovative design path, therefore students need to know how to innovate. This is seen as an essential competence. To gain this competence one can ask which field of knowledge is necessary for a student to master an innovation process? Examples of fields of knowledge are: medicine, knowledge of materials, biomechanics, life science etc.

From these fields of knowledge, final attainment levels or, subject benchmark statements can be defined. To take biomechanics as an example; to deal with a biomechanical design process, a student needs to be familiarized with statics, stress and strain, design, anatomy and physiology. From these final attainment levels lessons with learning objectives can be arranged.

The above indicates how the research of designing education problems and questions will be handled. This is a continue process and open to new insights and ideas.

Perception of determining competences

Skills and knowledge, with a causal relationship to a successful fulfilment of desired company objectives help to determine the competences which are asked for.

Competences are a cluster of:

- 'broad' skills;
- attitude; and
- knowledge 'behind the skills'.

Examples of competences:

Analysing	International understanding
Strategic thinking	Ability to abstraction
Making plans	Vision of future
Knowing the organisation	Responsibility
Leadership	Process monitoring
Communicative skills	Learn to learn
Corporate values	Research, data
Innovative thinking	Publish
Interdisciplinary work	(Self) reflecting, assessment, evaluation

Competences can be successfully introduced if the university is able to create an attractive learning and study climate. As a graduate higher vocational education in prosthetics and orthotics, an orthopaedic engineer is a person with perception of transformation of the material world in the field of rehabilitation and rehabilitation engineering. To meet these goals a general vision of competences of private enterprise, trade and industry must be developed. The question can be asked, how can a university educated staff member meet all this? Therefore the university had to characterize the required competences:



Figure: 2 Competences/aims

- Knowledge of the existing organisation. (What and how to organise?)
- Knowledge of technological capability. (What can be realised?)
- Agreement of a goal. (Is there consensus?)
- Knowledge of state of the art/development / innovations. (How to get the most out of it?)
- Vision for the future (Where to go?)
- Knowledge of project realisation (How to get there?)

Figure 2 shows a number of parts and divisions of general elements, which forms the competences. In summary the general competences necessary to start as a graduate within the occupation are listed below:

1. Is able to function in a dynamic, multidisciplinary and international environment in a variety of activities.
2. Is able to generate innovative ideas and is able to take initiatives, combined with the ability to deal with complex procedures.
3. Is able to keep skills up to date, expanding and transferring them.
4. Is able to weigh problems by virtue of professional background, ethics, and socially accepted standards and can come to a conclusion.
5. Is able to communicate effectively in a diversity of matters at every level.
6. Is able to work independently as well as in a multidisciplinary team in a structured way to achieve the necessary results and, if appropriate, based on specific methods.
7. Is able to function effectively in a variety of conditions.
8. Is able to perform management tasks, and develop and execute company/institution policy.
9. Is able to reflect their own behaviour and attitude, and give and receive feedback.
10. Is able to contribute in an active way to the development of the profession.

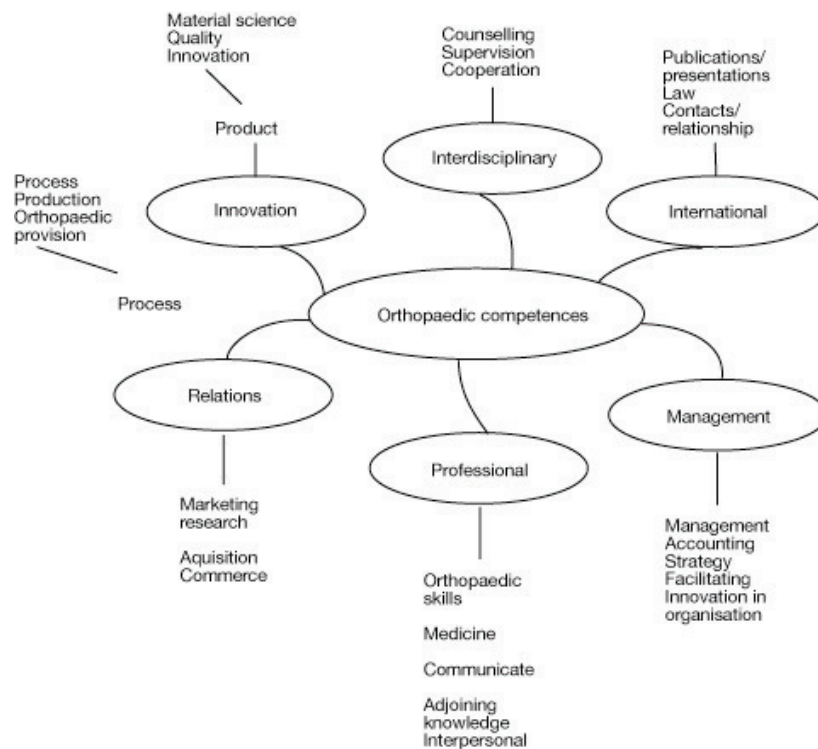


Figure: 3 Separate requirements

Defining general competences is not enough to describe the entire profession. There are also a number of specific competences which have to be defined, the so-called professional competences. These professional competences are like the general competences, subject to change and fine-tuning.

Professional competences specific for prosthetists and orthotists

Professional competences distinguish the profession of an orthopaedic engineer from other professions and must be therefore be rather specific in what is required for the profession. Figure 3 shows how separate requirements are linked in a way to produce competences. Prosthetists and orthotists in combination with rehabilitation and mobility expertise, forms the profession of orthopaedic technological engineering, or rehabilitation engineering.

A central issue in this profession is acquiring, collecting, and recording data and measurements, fitting, producing of supporting or replacement parts for the human body.

Graduates of professional education in prosthetics and orthotics will meet the competences stated below in order to perform the recurring duties as a starting professional:

1. Act as a professional in the field of healthcare and technology with the client/patient as centre, in a highly developed ethical way based on respect and equality, combined with an ability for empathy and care and able to see the orthopaedic profession from the users point of view.
2. Analyze questions and problems in rehabilitation centred on the musculoskeletal system and define these in an intermediary role between medicine, technology and society, with the intention to implement and produce these provisions on an orthopaedic technical basis, in order to preserve or improve quality of life and mobility.
3. Advising of clients/patients and employers with regard to liability, and responsibility of products and working conditions and able to cooperate and communicate in order to document and quality assure the whole process.
4. Is able to make conclusions regarding management, marketing, environment, quality manufacture, and maintenance in relationship to the total lifecycle of the product.
 - a. Insight knowledge of anatomy, physiology and pathology, structure function and dysfunction of the human body.
 - b. Insight and knowledge of possibilities to prevention and rehabilitation.
 - c. Insight into structure and tasks of health service, law, regulations and standards.
5. Measure and produce orthopaedic devices (prostheses, orthoses and bandages, rehabilitation and walking aids),
 - a. Insight into biomechanics, mechanics, material science, measurement systems in combination with anatomy, physiology and pathology, structure, function and dysfunction of the human body.
 - b. Insight, knowledge and skills to manufacture orthopaedic devices.
 - c. Insight into all technical equipment used in an orthopaedic workshop.
6. Analyse, convert and formulate the wishes of patients/clients into a functional medical and technological specification for the design, manufacture and fitting of orthopaedic devices (prostheses, orthoses, bandages, rehabilitation and walking aids). Innovation plays a large role, not only in treatment and product development but also in knowledge transfer; therefore knowledge about other relevant professions both in healthcare and social sectors as well as technical is necessary.
7. Manage a private enterprise, or public institution which is acting in the orthopaedic field; document, quality assure and evaluate the technical process and devices.
 - a. Guide employees in a design process to produce and manufacture of orthopaedic devices.
 - b. Coordinate labour employers and other sectors of service, necessary for the benefit of manufacturing of orthopaedic provisions.
 - c. Take care to meet the directives, law and standards of professional requirements, and the resulting responsibilities and certification of orthopaedic devices provided.
 - d. Take care in establishing professional indemnity insurance to cover the devices provided.

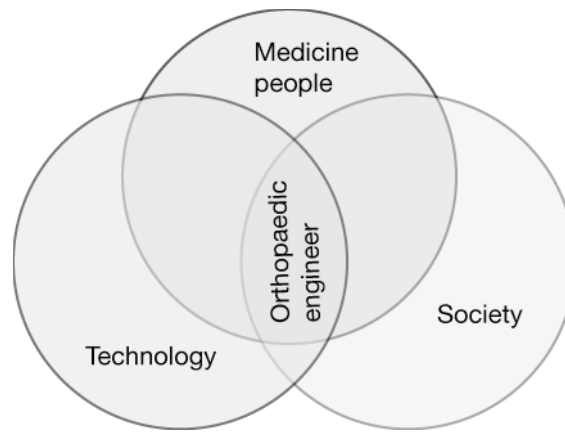


Figure: 4 The three main pillars

A graduate also needs to have the skills to anticipate the changing aspects of insurers, law, maturity of patients, higher requirements and faster delivery demanded by prescribing physicians, competitors, international developments and supply management. This will result in a more efficient management, protocols for choice of components and standardisation of procedures. In professional practice, the graduate acts as the communication between physicians, patients and the orthopaedic employers who manufacture the orthopaedic devices. It is therefore important that the graduate must have the knowledge and the skills to manufacture a diversity of orthopaedic devices.

In conclusion the orthopaedic engineer is a person with attitude, qualification, skills and motivation to solve quality of life questions in relation to rehabilitation and mobility. This is based upon three aspects (Fig. 4):

People:	Involvement (patients/clients) Physicians/prescribers/multidisciplinary team
Technology:	Knowledge/skills/techniques, attitude
Society:	Law/quality assurance/regulations

The above defined competences, combined with the general professional competences, are the factors which distinguish the orthopaedic engineer from other professionals and make them unique. These complete set of competences is fundamental to derive the more specific final attainment levels and objectives, such as the subject benchmark statements made by the quality assurance agency for higher education (2001) for the United Kingdom.

Learning styles

Having a competence set, final attainment levels and objectives available, it is possible to arrange the educational programme. Learning styles is a central issue. A number of possibilities are available to transfer knowledge and skills; classes and lectures as well as laboratory practice is used and a lot of experience is available. Additionally clinical practice is a necessity for students to learn and get experienced. Beside these forms of teaching the use of problem and project based learning is introduced in order to practise many other skills, (professional, social, technical, attitude) based on the formulated competences. The students must also keep a portfolio to record and survey their work and results. Both the problem based learning method as well as the portfolio demand engagement in self-directed learning by the student and, as far as possible, simulates the professional world and helps the student in the process of problem solving (Dool and Geurts, 2000). This curriculum is therefore a mix of conventional learning methods and skills training combined with a modern way to counsel and support a student to become a skilled professional.

This curriculum came into being during the design process in cooperation with the other partners.

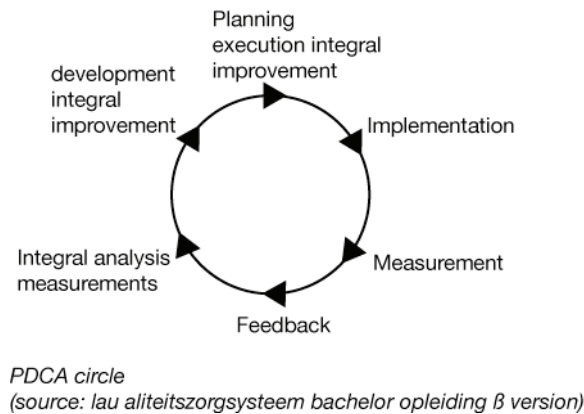


Figure: 5

ACCREDITATION

In the near future the curriculum will be assessed by a VBI, a visitation-judging institute of the VNAO (Vlaams Netherlands Accreditation Organization). Six subjects are major issues, which will be assessed (Vlaams Nederlandse Accreditatie Organisatie, 2003):

1. aim of the curriculum;
2. programme;
3. effort of personnel;
4. facilities;
5. internal quality assurance; and
6. results.

The general and specific competences form the fundamentals of the curriculum which is designed and developed and helps to specify in detail what factors of influence are important. In this way the competences are of major importance in assessing the aim of the curriculum and the programme by the VNAO.

Qualification and quantification, if handled in a correct way, gives feedback to the curriculum design and offers valuable information about new developments in education. It can be split into two parts. Firstly a form of quality evaluation directed by the government which is a compulsory evaluation process performed by the VNAO.

The second is a continuous design and adjustment process, shown in Figures 6, 7 and 8.

THE STATE OF AFFAIRS

This section reviews the course in a context of a PDCA and EFQM quality assurance system, as far as curriculum design can be reviewed. In reality it is a continuous process, in relationship to the acquired data and the quality assurance systems used at Fontys University.

Although it is common to design courses using the experience of staff and copying ideas from those who were first, it shows that designing and evaluating courses by means of design principles and 'evidenced based' data to obtain a desired result is also possible.

In order to achieve this, research has been done in the field of how to use, quality measurement techniques and evaluation methods in designing educational courses. By doing this, answers were found for questions such as 'what kind of subject should be or must be covered in the study?' Finding answers such as 'what percentage of certain educational parts or specific subjects is an optimum?', 'what kind of learning styles are appropriate?' and the length of courses in years are more difficult to answer.

To answer the last item, study duration is most often a legally described period. In cases of regular, initial education it is therefore three or four years, depending on political choice.

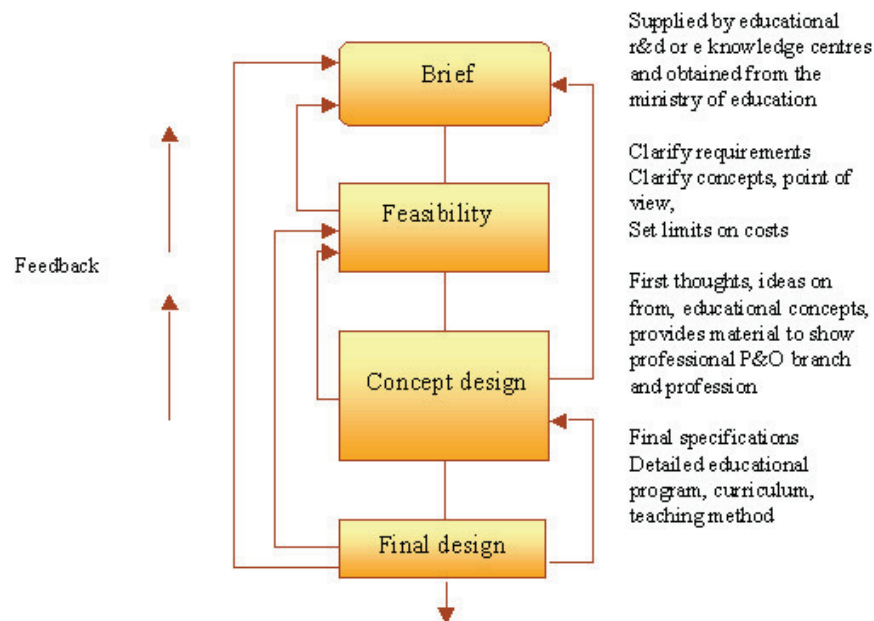


Figure: 6

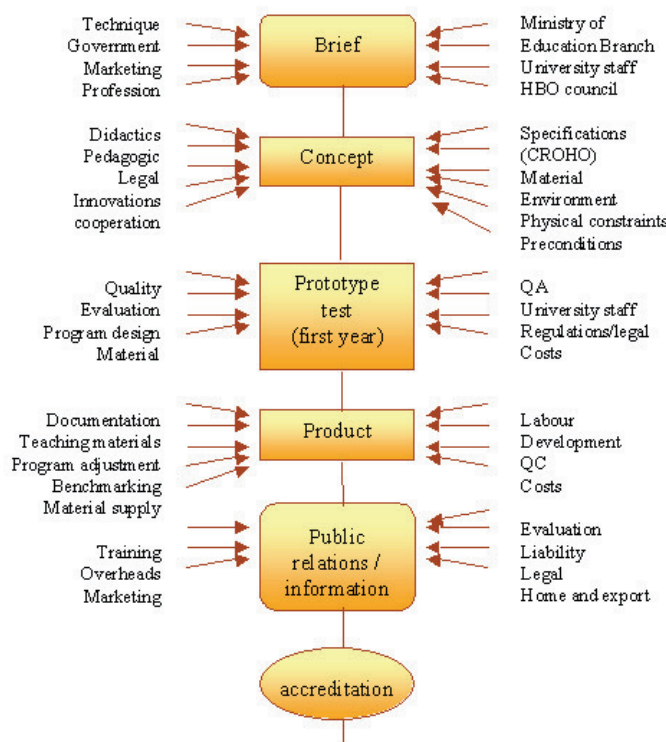


Figure: 7

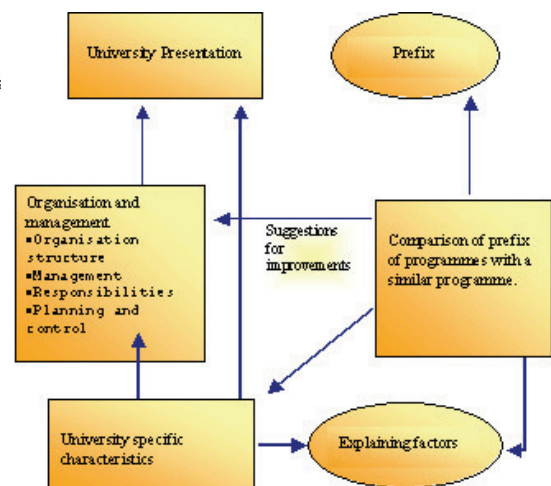


Figure:8

Reviewing the acquired data in order to find, for example, the optimum percentage for clinical laboratory activities of the curriculum, it was difficult to come up with an answer. In practice although all the expected items are covered, there is a large variation in the times of the individual subjects within the different curricula.

The near future

For future data acquisition and evaluation methods and techniques such as desk and field research will be used. Quality assurance models such as the EFQM (Fig. 9), the Fontys internally used quality assurance system ‘voortdurend verbeteren’ (Veerman and Ven, 2000), and ‘Kwaliteitszorgsysteem bacheloropleiding _-versie’ (Rexwinkel, 2001) will be used. Point of departure is Crosby’s (1998) definition of quality ‘Quality is fulfilling requirements’. KHKempen is using the EFQM model in quality assurance and Fontys is using the PDCA cycle (Fig. 5) which can be seen as a derivation of the EFQM model and fits the accreditation model in the Netherlands.

To be complete the two quality systems will be discussed in a broad way because both these tools will be able to generate valuable information in order to improve the curriculum.

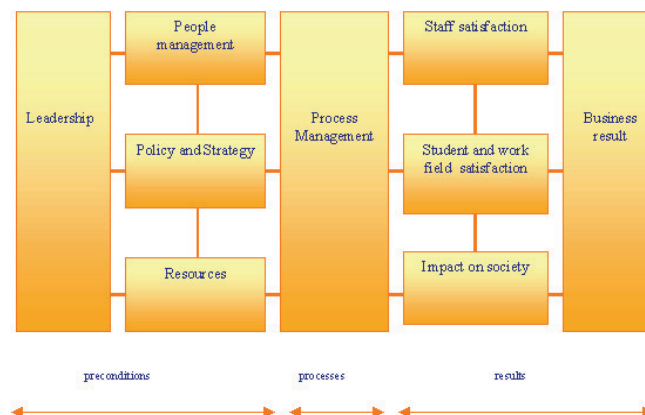


Figure: 9

EFQM

The main objective of EFQM (European Foundation for Quality Management) is to help profit or non-profit organisations is improving their results. The EFQM model, which recognizes a number of approaches, is an excellent organisation with an excellent product. Within this approach a number of basic assumptions can be distinguished. These basic assumptions form the basis of the EFQM model and are summarized by the term, Total Quality Management (TQM)., EFQM is a proposed quality review process, which uses the TQM model criteria and lists questions that should be asked (Fig. 9).

The Total Quality Model criteria can be summarized as follows:

1. leadership and behaviour;
2. strategic planning;
3. techniques and continuous improvement;
4. people;
5. quality assurance, process management;
6. quality and business results;
7. customer satisfaction; and
8. community (impact on society)

Accreditation is a process of quality assessment which, at the end, results in approval/non-approval.

Aspect	Accreditation	EFFQM model
Objective	Assessment of a University Meets the HBO standard	Control of organization and improvement
Result	Accreditation Yes/No	Clear view on point of improvement, ambitions
Way of assessing	Verification points: good/moderate/insufficient final opinion good/not good	Orientated around activities Total quality care

Comparing the objects of the accreditation, according to the HBO Council and EFQM, it is clear that the accreditation process sets high standards on the process management of staff, students, work satisfaction and impact on society (Kemenade, 2001). The main focus is directed towards process management. Within this is the question ‘is the curriculum is of sufficient HBO level?’ Also questions are asked on educational policy and prerequisites. The verification factors arising from accreditation are more operational than the setting of EFQM. EFQM gives fewer standards with respect to ‘HBO level, ‘assessments’ and ‘methodological requirements of evaluations’. EFQM, therefore, gives more attention toward suppliers and competitors.

The EFQM model is reorganised in the form of a circle supplemented with the ‘Design of Education’ model, in which the specific educational objectives, especially the items of process management are guaranteed to a certain extent (Fig. 10).

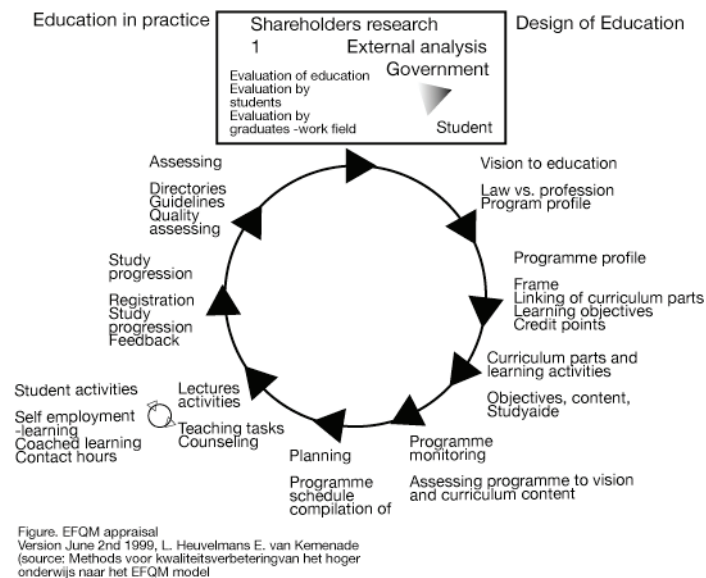


Figure: 10

Two phases, the design and the practice are combined within a continuous process. This figure shows the individual elements, which are to be assessed, starting from out of the design process and ending with evaluation. All the specific elements important in education are mentioned separately.

If the EFQM model (Fig. 9) as well as the EFQM appraisal (Fig. 10) the PDCA cycle (Plan – Do – Check – Act cycle) has come into being.

This PDCA cycle, is the instrument, which will be used because of the fact that the individual items can be assessed separately.

The PDCA cycle

As already mentioned, 10 quality requirements of a Bachelor level course are being assessed. This assessment will take place using the PDCA cycle (Fig. 10) as a quality measurement tool. This PDCA cycle describes the process of a continuous improvement of education as well as content. After setting plans an implementation phase is provided. After implementation, measurements are taken and analysis made of this data. The PDCA cycle consists of six phases which are repeated: planning integral improvement, implementation, measurement, feedback, integral analysis measurement, development of integral improvement and than again, planning, etc.

Planning

Every academic year plans and procedures are set, (and adjusted if necessary) of the measurements which will be taken. Analysis and the follow-up procedures must be described.

Implementation /execution

Implementation means bringing the education and curriculum into practice as well as the development of research instruments, such as, the formulation of questionnaires.

Measurement

A member of the quality control department of the university will take care of the collecting the measurements, using questionnaires, reviews, analyses etc. Main issue here is to retrieve information from students, lecturers, work environment and graduates.

Feedback

The researcher of the Quality Assurance Project of the Fontys University will process the data and also prepare an analysis.

Data will be collected from and feedback given back to:

- students
- teaching staff
- alumni
- profession
- Management Board

This integral analysis of the measurements taken, leads to the development of plans for improvement. The whole system is continuously and constantly running.

Integral analysis

The results of the various measurements are linked together. It is of importance to make cross links. The overview of these links and cross links is showed in the matrix (Fig. 11). Connections can be made in a horizontal, vertical and diagonal way and will result in management documents. The outcome of the integral analysis will form the basis of an integral improvement plan.

Results measurements work field	Results discussion board of advisors	Results former questionnaires	Publications work field developments	Curriculum profile	Final project policy	R and D policy
Results measurements graduates	Results discussion alumni society	Results former questionnaires	Analysis final project dissertations	Visitation report Examiners committee	Inspection report.	HOO. Final project coordinator
Results measurements students	Results conference	Results former questionnaires	Outcome Fontys questionnaire	Selection guide HO	Visitation report Assessment analysis	Mentor/lecturer IOWO OCW
Results measurements lectures	Results conference	Results former questionnaires	Results questionnaires staff	Publications HMR	Outcome student questionnaires	Policy HMR
Results consultations reflection group	Results former consultation discussions	Relevant policy	Visitation report	Material goods	Selection guide HO Student questionnaires	Reaction directors management

Figure 11: Matrix integral analysis

Developing integral improvement

After collecting and analysing all the required data, conclusions will be drawn for the benefit of an integral improvement plan, which must be discussed with the education committee, institution participation committee and Director of the institute. After receiving advice from the committees the plans must be implemented.

After implementation the whole cycle starts all over again.

Discussion and conclusions, suggestions for further research

After a number of attempts in 1999 cooperation between Fontys University of professional education and the Catholic University Kempen (KHKempen) has been effected in relation to a common orthopaedic technological curriculum. In February 2000 a formal approval was asked of the Dutch government which was acknowledged in May 2000. The newly designed curriculum started in August 2001. A course in prosthetics and orthotics was offered at Bachelor degree level.

One of the main goals in cooperation between Fontys and the KHKempen, that is offering for Dutch speaking students an approved, recognised and subsidized curriculum at university degree level, has been accomplished

Also the area of competence and competence development has been described in order to design tools to be able to identify what makes a graduate an orthopaedic engineer. This new curriculum takes four years to cover which is longer than most of the other curricula, although the average yearly load is equal.

Also the time spent on clinical instruction, clinical practice and final project work are approximately equal, although compared to the other curricula a somewhat smaller part of the curriculum is reserved for clinical hours in the university itself. The main conclusion about this designed curriculum is that, taking the directives of Dutch educational law into consideration, it is a sound orthopaedic curriculum based on a firm foundation, which is also under a continuous evaluation and quality assurance.

Problem based learning methods are also widely included, although a large variation in number of study hours did occur. In our experience working with competences in an educational surrounding gives more validity to the performance of an orthopaedic engineer than a number of single final attainments.

Firstly, we intend to introduce a small practical period (of about 1 day) within the first semester to give students the opportunity to 'experience' the prosthetics and orthotics work environment. This will be realised in the session 2004-2005.

Looking into the future only one thing is certain; changes in the curriculum will take place. When the accreditation system in Europe is in full progress, one can imagine that a new discussion will take place about the length in years of study programmes. If most of the HBO level programmes take 3 years, why must it take 4 years in the Netherlands? Of course, the outcome of this discussion will have an effect on the orthopaedic curriculum. Also changes will take place after quality assessments and consultations by professional bodies such as ISPO.

Items which will be worth while to do further research on can be describes as:

- What will be the effect on domestic educational reforms in the cooperation between the two partner Universities, in the near future?
- What can be expected of developments in the profession both national as well as international and how will this take an effect on the newly developed curriculum?
- Design an evaluation tool, which can be used in comparing different curricula in order to get an objective picture of the quantity and quality of the variety of curricula

References

- Crosby PB (1984). Quality without tears.-New York: McGraw-Hill.
- Dool den P, Geurts J (2000). Beta/techniek uit balans, een beeld van huidige knelpunten tussen aanbod en vraag en mogelijke oplossingen.-Delft: Axis.
- Gibbons M, Limoges C, Nowotny H, Schwartzman S, Scott P, Trow M (1994). The new production of technology: the dynamics of research in contemporary society. -London: Sage Publications.
- Kemenade van E (2001). Internationale accreditatie, part 1: van Sorbonne tot en met Salamanca.-Eindhoven: Fontys Hogescholen.
- Rexwinkel GB (2001). Kwaliteitsorgansysteem bacheloropleiding β -versie.-Eindhoven: Fontys Hogescholen.
- Veerman J, Ven van de H (1999). Voortdurend verbeteren, met Fontys kwaliteitssysteem.-Eindhoven: Fontys Hogescholen.
- Weggemen M (1999) Kennismanagement./3rd edition.-Schiedam: Scriptum.

8.2 Working Group feedback and discussion: Measuring quality in prosthetics and orthotics education

The topic addressed by the working groups was:

- Discuss and present ways of measuring the outcome of professional training of prosthetist/orthotists outside of the traditional examination.

Group 1	
Discussion	
<ul style="list-style-type: none"> • Traditional examination?? • UK - an unseen written exam. Written assignments/essays. • Objective structured clinical exam (OSCE) • Oral “seen” exams - Latvia • External parameters : • Possible to make surveys about expectations to the students by the market/ employers. • Feedback can be used for follow-up studies/changes to course. • Treatment planning - complex system • Pre-programmed case study - given 3 solutions - defend choice • Portfolio as an evaluation tool. Running throughout the education - continuous process. • Careful coupling between objectives and examination methods - clear view of what is tested. • Need to include a variety of assessment types, to allow for different learning styles (role play - e.g. interpersonal ability) • Using protocols for testing 	

Group 2	
Topic	Discussion
How to measure outcome? Professional training Measuring individual outcome or in general? Traditional examinations, what do we mean?	<ul style="list-style-type: none"> • Combination of traditional and holistic examinations • Clinical practice evaluated • Essays on prosthetics/orthotics topics • Oral examinations • Combination of results give degree • Evaluation done by students and employers after graduation and 1 year after • Integrated examinations • Need to examine multiple competencies • Is patient input a way? • Accreditation bodies? • Other professionals? • Country dependent • Licensing done by education or after experience? • Even new ideas become traditions! • Category-I is a measure of acquired knowledge • Different pathways to this knowledge • Should a European Board decide on levels of education? • Methods of measuring outcome • Accreditation via government in some countries • Support from ISPO? • Individual examinations in PT • Belgium; report could be sent to peer reviewed journal • Prosthetics/orthotics in Slovenia uses same idea • Clinical multi-disciplinary proof
Methods of measuring outcome	<ul style="list-style-type: none"> • Patient cases presented in seminars • Continuous student progress monitoring • Continuous evaluation towards learning objectives • Craftsmanship of students can show integration of knowledge • Patient assessment examination - skills in communication • No examination is perfect! • Combination of techniques needed.

Continuous education	<ul style="list-style-type: none"> • How to assess increasing knowledge? <ul style="list-style-type: none"> - Monitoring the quality of learning? - Is activity proof of ability? - Methods needed to test integrated knowledge. • Examination results are based on previous influence on students – to inspire is necessary.
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Group 3	
Topic	Discussion
Alternate means of measuring the outcome of students learning	<ul style="list-style-type: none"> •Portfolio – style learning •Seminars •Peer assessment (students evaluate their own learning) •Clinical examinations (simulated environments) •Examples •BUFA – Examination week at the end of the course. •Students must complete tasks during the semester but do not receive a mark •Netherlands - work experience combined with education •Every half year students submit a report
Country comparisons	<ul style="list-style-type: none"> • Lithuania - 3 part examination <ul style="list-style-type: none"> - Practical (8 hours) demonstrate skills by producing a device - Written - 12 weeks to prepare at same time as performing practical work in companies. Themes of examination are set by the school and enterprise. - Oral examination - presentation of their practical work and self-assessment - Similar to German system -collaborated with German schools - Examination commission - variety of representatives from different areas • France: Two systems <ul style="list-style-type: none"> - Students spend entire time at school - Employed in company (2 weeks in company and 1 week at school. Company tutor assists students to strengthen specific areas) - On the job experience as part of the education - How do ensure that students receive the same level of education when they are placed in a clinical facility to learn: <ul style="list-style-type: none"> o Must have a very good relationship with the companies o Students have a log book o Students receive payment from company. •We have discussed measuring outcomes of education but <i>How do we assess our profession to justify ourselves to funding agencies and government bodies?</i> •Can go out to clinics to evaluate success of training •The challenge is to know what to measure; practical skills or theoretical knowledge?

Group 4	
Topic	Discussion
Assessing the profession	<ul style="list-style-type: none"> •Could potentially use an accreditation process but ... <i>If we use an accreditation process the evaluation is directed toward the individual not the profession.</i> •We need to define and use quality indicators. For example: <ul style="list-style-type: none"> - Measures of patient satisfaction - Time to fitting - Number of repairs - Patients complications - Other ways of measuring the profession • Student follow-up after graduation: <ul style="list-style-type: none"> - Send assessment sheets to former students - Go to employers and managers to find out their opinions - User group (focus groups) - Prosthetists/orthotists

	<ul style="list-style-type: none"> - Other stakeholders (e.g.: other health professionals, patient groups, funding agencies) • Vital to measure these outcomes for total quality management. This is a very broad area and we need to establish which components to address
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General forum discussion

Topic	Discussion
Students should prove that they can communicate with team	Interpersonal skills
Has anyone gone to employers regularly for feedback?	Yes Lithuania and Strathclyde in Scotland

9. EDUCATION

9.1 Keynote address: Pathways of education

Dan Blocka

Introduction

Education aimed at developing the practitioner as a Category-I professional can be delivered in a number of ways, and must always include the essential elements of the Category-I Professional Profile as well as the learning objectives. The pathway for this level and type of education does not just involve prosthetic and orthotic schools, but could encompass other components involving practical and theoretical activities. Whichever pathway is chosen for education, it must include the following:

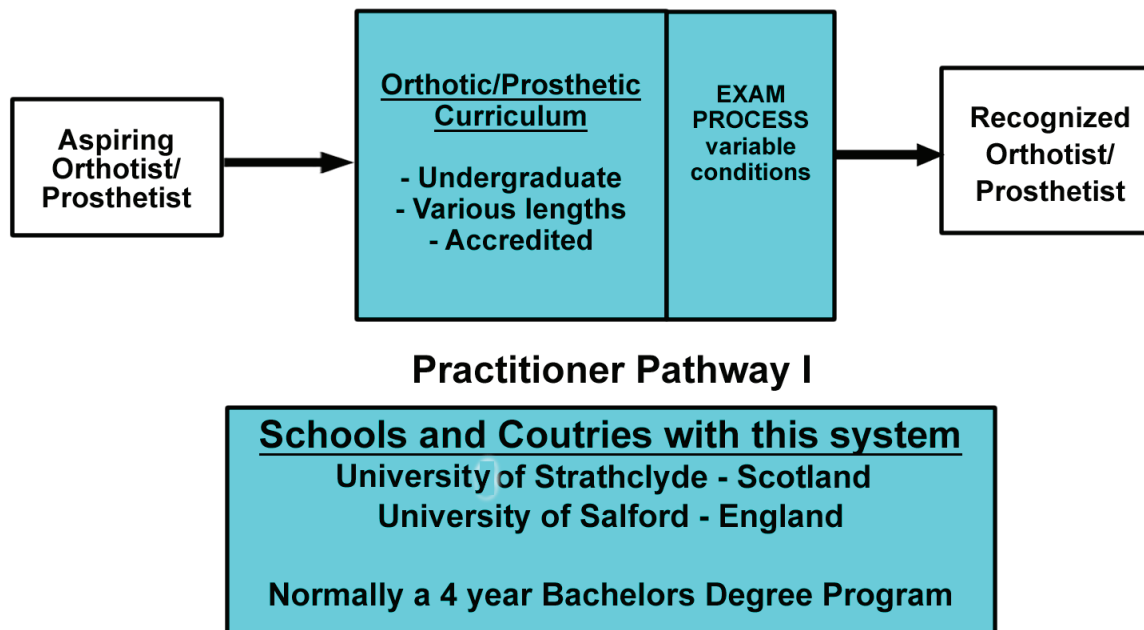
- Appropriate entry guidelines and selection process
- Formal education with appropriate practical and theoretical components
- Practical experience: within or outside the educational structure

In order to illustrate the variety in the structure of pathways of education for clinicians working in prosthetics and orthotics, three pathways will be discussed. Each pathway can be seen in practice in schools today and each produce competent practitioners who work as prosthetists and orthotists and benefit patient care.

Practitioner Pathway I

This education and training pathway is based within a university setting and is normally 4 years in duration. Ongoing assessment throughout the course is normally supplemented by final examinations at the end of the curriculum. With successful completion of the course, the graduate is permitted to directly apply to the countries specific regulatory or licensing body and gain entry to the professional register. Examples of schools following this pathway are the University of Salford, in England, and the University of Strathclyde, in Scotland.

Focusing on the University of Strathclyde to further illustrate this model, the aspiring orthotist/prosthetist should normally have at least 7 years primary education plus 5 years secondary education at Scottish Higher Level (6 years at English Advanced Level) to gain entry to the course. The curriculum includes orthotics and prosthetics elements. The first 3 years of the 4 year curriculum includes both theoretical and practical components and the fourth year is composed of two 6-month clinical placements. The course is reviewed by the regulatory body, the Health Professions Council, every 5 years. In the final clinical placement year examinations take place after each 6-month clinical placement. Graduates of the Strathclyde course are awarded a BSc (Hons) Prosthetics and Orthotics which permits state registration.



Practitioner Pathway-II

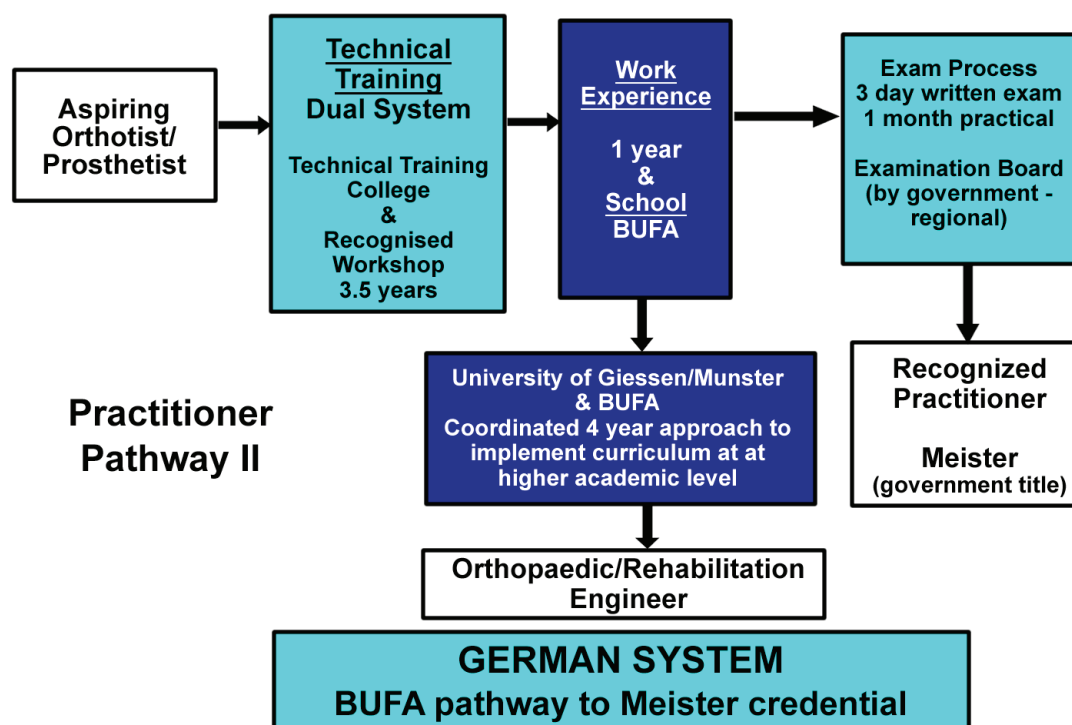
Practitioners working in Germany have the opportunity to work towards the title of Meister by undertaking a series of training and educational experiences. One example of this pathway is BUFA (Bundesfachshule für OrthopädieTechnik) pathway, which is the full pathway to the Meister credential. Training in this example begins with a dual system of training involving 3.5 years of technical training at a technical training college combined with work experience at a recognized workshop. Following this a minimum of one year of work experience is expected prior to a year of theoretical and practical training at BUFA. After the successful completion of the BUFA training, a government examination process consisting of a three day written examination and a one-month practical assessment takes place. The successful completion of this examination process enables the candidate to be recognized as a Meister (government title).

Candidates mostly have 10 years schooling with some having 12 to 13 years of education to gain entry to this pathway. The latter group of individuals can apply for credit in the next phase of training and education.

The initial technical training of 3.5 years is legislated and includes 2 days in a technical college plus 3 days in a recognized workplace. A number of clinical elements are introduced into this curriculum and the resulting graduate is similar to a Category-II professional.

The year (plus) of training and education at BUFA has a curriculum that has a 6-month block of theoretical and then a 6-month block of practical training. This training adds some of the essential elements for a Category-I level. Students are around 24 years old with previous training and experience in the field.

The final classification of Meister awarded to the successful candidate is seen as the highest attainable professional recognition in the field of prosthetics and orthotics in Germany. Alternative pathways, involving university based curriculum, are available and being developed. The following chart depicts one such alternative.

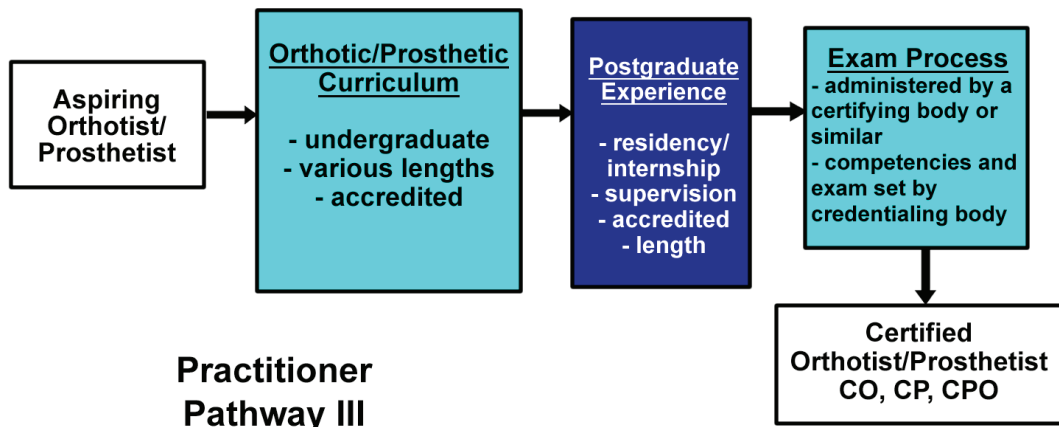


Practitioner Pathway III

The North American pathway is a third model leading to a recognized level of practitioner competency. Successful completion of this pathway leads to the title of Certified Orthotist (CO) or Certified Prosthetist (CP) being rewarded to the successful candidate. Entry to the educational programme in the pathway can either be after 12 to 13 years of schooling, at a University entry level or after a 4 years Bachelors degree in a health related topic. The candidate could also possess experience in the field. The entry-level requirements vary as there are some programmes at a post-Bachelor's degree level and others may require prior education at a university level.

As mentioned in the previous paragraph, orthotics/prosthetics curricula vary in length and may be either undergraduate or postgraduate. For example, the curriculum could be a 4-year university curriculum, or alternatively a 2-year post-degree programme with a curriculum containing essential prosthetics and orthotics theory and practical elements. Programmes are formally accredited by the specific national credentialing bodies (NCOPE in the USA or CBCPO in Canada).

Following the orthotics/prosthetics training and education, a postgraduate experience period is required. This is in the form of a residency or internship with supervision for a defined length of time. In the United States NCOPE oversees the residency programme for a minimum of 1 year. The residency programme itself has practical and academic requirements and each residency site is accredited. Successful candidates are permitted to proceed to sit national certification examinations administered by the American Board for Certification in Orthotics and Prosthetics (ABC).



Conclusion

In considering the three pathways shown it is obvious that the pathways of training and education vary, but all should incorporate the Category-I elements from the professional profile. Caution should be exercised in the concept of the university Bachelor degree being a requirement for a Category-I practitioner since an academic degree does not necessarily ensure professional competency!

ISPO now has a Category-I Inspection protocol that is comprised of the following elements:

- i. The entry requirements and minimal requirements for professional recognition.
- ii. Course and candidate recognition.
- iii. Certification of course.
- iv. Permanency of course.
- v. Programme/curriculum structure.
- vi. Content of courses – list course in each category and provide the following:
 - a. Theoretical subjects
 - b. Clinical subjects
 - c. Workshop/laboratory subjects
- vii. Teaching staff.
- viii. Examination process.
- ix. Final examination/certification examinations.
- x. Internship/residency/work experience arrangements.
- xi. Facilities such as classrooms, workshops, equipment, clinic areas.

The main focus of inspection is in ensuring the professional competency of the student achieved by way of an effective teaching and learning in a suitable environment.

Discussion following presentation on *Pathways to education*

Topic	Discussion
Are other members of the team degree qualified	<ul style="list-style-type: none"> Germany physiotherapist qualifications discussed
ISPO Category-I should be degree level only	<ul style="list-style-type: none"> As EU needs to be consistent education should be at a degree throughout
Title should just be prosthetists/ <i>orthotists not</i> Meister or orthopaedic engineer	<ul style="list-style-type: none"> Germany has a structure where companies take training to level II – government accreditation at higher level Feeling of Germany that they need to change
Category-I title	<ul style="list-style-type: none"> Category-I is to encompass a professional profile and learning objectives so titles could be different. EU should adopt same level of education <i>then</i> a decision can be made on <i>title</i> and if it should be the same Same thing with Physiotherapists in past, only Germany had different title
Same title needed	<ul style="list-style-type: none"> Similarity in Universities as independent commissions inspect all Universities within any one member state In a small country things may be different as no competition So may affect quality of Category-I. Lithuania uses German pathway. University level course only after acquiring Category-I: of 2 years duration. Universities in Lithuania have different standards and some are not up to scratch
Training and title	<ul style="list-style-type: none"> The practioner should cover all areas in training so outcome achieved with training and common title
Category-I inspection	<ul style="list-style-type: none"> Category-I inspection can overcome small member states level of qualification as can inspect across all member states Last comment need to be flexible with regard training methods. Modular training should be considered as an option

9.2 School presentations:

To facilitate understanding of the different educational models in use throughout Europe, a number of schools were invited to present an overview of prosthetics and orthotics education at their institution. Individual presentations are presented below.

9.2.1 England, United Kingdom

Sophie Hill

Prosthetics and Orthotics at the University of Salford

Prosthetics and orthotics at the University of Salford is part of the Faculty of Health and Social Care, one of the largest health care faculties in the UK. Within the Faculty are 3 schools and prosthetics and orthotics is within the School of Health Care Professions. The school is divided into 7 directorates: Sports, Physiotherapy, Podiatry, Midwifery, Occupational Therapy, Radiography and Prosthetics and Orthotics.

Funding

The directorate provides the only prosthetics and orthotics educational programme for England, Wales and Northern Ireland. Prosthetics and orthotics education for Scotland is provided by the University of Strathclyde. The funding is national from the National Health Service (NHS) but is directed through the Cumbria and Lancashire Workforce Development Confederation, part of the NHS.

Staff and Students

The Directorate is staffed by 8 state-registered prosthetists/orthotists, 2 biomechanists, and 2 technicians. There are 30 NHS funded student places per year. The NHS funded students have their fees paid by the NHS and UK students are entitled to a means-tested bursary and student loan. Non-EU students are extra to these places and must pay fees and support themselves. The programme is 4 years long: 3 years undertaking theoretical and supervised practical work and the fourth year is spent entirely on placement. Successful completion of the programme entitles graduates to eligibility for registration with the Health Professions Council (HPC). Approximately 2/3 of students are classed as mature (over 21) and have 'non-traditional' entry qualifications.

New programme development

We have a new programme commencing in September this year. The design of this new programme was influenced by developments in higher education and healthcare in the UK. These changes affected the philosophy of the programme and the learning, teaching and assessment strategy.

Health care developments

All prosthetists and orthotists who work within the NHS must be registered with the HPC. The HPC validate all educational programmes that lead to eligibility to join the register. They have developed standards of proficiency, conduct, performance and ethics and currently have standards of education and training and approval process out for consultation. All registrants will also be required to undertake mandatory continuing professional development from 2005.

Educational developments

The government is trying to increase the number of people in higher education. One of their strategies is the Widening Participation policy. The policy stems from the premise that all people who could benefit from higher education should be able to irrespective of social or economic background.

Higher Education in the Learning Society is commonly known as the Dearing Report. A similar report, the Garrick Report, was carried out in Scotland. Dearing made 93 recommendations to the government, higher education institutes, the Quality Assurance Agency (QAA) and funding bodies. Many of these were relating to improvement in quality in learning and teaching and focusing on the student experience.

The QAA's role is to protect public interest in standards of higher education qualifications and to encourage Higher Education Institutes to improve their management of the quality of higher education. Together with the NHS they developed both generic and subject specific benchmarks for healthcare courses in 2001. They have also developed the higher education qualifications framework and other codes of practice. They are also responsible for auditing institutions and in healthcare the major review of programmes.

University requirements

The university requires that all programmes are modularised with 2 semesters per year. Each level normally consists of 120 credits. Students, who leave after level 1 with 120 credits, or level 2 with 240 credits, are entitled to a certificate or diploma in higher education. In the new prosthetics and orthotics programme students who complete year 3, level 3 but do not complete year 4, level 3 will be eligible for a BSc (Hons) Health Studies. The programme is reviewed annually and copies sent to the HPC and the Cumbria and Lancashire Workforce Development Confederation. Every 5 years the programme team must undertake a major review of the programme.

Philosophy

The new programme aims to be student centred and encourage deep learning through its learning, teaching and assessment strategy. It also aims to be clinically relevant in its curriculum, delivery and assessment.

Learning and teaching

The redevelopment of the programme allowed the programme team to focus on student learning. We aim to achieve this through using active learning methods backed up by theory. Also we hope to encourage students to be responsible for their learning. We have also tried to link the learning and teaching strategy with clinical use of the information and in particular the problem solving nature of prosthetics and orthotics

Modules

- Prosthetics and Orthotics Science 1-8 focus on the theory and practice of clinical prosthetics and orthotics. Students undertake practical sessions with volunteer prosthetics/orthotics users completing the process from assessment to fitting, including manufacture. In Prosthetics and Orthotics Science 5-8 students will also be required to complete some directed learning relating to psychosocial, legal, and ethical issues and current NHS policies.
- Concepts in Healthcare is a multi-professional module, involving all level 1 students from all the directorates within the School of Health Care Professions with the exception of Sport. This equates to approximately 200 students. It is held in the first week of level 1 and requires students to consider communication skills, ethical dilemmas and other healthcare wide issues.
- Health and Disease modules cover anatomy, physiology and pathology. Its learning method is problem based learning with students being provided with relevant clinically focused problems.
- Manufacturing Concepts covers materials, design and manufacturing processes and mechanical principles.
- Biomechanics focuses on the clinical use of biomechanics through use of the gait laboratory and the application of biomechanics when designing prostheses and orthoses.
- Aspects of Prosthetics and Orthotics develops students' knowledge of other healthcare professionals, user organisations, componentry, and issues affecting service provision in the UK.
- Methods of Enquiry introduces and develops students' knowledge of research methods and evidence based practice. It culminates with students undertaking a project in year 3.
- Clinical Placements are the culmination of the programme. Students must undertake a prosthetics and an orthotics placement, both are 6 months long. These placements are located at various approved centres through England, Wales and Northern Ireland, with a small number overseas.

Assessment

In line with educational theory we have aligned the learning and teaching strategy and the learning outcomes for the modules and programme with the assessment. The assessment structure has been designed to encourage deep learning and also so that it is clinically relevant.

We will use a variety of assessment methods from traditional unseen written exams to posters, user information sheets and portfolios.

Summary

The syllabus is similar to that of the current programme but the delivery and assessment has changed, with its development being affected by changes to higher education and healthcare in the UK. We have put the student at the centre of the learning experience and linked learning, teaching and assessment. We also felt very strongly that methods we used should also be clinically relevant to healthcare.

Programme structure

Level 1

September Semester Year 1

Module Title	Credits
Concepts in Health Care	10
P&O Science 1	20
Health & Disease 1 (long thin module)	
Manufacturing Concepts 1 (long thin module)	
Biomechanics 1 (long thin module)	
Total	30

February Semester 2 Year 1

Module Title	Credits
Aspects of P&O 1	10
P&O Science 2	20
Health & Disease 1 (long thin module)	20
Manufacturing Concepts 1 (long thin module)	20
Biomechanics 1 (long thin module)	20
Total	90

Total Credits for Level 1 = 120

Intermediate Terminating Qualification = Certificate in Higher Education

Level 2

September Semester 1 Year 2

Module Title	Credits
P&O Science 3	20
Methods of Enquiry 2	10
Manufacturing Concepts 2	10
Biomechanics 2	10
Health & Disease 2 (long thin module)	
Total	50

February Semester 2 Year 2

Module Title	Credits
P&O Science 4	20
Methods of Enquiry 3	10
Aspects of P&O 2	10
Biomechanics 3	10
Health & Disease 2 (long thin module)	20
Total	70

Total Credits for Level 2 = 120

Intermediate Terminating Qualification = Diploma in Higher Education

Level 3

September Semester 1 Year 3

Module Title	Credits
P&O Science 5	20
P&O Science 6	20
Aspects in P&O 3	20
Total	60

February Semester 2 Year 3

Module Title	Credits
P&O Science 7	20
P&O Science 8	20
Methods of Enquiry 4	20
Total	60

Total Credits for Level 3, Year 3 = 120

Intermediate Terminating Qualification = BSc (Hons) Health Studies

September Semester 1 Year 4

Module Title	Credits
Clinical Placement 1	20
Total	20

March Semester 2 Year 4

Module Title	Credits
Clinical Placement 2	20
Total	20

Total Credits for Level 3, Year 4 = 40

Total Credits for BSc (Hons) Prosthetics and Orthotics = 400

9.2.2 BUFA, Germany

Detlef Kokegei

Federal Academy of Orthopaedic Technology

The structure of the prosthetics and orthotic education follows a pathway of training illustrated in the following paragraphs.

Entry into the pathway starts with successful completion of secondary school. The candidate then completes an apprenticeship and examination at around Category-II level and then continues with at least 1 year of clinical practice before accessing the BUFA entrance examination.

Prior to attending BUFA, the student must report on the range of clinical experiences and level of knowledge and skills for partial foot, trans-tibial, knee disarticulation, trans-femoral and hip disarticulation prosthetics.

They also complete a similar exercise for foot, ankle-foot, dynamic ankle-foot, knee-ankle-foot and hip-knee-ankle-foot orthoses.

BUFA course outline

Semester 1

Natural Sciences:

- Mathematics, Physics, Chemistry
- P&O Biomechanics, Material Sciences
- Orthopaedic Technology
- Anatomy, Pathology, Biology
- Technical Drawing, Calculation, Computer Studies, Industrial Safety
- Literature Research/Presentation Techniques

Semester 2

Theory:

- Anatomy, Pathology
- Quality Management
- Clinical Education

Clinical:

- Treatment of Scoliosis Patient
- Design of Lower Limb Orthoses and Patient Evaluation
- Fabrication/Design of Textile Corsets
- Partial Foot Prosthetics
- Trans-tibial Prosthetics
- Knee Disarticulation Prosthetics
- Hip Disarticulation Prosthetics
- Trans-femoral Prosthetics
- Trans-radial Prosthetics (myoelectric)
- Trans-humeral Prosthetics (body-powered)

BUFA System of Clinical Subjects:

- Demonstration and patient evaluation
- Demonstration of setting plaster cast
- Plaster cast and rectification by each student
- Fabrication/design of diagnostic devices
- Trouble shooting
- Gait analysis
- Presentation of results to two instructors and student group
- Continuing Education (Life-long learning)

- Registered courses
- Credit point system 100 points in 3 years
- Advanced training certification for CPO's and companies

Certifications in fields of:

- Prosthetics
- Orthotics
- Seating supports
- Wheelchair and mobility aids
- Bandages, medical stockings

9.2.3 Lithuania

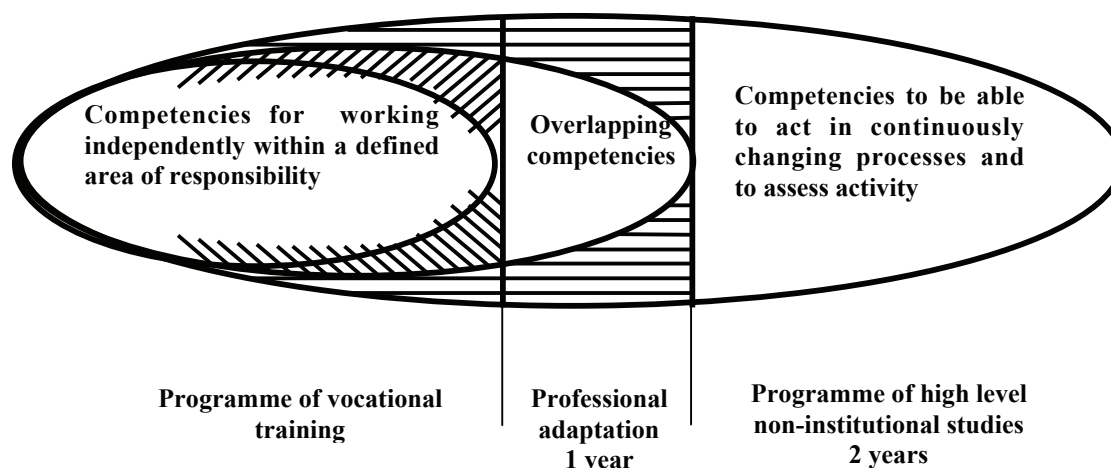
Karalius Mindaugo

Kaunas Service Business Specialists Vocational Training Centre (KSBSVTC) works in partnership with a number of European countries. Lithuania has borders with Latvia, to the north, Poland in the South West and Belorussia in the South East. Basic demographic data for the country include a population of 3,711,900 people distributed between urban 2,518,400 (67.85%) and rural 1,193,500 (32.15 %) locations.

KSBSVTC is an active participant of the Vocational Training Reform and International projects, Developing Youth, European Partnership founded in 1944. There are a variety of vocational training courses at the Centre including a surgical boot making and orthopaedic technology. Areas of education include initial vocational training, secondary education, higher studies, high studies and labour market training. Programme directions fall into three categories, either service, where orthopaedic technology training is placed, or manufacture and social quality of life. In 2003/2004, 61% of students were employed having finalised their course, and 19% continued with further study.

The career path of orthopaedic trainees in prosthetics begins with the level of vocational training programme for a surgical boot maker; this may proceed to the vocational training programme of the surgical boot maker and then culminate in the higher level, the non-institutional educational orthopaedics technology programme. This is geared towards practical activity.

The career model of orthotics – prosthetics competencies



Professional competencies within the non-industrial orthopaedic technology training include:

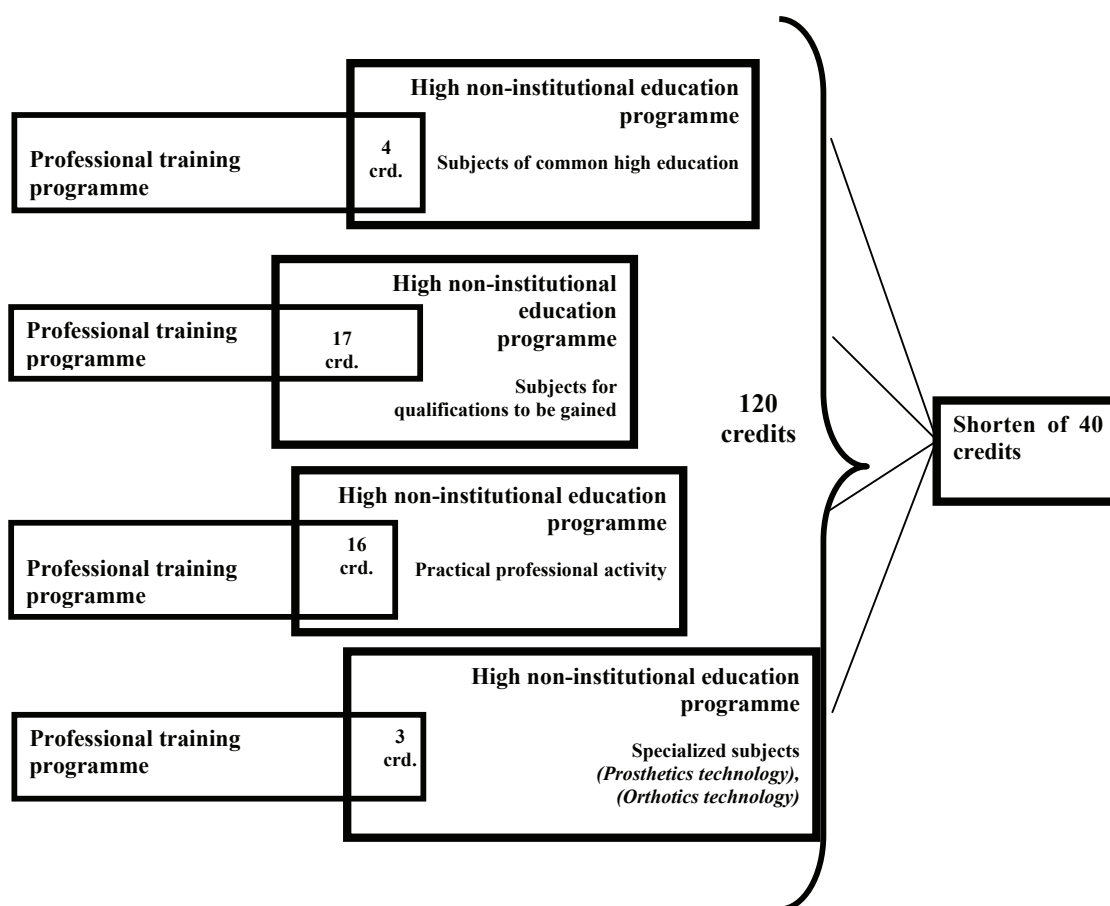
1. Evaluate personal needs and capabilities in selection of orthopaedic devices.
Subjects taught against this objective are: anatomy and physiology; pathology; professional studies; rehabilitation; history of culture; sociology; philosophy; foreign languages.
2. Design orthopaedic devices:
Subjects taught are: technology; biomechanics of prostheses; material; bio-mechanics; technical drawing; anatomy and physiology; theoretical mechanics; mathematics; pathology.

Professional competencies for the surgical boot maker training include:

1. Evaluate and determine a person's needs and capabilities in the area of surgical boots and other orthopaedic devices for foot care.
Subjects taught are: anatomy and physiology; pathology; professional ethics; biomechanics; physical fitness; in-processing; economics; design works; foreign languages.
2. To be able to select and adjust appropriate orthopaedic devices.
Subjects taught are: technology; professional training; material; biomechanics model construction; anatomy and physiology; official language.

There is some overlap between the orthopaedic technology course and the boot maker course which means shared subject teaching.

The following diagram represents the credit ratings for theoretical and practical elements of the training programme.



9.2.4 Netherlands

Fred Holtcamp

History of the graduate course in prosthetics and orthotics in the Netherlands

Since the early 70s in the Netherlands a wish for a 4-year full-time graduate (Bachelor) course in prosthetics and orthotics existed, known as a HBO course. The need for a prosthetics and orthotics course at this level was already mentioned in 1974. At that time an international study week on prosthetics/orthotics education took place (Hughes, 1976). HBO stands for 'Hogere Beroeps Opleiding' (higher vocational education) and can be compared with the English Polytechnic or graduate course. A common translation is also a University course of professional education. It will offer the graduates an ingenieur title (ing.) or, from 2004, a Bachelor title.

Compared to countries like Germany, the United Kingdom and the United States of America, the development of a prosthetics and orthotics course in the Netherlands did not develop until after World War II. The lack of large numbers of amputees as a result of World War I (1914-1918), the Netherlands was in that time a neutral country, is a possible reason. Up and till that time orthotists and prosthetists received their theoretical education in Germany, and learned their skills in practice in the Netherlands. There is reference to 'fachliche Vorschriften zur Regelung des Lehrlingswesens im Orthopädie' ('professional regulations of the vocational training of prosthetist and orthotists') dated 1938. This reference is to be found in the library of the Leipziger University, Leipzig, Germany. It indicates that in 1938 people were already engaged in education in orthopaedic technology. Despite the lack of training facilities, orthopaedic companies and workshops already existed in 1901 when Martin Loth founded the Martin Loth Orthopedic Industry.

After World War II an orthopaedic workshop and rehabilitation centre was founded in 1949 by a social insurance provision (Sociale Verzekeringsbank) and a medical doctor with knowledge of prosthetics was appointed. In 1950 the Sociale Verzekeringsbank founded a new rehabilitation centre and founds the association Orthobanda (Vereniging Orthobanda) with a committee for vocational training.

On 18th July 1950 the industrial disability assurance board appointed a 'prosthetic committee' to play an advisory role towards this board. In 1953 the rehabilitation council was formed and came into place of the industrial disability assurance board. This council was also involved in education and on 8th January 1957 a course was started following a model of modern apprenticeship. In 1961 the first 3 bandagists and 10 prosthetists/orthotists graduated.

After paying a visit to the USA, West Germany and the UK, Mr. H. Vlijm (inspector of the rehabilitation centre social insurance provision) concluded that a course only of modern apprenticeship would not be sufficient for the future. Although progress since 1949 had been made, the prosthetic devices do not meet that level of quality that was required. Thus plans for higher vocational education, were started in 1964. This should be considered as the first step to higher vocational education (HBO).

A number of initiatives have been undertaken in order to establish a prosthetics and an orthotics Bachelor level course. In 1977 an advisory committee, under the chairmanship of Professor R. Rozendal, started the design of 4 new course, Primary (prostheses), Secondary (orthoses), Tertiary (orthopaedic technician), and the 'meister-bildung'. In 1980 the primary and secondary courses were started. The other two were not.

Further developments, both national and international, gave the SOFOB (Stichting opleidingen flebologie, orthopedie, en bandagist - foundation courses for phlebology, orthopaedics and bandagists) encouragement to do more research to investigate whether this type of training could be adopted by the Higher Vocational Educational System. Consultation the HBO council resulted in the establishment of two separate courses in 1990, one in prosthetics and the other in orthotics, in cooperation with Fontys University.

This initiative led to a part-time variation the 'orthotics/prosthetics expert course (Kemenade, 1990^{a,b}). This course was designed as a 2-year part-time course and was meant as a continuation of the vocational training, which was offered by the Koning Willem I College in Den Bosch. This course has been offered since 1999 by the 'Stichting Vakopleidingen Gezondheidstechnische Beroepen' (SVGB, Foundation for Technical Health Education), in Nieuwegein near to Utrecht.

Every initiative to start a new full-time 4-year education must have been approved by the government, represented by the Minister of Education and Science. A new course or study must therefore be presented to the Minister by a so-called 't' document from CROHO (Centrale Registratie Opleidingen Hoger Onderwijs, the central register for university studies leading to a Bachelor degree). This document consists of all relevant information concerning the new course. In February 2000 a CROHO document for the HBOT (Hogere Beroepsopleiding Orthopedische Technologie, the Higher Professional Education in Orthopedic Engineering)I was presented to the Minister of Education and Science (Holtkamp, 2000). This education is to can be compared with a graduate (Bachelor) course in prosthetics and orthotics.

Fontys University in cooperation with a Belgium university, the Katholieke Hogeschool Kempen, made this course possible. In this cooperation two main goals had to be achieved. Firstly, to make a cost-effective course in prosthetics and orthotics for Dutch students in the Netherlands; bearing in mind that only a limited number of students will attend each year. Approximately 18-25 students will enter the course each year in 3-4 years time. The second main goal is to establish a real cooperation between the two Universities because Dutch students will attend an amount of lectures and skills at the Catholic University Kempen (KHKempen). Therefore there must be a comparable educational and student information system developed.

To be more specific, the Dutch educational model is a 4-year full-time programme. Belgium students only have to attend 3 years of education in Belgium. Dutch students will start their education the first year at Fontys University, Eindhoven. The second year students will then go to Belgium to receive their education together with the Belgian students. The third year is a mixed year. The first half is a follow-up from the second year. The second part of the third year is a practical clinical period, a traineeship. Dutch students will fulfil this period within companies or hospitals in the Netherlands. The final year again is a mixed year. Part of it is a final practical period, and part of it is finalization of the theory.

It is these kinds of developments that made a prosthetics/ orthotics course possible for the Netherlands. Figure 1 shows the educational model. Although much work still has to be done, the basics or fundamentals are presently available. The primary designs of this programme were based on the experience of people from the prosthetics and orthotics profession and industry, consultants, teaching staff, both from Fontys as well from the KHKempen. Then again all the courses, practical training and other arrangements have to fit within a very tight financial framework.

Recent developments

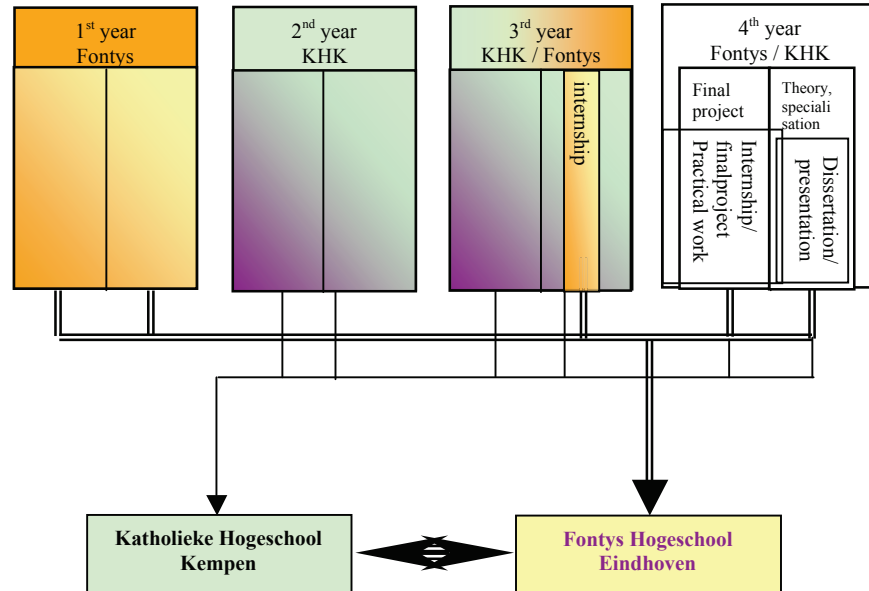
In February 2002, the Dutch government introduced a new system concerning grades and titles of students whom have finished their education. This is called the Bachelor/Master system and the titles Bachelor and Master (known as the Ba/Ma system). This system is introduced for a number of reasons. One of them is to make a system that is more easily comparable to those from abroad. This change is one of the results of the Bologna Statement made by all the Ministers of Education in Europe at Bologna on 19th June 1999.

There is also an ambition to start a dual study variation in prosthetics and orthotics education at Bachelor level in 2004-2005.

An overview of the school system in the Netherlands

After finishing primary education in the Netherlands children have to make a choice of one of the forms of secondary school systems. A variety of programmes, courses and school types are available.

Figure 1 Educational model of the Bachelor degree course in The Netherlands used by Fontys in cooperation with the KHKkempen



Depending on capabilities and wishes of young students from the age of 12, choices can be made from very practical courses to very theoretical courses. The compulsory education of pupils is from the age of 4 till the age of 16. From the age of 16 till the age of 18 there is a type of partial compulsory education (OC&W). Figure 2 shows an outline of this school system.

Choices can be made from VMBO (Voorbereidend Middelbaar Onderwijs, pre-intermediate vocational education), HAVO (Hoger Algemeen Vormend Onderwijs, higher general secondary education) or VWO (pre-university education). These three kinds of educational systems are meant for pupils from the age of 12. They all start with the basic (secondary school) curriculum. This basic curriculum usually takes 3 school years and consists of a very broad set of course options, which is in principle the same for all pupils. After finishing the basic curriculum students will enter the second phase. This phase is a more in-depth study. This second phase is not the same for every student. Depending of choices of profile and school type variations in study load can be recognized with a study load of 3200 hours for HAVO students and 4800 hours for VWO students.

The basic curriculum

All schools start the first year with the basic curriculum. During this period all pupils will deal with a broad composed set of course options, which do not differ a lot over the school system. A lot of time is spent on dealing with practical everyday situations. Pupils have to do a lot of things by themselves and they have to answer the question *'what can I do with what I have learned?'* The length of the basic curriculum can vary from school to school, in principle it will take 3 years, but a period of 2 or 4 years is also possible. The exact length of the basic curriculum is not defined; the programme will gradually convert to that from the higher school years. Most schools for secondary education with more than one education types know a first class secondary school of 1 or 2 years. This transitional year(s) is amongst other things allows postponement of the choice for VMBO, HAVO or VWO. Therefore students will have some extra time to make up their minds and find out where they want to go, depending on their capabilities.

Course programme in the basic curriculum

The basic curriculum contains at least the following subjects: Dutch, English, German or French, History and Civics, Geography, Economics, Gymnastics, Mathematics, Physics and Chemistry, Biology, Care (maintenance) Informatics, Technology, and Arts. Schools have to show in the basic curriculum how the various subjects are related to each other. Schools have to point out in their curriculum how the diversity of the different subjects is linked together. This can be realized in several ways. One of the possibilities is to deal with the different subjects in a variety of course programmes. Another possibility is to cluster the subjects in large projects. For example, an item can be 'nature' which would combine with other subjects such as physics, biology and chemistry. After finishing the basic curriculum a definitive choice must have been made concerning the follow-up in their secondary education school programme. This is the choice as mentioned before between VMBO, HAVO or VWO.

Description of different types of educational systems

VMBO, Pre-intermediate vocational education

Pre-intermediate vocational education is a new school type introduced on the 1st August 1999. This pre-intermediate vocational education consists of 'so-called' educational roads, coming in the place of the VBO and MAVO. This change of education must improve the connection to the (MBO). The pre-intermediate vocational education has four sectors with a pre-determined chosen set of course options. The final sector choice must be made at the end of the second school year. An educational road is the study route students have to follow starting with the basic curriculum and finishing with the secondary education. All four educational roads lead to the level of intermediate vocational education. The four educational roads are:

- A theoretical educational road;
- A mixed educational road;
- A profession aimed educational road;
- A cadre profession aimed educational road.

The theoretical educational road offers an access to vocational training (level 3) and middle management training (level 4) of the intermediate vocational education plus an access to HAVO, the school of higher general secondary education. Subjects such as mathematics and French or German language are compulsory. Every educational road can be chosen from the four sectors: technology, healthcare and welfare, economy, and agriculture.

A special form of pre-intermediate vocational education is the modern apprenticeship. In this kind of education a large amount of time is spent at the company or institution where the student works for 3 or 4 days a week. The one/two days that are left are used to follow classes at the school.

MBO, Intermediate Vocational Education

After finishing pre-intermediate vocational education students have the ability to access intermediate vocational education. This education type is aimed directly at the profession. Of course also here are four levels to distinguish, assistant (1), basic professional (2), office-holder (3), middle management (4). Succeeding in a positive way gives access to HAVO, school of higher general secondary education or HBO, school of higher vocational education.

Up and till the year 2000 the only possibility to study prosthetics and orthotics was to a level of intermediate vocational education in the normal way. The basic training of orthopaedic technicians started in 1960 (Hughes, 1976). Students were trained to work in this field in a broad variety of study routes: in the early days at the Koning Willem 1 College, Den Bosch and later on, from 1998, at the Stichting Vakopleidingen Gezondheidstechnische Beroepen in Nieuwegein.

HAVO and VWO, higher general secondary education and pre-university education

The school for higher general education takes 5 years of study and is intended for preparation to higher vocational education.

Pre-university education takes 6 years and is mainly intended for preparation for scientific university education. Pre-university education, also known as grammar school, consists of two school variations; Athenaeum and Gymnasium. At the Gymnasium all pupils are taught in Greek *and* Latin language, at the Athenaeum it was Greek *or* Latin.

There is also a educational reform process going on at this time with the higher general education and pre-university education. The renewal is based on the disappearance of free choice of subjects. Instead there is now a choice out of four study profiles:

- Nature and Technology;
- Nature and Healthcare;
- Economics and Society; and
- Culture and Society.

Each profile has a common part, which is the same in all study profiles. There is also a part that is specific to each study profile. Lastly there is a free study part. In this free part a student will be able to take certain subjects from other profiles, which will enhance the possibilities for students to enter university education.

Also a part of the educational reform at this level is the introduction of what is called 'study-house'. This is obviously not a new building but a concept in guidance or counselling the students, which is aimed at self-activation and an independent way of studying.

As mentioned earlier to succeed in the 5 years of study at higher general education a study load of 8000 hours in total must have been set aside (the first phase: 3 years*1600 hours plus the second phase: 2 years*1600 hours). In the case of pre-university education a study load of 9600 hours must have been set aside.

Higher vocational education, university of professional education, and university education

Contrary to the Anglo-Saxon countries where there is only one type of University offering Bachelor, Master and PhD courses, in the Netherlands two kinds of University exist

The first type of University is one, which offers a 4-year course (6720 hours of study load, 1680 hours each year) of higher vocational education. It is best described as a university of professional education and it offers Bachelor level courses leading to a Bachelor or ing title. Next to this there are a number of Universities of professional education who are offering also a Masters degree, mostly in cooperation with an English University, but in the near future also independent of a foreign university.

The second type is the academic university. This university offers a Master course leading to a Master or ir title. This is a 5-year course with a study load of 8100 hours. It is also possible to obtain a doctoral degree PhD or Dr. by research at this type of University. The level of Masters degree is described as an academic master, while a MSc degree obtained at a University of professional education is described as a practical master. Of course, the future will tell if this distinction is appropriate especially in relation to the new Bachelor/Master structure.

Higher vocational education has a variety of specializations. There are possibilities for instance to study in a numberr of directions:

- Technological course: engineering, informatics (known as HTS technical college);
- Healthcare: nursing, physiotherapy;
- Economics: school/institute for business administration and economics; and
- Social: psychology.

University of professional education

In order to get access to a school of higher vocational education, a university of professional education, at least an intermediate vocational education or higher secondary education or, pre-university education is required. The study-profile choice which the student has made is important in

his/her acceptance on a new course. To join a technical study at the university the study-profile also must have been technical; otherwise the difficulties are too great in order to guarantee a successful conclusion to the studies. The same applies for studies in healthcare etc. However there are always exceptions to this kind of rule. The prosthetics and orthotics Bachelor course is such an example. Both a technology as well as a healthcare profile is allowed for this study.

As mentioned previously a university of professional education course has a duration of 4 study year. Year one is a general introduction to the chosen study. Year two goes into depth in theoretical work and provides the opportunity to visit the work field during practical and or clinical hours. The third year is goes into more into depth and a full-scale clinical period is implemented. The forth year is the completion of the course and consists of a long period of internship including a project and the final examinations. This type of education is based on the principle of problem-based learning alongside formal lectures and classes.

University education

University education leading to a Master degree is a 5-year course. The Master course distinguishes itself from the Bachelor course by dealing with more abstract theory. Utilization of applications is somewhat less than in professional education. In this type of study a large amount of practical and, if appropriate, clinical internship is also included.

Changes in secondary and higher vocational and university education

When designing an educational course it is necessary to have some understanding of why things are changing in order to be able to adjust or fine-tune the new course.

Professional column

A major change in the coming years concerning vocational education in each professional level is that all education trajectories must be geared to another, in order to get a better functioning professional column. A demand for higher practically-orientated educated people is increasing (Dool and Geurts, 2000). The growing need for information and communication technologists is an important case in point. Due to this reason a lack of people on secondary or higher vocational training in other work fields has developed. Research shows that the number of students changing from secondary general education and pre-university education to higher vocational education is stabilizing; therefore there are no growing numbers from this trajectory.

Growth can be established more effectively from pre-intermediate vocational education to intermediate vocational education and from there to secondary vocational education. Growth must therefore be established from within the professional column.

However, too many students drop out from non-connecting programmes with different 'worlds', other subjects, atmosphere, different didactic approaches etc. Therefore, transparency and made to measure education must be improved. It is of importance that this is noticed, because although the profession and therefore the education in prosthetics and orthotics in pre-intermediate and intermediate vocational is small, the same kinds of problems are identified. Especially the fact that both study routes is operating by way of modern apprenticeship in contrast to higher vocational education, which is a 4-year full-time education.

European interests

Besides national, international interests are important. The European Council of Ministers in 2000 declared the ambition to make Europe one of the most dynamic and competitive regions of the world. A well-educated population is therefore very important. Another agreement is made to decrease the number of dropouts in 2010 by 50%.

What can be done to improve?

The Ministry of Education (OC en W) and the field of professional education have taken a number of initiatives in order to improve the results of the professional column. Documents such as 'Doorstroomagenda-Beroepsonderwijs' (Agenda for vocational education) and Naar een stevig fundament van de kennissamenleving (Towards a firm foundation of the knowledge society) and Middellange termijn verkenning Beroepsonderwijs (Medium-term exploration of vocational education) drive the steering committees for vocational education and training. The most important recommendations are:

- That more cooperation is necessary between the organizations involved in education to improve the move of students within the professional column, e.g. cooperative use of locations and/or machinery between pre-vocational, vocational and perhaps higher vocational education.
- There is a need for :
 - attractive and up to date study facilities;
 - variation between conventional lectures and problem based learning;
 - Helpful will be up to date computer facilities and expert teachers.
- Students must have a central position. This means that institutions must take into account individual needs, for instance a theoretical surrounding for one and a combination of learning and working for another.
- Making accessible movement from pre-vocational to intermediate vocational and even higher vocational education, by connecting curricula. Students will be more motivated to keep on studying.
- More and more people should keep on studying during their career by means of life-long learning. Within the vocational educations the combination of learning and working is rather common.
- Last, but not least; the Ministry of Education does have a task in making the profession of teachers and lecturer more attractive. Better career possibilities and training facilities for teachers must help attract new staff members.

Conclusion

The ultimate goal for the next coming years is to realizing a complete professional column, starting from lower vocational education up and till higher vocational education/university education, with the possibility for students from higher general secondary or pre-university education to attend courses within a certain professional column. The largest advantage introducing the professional column is a more transparent educational system for the student and the profession. Changes in secondary and higher vocational and university education should be made in harmony with the introduction of the Bachelor/Master structure together with a new form of accreditation.

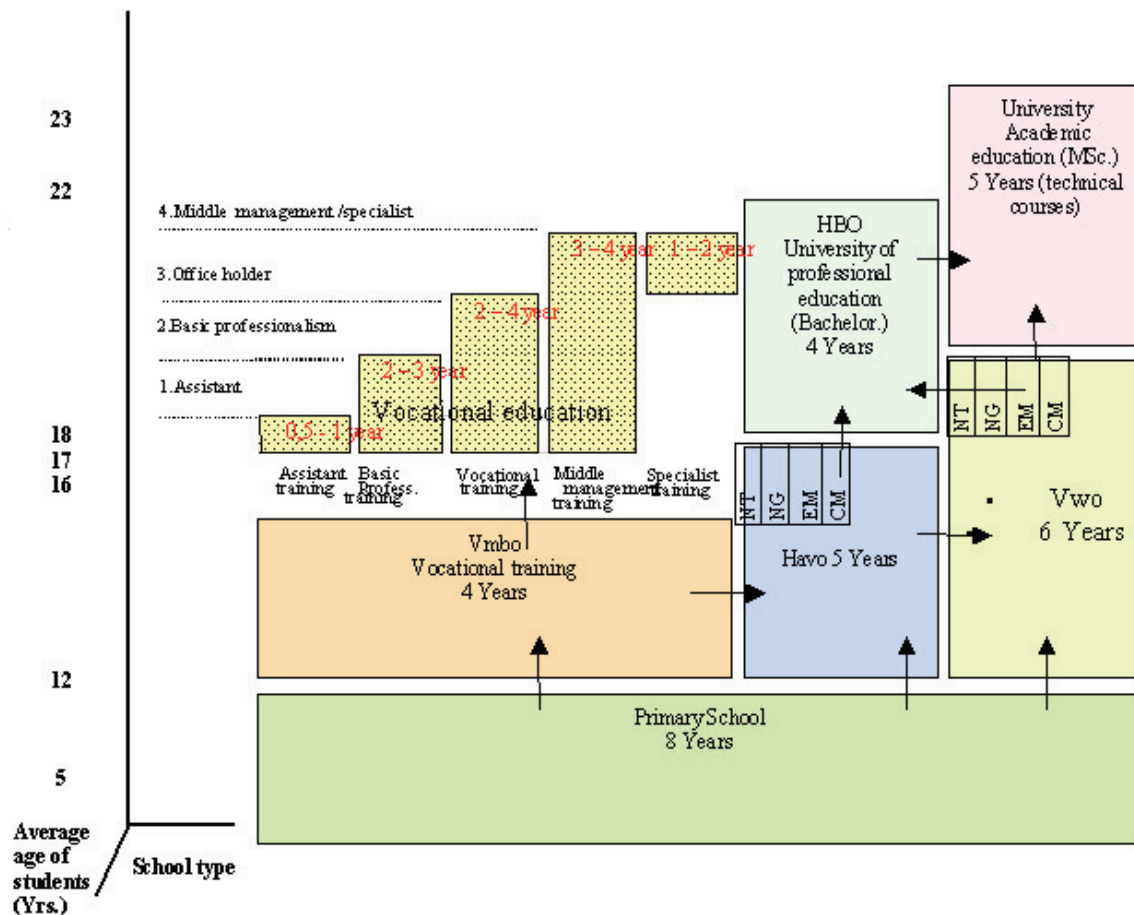


Figure 3 Educational organization in the Netherlands

References

- Dool den P, Geurts J (2000). Beta/techniek uit balans, een beeld van huidige knelpunten tussen aanbod en vraag en mogelijke oplossingen.-Delft: Axis.
- Hughes J (1976). International study week on prosthetic /orthotic education.-Edinburgh: Scottish Home and Health Department.
- Holtkamp F (2000). Hogere bereopsopleiding orthopedische technology, croho aanvraag.-Eindhoven: Fontys Hogescholen.
- Kemenade van E (1990^a). Studiehandleiding opleiding orthotist/prosthetist.-Eindhoven: Fontys Hogescholen.
- Kemenade van E (1990^b). Projectontwerp opleiding orthotist/prosthetist.-Eindhoven: Fontys Hogescholen.

9.2.5 Norway

Inger Marie Starholm

The Norwegian educational system offers a Bachelor of Science in Prosthetics and Orthotics. We are situated in the middle of the Norwegian Capitol at Oslo University College, where we are a part of the Faculty of Health Sciences.

The Prosthetics and Orthotics Programme in Norway was one of the first schools of its kind in Europe. It was established in 1969 as a 3-year course, and has since 1982 been approved as a college education. The school had until 1992 two separate courses, one for prosthetics and orthotics and one for orthopaedic footwear. In 2001 the degree system in Norway changed to international standards, and we became a Bachelor of Science degree in Prosthetics, Orthotics and Orthopaedic Footwear.

In Norway one needs a public authorisation to work as a Prosthetist/Orthotist. To get this you must have a two-year long internship after graduating from the College/University. This authorisation is given by the Norwegian Registration Authority for Health Personnel, which is an office placed under the Norwegian Ministry of Health. Our students are therefore not required to sit a national certification examination after graduating from our programme. The title we use in Norway is Authorised Orthopaedic Engineer.

Our academic year constitutes 40 weeks and we start mid-August and end the school year mid-June. This is the same for all three years. We admit 12 students every third year, and usually end up graduating 11 or 10 students. A dropout of 10% is looked upon as normal and indicating that the academic level is appropriate.

To indicate student workload we use the European Community Credit Transfer System, the ECTS *Credit Points* which is a part of the ERASMUS programme. This is the European Community action scheme for the Mobility of University students in the EU and the European Economic Area (EEA). The ECTS Credit Points are a course credit system based on student workload. Student workload in this system involves lectures, practical training and independent studies. It includes all work needed to prepare for an examination. The basic allocation of academic credits will be 60 ECTS credits per year of study which adds up to about 1600 hours per year.

Twelve (12) students every third year does not sound like a lot, but taking into consideration that we are about 4.5 million people in Norway the amount of Orthopaedic Engineers (Prosthetists/Orthotists) are 1: 35.000 habitants. Still, there is a big demand for Orthopaedic Engineers, so we hope to be able to have a larger intake of students in the future.

To enter the Prosthetics and Orthotics programme the minimum requirements for admission is successful completion of Norwegian Upper Secondary School. Admission may also be gained with other qualification recognised as being equal to the general matriculation standard. We are very pleased with the fact that we have additional entrance requirements in mathematics and physics. This is a big help when it comes to the students' fundamental understanding of subjects such as mechanics, biomechanics and material science. The average age of the students is 25 years and many of the students have some sort of higher education before entering the programme.

The students enrolled in our programme are required to complete 18% of the time in theoretical studies in prosthetics and orthotics. Some 45% of the time is used for theoretical studies in other subjects. Clinical studies where the students work with real patients constitute 19% of the time and the technical training constitutes 18% of the time.

The theoretical studies in other subjects are to a great extent subjects looked upon as the foundation of understanding the prosthetics and orthotics field; subjects such as mechanics, biomechanics, life science and materials science.

Term-map for main and subordinate subjects			
Term	Subjects	Study points	
1 st term	Module 1	9	27
	• Introductory core skills and basis P&O science	7	
	• Biomechanics	2	
	Anatomy/physiology	6	
	VEKS	7,5	
	Mechanics	4,5	
2 nd term	Module 2	15	33
	• Prosthetics I	10	
	• Biomechanics	3	
	• Pathology	2	
	Anatomy/physiology	9	
	Mechanics	7,5	
	Mechanics of materials	1,5	
3 rd term	Module 3, 4	22,5	27
	• Orthopaedic appliances for the foot	16,5	
	• Orthotics I	1,5	
	• Biomechanics	3	
	• Pathology	2	
	Mechanics of materials	4,5	
4 th term	Module 4,5,6	25,5	33
	• Orthotics I	8,5	
	• Prosthetics II	5	
	• Orthopaedic and technical appliances for the upper limb	7	
	• Biomechanics	3	
	• Pathology	2	
	VEKS	7,5	
5 th term	Module 7,8	15	27
	• Prosthetics III	4	
	• Orthotics II	6	
	• Biomechanics	3	
	• Pathology	2	
	Rehabilitation/habilitation	6	
	Statistics and scientific method	3	
	Production and quality technology	3	
6 th term	Module 9,10	21	33
	• Orthotics III	4	
	• In depth theses	15	
	• Biomechanics	1	
	• Pathology	1	
	Rehabilitation/habilitation	3	
	Statistics and scientific method	3	
	Computer technology and orthopaedic technology	6	

Sp = Study point

VEKS = The 4 capital letters identify the following:

V for scientific theory

E for ethics

K for communication, co-operation and conflict solution

S for knowledge about state and communities, health and social politics

The study of prosthetics and orthotics presupposes a process of learning based on interaction between theoretical and practical acquisition of knowledge. Our teaching philosophy is therefore that theory and practice should be integrated in the learning situation. The work-habits shall encourage the students to apply theory in practice and to process their practical experiences through reflection and analysis so that single experiences are evaluated in a greater context and can be transferred and used in other connections.

The theoretical studies and a substantial part of the clinical and technical training are therefore carried out on the premises of the University College. A quality assured clinic situation is therefore arranged in all the prosthetics, orthotics and orthopaedic footwear modules. The ratio is 1 patient for every 2 students but each student working with their own orthopaedic device using the latest technology. We focus on the pedagogic framework and the collaboration with the patient and other team members such as the orthopaedic surgeon, physiotherapist and occupational therapist. Some parts of the practical studies are moved to external orthopaedic departments so that the students can be acquainted with the real life situation and acquire a broader insight and understanding of the profession. This external practise consists primarily of tasks through which the students shall observe, reflect and write reports.

More than 60% of the course content is theoretical studies in prosthetics and orthotics and other theoretical subjects. This emphasis on theory is an important ballast when the students start their internship, where emphasis is put on clinical and technical practice before they receive their public authorisation and a legal responsibility towards the patients they treat.

On the previous page you can see the subjects included in the curriculum. The subjects' biomechanics, pathology and some of the material science will be integrated in the Prosthetics and Orthotics Science modules.

During the last semester of the third year the students have 12 weeks where they only work on a research project. These written theses should be in the area of Prosthetics and Orthotics Science and should be a systematically investigation where scientific methods shall be used.

The subject called VEKS is a general course for all the study programmes at the Faculty of Health Sciences. The unique detail about this course is that it is organised in interdisciplinary groups of all the students in the different health programmes such as physiotherapy, occupational therapy, radiography and several others. They use the method of problem based learning. The topics are ethics, communication, collaboration and problem solving, scientific theory and research methods and health politics. The aim is to make the students understand at an early stage of their studies that team work is essential for the health workers to give the patient the best treatment and rehabilitation.

The Norwegian Prosthetics and Orthotics programme is trying to make bilateral exchange agreements with similar institutions in other countries. We want to make it possible for the students to take a part of their Bachelor degree abroad. Just now we have 2 students in Vancouver, Canada where they are doing their scientific project. We are in the middle of planning an exchange module in English on 'Appliances for the foot' which will contain foot orthotics and orthopaedic footwear.

To be able to sit their final examinations, the students must pass certain compulsory requirements throughout the study. These requirements can be both theoretical and practical. Continuous evaluation aims at informing and motivating students in the work of achieving learning targets.

At an early stage the students have to prepare individual presentations of patient cases. This is a good way to develop skills in formulating and expressing their thoughts and opinions, and reflect on their attitudes and actions. Communications skills are very important as a professional Prosthetist/Orthotist.

The final examinations we have in Prosthetics, Orthotics and Orthopaedic Footwear are as follows:

- In the first year we have an examination where the students work in groups on a project. The project is also to be presented with another group of students acting as an opponent group (critique). The students are evaluated in relation to their project, their presentation and also for their performance as opponents.
- In the second year we have an individual clinical examination where the students examine a patient. One hour later, their choice of appliance and their given grounds for this choice are presented for the examiners. The examiner evaluates both the examination and the presentation.

- In the third year we have a 5-day written examination where the subjects rehabilitation and prosthetics and orthotics are integrated to make the students bring a more interdisciplinary view on their role in the rehabilitation process of the patients they meet in their professional lives.

In our programme we are 4 staff members teaching Prosthetics and Orthotics Science.

As earlier mentioned there are only approximately 130 Orthopaedic Engineers in Norway and there is good access to jobs. Very few are therefore tempted to continue their education into a higher academic level. We are working hard trying to stimulate our students to come back to do an MSc in Rehabilitation at the Oslo University College after being out practicing for a few years, or search for other possibilities in postgraduate studies, for example abroad. We hope to see an increase in the academic level of the Norwegian Orthopaedic Engineers in a few years.

9.2.6 Poland

Zbigniew Oksiuta

Bialystock is the capital of the north eastern region of Poland, Podlaskie Province, near the border with Belarus. It is the most prominent academic and scientific centre of the North East of Poland serving some 40,000 students. The oldest public institutions of considerable achievement are the Medical Academy, BTU and the local University of Bialystock, created from the former Bialystock Branch of Warsaw University. A specialisation of Prosthetics and Orthotics Engineering has been introduced in 1994 at Bialystok Technical University (BTU), in the Materials department of the Faculty of Mechanical Engineering. Unfortunately there is only one Orthopaedics Technical High School in Poznan and only a few workshops in Poland. Only one Polish Technical university educates students in prosthetics and orthotics engineering and this is BTU.

In the Materials Science Department at BTU there is a field of study called Mechanics and Machine Technology and a specialisation of Orthopaedics and Prosthetics Engineering. Education in this specialisation takes place at engineer and Masters levels. Students can choose from the following specialisations:

- Orthopaedics and Prosthetics Engineering (Biomedical Engineering - from 2004/2005);
- Mechanics and Applied Computing;
- Automobile Vehicles; and
- Thermal Engineering and Food Industry Machines.

The curriculum is prepared and realised in cooperation with the Medical Academy of Bialystock and hospitals in Bialystock, and encompasses education in the field of specialised engineering courses as well as medical courses. The graduates gain specialised knowledge in the fields of biomechanics, anatomy and human physiology, engineering and medical materials, design and use of medical equipment, orthopaedic supply, especially in the field of orthotics, prosthetics and rehabilitation engineering. During the course of study special emphasis is put on preparing the graduates to take full advantage of advanced computer technologies. The graduates gain good knowledge in how to work alongside doctors in rehabilitation, especially taking account of the growing population of persons with disability.

Programme of Study			
<i>Name of course subject</i>	<i>Lectures</i>	<i>Hours Laboratories</i>	<i>Projects</i>
<i>Anatomy and Human Physiology</i>	30	-	-
<i>Rehabilitation in Diseases of Organs of Movement</i>	30	-	-
<i>Basic Orthopaedics and Traumatology</i>	45	-	-
<i>Anthropometry</i>	15	15	-
<i>Biomechanics</i>	45	15	-
<i>Medical Materials</i>	45	30	-
<i>Biotribology</i>	15	15	-
<i>Modelling of Anatomical Systems</i>	30	45	-
<i>Orthopaedic and Prosthetic Supply</i>	45	15	-
<i>Prosthetic and Orthotic Equipment Design</i>	45	-	30
<i>Rehabilitation Engineering</i>	30	-	30
<i>Biomechanisms</i>	30	-	-
<i>Measurement in Medicine</i>	30	15	-
<i>Technology of Medical Instruments</i>	30	15	-
<i>Biomedical Engineering</i>	45	15	-
<i>Exploitation of Medical Equipment</i>	45	15	-

A plan of specialisation is given in the above table.

From the next academic year the new specialty, Biomedical Engineering, will start with a new programme of study aimed at meeting the needs of the local population for employment purposes.

Biomedical Engineering (from 2004/2005)
Programme of Study

SEMESTER V	SEMESTER VI	SEMESTER VIII	SEMESTER IX
Anatomy and Human Physiology	Biomechanics I	Biomechanics II	New Technology for Medicine II
Biophysics	Medical Materials II	Prosthetic and Orthotic Equipment Design	Health Protection
Artificial Systems	Orthopaedics Supply	Exploitation of Medical Equipment	Biocybernetics
Medical Materials I	Temporary Work	New Technology for Medicine I	Automation of Medical Processes
Rehabilitation Engineering	Rehabilitation Engineering		Modelling of Anatomical Systems
Anthropometry	Medical Equipment		Analysis of Biomedical Images
Total number of hours per week 11	Total number of hours per week 13	Total number of hours per week 9	Total number of hours per week 16

In orthotics and prosthetics supply, the lecture topics are:

1. Orthotic supply of the organs of movement.
2. Amputation stump - preparation for prosthetics. Methods in the process of treating patients classified for amputation, the differences in young and aged patients.
3. The lower limb orthotics supply.
4. Stumps characteristics – different types of prostheses.
5. Amputation for vascular diseases.
6. The role of an orthotics technician in the treatment process.
7. The foot orthotic supply.
8. Prophylactic footwear for apparatuses, correcting shortening.
9. Lower limb orthoses.
10. The basics of the upper limb anatomy, levels of amputation, different types of stumps.
11. Upper limb prostheses.
12. Upper limb orthoses, spinal orthoses.

And in prosthetic and orthotic equipment design, the lecture topics are:

1. General principles of medical equipment construction.
2. Biomechanics of interaction and the principles of lower limb prostheses construction.
3. Ankle, knee, and hip joints.
4. Modular prostheses and prostheses with an external source of energy.
5. General principles of lower limb orthoses design.
6. Principles of an upper limb prostheses design - sockets, terminal devices, suspension, joints.
7. Upper limb prostheses with an external source of energy.
8. Principles of spinal orthoses construction.
9. Stabilizers and joining plates.

Examples of Master's Thesis topics for the students are:

1. Material and technological solutions suggested for orthopaedic shoe inserts for sensitive feet.
2. Design of a wheelchair for the disabled.
3. Foot biomechanics in persons with diabetes.
4. Research into the electric activity of muscles during physical effort.
5. Foot and spine biomechanics in hemiparesis.
6. Inter-marrow stabilization of long bones fractures: a numerical analysis.
7. Jackets in rehabilitation of scoliosis in children.
8. Pronative-abductive orthotics in children's foot disease.
9. Creating an algorithm and quality testing of orthopaedic shoe inserts.
10. The influence of discopathy on spinal biomechanics.
11. Design of a knee joint with a lock.

Special project attention is afforded to analysis and correction of human body positioning.

Staff resources comprise 24 teachers, 16 people from the Technical University, and 8 from the Medical University of Białystok (4 Professors, 16 DSc, 4 MSc). Current student numbers stand at 87 (number of graduates: 120). The Department also has cooperation with the Medical University of Białystok, hospitals and an Orthopaedic Workshop in Białystok (OrthoBial Co). Cooperation with the Technical University in Koszyce (Slovakia) is also in place. Finally, regular Symposia take place at BTU entitled 'Orthopaedics and Prosthetics Engineering'.

9.2.7 Scotland, United Kingdom

Elaine Figgins

As of May this year 2004 the undergraduate course in prosthetics and orthotics at National Centre, University of Strathclyde in Glasgow will have been reviewed no less than four times in the previous 18 months by the following organisations:

1. Health Professions Council (HPC)/British Association of Prosthetists and Orthotists (BAPO)
2. University of Strathclyde Faculty undertaking a Departmental Review (under the QAA benchmark statement)
3. Scottish Executive (who are the department funding agency and are a government/state organisation)
4. ISPO Category-I Inspection Team.

The department is willing to be scrutinised in its activities as it is vital that in its education of prosthetists/orthotists it can account for its educational standards. The course has always maintained its teaching of the following 'core subjects':

• Prosthetics and Orthotics Science	1614 hours
• Mechanics and Biomechanics	324 hours
• Life Science	360 hours
• Professional Development Studies	216 hours
• Prosthetics and Orthotics Clinical Practice	1610 hours

The current hours of each subject are listed to show the emphasis on the theory and practice of prosthetic and orthotic science and are actual contact hours. In the undergraduate four year Bachelor of Science Honours degree programme the ratio of theoretical teaching to practical elements can be divided into the following percentages:

• Theoretical teaching	28 %
• Supervised Practical Instruction	72 %

Of the practical instruction the ratio of the use of subject based clinical teaching in the first three years of the course compared to the final year of clinical practice is 50:50.

The whole curriculum of the undergraduate course by subject and hours is detailed in the POEM post-meeting document.

In the first three years each year currently has 40 academic taught weeks per year. These involve both theoretical teaching and supervised practical instruction. The practical instruction is subject based and not actual treatment programmes for the patients. In the fourth year the students undertake 46 weeks of clinical practice, 23weeks in prosthetic clinical practice and 23weeks in orthotic clinical practice. This gives a total of 805 hours in each discipline. This is supervised practical instruction which is patient based that is carried out at approved clinical centres.

The supervised practical instruction in the first three years can be subdivided into the following areas in Prosthetics and Orthotics Science:

Introductory Core Skills	168 hours
Lower Limb Prosthetics	450 hours
Upper Limb Prosthetics	264 hours
Lower Limb Orthotics	492 hours
Upper Limb Orthotics	90 hours
Spinal Orthotics	150 hours
Total	1614 hours

Patients are used in these areas which are taught in modules. The discussions at the meeting (POEM) in Sweden (August, 2002) debated that '*Real patient in school does not represent typical patient population's*'. However, others argued that '*It is important to remember that the patient is REAL to the student*' and this clinical environment can be controlled, monitored and assessed to provide an excellent teaching environment. The practical instruction of all the prosthetics and orthotics science modules always includes the following:

- Physical examination and full assessment of the patient
- Prescription of device if appropriate
- Measurement/casting/or appropriate image sensing
- Modification/rectification of model
- Manufacture/fabrication
- Alignment/fitting
- Checkout/critique
- Clinical note keeping

Modes of delivery of the clinical subject vary to aid student learning. They include experiential learning, use of video and gait laboratories, and are mainly by practical demonstrations supported with theoretical instruction and as much critically appraised evidenced based findings to support practice as is possible in the field.

Another area now included is the emotional intelligence of the undergraduates as they progress through the course. This work has been developed by staff of the Centre to aid the teaching and awareness of patient empathy and a consciousness of self-awareness and self-ability by focusing on personal and interpersonal skills. The aim is to focus the individual student on realising their own current competency at the present time and then ongoing awareness as they become a qualified practitioner. Then it is hoped that they will be aware of the need to work within their correct scope of practice and maintain competency to practice.

Assessment methods range from written degree examinations to essay writing and peer assessment of oral presentation. Practical instruction is usually graded in the various core elements and written feedback is given individually at the end of each module. This is carried out by individual or group critiques which is done in part to mimic the final fourth year examination. Assessment in fourth year is by:

1. Continuous assessment of clinical supervisor
2. Clinical Essay
3. Clinical Examinations, one in prosthetics lasting 3 hours and one in orthotics also 3 hours. Both have six stations with two separate examiners in each station.

In September 2004 there will be the introduction of electives in the 2nd year. The elective of one subject at this stage introduces student choice and individuality within a full curriculum. Also in September there has been a reorganisation and rationalisation of prosthetics and orthotics science modules within the curriculum.

Inter-professional Learning in Health and Social Care (IPL) is being introduced in September 2004. This first year module will be for all student health professionals at Glasgow Caledonian University and the students of the prosthetics and orthotics honours degree course at the University of Strathclyde.

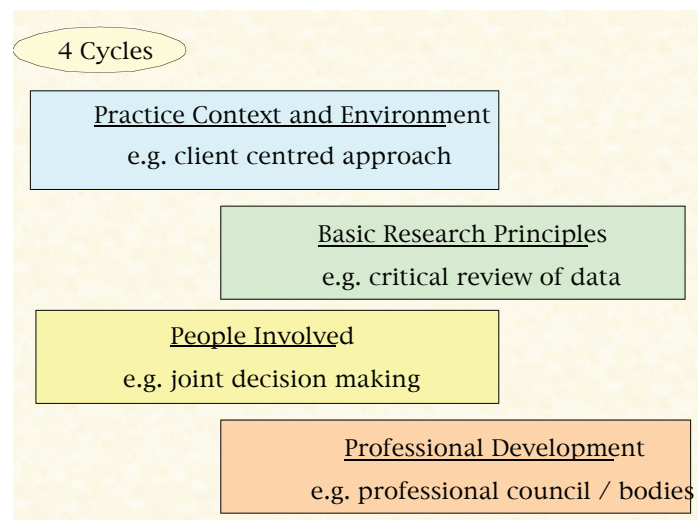
The aim of the IPL module is to determine whether there is any professional benefit of IPL, how it develops throughout the undergraduate career of the student, and whether the skills acquired are eventually translated into practice. This Inter-professional Studies for Health and Social Care module has the following learning outcomes to:

- Demonstrate an ability to identify, access and use information
- Understand the integral role of clinical governance
- Understand and reflect on the importance of professional issues
- Understand professional identity
- Understand the importance of team working
- Understand the importance of the role of the patient/service users and carers in delivery of healthcare
- Identify key legislative and policy frameworks which govern practice

Its delivery will be in the following format:

- 12 x 1 hour - lectures delivered fortnightly
- 18 x 2 hour - tutorials delivered fortnightly
- 128 hours - self directed learning
- 24 hours – assessment

Its assessment will be formative assessments which will takes place at the end of each cycle and use a variety of methods. A final summative assessment will be a reflective summary from the personal portfolio kept by the student for the module.



Participants

n=308/385 (80% response rate)

257 females and 49 males
(2 non respondents).

Age range 16-51 years.
Mean age 22.4 years.

197 direct entry from school (64%).

Professional Group	n	Mean Age
Dietetics	18	18.28
Nursing Studies	59	21.84
Occupational Therapy	64	24.07
Physiotherapy	54	19.13
Podiatry	25	24.91
Prosthetics & Orthotists	21	20.29

The current first year cohort of students are the control group for this academic analysis. The apparatus being used to assess the effectiveness of the introduction of this model is for both the control and trial groups from the following research: Readiness for Inter-professional Learning Scale (RIPLS) (Parsell and Bligh 1999; Parsell *et al.*, 1998), Interdisciplinary Education Perception Scale (IEPS) (Leucht *et al.*, 1990), as well as a short demographic profile which is seen above for the control group.

The first the RIPLS is a 19-item scale, with 3 sub-scales as follows:

TEAMWORK AND COLLABORATION

e.g. Learning with other students will help me become a more efficient member of a health care team.

PROFESSIONAL IDENTITY

e.g. Shared learning with other health care professionals will help me to communicate better with patients and other professionals.

ROLES AND RESPONSIBILITIES

e.g. The function of nurses and therapists is mainly to provide support for doctors.

Integer responses from 1 (strongly disagree) to 5 (strongly agree).

Next the IEPS is an 18-item scale 4 sub-scales looks at:

PROFESSIONAL COMPETENCY AND AUTONOMY

e.g. Individuals in my profession are extremely competent.

PERCEIVED NEEDS FOR PROFESSIONAL COOPERATION

e.g. Individuals in my profession need to co-operate with other professions.

PERCEPTION OF ACTUAL COOPERATION AND RESOURCE SHARING WITHIN AND ACROSS PROFESSIONS

e.g. Individuals in my profession think highly of other related professions.

UNDERSTANDING OF THE VALUE AND CONTRIBUTIONS OF OTHER PROFESSIONS/ PROFESSIONALS

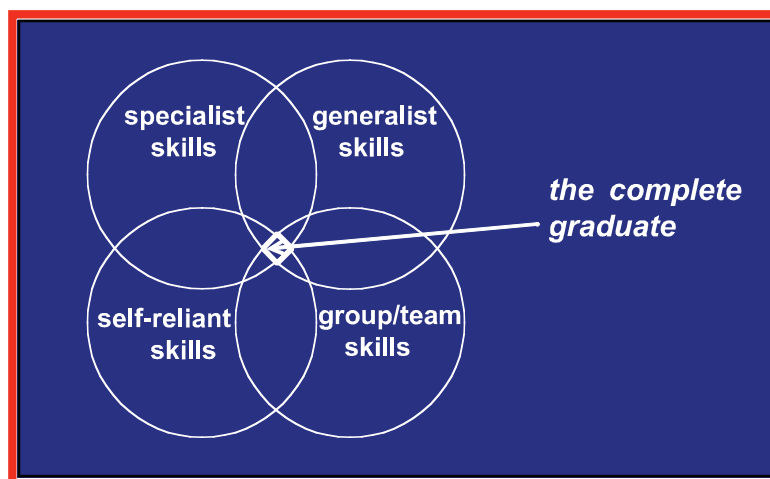
e.g. Individuals in my profession make every effort to understand the capabilities and contributions of other professions

Integer responses from 1 (strongly disagree) to 6 (strongly agree).

Lastly the Centre has undertaken a graduate and employer audit. The background to this was taken from a general education literature search, notably from 'Adapted from Skills for Graduates in the 21st Century', Association of Graduate Recruiters, 1995. Searching the literature showed in general that graduate skills could be sorted into 4 categories. These were used in the audit and are specialist,

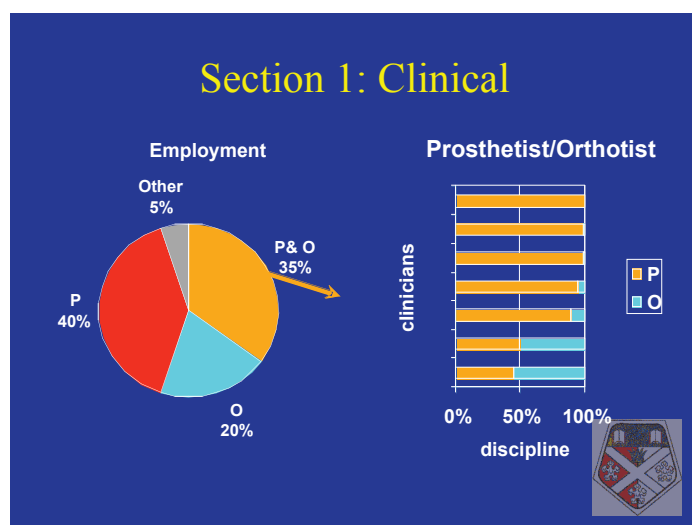
general, self-reliant and group/team skills. Other studies showed that it would be prudent to harmonise the expectations of employers with the capabilities and competencies taught within the Centre. The papers highlighted that the transition of students from higher education to the work place needed to be improved. It said that this was the opinion of employees, employers and managers.

Skills gap between the skills mastered by students in education and training and the skills considered being most important by future employers was also highlighted as a problem. These issues reinforced the fact that the Centre needed to consider an audit of graduates and also the employers.



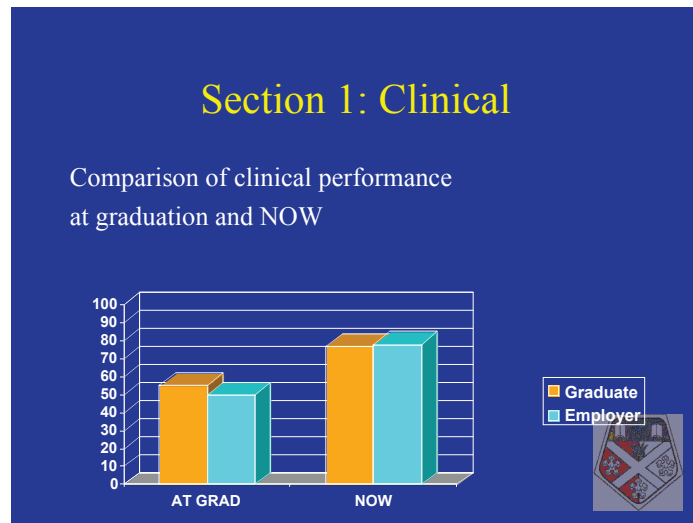
The audit was carried out by using questionnaire which was subsequently developed as an appropriate tool. Four sections within the questionnaire were set out as mentioned from the evidence found in the literature search, namely clinical, personal and interpersonal, knowledge and understanding and skills/skills base. Questions were structured to allow a measured response by using a Visual Analogue Scale. A space for comment was available in some sections.

The results of the audit from each section were: Section 1 'clinical' asked the graduates employment with 40% working as Prosthetists, 20% as Orthotists, 5% in further education, and 35% who considered themselves dual Prosthetists/Orthotists. It can be seen from the graph that actually only 10% of the total had a shared practice close to 50:50. While the majority spent most of their time in one discipline, prosthetics. This seems disappointing that more should have the opportunity to practice in both so early in their careers.

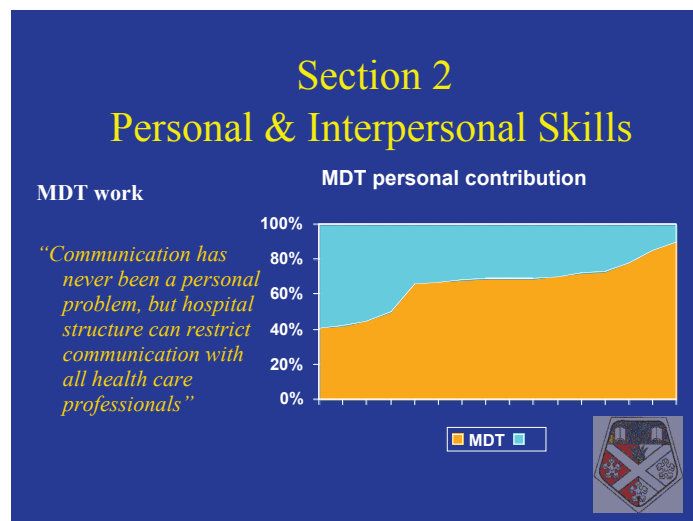


Views on their clinical performance at graduation and at 18 months afterwards were asked. The average graduate moved from 55% to 77% on the scale (an increase in 22%). Employers viewed the

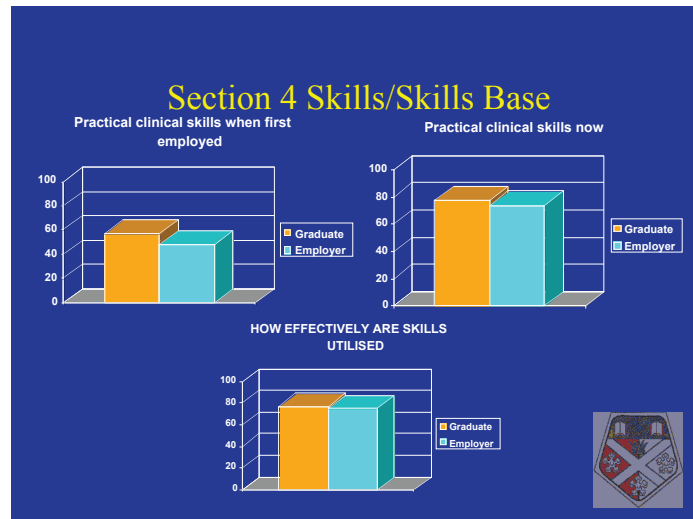
change slightly greater from 50% to 78% (an increase of 28%). Although very similar it may be that the employers' opinion included a rating for awareness of the business rather than clinical performance alone.



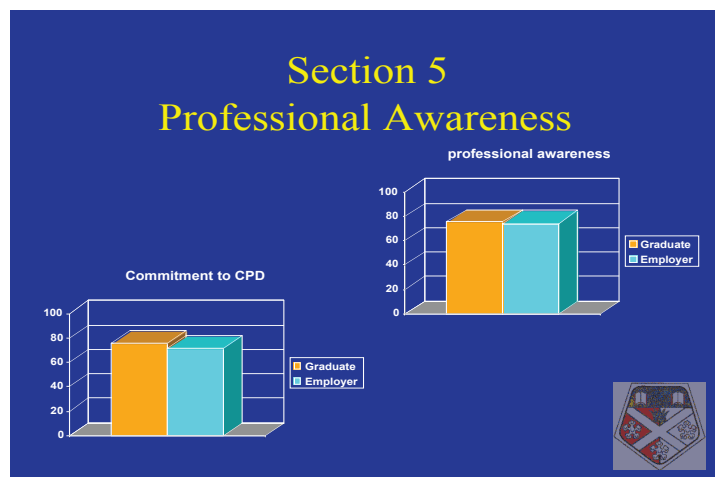
The graduates' perceived effectiveness as a team member varied from 41% to 90%. Overall graduates felt their interpersonal skills were effective. Comments suggested that it was hospital structure that restricted communication between all healthcare professionals.



In Section 4 'skills and skills base' the average figures again for both increased similarly. The graduates from 57% to 78% (a 21%) while the employers from 48% to 74% (a 26% increase) in this 18 month period. A very positive responses was seen when asked how effectively skills were utilised 77% and 75% from both graduates and their employers.



Lastly a section 5 was added on professional awareness and the commitment of both graduates and employers to Continuing Professional Development. These scores were between 71% and 75%. There were some comments that there was too much paperwork to concentrate on patient care in prosthetics and orthotics. Although all clinical aspects of prosthetists and orthotists were found very satisfying they expressed feeling uncomfortable with the commercial aspects of the fields.



To conclude the educational model for training prosthetists/orthotists in the United Kingdom at the National Centre for Training and Education in Prosthetics and Orthotics, University of Strathclyde is never static. It is being monitored continuously and has changed gradually over the years, it is believed for the better. The maintenance of good clinical teaching skills and fundamental knowledge bases always need to be taught, but current practice and advances in educational methods as well as constant analysis of outcomes from the graduates and employers perspective always needs monitored and implemented when appropriate.

References

- Leucht R, Madsen M, Taugher M, Petterson B (1990). Assessing professional perceptions: design and validation of an interdisciplinary education perception scale. *J Allied Health* 19(2), 181-191.
- Parsell G, Bligh J (1999). The development of a questionnaire to assess the readiness of health care students for interprofessional learning (RIPLS). *Med Ed* 33, 95-100
- Parsell G, Stewart A, Bligh J (1998). Testing the validity of the 'Readiness for Inter-professional Learning Scale'. Proceedings of 8th Ottawa International Conference, 12-15 July 1998, Philadelphia.

9.2.8 Slovenia

Helena Burger

The School for Prosthetics and Orthotics was established in 1987 as a department of the College for Health Studies Ljubljana, Slovenia. The school is located near the city centre and about 2 km from the Rehabilitation Institute in Ljubljana, where students receive practical knowledge in prosthetics and orthotics. Every three years, 30 students can enrol in the programme.

At the moment, the educational system in Slovenia is being revised. Until now, all students of the prosthetics and orthotics programme had previously finished 8 years of elementary schooling, which they started at the age of 7, and 4 years of secondary schooling. The next generation of students will have finished 9 years of elementary schooling (starting at the age of 6) and 4 years of secondary schooling.

Since its establishment, the prosthetics and orthotics programme has undergone changes and improvements in accordance with the educational legislation in Slovenia. It started as a 2-year programme and the students were compelled to have finished a vocational secondary school before the enrolment.

In 1991, the curriculum was extended to 2_ years (5 semesters). Before registering, the students had to finish a secondary school. In 1997, the curriculum was extended again. All engineers who had graduated before and wanted to get a new title had to register for another year and write another graduation thesis at the end of the programme. The same curriculum is still used today. It is a 3-year programme. The students are required to have finished a Secondary school before registering. Each academic year has 30 weeks of lectures and practical training. The number of weeks is the same for all technical colleges and other university programmes. The Slovenian legislation allows technical colleges to offer a programme with a total of only 750 hours of lectures and practical work altogether. After 3 academic years and after having passed all the exams, the students are required to write a graduation thesis. The thesis has theoretical background and it includes practical work: e.g., making a device for one or more patients, performing measurements in a kinesiology laboratory, such as gait analysis, measurements of isokinetics and similar. The students complete the thesis in 2 to 6 months. After graduation, they have to do 9 months of clinical practice in prosthetics and orthotics with a clinical supervisor, a prosthetist and orthotist with at least 5 years of clinical experience in prosthetics and orthotics. During the clinical practice, they have to work on a rehabilitation ward in a multidisciplinary rehabilitation team. After the 9 months, they have to pass a State Board Examination given by the Ministry of Health in order to become certified engineers and to do independent clinical work. The State Board Examination is required also from other paramedical professionals (physiotherapists, occupational therapists, nurses and others). The existing curriculum is presented in the Table 1.

Subject	Theory	Practice	Total
I. Year			
Philosophy, ethics	20	0	20
Sociology	30	20	50
Anatomy, physiology, pathology	90	30	120
Chemistry and technology of materials	120	70	190
General and special biomechanics	100	65	165
Functional anatomy and kinesiology	60	70	130
Medical psychology	15	15	30
English language	20	25	45
Total I. Year	455	295	750
II. Year			
Prosthetics	80	160	240
Orthotics	80	170	250
Pathology of locomotor system	50	0	50
Design and computer engineering	30	30	60
Physics with mathematics and electrical engineering	100	50	150
Total II. Year	340	410	750
III. Year			
Prosthetics	60	85	145
Orthotics	60	85	145
Social medicine, statistics, hygiene	90	15	105
Medical rehabilitation	30	0	30
Health education	20	20	40
Organization of P&O services	20	10	30
Health care in emergency and first aid	35	30	65
Rehabilitation engineering	30	30	60
Research and development in P&O	100	0	100
Total III. Year	475	275	750
Total all years	1270	980	2250

Table 1: The existing curriculum

In December 2003, a new law on university education was adopted in accordance with the Bologna declaration. The law allows university programmes to consist of up to 42 weeks per year and offer 40 hours of theory and practice per week. However, the University of Ljubljana is able to finance maximally up to 900 hours per year. Currently, a new programme is being prepared to comply with these rules as well as with ISPO requirements. The latest comparison with the ISPO Category-I Guideline found 300 missing hours in prosthetics and 200 missing hours in orthotics. The draft version of the new programme is presented in the Table 2. The new curriculum will be implemented with the next generation of students in the academic year 2005/06. After having passed all examinations, the students will still have to undertake a graduation thesis, 9 months of clinical practice and pass the State Board Examination given by the Ministry of Health in order to become certified engineers.

I. Year	Total	Theory	Practice
I. semester			
1. Anatomy	120	80	40
2. Physiology	50	40	10
3. Mathematics	70	40	30
4. Physics	70	40	30
5. Chemistry and technology of materials	140	70	70
II. semester			
6. Functional anatomy and kinesiology	130	60	70
7. General biomechanics	100	70	30
8. Orthopedic surgery	50	30	20
9. Traumatology	40	20	20
10. Orthopedic footwear and foot orthoses	100	40	60
11. Technical skills	30	10	20
12. Practice in technical skills	80	0	80
Total	900 + 80	500	400 + 80
2. Year			
III. semester			
1. General biomechanics	30	20	10
2. Special biomechanics	150	90	60
3. Neurology	50	30	20
4. Lower limb orthotics	120	40	80
5. Upper limb prosthetics	100	40	60
IV. semester			
6. Lower limb orthotics	175	50	125
7. Lower limb prosthetics	225	65	160
8. First aid	30	15	15
9. Ethics	20	20	0
10. Clinical practice – orthotics	160	0	160
Total	900 + 160	370	530 + 160
3. Year			
V. semester			
1. Spinal orthotics	150	50	100
2. Lower limb prosthetics	250	70	180
3. Statistics	30	15	15
4. Health legislation and organization of P&O services	20	20	0
VI. semester			
5. Upper limb orthotics	100	40	60
6. Research and development in P&O	70	70	0
7. Rehabilitation medicine	50	30	20
8. Computer engineering	50	20	30
9. Rehabilitation engineering and sitting	150	60	90
10. Psychology	30	15	15
11. Clinical practice – prosthetics	160	0	160
Total	900 + 160	390	510 + 160

Table 2: Draft version of the new curriculum

At the time of its establishment, the school was responsible for training prosthetics and orthotics students from the western part of former Yugoslavia. There were 4 students from Croatia already in the first generation. After Slovenia's separation and during the war in the Balkan's, the students were only Slovene. In the last but one generation, there was a student from Republika Srpska of BiH and at the present, there is a student from Croatia, 3 from Bosnia (1 from each ethnic group) and 1 from Macedonia.

Until now, 38 students graduated from the 2 or 2_-year programme and 34 from the 3-year programme. After graduation, some students continue to study at another faculty and some of them do not work in the field of prosthetics and orthotics.

9.2.9 Sweden

Kjell-Åke Nilsson

The School of Health Sciences, Jönköping is a branch of Jönköping University and the sole prosthetics and orthotics teaching centre for Sweden, Denmark and Iceland

The points of discussion will be the branches of Jönköping University and the awards offered, the 3-year prosthetics and orthotics course plan and the teaching/learning philosophy. The presentation will conclude with information about mode of delivery, examinations and the resources necessary for teaching.

Jönköping University consists of four branches; the Jönköping International Business School, the School of Education and Communication, the School of Engineering and the School of Health Sciences. We also have an affiliation with the Science Park that provides a starting point for spin-off enterprises from the University.

Jönköping University offers Bachelor and Master awards in all disciplines; prosthetics and orthotics, engineering, teaching, occupational therapy, nursing, social sciences and gerontology. PhDs are offered in humanities, social sciences, law and political economy.

The 3-year prosthetics and orthotics course plan is built from courses running in sequence and not in parallel. For each course block, we try to make each subsequent block build on the previous ones.

Time does not allow us to go over the course plan in great detail, but let me point out a few key elements; the Clinical Course is there to prepare the students for actual work with real patients. Among other things, it covers the correct keeping of medical records. This and other topics are important since the prosthetics/orthotics profession will probably be licensed in Sweden by next summer.

For the 3rd year, I would like to point out three things; firstly, the elective course that provides a deeper focus on for instance gait analysis or CAD/CAM work; secondly, the applied science practice, which is done at prosthetics and orthotics centres throughout Sweden which have approved supervisors who mentor the students; thirdly, our final examination where students take a written examination and assess real patients with real pathologies whilst under the scrutiny of external examiners.

Our teaching/learning philosophy is that of Problem Based Learning (PBL). For each course there is a Study Guide; a document that provides students with the learning theory; that outlines the course and provides rules for the examination and the grade levels. Our strategy for the courses is that complexity increases over time; a deep understanding of the subject is expected to follow. There is more tutoring to begin with, but as students progress, less guidance is needed for their work.

We do not apply a pure PBL perspective since, especially for practical sessions, information is not always available in readily accessible literature, and supervised hands-on experience is necessary for the profession. Whatever lectures we give still promote self-study. Our students do not come as empty vessels; they have had jobs, pay taxes and hold drivers licenses! So we encourage them to reflect upon their own existing knowledge, to build from previous experience, to seek the best available evidence and to build a synthesis of the acquired knowledge.

We want the students to identify the Key Concepts for each course. The first element is the Key-Up Lecture, which is held to promote interest in the topic, to identify key concepts in the literature and to build a base for discussions. The following theory lecture(s) are held to focus on evidence based solutions, to present relevant science and to promote discussions with and among the students.

The Key Concepts Seminar is held after approximately one week of study in the course. The students have patient cases to solve; they prepare the presentation in study groups and present the case to the

others for a general, supervised discussion. There is no grading at this seminar. It is a learning occasion where lecturers give direct feedback and encourage communication.

We have a few course tools to facilitate the work. The first is called PingPong, which is a web-based distance learning tool, a message board system that also serves as the course library. Streaming video is possible, and the software is fully interactive. Anything pertaining to the course is put on PingPong, and all students have their own e-mail and login.

The Journal Article Compendium is an ongoing task for the students. They build their own database of found journal articles. This is used in key concept seminars, where the references are cited in the discussion. The aforementioned use of patient case studies is the main course tool. The students work in study groups, they identify the assumptions they had to make to solve the case. The results are presented at the seminars; both patient case studies and the compendium are used in examinations.

Some resources are vital to the success of our teaching/learning philosophy; computers need to be available to students, and they need access to Internet, printers and copiers. Our teaching rooms have network connections so that students and lecturers can log on to the school server to show presentations saved there. The library gives access to scientific full-text databases, some 170,000 separate volumes in sciences taught at the University and 1200 scientific journals. Some 5,300 electronic journals/databases are available via the library website.

While the students can do their work anywhere, at a coffee shop or at somebody's house, we will always schedule a group room for them at a specific time when we are available for questions and clarifications. The scheduling system is on our network and provides easy access to scheduling of rooms, teachers or student groups. We also have a gait laboratory with force line visualisation on the walkway and a full 3-D movement analysis system. The laboratory is used both in research and teaching, and also holds a specially built, speed-calibrated treadmill, equipment to measure oxygen consumption, a motion X-ray laboratory and an EMG system.

In using PBL, we hope to give the students a deep learning. We believe that quality of learning produces quantity of learning but not the other way around, and make use of the SOLO taxonomy as described by Biggs and Collis (1982) in evaluating the students' case presentations.

The SOLO taxonomy provides us with a method of defining what level of deep learning the student has achieved. Are they just citing mere facts or can they connect these facts into a cohesive whole? The SOLO taxonomy ranges from unstructured, that makes use of irrelevant information, via mono-structural, multi-structural and related to the expanded context, where there is a broad level of generalisation and transfer to other contexts.

We use a seminar structure in our examinations; the patient cases are put on PingPong, the student work groups prepare, the cases are presented by the groups and discussed. The final result is handed in as a consensus report with references. Feedback is given as directly as possible; we encourage ideas based on related facts and evidence. All courses are evaluated by us and the students. Student progress is monitored, and the teaching changes according to the needs of the specific group.

9.2.10 Giessen, Germany

Professor Joerg Subk

The practice orientated education at Giessen Friedberg, University of Applied Sciences in Orthopaedic and Rehabilitation Technology is composed of natural science, engineering science, medical science and business economics

The alumni are able to solve engineering tasks in the following fields:

- healthcare industry
- orthopaedic and rehabilitation clinics
- services sector in the community health

Every candidate must satisfy the General Entrance Requirements and two conditions. The first condition is University of Applied Sciences Access Authorisation or general qualification for University entrance and the second requirement is that the applicant has completed vocational education as an orthopaedic technologist.

Ten students are admitted to the course and in the case of more than 10 applicants, the very best are chosen.

The structure of the course is shown in the following table –

STRUCTURE OF THE COURSE							
Terms of the basic study period		Terms of the advanced study period					
1	2	3	4	5	6	7	8
1. academic year		2. academic year		3. academic year		4. academic year	
UAS Gießen				BUFA Dortmund		UAS Gießen	
Basics of the natural sciences: Mathematics, physics, chemistry, computing, CAD.		Basics of the engineering sciences: Electrical engineering, electronics, computing, engineering, mechanics, materials sciences.		Expert term:	Practical experience term:	Advanced term:	Exam
In addition: Work methods, foreign languages		In addition: Basics of biomechanics and medical sciences		Biomechanics	Construction	Biomechanics	Project
				Prosthetics		Rehabilitation	
				Orthotics		Business economics	
				Rehabilitation	Patient work		Thesis

Examinations are held at:

- BUFA (Federal Academy of Orthopaedic Technology)
- Chamber of Handicraft
- University of Applied Science Gießen-Friedberg

Three degrees are offered as:

1. Dipl.-Ing (FH) Orthopaedics and Rehabilitation Technology
2. European Diploma (according to the specification of INTERBOR/ISPO)
3. Meister of the Orthopaedic Technology

It is also possible to extend the research element of the course into a PhD thesis in cooperation with the University of Gießen.

Graduates from the course work in a number of areas including managerial functions in healthcare industry, managerial functions in standardisation organisations (community health services sector, insurance companies), clinical rehabilitation, orthopaedic technical industry research and development, quality management, marketing and sales.

Teaching and learning is via the University of Applied Sciences at Gießen-Friedberg and at BUFA in Dortmund, Germany where patient work is conducted. The students undertake a number of classes in biomechanics, materials testing, metallography, computers and electronics.

An example of a research project in cooperation with BUFA is “strain measurement of the prosthesis by means of a pylon under life conditions”. Research in the biomechanics laboratory include three-dimensional video-based motion analysis systems, testing of ankle-foot devices and foot units, development of a test machine (ENISO 22675).

Further information about the course can be found at the website: <http://www.fhgiessen.de/pm/kmub>.

Details of course curriculae can be found in the following tables:

Sem. /Nr.	Code	Modul	Content	Lectures per week				ECTS
				L	E	P	Total	
1-1	MATH1	Ingenieur-Mathematik 1	Engineering Mathematics 1	4	2		6	8
1-2	PHYS1	Physik 1	Physics in Medicine 1	3	2	2	7	8
1-3	AEDV1	Angewandte EDV 1	Computing 1	3	1	2	6	6
1-4	BRUF1	Berufsqualifizierendes Training 1	Professional Training 1	1	4	2	8	8
		Summe/Total		11	8	6	27	29
2-1	MATH2	Ingenieur-Mathematik 2	Engineering Mathematics 2	4	2		6	8
2-2	PHYS2	Physik 2	Physics in Medicine 2	3	2	2	7	8
2-3	CHEM1	Einführung in die Chemie	Introduction to Chemistry	3		2	5	6
2-4	AEDV2	Angewandte EDV 2	Computing 2	2	2		4	4
2-5	BRUF2	Berufsqualifizierendes Training 2	Professional Training 2		6		6	6
		Summe/Total		12	12	4	28	31

L=lectures; E=exercises; P=practical courses

Ende erster Studienabschnitt (Grundstudium) (End of fundamental studies)

Sem. /Nr.	Code	Modul	Content	Lectures per week				ECTS
				L	E	P	Total	
3-1	ELTEC	Elektrotechnik	Electrical engineering Theoretical part: Electric charge, current, current intensity, voltage, potential, energy, power, electr. conduction, electro-chemical power sources, two poles, network analysis, periodical electr. variables, AC networks, filter, oscillating circuit, transformers, three phase AC, electr. machines, active and passive components, electr. security Practical part: Exercises with different instruments, resistance, voltage divider, measuring of current, voltage, energy, step response of RLC-circuits, frequency response, resonant circuits	4	1	1	6	6
3-2	ELMES	Elektrische Messtechnik	Electrical Measurement Theoret. part Measuring systems, systematic and dynamic errors, filtering, influence quantity, read-out and registration of results, Practical part: Measuring bridges, operational amplifier, digital signal processing, A/D –D/A converter, measuring of different physical parameters (pressure, temperature etc.) Digital signal acquisition and control of machines with LabView	2		4	6	6
3-3	HUMOR	Humanbiologie/Orthopädie	Human Biology	8		3	11	11
3-4	ECOM	Betriebswirtschaftlehre	Economy General business economics; legal form of organization, organizational shape Introduction into marketing, base of materials management, transaction and cost account, capital budgeting, staff management, Marketing	4			4	4
3-5	ABE1	Ausbilder-Eignung 1	Training of Trainers 1 in full knowledge of vocation and physiology of effort in line with the German laws (Ausbildereignungsverordnung (AEVO))	4			4	4
		Summe/Total		22	1	8	31	31

Sem. /Nr.	Code	Modul	Content	Lectures per week				ECTS
				L	E	P	Total	
4-1	BIOMES	Med.-Biolog. Messtechnik	Biomeasurement	5	2	1	8	8
4-2a	PRAEL	Praktische Elektronik	Practical Electronics	2		1	3	3
4-2b	DiSYS	Digitalelektronik/Mikroprozessortec.	Digital-Electronics /Microprocessor-Technology	3		3	6	6
4-3	MECMA	Mechanik u. Werkstoffe	Mechanics & Materials	5	1	3	9	9
4-4		Ausbilder-Eignung 2	Training of Trainers 2	2		2	4	4
		Summe/Total		17	3	10	30	30

5th & 6th term will taught at the Federal School for Orthopedic Technology in Dortmund

5-1	Orthopädie/Pathologie	Orthopedics/Pathology							
5-2	Biomechanik 1	Biomechanics 1							
5-3	Rehatechnik 1	Rehab Technology 1							
5-4	Werkstoffe in der OT	Materials in Orthopedic Technology							
5-5	Orthetik u. Prothetik	Orthotics and Prosthetics							
5-6	Messtechnik in der OT	Measurement in Prosthetics							
5-7	Wahlpflichtmodul	Elective Module							
	Summe/Total						30		30
6-1	Projektarbeiten (+Meisterstück)	Projects							
6-2	Wahlpflichtmodul	Elective Module							
	Summe/Total						30		30

For further information see curriculum BuFa

Sem. /Nr.	Code	Modul	Content	Lectures per week				ECTS
				L	Ü	P	Total	
7-1	BIOMEC	Biomechanik 2	Human gait, forces, moments in the human body, centre of gravity, introduction in kinematics, kinetics, studies of electromyography, gait analysis with video and ultrasonic equipment	4		2	6	7
7-2	REHA	Rehatechnik	Rehabilitation Technology	2		2	4	5
7-3W	FAMOE	Wahlpflichtmodul Wirtschaft (nur Schwerpunkt W)	Elective module Economy (only curriculum economy)	16			16	16
7-3aT	FAMOET	Wahlpflichtmodul Wirtschaft (nur Schwerpunkt T)	Elective module Economy (only curriculum technology)	8			8	8
7-3bT	FAMOTT	Wahlpflichtmodul Technik (nur Schwerpunkt T)	Elective module Technology (only curriculum technology)	8			8	8
7-4W	PROJE	Studienarbeit Wirtschaft (nur Schwerpunkt W)	Project Economy (only curriculum economy)			2	2	2
7-4T	PROJT	Studienarbeit Technik (nur Schwerpunkt T)	Project Techniques (only curriculum technology)			2	2	2
		Summe/Total		24		6	30	32
8-1	THESIS	Diplomarbeit	Thesis					

Ende zweiter Studienabschnitt – Completion of studies
Examination degree: Diplom-Ingenieur (Dipl.Ing. (FH))

9.2.11 France

Karine Mialon and Florence Dumez

Prosthetists and Orthotists in France have access to six educational centres in France. Two of these schools provide the equivalent of ISPO Category III teaching and only accepts students with a disability. A further two schools are public schools that provide the equivalent standard of teaching as ISPO Category II and III. One of the six schools is private and provides the equivalent of ISPO category I teaching. Finally, one public school provides equivalent teaching at ISPO category I, II and III level.

In France a professional certificate (CAP) is awarded at a similar level to that described in the ISPO category III professional profile. This award indicates that the graduate fabricates (basic tasks) devices for disabled people. He/she works either in a workshop which is part of a company or in a rehabilitation center.

A Technical Diploma (DT) at a similar level to ISPO Category II is awarded to graduates who work as a workshop manager. This type of graduate fabricates prosthetic and orthotic devices and additionally acts as the interface between the prosthetist/orthotist and technician. The working environment would be in a workshop which is part of a company or rehabilitation center.

Graduates qualifying from Lycée Polyvalent d'Alembert, Paris or Montplaisir, Valence at the level of ISPO Category I gain a Superior Technician Diploma (BTS). The professional profile of this graduate includes the following key points:

- The graduated designs, fits and/or customizes prostheses and orthoses
- He/she takes casts and rectifies them
- He/she participates as a full member of the clinic team
- He/she works in a company or in a rehabilitation center.

Students deliver prosthetic and orthotic devices for patients who come to the schools for their care. By engaging with patients and users in this way, students learn to apply their knowledge and understanding in prosthetics, orthotics, and related areas.

Students learn advanced skills for the use of different systems of computer assisted design and manufacture. They are also supported in using sophisticated research equipment and materials and have the opportunity to exchange and acquire the skills of different countries including Belgium, Germany, Canada, US, Eire, Morocco and the United Kingdom.

10. PROFESSIONAL RECOGNITION IN EUROPE

10.1 Keynote address: Professional recognition in Europe

Sandra Sexton

In 2002 a Commission Communication entitled, the '*Reform of the system of professional qualifications*' was published. The background to this initiative can be found in the Stockholm European Council request for proposals to make Europe the world's most dynamic and competitive economy by 2010. This proposal was the first attempt to modernise the whole community system for the recognition of professional qualifications.

The proposal aims to bring together 15 directives from the last 40 years with different systems of recognition. It aims to create a single legal framework which promotes greater liberalisation in the provision of services and automatic recognition of qualifications.

The Enlarged European Union and the free movement of workers in this union requires a simpler system for the recognition of professional qualifications. This will help to increase labour market flexibility and promote public services.

The reform of the system will facilitate Member State nationals to be allowed the freedom to provide services and the right of establishment. The recognition of professional qualifications will allow professionals to gain access to host member states and to enjoy the same rights as nationals in their professional capacity.

Where the qualification does not fully correspond between the Member States, migrants will be required to complete a compensatory measure:

- Aptitude test; or
- Adaptation period.

The freedom of establishment means a framework which applies when a professional enjoys the effective freedom to become established in another member state so as to conduct a professional activity. This freedom of establishment allows for three systems of recognition:

1. A general system for recognition based on mutual recognition. This system appropriate qualifications or, in the case where there is a gap in qualifications the migrant may choose from either assessment by an aptitude test or period of adaptation.
2. The automatic recognition of qualifications. This system encompasses industrial craft and commercial activities.
3. A system of automatic recognition of qualifications for specific professions which includes doctors, nurses (general care), dental practitioners, veterinary surgeons, mid-wives, pharmacists and architects.

The system recognises 5 levels of professional qualifications:

1. Attestation of competence. This is based on a short training course
 2. Certificate. This corresponds to training at secondary level of a professional nature, or general in character, supplemented by a professional course
 3. Diploma certifying successful completion of a short training course. This corresponds to training at post-secondary level and of duration of at least 1 year and less than 3 years
 4. Diploma certifying successful completion of an intermediate training course. This corresponds to a course of training at higher or university level and a duration of at least 3 years and less than 4 years
 5. Diploma certifying successful completion of a higher training course. This corresponds to training at higher education level and of a minimum duration of 4 years
- (from <http://europa.eu.int>)

The procedure for the mutual recognition of professional qualifications is as follows: the application must be submitted to a competent authority in the designation Member State. A decision should be reached within 3 months. Should this decision be appealed by the applicant it may be attested in court.

Should the application be successful for recognition of professional qualifications, then the Member State nationals shall use the title conferred on them as well as the title of the corresponding host Member State.

In the case of a profession being regulated by an association or organisation in the host member state, then Member state Nationals should become members of that organisation or association in order to use the title.

As has been seen from the survey report and the schools presentations, there is a variety of educational and professional models for professionals working in the field as clinicians in prosthetics and orthotics.

We should consider if professional regulation is beneficial to our patients in Europe. Professional regulation could help to provide a system of patient care of an agreed standard across Europe. If this were the case then freedom of movement and freedom of establishment would be more possible.

So how can we move forward and achieve professional recognition? This is an important question which will be debated this afternoon. We can look towards other professions and some of the European Union initiatives to shed some light on this situation.

As a profession we have a variety of educational levels. How are we recognised in Europe? There is no one answer to this, although we could consider other allied health professions and in comparison prosthetists/orthotists have a lower profile professionally than other with more established professions who are larger in number and perhaps have a stronger voice.

The quality of patient care may vary from country to country across the European area. Consider the following question....*if you needed a prosthesis or orthosis and had the choice...which country would you choose to visit in the European Union for Treatment?* If you have a country in mind, then perhaps this point has been made!

Do patients have the right to a minimum standard of treatment and care? Should patients expect to be involved in proper assessment, fitting, checkout and review procedures by their prosthetist/orthotist? Perhaps we all need to consider the standards by which we practice professionally.

What are the pros and cons for us as professionals to have stronger regulation of prosthetists and orthotists in the Europe Union? We cannot escape regulation – this is European legislation today. We have to consider where we want to fit into the system of recognition (1 to 5) of professional qualifications now, and in ten years time.

As professionals in our country specific situations, we may feel that your professional role as ideal or we may be striving to change and improve our profession through education. I imagine that we are all working towards the same goal, but doing this as individual schools has less of an impact that if we agree on some common elements of education.

A recent example of an initiative in moving forward with professional recognition in Europe can be seen in physiotherapy. Following the Quality Assurance Agency publication of the subject benchmark in Physiotherapy in the United Kingdom, the European division of a worldwide network for physiotherapy agreed to adopt the subject Benchmark for Europe.

A similar document has been published in prosthetics and orthotics by the QAA as part of a suite of subject benchmarks for allied health professionals and this was considered by the Education

committee of ISPO and was seen as a useful reference document. The ISPO Category-I guideline has similar content.

It may be possible for us to consider using the ISPO Category-I guideline for education and practitioner standards for the profession. I wish to explore more fully the issue of benchmarking and higher education and so will move on to focus on a publication which discusses this in relation to Europe.

The European Network for Quality Assurance in higher Education (ENQA) in 2003 published a report about benchmarking in the improvement of higher education following a workshop on the subject. This report is useful in helping us to consider the impact of measuring practice against a standard. The document gives a number of definitions for 'benchmarking' and the one chosen for illustration is from the Quality Assurance Agency: *'Benchmarking is a subject community making explicit the nature and standards of awards which carry the subject in their title, or in which the subject is included in the programme leading to the award'*.

The workshop looked towards activities in benchmarking and suggests a number of principles of good benchmarking, namely:

1. Benchmarking depends on comparisons obtained through common reference points, or criteria against which programmes are assessed
 2. Benchmarking implies a strong element of learning and a commitment to improve practices
 3. Benchmarking is ongoing and time-consuming. It is part of continuous quality improvement
- Ownership of the process is crucial.

I have already mentioned some of the work of ENQA. ENQA is described as a European Network to disseminate information, experiences, good practices and new developments in the field of quality assessment and quality assurance in higher education between interested parties.

ENQA were involved in a pilot project to investigate the quality evaluation of study programmes in three areas, namely History, Physics and Veterinary Science. You may wonder about my slide of the vet with the cat and the dog in the picture. I just wish to comment that the schools of veterinary science have trans-national quality assurance procedures in place. I entirely agree with this initiative but think that we should have perhaps been involved in such quality measures as we are involved in the teaching about the care and treatment of human subjects!

The study ranged across Europe and aimed to test a set of common criteria. These criteria in themselves made comparisons between courses possible. The conclusions of the study were that the usefulness of the criteria depended on their 'readability'. The criteria also depended on the extent to which they represented a nationally and internationally threshold, or standard.

The results showed that there were considerable differences in terms of educational cultures, traditions and regulatory systems. Whenever criteria are used for such comparisons, they should be flexible enough to allow for national contexts, legislation and developments. These themes should also be considered in relation to professional recognition linked to educational standards for prosthetics and orthotics.

In conclusion, we have the option of being content with our professional standing under current law. We also have the option of creating opportunities to change our professional standing and be recognised in a different way in the future European area.

10.2 Working Group Feedback And Discussion: Working Towards Professional Recognition In Europe

The topics addressed by the working groups were:

- a. *With consideration of the ISPO profile, do you accept the level of education described in the ISPO guidelines?*
- b. *How can we influence the European Union to accept the specified level of education and training in Prosthetics and Orthotics?*

Group 4	
Topic	Discussion
Do you accept the level of education described in the ISPO guidelines?	<ul style="list-style-type: none"> Guidelines have to be strictly defined and implemented in each country according to their laws There are countries where the guidelines can not be implemented at the moment Looking at the document as guidelines, not as rules, is necessary EU has a common need, maybe we have a common need also in the education ISPO Category-I guidelines usability The guidelines may look rigid but they are not Putting in specific models or pathways may limit usability of ISPO document If we have an accrediting body, such as ISPO, then we can have different models providing the same result It can exist in such form as it is now We shall work according to Bologna declaration There is general consensus in the workgroup that the ISPO profile is acceptable
How can we influence the European Union to accept the specified level of education and training in Prosthetics and Orthotics?	<p>Can we influence the EU?</p> <ul style="list-style-type: none"> We are a small profession, comparatively People in government bodies do not know a lot about us, unless they have a relative who needs our services Sexton mentions low interest of contacted individuals Swedish licensing work as example Work, work, work! People from professional body need to volunteer ISPO influence needs ISPO people, even non-members supporting the document Influence of profession Work on finding support groups for disabled at EU level Safety standards on prosthetics/orthotics products do not state level of education for production; need to find right EU workgroup Maybe a funded project on education in view of new EU members? This would make the work official and published. Time for ISPO Europe? Gathering ideas We need someone to work on these ideas for something to happen Contact the Chairman of the ISPO Education Committee
Summary	<p>Accept ISPO described level?</p> <ul style="list-style-type: none"> In general ISPO guideline is accepted given the suggested amendments Edit remarks for clarifications made during conference Examination objectives have to be specified Final guideline should be communicated clearly

	<p>Additional remarks...</p> <ul style="list-style-type: none"> • Category-I grade requires a certain quality level • Grade leads to recognition on EU level • What is the level meant by Category-I? • practitioner that can work independently (and in team) with a patient • Guideline is for the: <ul style="list-style-type: none"> - professional - companies - educators - government • However, the actual document should be clear for. insurance company, etc • We need a holistic document for teachers and students (educational profile) • The document gives no details on educational goals (it was not meant to)
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Group 3	
Topic	Discussion
Do you accept the level of education described in the ISPO guidelines?	<ul style="list-style-type: none"> • Yes, given that: <ul style="list-style-type: none"> - Some amendments are made - The document is revised with remarks from conference - It can be used as a tool for educational programmes
How can we influence the European Union to accept the specified level of education and training in Prosthetics and Orthotics?	<ul style="list-style-type: none"> • Do we have to? <ul style="list-style-type: none"> - there is a need for non-recognized professions to be recognized: the EU specifies in this case that professional associations should be consulted - who can we address on prosthetics and orthotics matters in the EU commission? Nobody knows and what is needed? • With respect to training and education, ISPO and INTERBOR will speak as one • It is important to know: <ul style="list-style-type: none"> - who to talk to in the EU? - which administration is responsible for this? - what information do we need? • We should be represented there with as many countries as possible • We might have to go through the EU parliament to get somewhere
General comments	<p>Reminder:</p> <ul style="list-style-type: none"> • Discussion started in 1988 in Paris..... • We have not known where to go to since • Sometimes the new EU countries offer opportunities to talk much more easily to someone from the EU parliament • What to do? • Find the official to be addressed on prosthetics/orthotics • Use ISPO guideline as a base for discussion • Find out what the plans are with allied health professions • Get to know what would be needed for prosthetists/orthotists to get the desired status • Find the department interested in dealing with prosthetics/orthotics • Determine the additional information we need • next step could be meeting with national professional associations • We think we know beforehand what will be required: it would be wise to keep that in mind • Do not submit a proposal yet, are there any relevant?

General Forum discussion

Topic	Discussion
Who was the document for?	<ul style="list-style-type: none"> • Need to include students as stakeholders
Influence the EU	<ul style="list-style-type: none"> • Need to try different ways to influence the EU; can we identify a person in each country to influence?
Advice from professional bodies in other countries	<ul style="list-style-type: none"> • Huge amount of knowledge in Sweden and UK (and others?) regarding gaining recognition, regulation and protection of title, can we tap into this?
Input from user groups	<ul style="list-style-type: none"> • Could we ask the help of user groups, in the UK we have to include them in the process
Variations of pathways into Category-I	<ul style="list-style-type: none"> • If we present different pathways, someone from outside might be puzzled • Red herring? • Degree required for Category-I across Europe? This may happen but we need to work together and not sit in different camps • How long will countries have to meet the level of education if we set one? • Up to now no-one in European Parliament/Brussels has been interested
EU applicants to work in UK	<ul style="list-style-type: none"> • In the UK the HPC can only give a 'period of adaptation' not a 'test of competence' • How does this work in other EU countries? • In Germany the law was interpreted that either an exam or a period of adaptation was possible (2 people from UK given recognition without having to sit a test) • In Belgium you have had to sit a test • Seems to be some confusion regarding EU law; what does this actually say and are all countries adhering to law

11. OUTCOMES AND RECOMMENDATIONS

General Forum discussion

Topic	Discussion
Professional Profile	<ul style="list-style-type: none"> In principle the professional profile is accepted, it should be edited following the recommendations and outcomes of the discussion and given to all participants of the conference Inclusion of a phrase commenting that the document will be reviewed <p><i>Recommendation:</i> <i>ISPO should alter the professional profile for Category-I professionals and encourage its adoption following consultation. A time limit should be put on this activity.</i></p>
Quality: measure of graduates performance rather than of the assessment process	<ul style="list-style-type: none"> Collate suggestions from different countries and use to create guidelines Use quality assurance models? Perhaps too far ahead? Project to validate a questionnaire First develop guideline and then develop a tool Gather information from Lithuania and Strathclyde to use as basis for moving forward? To be used as a tool for evaluation by individual prosthetics/orthotics programmes, not for other bodies The guidelines/tools developed in EU could be then used in the rest of the world Guideline could state that you have to do it but not how An example of a tool could be helpful Must be after graduation, and state the areas that should be looked at Should the guideline recommend that schools look at outcome measures? In some situations it is necessary to have some evidence to show others outside prosthetics/orthotics Look at document to see where it is possible to put in general guidelines Often in education, outcome measures are seen as necessary Should the guidelines also state that programmes should undertake periodic programme review? Is this included in general quality management guidelines? <p><i>Recommendation:</i> <i>ISPO should develop guidelines on graduate performance. Information on existing programmes to measure graduate performance should be to the Chairman of the ISPO Education Committee.</i></p>
Learning objectives	<p><i>Recommendation:</i> <i>ISPO should revise the learning objectives in the Category-I guidelines following the discussions in the conference. In particular they should be reorganised into core and secondary subjects and consideration should be given to the removal of some subjects. The revised guidelines should be sent out for comment.</i></p>

EU community	<ul style="list-style-type: none"> • What are the plans for AHPs (especially P&O) within the EU? • We need to know what questions the EU parliament and administration want to discuss • it is a good idea for standing committee/task force to monitor EU since the situation changes <p><i>Recommendation:</i> <i>There is a need for ISPO to become more pro active in EU on matters related to prosthetics and orthotics education by;</i></p> <ul style="list-style-type: none"> - <i>forming a group for the purpose of lobbying the EU;</i> - <i>having direct contact with Brussels administration</i> - <i>making contact with national members of the European Parliament;</i> - <i>increasing contact with user groups to gain their assistance in contacting the European Parliament;</i> - <i>contacting universities' international offices to obtain information regarding contacts in the EU; and</i> - <i>involving national associations (professional bodies, etc) and gaining their support in lobbying the European Parliament.</i>
<p>Expectations of Participants</p> <ol style="list-style-type: none"> 1. Certification programmes and accreditation 2. Framework for Bachelor and Master courses 3. Collaboration – make contacts 4. Teaching and research 5. Overview of educational models 6. Clarification of titles/names in education 7. Harmonisation of education 8. Variety of programmes 	<p>Comments</p> <ol style="list-style-type: none"> 1. Discussed at this meeting but in the future these could be discussed in more depth if necessary. Accreditation across countries may need further consideration 2. Requirement for practical abilities may cause some issues with Bachelor framework 3. Lots of contacts made 4. Lack of time to discuss teaching and research. Level of research for students was partially discussed. Perhaps this could be the topic for a further conference? 5. Different educational models were considered and we now know more about what and why there are different models in different countries 6. Internationally use Category-I, but nationally we can keep variety of titles 7. Now able to understand the differences and this will enable us to move forwards 8. Same comments as point 5. Somehow we need to harmonise them to speak to Brussels with a combined voice. Need to be guided by ISPO and this will take time, this is the beginning of future developments
Satisfaction with conference	<ul style="list-style-type: none"> • Good use of time • Everyone engaged and contributing • Better knowledge of existing programmes • Contacts made allowing exchange of information • Met goals and worked together well

12. CONFERENCE PROGRAMME

Wednesday 31 March 2004

09.15 – 09.45	Background and aims of the conference Issues to be addressed and working practices	<i>Sepp Heim</i>	
09.45 – 10.00	Overview of Reference Material	<i>Anne Henriksen</i>	
10.00 – 10.30	Keynote speaker ISPO Guidelines: Professional Profile	<i>Norman Jacobs</i>	
10.30 – 11.00	<i>Coffee Break</i>		
11.00 – 11.30	Overview survey results Part 1: Professional profiles	<i>Nerrolyn Ford</i>	
11.30 – 12.30	Country presentations Professional profiles	<i>Dirk Vermetten</i> <i>Detlef Kokegei</i> <i>Serap Alsancak</i> <i>Elaine Figgins</i>	<i>Belgium</i> <i>Germany</i> <i>Turkey</i> <i>UK</i>
12.30 – 13.30	<i>Lunch Break</i>		
13.30 – 15.00	Working groups Professional profiles	<i>Facilitators</i>	
15.00 – 15.30	<i>Coffee Break</i>		
15.30 – 16.30	Keynote speaker POEM Report	<i>Nerrolyn Ford</i>	
16.30 – 17.00	Discussion of participant expectations		
17.00	Tour of BUFA Delegates are invited to tour the teaching and learning facilities of the Bundesfachschule	<i>Stefan Bieringer</i>	
18.00	The BUFA Buffet Willkommen in Dortmund! A welcome meal in the BUFA dining room		

Thursday 1 April 2004

09.00 – 10.30	Working groups feedback and discussion Professional profiles	<i>Norman Jacobs</i>	
10.30 – 11.00	<i>Coffee Break</i>		
11.00 – 11.30	Keynote speaker European legislation and education	<i>Sandra Sexton</i>	
11.30 – 12.30	Working groups European legislation and education	<i>Facilitators</i>	
12.30 – 13.30	<i>Lunch Break</i>		
13.30 – 14.00	Learning objectives (ISPO Guideline)	<i>Anne Henriksen</i>	
14.00 – 14.30	Keynote speaker Quality in prosthetics and orthotics education	<i>Fred Holtcamp</i>	
14.30 – 15.00	Working Group Feedback and Discussion European legislation and education	<i>John Hughes</i>	
15.00 – 15.30	<i>Coffee Break</i>		
15.30 – 16.00	Working Group Feedback and Discussion European legislation and education (continued)	<i>John Hughes</i>	
16.00 – 17.00	Working groups Measuring quality in prosthetics and orthotics education	<i>Facilitators</i>	

Friday 2 April 2004

09.00 – 10.00	Working groups feedback Measuring quality in prosthetics and orthotics education	<i>Inger-Marie</i>	<i>Starholm</i>
10.00 – 10.30	Keynote speaker Pathways of education	<i>Dan Blocka</i>	
10.30 – 11.00	<i>Coffee Break</i>		
11.00 – 12.30	School presentations – educational models	<i>Sophie Hill</i> <i>Detlef Kokegei</i> <i>Karalius Mindaugo</i> <i>Fred Holtcamp</i> <i>Inger Marie Starholm</i> <i>Zbigniew Oksiutai</i>	<i>UK</i> <i>Germany</i> <i>Lithuania</i> <i>Netherlands</i> <i>Norway</i> <i>Poland</i>
12.30 – 13.30	<i>Lunch Break</i>		
13.30 – 14.30	School presentations – educational models	<i>Elaine Figgins</i> <i>Helena Burger</i> <i>Kjell-Åke Nilsson</i> <i>Joerg Subke</i> <i>Karine Maillon</i>	<i>UK</i> <i>Slovenia</i> <i>Sweden</i> <i>Germany</i> <i>France</i>
14.30 – 15.00	Overview survey results Part 2 – Educational models		
15.00 – 15.30	<i>Coffee Break</i>		
15.30 – 16.00	Keynote speaker Professional Recognition in Europe	<i>Sandra Sexton</i>	
16.00 -17.00	Working groups Professional recognition in Europe	<i>Facilitators</i>	
19.30	Dinner reception		
20.00	Conference dinner		

Saturday 3 April 2004

09.00 – 10.30	Working groups feedback and discussion Working towards professional recognition in Europe	<i>John Hughes</i>
10.30 – 11.00	<i>Coffee Break</i>	
11.00 -12.30	Outcomes and recommendations Discussion with all delegates Concluding remarks	<i>Sepp Heim</i>
12.30 – 13.30	<i>Lunch</i>	

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14. REFERENCES

ISPO (2002). Category 1 professional – prosthetist/orthotist, orthopaedic engineer, orthopaedic meister: information package. Copenhagen, Denmark. International Society for Prosthetics and Orthotics.

Ford et al (2002). Prosthetic and Orthotic Educators Meeting. Post Meeting report. Developing strategies for the future of prosthetics and orthotics university education. Jönköping, Sweden.

European Council Directive 92/51/EEC. (1992) A second general system for the recognition of professional education and training



International Society for Prosthetics and Orthotics

REPORT OF THE EUROPEAN CONFERENCE FOR EDUCATION IN PROSTHETICS AND ORTHOTICS (PART 2)

An Investigation into the Professional Profile
and Education of
Prosthetists and Orthotists in Europe

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AN INVESTIGATION INTO THE PROFESSIONAL PROFILE AND EDUCATION OF PROSTHETISTS AND ORTHOTISTS IN EUROPE

Nerrolyn Ford PhD, Jönköping University, Sweden

INTRODUCTION

There has been much discussion over the past decade regarding the future of the prosthetics and orthotics profession. Several authors have identified factors which are likely to contribute to the professions inability to meet future market demands (Nielsen, 2002; Raschke and Ford, 2002). Others call for development of “professional status” in the field (Schoenwald, 1990).

It has been suggested that the criteria for reaching professional status should include such factors as: a professional organisation, an ethical code, standards of practice, an accrediting body and licensing governing practice (Feit and Lloyd, 1990; Ritchie, 1990). Unfortunately in many countries and states these criteria have not yet been met in the field of prosthetics and orthotics. Furthermore, when formal attempts have been made to strengthen the professional status, in some instances, they have been unsuccessful (Kazanjian *et al.*, 1997).

It is essential that steps, are made to ensure longevity of the prosthetics and orthotics profession. Given the relatively small size of the field, an international strategy which combines resources and demonstrates common goals and practices is most desirable.

With the establishment of the European Union it is becoming increasingly important for prosthetists and orthotists within Europe to increase their co-operation on an international level. Requiring particular attention are the European Commissions’ directive that citizens of the European Union should have the right to provide services anywhere in Europe (Council of the European Communities, 1992) and the Bologna declaration which aims to eliminate all obstacles that stand in the way of free mobility of students between academic institutions (European Ministers of Higher Education, 1999).

In order for unifying efforts to be efficient and effective, it is necessary to first obtain a complete understanding of current practices of prosthetists and orthotists. The aim of this study was to identify similarities and differences in the clinical practices and educational models of prosthetists and orthotists across Europe. The study took the form of a questionnaire that was completed by 21 prosthetic and orthotic educators representing 18 European countries.

METHOD

A questionnaire was distributed to European prosthetic and orthotic education institutions known to the International Society of Prosthetics and Orthotics. This questionnaire was, in the main, directed to University level institutions. In countries where no such education was available the questionnaire was completed by other interested parties. Respondents were permitted to return the questionnaire by mail or to complete the questionnaire online. In total 33 questionnaires were distributed. Repeat questionnaires were distributed to those institutions who did not respond.

The questionnaire was divided into two general themes, one addressing the professional profile of clinicians practising in Europe and the other addressing the educational models of clinical prosthetists and orthotists. Questions were presented in English and reviewed for content validity by 5 clinicians representing 5 different countries.

The professional profile element of the survey was divided into 4 key areas. Eight (8) questions related to the prosthetists and orthotists involvement in patient assessment. Twelve (12) questions related to clinicians' involvement in device fabrication and provision. Seven (7) questions addressed the level of involvement of clinicians in administrative duties and 10 concerned involvement in education and research within the field. Respondents were requested to rate questions on a simple 3 point scale. For each question they were asked to indicate if a specific task listed in the questionnaire was performed by the majority of prosthetic and orthotic clinicians in their country, by some prosthetic and orthotic clinicians in their country or by no prosthetic and orthotic clinicians. In addition, 47 specific devices were listed and respondents were requested to indicate if each device could be obtained by a prosthetist or orthotist in their respective country.

The educational models section of the survey contained questions related to the level and length of education offered in the respondents' country, student and staff specific information and the general structure of curriculum.

RESULTS

Replies to the questionnaire were received from 21 institutions (64%) (Appendix 1). Appendix 2 presents the complete results obtained from the professional profile element of the survey while Appendix 3 presents results of educational models.

Professional profile

Each category investigated in the professional profile section of the survey (patient assessment, device provision, administration and education and research) will be discussed in detail below. Combined results under each of these categories are presented in Figure 1. The category that proved to generate responses that were most similar across those countries surveyed was the category "device provision". Under this category 78% of respondents indicated that the majority of clinicians in their respective country performed the specific tasks listed in the questionnaire. Also generating relatively similar results across countries was the category "education and research". Under this category 67% of respondents indicated that some clinicians in their country were involved in education and research activities. The categories of "patient assessment" and "administration" generated varied responses from survey respondents indicating that clinicians across countries differ most in their practice of these activities.

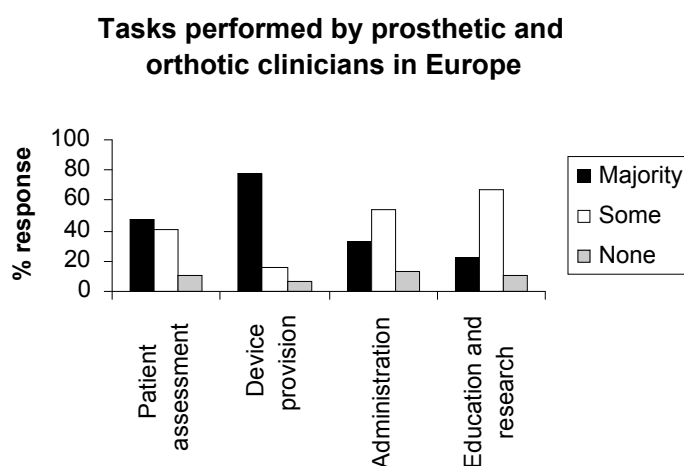


Figure 1: This graph provides an indication of the number of prosthetic and orthotic clinicians (majority, some, or none) who are responsible for performing tasks within four general areas of clinical practice.

Patient assessment

Questions related to patient assessment addressed the involvement of prosthetic and orthotic clinicians in the collection and documentation of patient medical histories, in performing specific neurological and musculoskeletal tests and in referral of patients to other health care professionals. Results indicated that the level of involvement of prosthetic and orthotic clinicians in such activities is quite varied across countries. Some 67% of respondents indicated that the majority of clinicians in their country collect a patient medical history, perform tests of muscle strength and perform observational gait analysis. Less than 50% indicated that the majority of clinicians perform basic neurological tests (44%), document the findings of physical examination (44%) and refer patients to other health care providers (33%).

Device provision

The category of device provision addressed questions related to prescription, casting, fabrication and fitting of prosthetic and orthotic devices. In general country responses were quite similar regarding these elements of clinical practice. Table 1 presents an overview of responses for tasks that respondents indicated were performed by the majority of clinicians.

Over 80% of responses	50-79% of responses	Less than 50% of responses
Take a plaster mould or digital scan of a body segment	Prescribe an orthosis or prosthesis (ie. Has autonomy to determine if a device is needed)	Actively fabricate the device
Modify/make changes to patient moulds or digital images	Supervises fabrication of a device	
Decide which materials and components will be used in fabrication of the device	Performs static and dynamic alignment when appropriate	
Fit a device to a patient	Document the results of fabrication and fitting	
Makes changes/modifications to the device when necessary	Determines when a new device is necessary	
Reviews fit of the device		

Table 1: This table presents an overview of those tasks that survey respondents indicated were performed by the majority of clinicians

Administration

Administrative duties carried out by prosthetic and orthotic clinicians proved to vary across countries included in the survey. The most consistent results were obtained for the tasks: financial management, acting as a representative on various committees and supervising staff activities with 72% of respondents indicating that at least some clinicians from their country were involved in these activities. The level of involved in strategic planning proved to generate the most varied responses. Results for this activity are depicted in Figure 2.

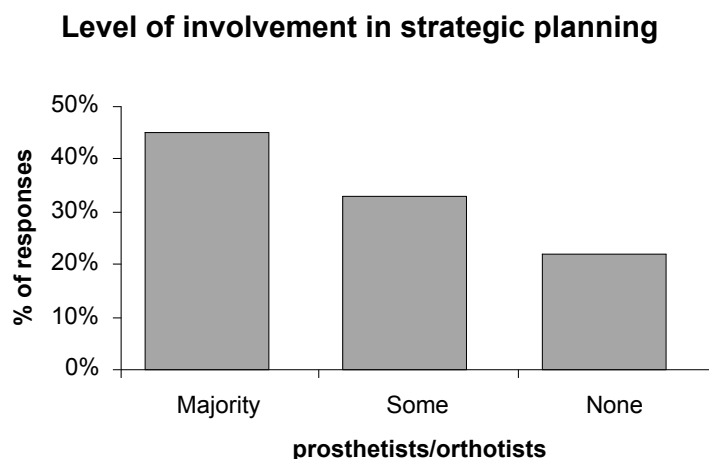


Figure 2: This graph depicts the percentage of survey responses received regarding the level of involvement of prosthetists and orthotists from different countries in strategic planning activities.

Education and research

Results regarding the level of involvement of prosthetists and orthotists in education and research indicated that some clinicians in most countries are involved in these activities. Over 80% of respondents indicated that some clinicians in their country were involved in the development of research projects and participation in formal research programmes. Clinicians' involvement in education related activities proved to be more varied than involvement in research activities. This was particularly evident in relation to training of patients to use prosthetic and orthotic devices. As depicted in figure 3 responses to this particular aspect of education was very inconsistent.

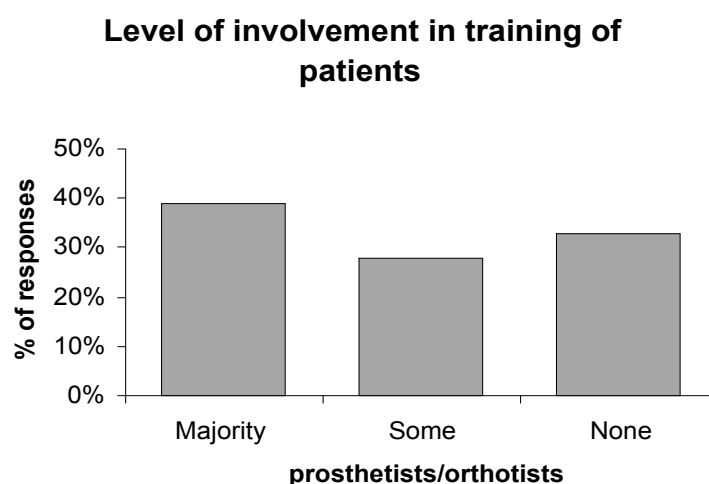


Figure 3: This graph depicts the percentage of survey responses received regarding the level of involvement of prosthetists and orthotists from different countries in training of patients to use prosthetic and orthotic devices.

Specific devices provided by clinicians

Survey respondents were requested to indicate from a list of 47 specific devices, those which could be obtained from a prosthetist or orthotist in their respective country. Table 2 presents a list of those devices that received a response of 80% or less.

Orthopaedic shoes	67%
Shoe repair	56%
Hand orthoses (Low temperature thermoplastic)	72%
Gait aids (eg crutches, walking sticks)	67%
Orthoses for burns management	78%
Fracture casts	39%
Facial /ocular prostheses	33%
Mastectomy prostheses	50%

Table 2: This table presents a list of those prosthetic and orthotic devices in which 80% or less respondents indicated could be obtained from a prosthetist/orthotists from their respective country.

EDUCATIONAL MODELS

In addition to identifying common elements and differences in clinical practice the survey also addressed issues related to the education of prosthetists and orthotists across Europe. Results indicated large variances in educational models which could potentially inhibit the convergence of prosthetics and orthotics education (see Appendix 2 for complete results).

Of the 21 survey responses received, 13 offered a Bachelor level education as the basic educational level to become a clinical prosthetist/orthotist. Three (3) schools offered a Diploma qualification, one offered a Master level education and 4 schools offered a Meister qualification.

The formal requirement for entry into prosthetics and orthotics programmes was generally reported as being high school graduation. Schools which offer a Meister qualification required that applicants to the programme complete a Diploma qualification prior to entry into the course. One (1) school required completion of a Bachelor level education as an entry prerequisite.

The duration of study for students wishing to become clinical prosthetist/orthotists also proved to be very varied across countries represented in the survey. The duration of study in weeks ranged from 34 to 160 with a mean duration of 100 weeks (SD = 40.9).

The average number of students graduating from prosthetics and orthotics programmes included in the survey was 20 with a range from 4 to 100 students.

Staff: student ratios were calculated by dividing the total number of students at an institution by the total number of part-time and full-time staff members employed. Three (3) schools were excluded from this calculation as they operate using only sessional staff and do not employ any full or part-time staff members within the programme. The average staff: student ratio of the remaining schools was calculated as 1 member of staff per 10.4 students.

The balance of curriculum was investigated by requesting survey respondents to estimate the percentage of time students at their respective institution spent studying different educational elements. These elements included prosthetics and orthotics theory, other theoretical subjects, practical clinical work and practical technical work. Average results are presented in Figure 4. As depicted in the graph, the study of theoretical subjects related to prosthetics and orthotics (e.g. anatomy, physiology, materials science) was dedicated the largest proportion of study time (38%). On average practical technical work was assigned the least amount of study time (17%).

Eighteen (18) of the 21 institutions represented in the survey required that students complete a period of practical experience within a prosthetic and orthotic facility prior to graduation. Ten (10) institutions indicated that graduates from their programme were required to complete an internship period under the supervision of an experienced clinician before being able to practice independently. Eight (8) institutions representing 6 countries indicated that graduates from their programme were required to sit a national certification exam, set by an independent body, after graduation.

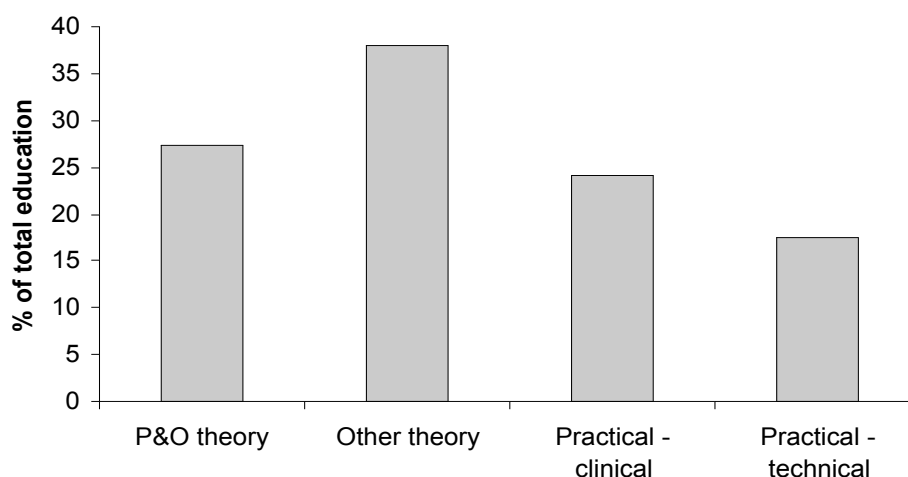


Figure 4: This graph depicts the average duration of time that students enrolled at participating institutions spend studying prosthetics and orthotics theory, other theoretical subjects, practical clinical work and practical technical work

DISCUSSION

Investigation of the professional profile of prosthetists and orthotists across Europe indicated that most similarities exist in those areas of practice that involve casting and fitting of orthopaedic devices. Of concern is the fact that some clinicians appear not to be involved in those activities that would contribute to growth and promotion of the profession. Such activities include administrative activities such as strategic planning, and education of patient groups and peers. To ensure the longevity of the prosthetics and orthotics profession across all countries in Europe it is important that those countries in which clinicians are not participating in such activities be provided with support to enable them to do so.

A further major difference was also observed in the level of clinician involvement in patient assessment activities and documentation of assessment outcomes. These tasks have been listed by ISPO as part of the professional profile of a prosthetist/orthotist (ISPO, 2002).

The most common educational model for prosthetist/orthotist in use across Europe is a 3 to 4 year Bachelor level qualification. There are however other models in use including Diploma and Masters level qualifications as well as the German “Meister” qualification. Given that the Bologna declaration calls for the free movement of students across the European Union this issue requires attention.

The general breakdown of coursework in prosthetic and orthotic programmes was relatively consistent in the distribution of time between theoretical subjects, clinical practice and technical training. This survey did not, however, address the specific competencies required of graduates from each European institution. To meet the aims of the Bologna declaration it is necessary that specific graduate competencies are investigated further.

CONCLUSION

Prosthetics and orthotics is a relatively small profession. In order for significant advancements to be made within the profession it is necessary to present a united front on an international level. This survey has highlighted differences in both the professional practice and the education of clinicians across Europe. These differences pose as barriers to the advancement of the prosthetics and orthotics profession and toward mobility of workers within a unified Europe.

REFERENCES

Barringer W, Kapp S, Dankmeyer C, Clark D, Supan T, Seabrook R (1993). The changing face of O&P education: can we make a better practitioner? *J Prosthet Orthot*, 5, 55-58.

Council of the European Communities (1992) Council directive 92/51/EEC of 18 June 1992 on a second general system for the recognition of professional education and training to supplement Directive 89/48/EEC

European Ministers of Higher Education (1999). Joint declaration of the European Ministers of Education, Bologna, Italy.

ISPO (2002). Category I professional – prosthetist/orthotist, orthopaedic engineer, orthopaedic meister; information package. Copenhagen, Denmark: International Society for Prosthetics and Orthotics,

Kazanjian A, Tingey D, Neads F (1997). Health Professions Council recommendation on the designation of prosthetics and orthotics Ministry of Health Services, Government of British Columbia.

Raschke, S, Ford N (2002). Report on key points arising from visioning process on prosthetic and orthotic education done at the British Columbia Institute of technology. *J Prosthet Orthot* 14, 23-26.

Nielsen C (2002). Issues affecting the future demand for orthotists and prosthetists: update 2002 Alexandria VA, National Commission on Orthotic and Prosthetic Education.

Schoenwald I (1990). Thoughts on the profession. *J Prosthet Orthot*, 2, 182-185.

APPENDIX 1

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APPENDIX 2

Part 1- Professional profile

The aim of this section of the survey was to develop a professional profile of prosthetic and orthotic clinicians working in Europe. Following is a compilation of survey results indicating the number of responses submitted for each question and category.

Patient assessment

	Task performed by the majority of clinicians	Task performed by some clinicians	Task not performed by a prosthetic and orthotic clinician
Collect patient medical history	67%	22%	11%
Examine joint range of motion	61%	39%	0%
Examine muscle strength	67%	22%	11%
Perform basic neurological tests (e.g. sensation testing, testing for muscle tone)	44%	50%	6%
Perform tests of joint integrity	50%	33%	11%
*No response = 1			
Observational gait analysis	67%	28%	5%
Instrumented gait analysis (kinematics and/or kinetics)	0%	83%	17%
Document findings of physical examination	44%	50%	6%
Referral of patients to other health care professionals	33%	45%	22%
Other : Level/length of assessment is limited by clinic structure			

Device provision

	Task performed by the majority of prosthetic and/or orthotic clinicians	Task performed by some prosthetic and/or orthotic clinicians	Task not performed by a prosthetic and/or orthotic clinician
Prescribe an orthosis or prosthesis (i.e. Has autonomy to determine if a device is needed)	61% *One school selected two options	17%	28%
Take a plaster mould or digital scan of a body segment	94%	6%	0%
Modify/make changes to patient moulds or digital images	94%	6%	0%
Decide which materials and components will be used in fabrication of the device	83%	17%	0%
Actively fabricate the device	44%	39%	17%
Supervises fabrication of a device	67%	33%	0%
Fit a device to a patient	94%	6%	0%
Performs static and dynamic alignment when appropriate	78%	17%	5%
Makes changes/modifications to the device when necessary	89%	11%	0%
Document the results of fabrication and fitting	78%	17%	5%
Reviews fit of the device	83%	11%	6%
Determines when a new device is necessary	67%	11%	22%

Administration

	Task performed by the majority of prosthetic and/or orthotic clinicians	Task performed by some prosthetic and/or orthotic clinicians	Task not performed by a prosthetic and/or orthotic clinician
Manage finances	17%	72%	11%
Maintain patient medical records	50%	33%	17%
Schedule appointments	39%	44%	17%
Strategic planning	45%	33%	22%
Inventory control	39%	50%	11%
Represent workplace or profession on governmental and non governmental committees	22%	72%	6%
Supervise staff activities	22%	72%	6%
Other (Please specify)	Price negotiations with Health Insurances etc. performed by some clinicians.		

Education and research

	Task performed by the majority of prosthetic and/or orthotic clinicians	Task performed by some prosthetic and/or orthotic clinicians	Task not performed by a prosthetic and/or orthotic clinician
Regular training of patients to use a prosthetic or orthotic device (e.g. Gait training)	39%	28%	33%
Provide formal education sessions to groups of patients	11%	55%	33%
Attend hospital clinics/rounds	44%	56%	0%
Provide formal education to groups of students	22%	78%	0%
Provide formal education sessions to professional colleagues	22%	78%	0%
Prepare research grant proposals	6%	72%	22%
Develop research projects	6%	83%	11%
Participate in formal research programmes	6%	94%	0%
Participate in scientific/professional meetings	50%	50%	0%
Participate in formal evaluation of activities	22%	72%	6%

Specific devices provided by clinicians

Respondents were requested to indicate if the following devices/services are obtained from prosthetic and orthotic clinicians in their country.

Device is obtained from a prosthetic and orthotic clinician	
Orthopaedic shoes	67%
Shoe modifications	83%
Shoe repair	56%
Custom moulded foot orthoses	94%
Prefabricated foot orthoses	94%
Custom moulded ankle orthoses	100%
Prefabricated ankle orthoses	100%
Custom moulded ankle foot orthoses	100%
Prefabricated ankle foot orthoses	100%
Custom moulded knee orthoses	100%

Device is obtained from a prosthetic and orthotic clinician	
Hip orthoses	100%
Custom moulded spinal orthoses	100%
Prefabricated spinal orthoses	89%
Cranial helmets	83%
Halo thoracic orthoses	94%
Hand orthoses (Low temperature thermoplastic)	72%
Hand orthoses (High temperature thermoplastic)	100%
Wrist hand orthoses (Low temperature thermoplastic)	94%
Wrist hand orthoses (High temperature thermoplastic)	100%
Elbow orthoses	100%

Shoulder orthoses	100%	Elbow disarticulation prostheses	100%
Prefabricated knee orthoses	100%	Trans-humeral prostheses	89%
Knee ankle foot orthoses	100%	Shoulder disarticulation prostheses	100%
Hip knee ankle foot orthoses	100%	Forequarter prostheses	89%
Custom moulded seating	89%	Partial foot prostheses	78%
Modular seating	83%	Symes/ankle disarticulation prostheses	94%
Custom moulded fracture orthoses	100%	Trans-tibial prostheses	100%
Gait aids (e.g. crutches, walking sticks)	67%	Knee disarticulation prostheses	100%
Orthoses for burns management	78%	Trans-femoral prostheses	100%
Fracture casts	39%	Hip disarticulation prostheses	100%
Custom moulded fracture orthoses	83%	Hemipelvectomy prostheses	100%
Partial hand prostheses	100%	Facial /ocular prostheses	33%
Wrist disarticulation prostheses	94%	Mastectomy prostheses	50%
Trans-radial prosthesis	94%	Other : Reciprocating gait orthoses Some orthoses are supplied by other allied health professionals (e.g: podiatrists, physiotherapists, occupational therapists as well as prosthetists and orthotists)	

APPENDIX 3

Part 2 - Educational programmes

INTRODUCTION

The aim of this section of the survey was to identify the different prosthetic and orthotic education models in use throughout Europe. Individual responses to this section of the survey are presented in alphabetical order.

BELGIUM - ISEK

1. **What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)**

	In prosthetics	In orthotics	In prosthetics and orthotics
Bachelor	X	X	X
Diploma	X	X	X

2. **How many places for students do you offer each year to;**

a) undergraduate students? 15

b) postgraduate students? Will begin in September 2006

3. **How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = _ year.) Please state.**

School - 3 years + Trainee 2 years

4. **How long (in weeks) is your academic year? Please state.**

5. **Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.**

Year 1 - 915 hours

d) Year 4 – Trainee (full time)

Year 2 - 825 hours

e) Year 5 – Trainee (full time)

Year 3 - 840 hours

6. **On average how many students graduate from your program each year**

10

7. **Please outline the entry requirements for your course by listing the prerequisite requirements.**

High Secondary School (18 years)

8. **Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;**

First year

- Theoretical training in Prosthetics and orthotics specific subjects

225 hours

- Theoretical training in other subjects (eg. anatomy, physiology, material science, mathematics)

480 hours

- Practical experience (with patient or simulated patient models)

60 hours

- Technical training (fabrication of devices)

150 hours

9. **Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.**

No ☐ Yes X (please indicate duration) – every year

10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**
 No ☐ Yes X (please indicate duration) 2 years for O and P
11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**
 No ☐ Yes X
12. **Please list the names of subjects that are included in your curriculum**
 Year 1 Year 2 Year 3
13. **Is there a research project, report or thesis that is required to be completed by students in your course?**
 No ☐ Yes X (Please indicate number of hours of study) –
14. **How many staff members in prosthetics and orthotics do you have at your school?**
 Full time - 1 Part time – 12 Sessional – 6
15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**
 number of individuals
 PhD 4
 BSc 5
 OTHER 9

BELGIUM - KATHOLIEKE HOGESCHOOL KEMPEN

1. What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)

	In prosthetics	In orthotics	In prosthetics and orthotics
Bachelor	<input type="checkbox"/>	<input type="checkbox"/>	X

2. How many places for students do you offer each year to;

a) undergraduate students?

In principle unlimited by law, mean admission rate 35

b) postgraduate students? 0

3. How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = $\frac{1}{2}$ year.) Please state.

3 years

4. How long (in weeks) is your academic year? Please state.

35

5. Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.

Year 1 - 35

d) Year 4

Year 2 - 35

e) Year 5

Year 3 - 35

f) Year 6

6. On average how many students graduate from your program each year

15

7. Please outline the entry requirements for your course by listing the prerequisite requirements.

By law there are no requirements, every student with a high school diploma may enter the course

8. Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;

- Theoretical training in Prosthetics and orthotics specific subjects

20%

- Theoretical training in other subjects (eg. anatomy, physiology, material science, mathematics)

35%

- Practical experience (with patient or simulated patient models)

40%

includes fabrication of devices

- Technical training (fabrication of devices)

10%

9. Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.

No ☐

Yes X (please indicate duration) - 22.5 weeks

10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**

No ☐ Yes X (please indicate duration) 2 years

11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**

No ☐ Yes X

12. **Please list the names of subjects that are included in your curriculum**

Year 1	Year 2	Year 3
Communicative skills	Communicative skills	Religion
Statistics	Pathology	Philosophy
Information technology	First aid	Communicative skills
Mechanics	Orthoses theory	Social legislation
Mechanics exercises	Orthoses practice	Deontology and ethics
Biomechanics	Drawing, CAD CAM	Company organization
Measuring techniques	Bandages, orthoses and	CAD and CADAM
Anatomy	prostheses	Electronics
Physiology	Practical orthopaedic skills	Practical Electronics
Kinesiology	Cusiness management	Pathology
General psychology	Workshop technology	Hygiene and rehabilitation
Chemistry	Electricity	Bandages, orthoses and
Materials Science	Practical electricity	prostheses
Arithmetic	Materials science	Work placement
Electricity	Biomechanics	Final report and seminars.
Bandages, orthoses and	Hygiene and rehabilitation	
prostheses	Work placement	
Practical orthopaedic skills		
Workshop technology		

13. **Is there a research project, report or thesis that is required to be completed by students in your course?**

No ☐ Yes X (Please indicate number of hours of study) –

During period of practical experience in a prosthetic and orthotic facility. Time estimates in curriculum 96 hours in reality it is more.

14. **How many staff members in prosthetics and orthotics do you have at your school?**

Full time - Part time – 6 Sessional – approximately 10

15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**

	number of individuals
PhD	4
MSc	11
BSc	4
Diploma/certificate	1

DENMARK

1. **What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)**

	In prosthetics	In orthotics	In prosthetics and orthotics
Bachelor	<input type="checkbox"/>	<input type="checkbox"/>	X
2. **How many places for students do you offer each year to;**
 - a) undergraduate students? 7
 - b) postgraduate students?
3. **How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = $\frac{1}{2}$ year.) Please state.**

6 months in Denmark, 3 years in Sweden, 2 years internship
4. **How long (in weeks) is your academic year? Please state.**

40
5. **Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.**

Year 1 - 20 ($\frac{1}{2}$ year)	d) Year 4 - 40
Year 2 - 40	e) Year 5 - 46
Year 3 - 40	f) Year 6 - 46
6. **On average how many students graduate from your program each year**

5 students
7. **Please outline the entry requirements for your course by listing the prerequisite requirements.**

Secondary School
8. **Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;**
 - Theoretical training in Prosthetics and orthotics specific subjects

90
 - Theoretical training in other subjects (eg, anatomy, physiology, material science, mathematics)

90
 - Practical experience (with patient or simulated patient models)

90
 - Technical training (fabrication of devices)

90
9. **Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.**

No <input type="checkbox"/>	Yes X (please indicate duration) 7 weeks
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10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**

No <input type="checkbox"/>	Yes X (please indicate duration) 2 years (2 x 46 weeks)
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11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**

No X	Yes <input type="checkbox"/>
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12. Please list the names of subjects that are included in your curriculum

Year 1	Year 2	Year 3
Orthopaedic Technology –	Prosthetics II	Orthopaedic Technology Work
Introductory course	Applied orthopaedic Technology	Orthopaedic Technology advanced
Anatomy and Physiology		course
Orthopaedics related to prosthetics		Podology
and orthotics		
Mechanics		
Mathematics, computer science		
Kinesiology		
Biomechanics I		
Biomechanics II		
Material Science and Strength of		
materials		
Orthotics		
Prosthetics I		
Psychology		
Scientific methods		

13. Is there a research project, report or thesis that is required to be completed by students in your course?

No ☐ Yes X (Please indicate number of hours of study) - 10 weeks

14. How many staff members in prosthetics and orthotics do you have at your school?

Full time - 0 Part time - 0 Sessional -0

15. What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?

Diploma/certificate - 5 persons

ENGLAND, UK

1. What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)

	In prosthetics	In orthotics	In prosthetics and orthotics
Bachelor	<input type="checkbox"/>	<input type="checkbox"/>	X
Other (please specify)			
Bachelor degree with honors, Since a PhD is a research degree, students can study for a PhD in P&O			

2. How many places for students do you offer each year to;

a) undergraduate students? 30 (NHS funded) + 2 overseas students (non EU)

b) postgraduate students? 0

3. How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = $\frac{1}{2}$ year.) Please state.

4 years

4. How long (in weeks) is your academic year? Please state.

32 weeks (year 4 is longer)

5. Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.

Year 1 - see above d) Year 4 -

Year 2 - e) Year 5

Year 3 - f) Year 6

6. On average how many students graduate from your program each year

20-29

7. Please outline the entry requirements for your course by listing the prerequisite requirements.

- A-level or equivalent (maths and/or physics + biology required)

8. Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;

- Theoretical training in Prosthetics and orthotics specific subjects
33% yrs 1&2, 66% year three
- Theoretical training in other subjects (eg, anatomy, physiology, material science, mathematics)
66% years 1& 2, 33% year 3
- Practical experience (with patient or simulated patient models)
Years 1-3 combined with theory, year 4 = whole year
- Technical training (fabrication of devices)
Years 1-3 combined with theory, some in year 4

9. Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.

No ☐ Yes X (please indicate duration) – 2 placements of six months each

10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**

No X* Yes ☐ (please indicate duration)

* BAPO recommend supervision for 1 year.

11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**

No X Yes ☐

Programme is validated by the health professions council, the statutory regulatory body

12. **Please list the names of subjects that are included in your curriculum**

Year 1	Year 2	Year 3	Year 4
Concepts in health care	P&O science 3	P&O science 5	Clinical placement 1
P&O science 1	P&O science 4	P&O science 6	Clinical placement 2
P&O science 2	Methods of enquiry 2	P&O science 7	
Health and Disease 1	Methods of enquiry 3	P&O science 8	
Manufacturing concepts 1	Health and Disease	Aspects of P&O 3	
Biomechanics 1	Manufacturing concepts 2	Methods of enquiry 4	
Aspects of P&O 1	Biomechanics 2		
	Biomechanics 3		
	Aspects of P&O 2		

13. **Is there a research project, report or thesis that is required to be completed by students in your course?**

No ☐ Yes X (Please indicate number of hours of study) -

14. **How many staff members in prosthetics and orthotics do you have at your school?**

Full time – 8 P&O + 2 biomechanics Part time ____ Sessional ____

15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**

number of individuals

PhD	4
MSc	2
BSc	2
Other	2 Postgraduate certificate

FINLAND

1. **What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)**

	In prosthetics	In orthotics	In prosthetics and orthotics
Masters	<input type="checkbox"/>	<input type="checkbox"/>	X
Bachelor	<input type="checkbox"/>	<input type="checkbox"/>	X
Diploma	<input type="checkbox"/>	<input type="checkbox"/>	X
Certificate	<input type="checkbox"/>	<input type="checkbox"/>	X

2. **How many places for students do you offer each year to;**

a) undergraduate students? 20 every 2nd year

b) postgraduate students? none

3. **How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = $\frac{1}{2}$ year.) Please state.**

$3\frac{1}{2}$

4. **How long (in weeks) is your academic year? Please state.**

40

5. **Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.**

Year 1 - 40

d) Year 4 - 20

Year 2 - 40

Year 3 - 40

6. **On average how many students graduate from your program each year**

16-20 every second year

7. **Please outline the entry requirements for your course by listing the prerequisite requirements.**

High School Examination
(Matriculation Examination)

8. **Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;**

- Theoretical training in Prosthetics and orthotics specific subjects

35%

- Theoretical training in other subjects (eg. anatomy, physiology, material science, mathematics)

30%

- Practical experience (with patient or simulated patient models)

10%

- Technical training (fabrication of devices)

35%

9. **Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.**

No ☐ Yes ☒ X (please indicate duration) 50 weeks

10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**

No ☒ X Yes ☐ (please indicate duration)

11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**

No ☒ X Yes ☐

12. **Please list the names of subjects that are included in your curriculum**

Year 1 – Year 3.5

Basic studies of Prosthetics and Orthotics

Language studies

Identification and assessment of locomotion and functional ability

Influence of individual and environmental, support and create opportunities of functional ability

Health obstacles and influential factors of functional ability

Material and workshop technology

Technical aids for support of functional ability of client

Expertise in prosthetics and orthotics

Optional professional studies

Practical training in working life

Practical training; optional professional studies

Final thesis

13. **Is there a research project, report or thesis that is required to be completed by students in your course?**

No ☐ Yes ☒ X (Please indicate number of hours of study) - 400

14. **How many staff members in prosthetics and orthotics do you have at your school?**

Full time - 2 Part time – 1-2 Sessional -1

15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**

number of individuals

MSc 1

BSc 2-3

FRANCE

1. **What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)**

	In prosthetics	In orthotics	In prosthetics and orthotics
Meister	X	X	X
Bachelor	X	X	X
Certificate	X	X	X

2. **How many places for students do you offer each year to;**

a) undergraduate students? 30

b) postgraduate students? 24

3. **How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = _ year.) Please state.**

3 years

4. **How long (in weeks) is your academic year? Please state.**

36 weeks

5. **Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.**

Year 1 - 36 weeks

Year 2 - 36 weeks

Year 3 - 32 weeks

6. **On average how many students graduate from your program each year**

78%

7. **Please outline the entry requirements for your course by listing the prerequisite requirements.**

Scientific bac and an interview

8. **Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;**

- Theoretical training in Prosthetics and orthotics specific subjects

50%

- Theoretical training in other subjects (eg, anatomy, physiology, material science, mathematics)

25%

- Practical experience (with patient or simulated patient models)

25%

- Technical training (fabrication of devices)

25%

9. **Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.**

No ☐

Yes X (please indicate duration) 24 weeks/3 years

10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**

No X Yes ☐ (please indicate duration)

11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**

No X Yes ☐

12. **Please list the names of subjects that are included in your curriculum**

Year 1	Year 2	Year 3
Mathematics	Mathematics	Mathematics
Sciences	Sciences	Sciences
French	French	French
1 language compulsory	1 language compulsory	1 language compulsory
Laws	Laws	Laws
Accountancy	Accountancy	Accountancy
Practice	Practice	Practice
Technology	Technology	Technology
Material science	Material science	Material science
Anatomy	Pathology	Pathology
Training periods	Training periods	Training periods

13. **Is there a research project, report or thesis that is required to be completed by students in your course?**

No ☐ Yes X (Please indicate number of hours of study) -

14. **How many staff members in prosthetics and orthotics do you have at your school?**

Full time - 8 Part time - 0 Sessional -20

15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**

number of individuals

MSc	1
Meister	7

GERMANY (DORTMUND)

1. **What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)**

	In prosthetics	In orthotics	In prosthetics and orthotics
Meister	<input type="checkbox"/>	<input type="checkbox"/>	X
Diploma	<input type="checkbox"/>	<input type="checkbox"/>	X
Certificate	<input type="checkbox"/>	<input type="checkbox"/>	X

Other (please specify)

BUFA is preparing students for the national Meister Diploma, the examinations are carried out by an external examination committee.

2. **How many places for students do you offer each year to;**

a) undergraduate students? 32

b) postgraduate students? 0

3. **How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = _ year.) Please state.**

14 months

4. **How long (in weeks) is your academic year? Please state.**

46

5. **Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.**

Year 1 -

d) Year 4 -

Year 2 -

e) Year 5 -

Year 3 -

f) Year 6 -

6. **On average how many students graduate from your program each year**

28

7. **Please outline the entry requirements for your course by listing the prerequisite requirements.**

3,5 years apprenticeship, passing final national examination (Orthopaedic Technologist)

2,0 years clinical experience as Orthopaedic Technologist

Passing BUFA Entry-Examination

8. **Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;**

- Theoretical training in Prosthetics and orthotics specific subjects

50

- Theoretical training in other subjects (eg. anatomy, physiology, material science, mathematics)

20

- Practical experience (with patient or simulated patient models)

20

- Technical training (fabrication of devices)

10

9. **Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.**

No ☐ Yes ☒ (please indicate duration) 2 years

10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**

No ☒ Yes ☐ (please indicate duration)

11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**

No ☐ Yes ☒

12. **Please list the names of subjects that are included in your curriculum**

Months 1-14

Biology/Physiology	Mach-/Tools-Technology
Anatomy	Administration
Pathology/Orthop.	Management
Physics	Communication
Chemistry	
Mathematics/Statistics	Clinicals:
Materials Technology	Orthotics
	Prosthetics
	Rehabilitation Technology

13. **Is there a research project, report or thesis that is required to be completed by students in your course?**

No ☐ Yes ☒ (Please indicate number of hours of study) – 20-40 hours

14. **How many staff members in prosthetics and orthotics do you have at your school?**

Full time - 8 Part time - 6 Sessional -200 (30 during the course)

15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**

number of individuals

PhD	6
Meister	8

GERMANY (HEIDELBERG)

1. What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)

	In prosthetics	In orthotics	In prosthetics and orthotics
Meister	X	X	X

2. How many places for students do you offer each year to;

a) undergraduate students?

b) postgraduate students? 0

3. How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = $\frac{1}{2}$ year.) Please state.

1,5 years

4. How long (in weeks) is your academic year? Please state.

40

5. Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.

Year 1 - 40

Year 2 - 20

6. On average how many students graduate from your program each year

15 every two years. One course runs 1,5 years, the next course starts after finishing the past course

7. Please outline the entry requirements for your course by listing the prerequisite requirements.

Basic diploma (Gesellenprüfung)

8. Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;

- Theoretical training in Prosthetics and orthotics specific subjects

20

- Theoretical training in other subjects (eg, anatomy, physiology, material science, mathematics)

38

- Practical experience (with patient or simulated patient models)

42% together with "technical training" (fabrication of devices)

- Technical training (fabrication of devices)

See above

9. Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.

No ☐

Yes X (please indicate duration) 3 years

10. After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?

No X

Yes ☐ (please indicate duration)

11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**

No ☐ Yes ☒

12. **Please list the names of subjects that are included in your curriculum**

Year 1	Year 2
Anatomy	Anatomy
Physiology	Physiology
Pathology	Pathology
Orthopaedics	Orthopaedics
Biomechanics	Biomechanics
Practical experience	Practical experience
Technical training	Technical training
Material science	Material science
Mathematics	Mathematics
Economy	Economy

13. **Is there a research project, report or thesis that is required to be completed by students in your course?**

No ☒ Yes ☐ (Please indicate number of hours of study) hours

14. **How many staff members in prosthetics and orthotics do you have at your school?**

Full time - Part time - Sessional - 24

15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**

number of individuals

PhD	7 part time
Meister	12 part time
Diploma/certificate	5 part time

GERMANY (MUNICH)

1. **What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)**

	In prosthetics	In orthotics	In prosthetics and orthotics
Meister	<input type="checkbox"/>	<input type="checkbox"/>	X
Certificate	<input type="checkbox"/>	<input type="checkbox"/>	X (Cat II)

2. **How many places for students do you offer each year to;**

a) undergraduate students? 80

b) postgraduate students? 24

3. **How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = _ year.) Please state.**

3,5 years

4. **How long (in weeks) is your academic year? Please state.**

11

5. **Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.**

Year 1 - 11 d) Year 4 - 3 (Exam as Cat II PO)

Year 2 - 12 e) Year 5 - 38 for Meister only

Year 3 - 11

6. **On average how many students graduate from your program each year**

75 Cat II, 10 Meister

7. **Please outline the entry requirements for your course by listing the prerequisite requirements.**

Requirements for Cat II:
Examination of primary school

Requirements for Meister:
Examination of Cat II PO + 2 years practice work,

8. **Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;**

- Theoretical training in Prosthetics and orthotics specific subjects

Cat II 10% Meister: 10%

- Theoretical training in other subjects (eg. anatomy, physiology, material science, mathematics)

Cat II 40% Meister: 30%

- Practical experience (with patient or simulated patient models)

Cat II 5% Meister: 10%

- Technical training (fabrication of devices)

Cat II 15% Meister: 15%

9. **Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.**

No ☐

Yes X (please indicate duration)

10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**
- No ☐ Yes X (please indicate duration) - 2 years, then absolve the Meisterschule (1 year)
11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**
- No ☐ Yes X
12. **Please list the names of subjects that are included in your curriculum**
- | Year 1 | Year 2 | Year 3 | Year 4 |
|--------|--------|--------|--------|
| | | | |
13. **Is there a research project, report or thesis that is required to be completed by students in your course?**
- No ☐ Yes X (Please indicate number of hours of study) _____
14. **How many staff members in prosthetics and orthotics do you have at your school?**
- Full time 4 Part time 5 Sessional 17
15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**
- | | number of individuals |
|---------|-----------------------|
| PhD | 2 |
| MSc | 6 |
| Meister | 14 |
| Other | 4 |

LATVIA – RIGA STRADINS UNIVERSITY ACADEMIC SCHOOL OF P/O

1. **What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)**

	In prosthetics	In orthotics	In prosthetics and orthotics
Bachelor	<input type="checkbox"/>	<input type="checkbox"/>	x
Diploma	<input type="checkbox"/>	<input type="checkbox"/>	x
Certificate	<input type="checkbox"/>	<input type="checkbox"/>	x

2. **How many places for students do you offer each year to;**

a) undergraduate students? 5-6

b) postgraduate students?

3. **How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = $\frac{1}{2}$ year.) Please state.**

3 years

4. **How long (in weeks) is your academic year? Please state.**

40 weeks

5. **Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.**

Year 1 - 40

d) Year 4 - 40

Year 2 - 40

Year 3 - 40

6. **On average how many students graduate from your program each year**

4

7. **Please outline the entry requirements for your course by listing the prerequisite requirements.**

8. **Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;**

- Theoretical training in Prosthetics and orthotics specific subjects

34%

- Theoretical training in other subjects (eg, anatomy, physiology, material science, mathematics)

47%

- Practical experience (with patient or simulated patient models)

19%

- Technical training (fabrication of devices)

20%

9. **Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.**

No ☒ Yes ☐

10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**
- No ☐ Yes X (please indicate duration) 3 years
11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**
- No ☐ Yes X
12. **Please list the names of subjects that are included in your curriculum**
- | Year 1 | Year 2 | Year 3 | Year 4 |
|--------|--------|--------|--------|
| | | | |
13. **Is there a research project, report or thesis that is required to be completed by students in your course?**
- No ☐ Yes X (Please indicate number of hours of study) 2hours
14. **How many staff members in prosthetics and orthotics do you have at your school?**
- Full time - 2 Part time – 4 Sessional - 7
15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**
- | | number of individuals |
|---------------------|-----------------------|
| PhD | 1 |
| BSc | 2 |
| Diploma/certificate | 6 |
| Other | 4 |

LATVIA - RIGA TECHNICAL UNIVERSITY

1. **What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)**

	In prosthetics	In orthotics	In prosthetics and orthotics
PhD	<input type="checkbox"/>	<input type="checkbox"/>	x
Masters	<input type="checkbox"/>	<input type="checkbox"/>	x
Meister	<input type="checkbox"/>	<input type="checkbox"/>	x
Certificate	<input type="checkbox"/>	<input type="checkbox"/>	x
Other (please specify)			

and the engineer in prosthetics and orthotics

2. **How many places for students do you offer each year to;**

a) undergraduate students? Not limited - average 10 students

b) postgraduate students? Not limited

3. **How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = _ year.) Please state.**

1.5 years

4. **How long (in weeks) is your academic year? Please state.**

40 weeks

5. **Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.**

Year 1 - min 16

d) Year 4

Year 2 - min 6

e) Year 5

Year 3 - min 6

f) Year 6

6. **On average how many students graduate from your program each year**

5

7. **Please outline the entry requirements for your course by listing the prerequisite requirements.**

first level after school.

1 level - prosthetics technician and ortopedic technician

2 level - ingineer

3 level - masters

4 level - doktor philisothy

all 10 (ten years)

8. **Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;**

- Theoretical training in Prosthetics and orthotics specific subjects

26%

- Theoretical training in other subjects (eg. anatomy, physiology, material science, mathematics)

64%

- Practical experience (with patient or simulated patient models)

10%

- Technical training (fabrication of devices)

0%

9. **Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.**

No ☐ Yes X (please indicate duration) – 0.5 year

10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**

No ☐ Yes X (please indicate duration) 2 years

11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**

No X Yes ☐

12. **Please list the names of subjects that are included in your curriculum**

Year 1	Year 2	Year 3	Year 4
1. Anatomy	1. Medical equipment and tools	1. Mathematics	1. Parts of machinery
2. Bionics	2. Management of clinic	2. Physics	2. Anthropomorphic robotics to the practical engineers
3. Prostheses ordering systems	3. Computer science (basic course)	3. Descriptive geometry and engineering graphics	3. Mechanics of materials
4. Technology of a prosthesis	4. Relation with the patients and business partners	4. Mechanics	4. Models of social development
5. Introducing in an economic theory	5. Methods of after treatment post-trauma and prosthetics	5. Civil defence	5. Labour safety
6. Labour safety principles	6. Languages (English or German)	6. The computer-controlled designing of prostheses and orthoses	6. General chemistry
7. Human biomechanics	7. Prosthetics	7. Overall sociology	7. Practical activity
8. Pathology of human locomotion	8. Law principles	8. Sociology of control	8. Engineering project
Human biomechanics	9. Practice	9. Theoretical mechanics	
	10. Qualifying work	10. Strength of materials	
		11. Technology and engineering of designing	
		12. Application of computers in engineering	

13. **Is there a research project, report or thesis that is required to be completed by students in your course?**

No ☐ Yes X (Please indicate number of hours of study) 240hours

14. **How many staff members in prosthetics and orthotics do you have at your school?**

Full time - 32 Part time – 0 Sessional - 5

15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**

number of individuals

PhD	27
MSc	7
Meister	3

LITHUANIA

1. **What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)**

	In prosthetics	In orthotics	In prosthetics and orthotics
Bachelor	<input type="checkbox"/>	<input type="checkbox"/>	X
Diploma	<input type="checkbox"/>	<input type="checkbox"/>	X
Certificate	<input type="checkbox"/>	<input type="checkbox"/>	X

2. **How many places for students do you offer each year to;**

a) undergraduate students? 25

b) postgraduate students? 25

3. **How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = _ year.) Please state.**

3 years

4. **How long (in weeks) is your academic year? Please state.**

46

5. **Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.**

Year 1 - 46

d) Year 4

Year 2 - 46

e) Year 5

Year 3 - 46

f) Year 6

6. **On average how many students graduate from your program each year**

45

7. **Please outline the entry requirements for your course by listing the prerequisite requirements.**

- First level - basic 10 class education
- Fourth level - preference given to first level students
- Fifth level - finished fourth level with one to two years practical skills and employer review, has to take special test.

8. **Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;**

- Theoretical training in Prosthetics and orthotics specific subjects

49%

- Theoretical training in other subjects (eg. anatomy, physiology, material science, mathematics)

13%

- Practical experience (with patient or simulated patient models)

12%

- Technical training (fabrication of devices)

37%

9. **Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.**

No ☐

Yes X (please indicate duration) _____

10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**
 No ☐ Yes X (please indicate duration) _____
11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**
 No ☐ Yes X
12. **Please list the names of subjects that are included in your curriculum**
- | Year 1 | Year 2 | Year 3 |
|-----------------------------------|-----------------------------------|----------------------------------|
| Philosophy, | History of culture, | Professional management, foreign |
| sociology, | foreign language, international | language, |
| foreign language, mathematics, | projects and programs, | computer technology, |
| computer technology, | computer technology, pathology, | rehabilitation, |
| anatomy and physiology, | biomechanics, | professional ethics, philosophy, |
| machinery, | professional philosophy, business | business economy, production |
| technology and materials science, | economics, practice of materials | technology, outreach planning |
| mechanics, | science, | specialization, |
| polymer chemistry, | production technology | prosthetic, |
| drawing | | orthotic technology |
| practice of materials science, | | |
| production technology | | |
13. **Is there a research project, report or thesis that is required to be completed by students in your course?**
 No ☐ Yes X (Please indicate number of hours of study) - 320
14. **How many staff members in prosthetics and orthotics do you have at your school?**
 Full time - 8 Part time – 8 Sessional -5
15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**
- | | number of individuals |
|---------|-----------------------|
| PhD | 4 |
| MSc | 12 |
| Meister | 5 |

NETHERLANDS – FONTYS UNIVERSITY

1. **What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)**

In prosthetics

In orthotics

In prosthetics and
orthotics

Bachelor

☐
☐

x

2. **How many places for students do you offer each year to;**

a) undergraduate students? Approximately 16-20, it is not limited by law, 60-70% will graduate. (this is an estimation, due to the fact that the Dutch curriculum only exists now for 3 years.

b) postgraduate students? N.A

3. **How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = _ year.) Please state.**

4 years

4. **How long (in weeks) is your academic year? Please state.**

40

5. **Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.**

Year 1 - 40

d) Year 4 - 40

Year 2 - 40

Year 3 - 40

6. **On average how many students graduate from your program each year**

see question 2

7. **Please outline the entry requirements for your course by listing the prerequisite requirements.**

Each student must have a form of secondary education such as higher general secondary generation, intermediate secondary school or pre-university education

8. **Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;**

- Theoretical training in Prosthetics and orthotics specific subjects

25-30%

- Theoretical training in other subjects (eg, anatomy, physiology, material science, mathematics)

30-55%

- Practical experience (with patient or simulated patient models)

40% (as well as in the internal program as in practical / clinical periods while in clinics and companies)

- Technical training (fabrication of devices)

15% (only in the university)

9. **Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.**

No ☐

Yes X (please indicate duration) – 28 weeks

10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**

No ☒ X

Yes ☐ (please indicate duration) _____

11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**

No ☒ X

Yes

☐

12. **Please list the names of subjects that are included in your curriculum**

Year 1	Year 2	Year 3	Year 4
Competence development	Communication skills	Communication skills	Communication skills
Mathematics	Data processing	O/P theory	Social studies
Anatomy	Chemistry	O/P practice	Law
Physiology	Material science	Drawing techniques	Ethics
Electronics	Mechanics	Pathology	Business adm.
Material science	Biomechanics	Hygiene	Orthopaedic technology
Mechanics	Measurement	Rehabilitation	Final project
Production techniques	Anatomy	Production techniques	
General orthopedics	Physiology	Electronics	
Construction/design	Gait analysis	Business adm.	
podiatry	Psychology	Material science	
	Production techniques	Internship /practice	
	Material science		
	Orthopedic technology		
	Math.		
	Electronics		

13. **Is there a research project, report or thesis that is required to be completed by students in your course?**

No ☐

Yes ☒ X (Please indicate number of hours of study) 800

14. **How many staff members in prosthetics and orthotics do you have at your school?**

Full time - 0

Part time – 8

Sessional -0

15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**

number of individuals

	Fontys	KHK
PhD	1	(4)
MSc	4	(11)
BSc	2	(2)

Note:

The Dutch curriculum at the Fontys University in Eindhoven, the Netherlands, is to be seen in combination with the curriculum offered at the Catholic University Kempen (KHK) in Belgium. It is with this institute that there is a collaboration within the P and O curriculum.

NETHERLANDS (SVGB)

1. What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)

	In prosthetics	In orthotics	In prosthetics and orthotics
Diploma	<input type="checkbox"/>	<input type="checkbox"/>	X
Certificate	<input type="checkbox"/>	<input type="checkbox"/>	X

2. How many places for students do you offer each year to;

a) undergraduate students? 125

b) postgraduate students? 0

3. How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = $\frac{1}{2}$ year.) Please state.

4 years

4. How long (in weeks) is your academic year? Please state.

40

5. Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.

Year 1 - 40

d) Year 4 - 40

Year 2 - 40

e) Year 5

Year 3 - 40

f) Year 6

6. On average how many students graduate from your program each year

100

7. Please outline the entry requirements for your course by listing the prerequisite requirements.

umbo - t

8. Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;

- Theoretical training in Prosthetics and orthotics specific subjects

10%

- Theoretical training in other subjects (eg. anatomy, physiology, material science, mathematics)

10%

- Practical experience (with patient or simulated patient models)

66%

- Technical training (fabrication of devices)

14%

9. Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.

No ☐

Yes X (please indicate duration) – 4 years, 4 days per week

10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**

No ☒ Yes ☐ (please indicate duration) _____

11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**

No ☐ Yes ☒

12. **Please list the names of subjects that are included in your curriculum**

Year 1	Year 2	Year 3	Year 4
Anatomy	See year 1	See year 1	See year 1
Pathology			
Material science		communication	
Mathematics			
Orthotics			
Prosthetics			
ICT			

13. **Is there a research project, report or thesis that is required to be completed by students in your course?**

No ☒ Yes ☐ (Please indicate number of hours of study)

14. **How many staff members in prosthetics and orthotics do you have at your school?**

Full time - 6 Part time – 8 Sessional -5

15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**

number of individuals

MSc	3
BSc	4
Diploma/certificate	7

NORWAY

1. **What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)**

	In prosthetics	In orthotics	In prosthetics and orthotics
Bachelor	<input type="checkbox"/>	<input type="checkbox"/>	X
Other (please specify)			
	Orthopaedic footwear		

2. **How many places for students do you offer each year to;**

a) undergraduate students? 12 every 3rd year

b) postgraduate students? none

3. **How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = _ year.) Please state.**

3 years

4. **How long (in weeks) is your academic year? Please state.**

40

5. **Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.**

Year 1 - 40

Year 2 - 40

Year 3 - 40

6. **On average how many students graduate from your program each year**

4

7. **Please outline the entry requirements for your course by listing the prerequisite requirements.**

General study competence from Norwegian upper secondary school for entering the university college and the minimum requirements specified at any given time by the ministry of education and research in their regulations regarding special entrance requirements special requirements for the P&O programme = mathematics (3MX, 3MY) and Physics (2FY) from high school.

8. **Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;**

- Theoretical training in Prosthetics and orthotics specific subjects

18%

- Theoretical training in other subjects (eg. anatomy, physiology, material science, mathematics)

45%

- Practical experience (with patient or simulated patient models)

18%

- Technical training (fabrication of devices)

19%

9. **Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.**

No X

Yes ☐ (please indicate duration)

10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**

No ☐ Yes X (please indicate duration) - 2 years

11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**

No X Yes ☐

12. **Please list the names of subjects that are included in your curriculum**

Year 1	Year 2	Year 3	Year 4
P&O module 1 (care skills and basic P&O science)	P&O module 3 (Appliances for the foot)	P&O module 7 (prosthetics III)	Year 4 and 5 – Internship.
P&O module 2: (Prosthetics 1)	P&O module 4 (orthotics I)	P&O module 8 (orthotics II)	
Anatomy	P&O module 5 (prosthetics II)	P&O module 9 (orthotics III)	
Physiology	P&O module 6 (Upper limb P&O and grip devices)	P&O module 10 (In depth theses)	
Pathology	Biomechanics	Rehabilitation/habilitation	
Mechanics	Pathology	Statistics and scientific methods	
Biomechanics	Mechanics of materials	Production and quality technology	
Mechanics of materials	VEKS*	Computer technology and P&O	
VEKS*			

*VEKS: Students from all the health science programmes work in PBL – groups with sociological and humanistic subjects 1) theory of science and research 1) ethics 3) communication and co-operation

13. **Is there a research project, report or thesis that is required to be completed by students in your course?**

No ☐ Yes X (Please indicate number of hours of study) - 450

14. **How many staff members in prosthetics and orthotics do you have at your school?**

Full time - 2 Part time – 2 Sessional – approximately 10

15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**

number of individuals

MSc	1
BSc	2 with postgraduate courses in educational science
Other	1 technician

POLAND

1. **What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)**

	In prosthetics	In orthotics	In prosthetics and orthotics
Masters	<input type="checkbox"/>	<input type="checkbox"/>	x
2. **How many places for students do you offer each year to;**
 - a) undergraduate students? 30-35
 - b) postgraduate students? 30-35
3. **How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = _ year.) Please state.**

3 years
4. **How long (in weeks) is your academic year? Please state.**

30 weeks
5. **Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.**

Year 1	d) Year 4 - 30
Year 2	e) Year 5 - 30
Year 3 - 30	
6. **On average how many students graduate from your program each year**

30-35
7. **Please outline the entry requirements for your course by listing the prerequisite requirements.**

Materials science, mechanics, mathematics, physics, strength of materials, machine design, CAD/CAM methods
8. **Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;**
 - Theoretical training in Prosthetics and orthotics specific subjects
25%
 - Theoretical training in other subjects (eg, anatomy, physiology, material science, mathematics)
55%
 - Practical experience (with patient or simulated patient models)
5%
 - Technical training (fabrication of devices)
15%
9. **Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.**

No ☐ Yes X (please indicate duration) – 4 weeks
10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**

No X Yes ☐ (please indicate duration) _____
11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**

No X Yes ☐

12. **Please list the names of subjects that are included in your curriculum**

Year 3	Year 4	Year 5
Anatomy and Physiology, Orthopedics and Traumatology Biophysics, Artificial organs, Anthropometry, Rehabilitation engineering	Biomaterials, Biomechanics, Design of prosthetic and orthotic devices, Orthotic and Prosthetic (technician training)	Technology in medicine, Computational methods in bioengineering, Organization and management in the health care

13. **Is there a research project, report or thesis that is required to be completed by students in your course?**

No ☐

Yes X (Please indicate number of hours of study) :

60 hours

14. **How many staff members in prosthetics and orthotics do you have at your school?**

Full time – 8

Part time – 1

Sessional – 4

15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**

number of individuals

PhD	6
MSc	1
Meister	2

SCOTLAND, UK

1. What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)

	In prosthetics	In orthotics	In prosthetics and orthotics
PhD	X	X	<input type="checkbox"/>
Masters	X	X	<input type="checkbox"/>
Bachelor	<input type="checkbox"/>	<input type="checkbox"/>	X
Other (please specify)			
Masters by distance learning in rehabilitation studies.			
PhD and Masters do not offer a license to practice – only bachelors with honours allows this.			

2. How many places for students do you offer each year to;

a) undergraduate students? 28

b) postgraduate students?

3. How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = _ year.) Please state.

4 years

4. How long (in weeks) is your academic year? Please state.

See below

5. Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.

Year 1 - 40

d) Year 4 - 46

Year 2 - 40

Year 3 - 40

6. On average how many students graduate from your program each year

22

7. Please outline the entry requirements for your course by listing the prerequisite requirements.

- Scottish higher examinations at level B including mathematics and two other science subjects (physics and biology preferred)
- Or
- 3 English 'A' levels at level C including mathematics and one of the other science subjects.
- Or
- Wider access courses as applicable for mature applicants
- Or
- Equivalent

8. Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;

- Theoretical training in Prosthetics and orthotics specific subjects
10%
- Theoretical training in other subjects (eg, anatomy, physiology, material science, mathematics)
27.5%
- Practical experience (with patient or simulated patient models)
48%
- Technical training (fabrication of devices)
14.5%

9. **Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.**

No ☐ Yes ☒ (please indicate duration) - one year

10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**

No ☒ Yes ☐ (please indicate duration)

* recommended that graduates have mentoring for the first two years.

11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**

No ☒ Yes ☐

12. **Please list the names of subjects that are included in your curriculum**

Year 1	Year 2	Year 3	Year 4
Mathematics and Statistics	Computer science	Materials technology	Prosthetic clinical practice
Electrotechnology	(changing to an Elective in 2004)	Professional development studies	Orthotic clinical practice
Graphical communication	Professional development studies	Mechanics and biomechanics	
Professional development studies (changing to Interprofessional Learning for Health and Social Care in 2004)	Mechanics and biomechanics	Life sciences	
Mechanics and biomechanics	Life sciences	Prosthetic and orthotic science	
Life science	Prosthetic and orthotic science		
Prosthetic and orthotic science			

13. **Is there a research project, report or thesis that is required to be completed by students in your course?**

No ☐ Yes ☒ (Please indicate number of hours of study) - 100

14. **How many staff members in prosthetics and orthotics do you have at your school?**

Full time – 12 P&O + 4 bioengineers Part time ____ Sessional ____

15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**

number of individuals

PhD	3 (including 1 P&O)
MSc	2
BSc	6 (All P&O)
Diploma/certificate	3 (All P&O)
Other	2 (All P&O)

SLOVENIA

1. What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)

	In prosthetics	In orthotics	In prosthetics and orthotics
Diploma	<input type="checkbox"/>	<input type="checkbox"/>	X
Certificate	<input type="checkbox"/>	<input type="checkbox"/>	X

2. How many places for students do you offer each year to;

a) undergraduate students? = 30 every 3rd year

b) postgraduate students? 0

3. How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = $\frac{1}{2}$ year.) Please state.

3 years + diploma thesis + 9 month of internship

4. How long (in weeks) is your academic year? Please state.

30 weeks

5. Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.

Year 1 - 30

d) Year 4 - 36

Year 2 - 30

e) Year 5

Year 3 - 30

f) Year 6

6. On average how many students graduate from your program each year

7

7. Please outline the entry requirements for your course by listing the prerequisite requirements.

Finished secondary school (12 years).

8. Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;

- Theoretical training in Prosthetics and orthotics specific subjects

40%

- Theoretical training in other subjects (eg. anatomy, physiology, material science, mathematics)

60%

- Practical experience (with patient or simulated patient models)

55%

- Technical training (fabrication of devices)

10%

9. Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.

No X

Yes ☐ (please indicate duration)

10. After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?

No ☐

Yes X (please indicate duration) – 9 months

- No Yes X

- | Year 1 | Year 2 | Year 3 | Year 4 |
|---|--|---|--------|
| 1. philosophy, ethics | 1. Prosthetics | 1. Prosthetics | |
| 2. sociology | 2. Orthotics | 2. orthotics | |
| 3. anatomy, physiology, pathology | 3. Pathology of locomotor system | 3. Social medicine, statistics, hygiene | |
| 4. Chemistry and technology of material | 4. Physics with mathematics and electrical engineering | 4. Medical rehabilitation | |
| 5. Functional anatomy and kinesiology | 5. Design and computer engineering | 5. Health education | |
| 6. General and special biomechanics | | 6. Health legislation | |
| 7. Medical psychology | | 7. Organisation of P&O services | |
| 8. english language | | 8. Health care emergency and first aid | |
| | | 9. Rehabilitation engineering | |
| | | 10. Research and development in P&O | |

- No ☐ Yes X (Please indicate number of hours of study) - 3 months

- Full time - 10 Part time – 25 Sessional - 0

- | | number of individuals |
|---------------------|-----------------------|
| PhD | 10 |
| MSc | 5 |
| Diploma/certificate | 15 |

SWEDEN

1. **What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)**

	In prosthetics	In orthotics	In prosthetics and orthotics
Masters	<input type="checkbox"/>	<input type="checkbox"/>	X
Bachelor	<input type="checkbox"/>	<input type="checkbox"/>	X

2. **How many places for students do you offer each year to;**

a) undergraduate students? 24

b) postgraduate students? 20

3. **How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = _ year.) Please state.**

3 years

4. **How long (in weeks) is your academic year? Please state.**

40

5. **Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.**

Year 1 - 40

d) Year 4

Year 2 - 40

e) Year 5

Year 3 - 40

f) Year 6

6. **On average how many students graduate from your program each year**

20

7. **Please outline the entry requirements for your course by listing the prerequisite requirements.**

High school graduation

8. **Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;**

- Theoretical training in Prosthetics and orthotics specific subjects

35%

- Theoretical training in other subjects (eg. anatomy, physiology, material science, mathematics)

45%

- Practical experience (with patient or simulated patient models)

15%

- Technical training (fabrication of devices)

5%

9. **Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.**

No ☐

Yes X (please indicate duration) – 9 weeks

10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**
 No ☒ Yes ☐ (please indicate duration)
11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**
 No ☒ Yes ☐
12. **Please list the names of subjects that are included in your curriculum**
- | Year 1 | Year 2 | Year 3 |
|--|--|---------------------------|
| Orthopaedic technology (Prosthetics and orthotics) | Material science and strength of materials | Scientific methodology |
| Anatomy and physiology | Biomechanics | Rehabilitation |
| Mathematics | Orthopaedic technology (prosthetics and orthotics) | Prosthetics and orthotics |
| Psychology | | Biomechanics |
| Somatic disorders related to prosthetics and orthotics | | Materials technology |
| Mechanics | | Elective course |
| | | Thesis |
13. **Is there a research project, report or thesis that is required to be completed by students in your course?**
 No ☐ Yes ☒ (Please indicate number of hours of study) - 400
14. **How many staff members in prosthetics and orthotics do you have at your school?**
 Full time – 5 Part time 2 Sessional -approximately 8-10
15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**
- | | number of individuals |
|-----|-----------------------|
| PhD | 3 (including 1 P&O) |
| MSc | 1 |
| BSc | 2 |

SWITZERLAND

1. What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)

	In prosthetics	In orthotics	In prosthetics and orthotics
Meister	<input type="checkbox"/>	<input type="checkbox"/>	X
Diploma	<input type="checkbox"/>	<input type="checkbox"/>	X
Certificate	<input type="checkbox"/>	<input type="checkbox"/>	X

2. How many places for students do you offer each year to;

a) undergraduate students? = Approximately 18

b) postgraduate students?

3. How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = $\frac{1}{2}$ year.) Please state.

4 years

4. How long (in weeks) is your academic year? Please state.

10 weeks

5. Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.

Year 1 - 38

d) Year 4 - 38

Year 2 - 38

Year 3 - 38

6. On average how many students graduate from your program each year

Approximately 18

7. Please outline the entry requirements for your course by listing the prerequisite requirements.

g-12 or university entry level

8. Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;

- Theoretical training in Prosthetics and orthotics specific subjects

15%

- Theoretical training in other subjects (eg, anatomy, physiology, material science, mathematics)

15%

- Practical experience (with patient or simulated patient models)

20%

- Technical training (fabrication of devices)

50%

9. Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.

No ☐

Yes X (please indicate duration) – 4 years

10. After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?

No X

Yes ☐ (please indicate duration)

11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**

No ☐ Yes ☒ X

12. **Please list the names of subjects that are included in your curriculum**

Year 1	Year 2	Year 3	Year 4
Anatomy	Anatomy	Pathology	Same as the year before
Orthopaedic technique (theory)	Orthopaedic technique (theory)	Orthopaedic technique (theory)	Electronic studies
Orthopaedic technique (practice)	Orthopaedic technique (practice)	Orthopaedic technique (practice)	
Theoretical material	Theoretic material	Biomechanics	
Practice material	Practice material	general education	
General education	General education		
language studies	language studies		
Law	Law		
Mathematics	Mathematics		

13. **Is there a research project, report or thesis that is required to be completed by students in your course?**

No ☒ X Yes ☐ (Please indicate number of hours of study)

14. **How many staff members in prosthetics and orthotics do you have at your school?**

Full time - 2 Part time – 2 doctors Sessional - 0

15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**

number of individuals

Meister	1
Diploma/certificate	1

TURKEY

1. What awards does your institution offer in the field of prosthetics and orthotics? (tick all that apply)

	In prosthetics	In orthotics	In prosthetics and orthotics
PhD	<input type="checkbox"/>	<input type="checkbox"/>	X
Masters	<input type="checkbox"/>	<input type="checkbox"/>	X
Diploma	<input type="checkbox"/>	<input type="checkbox"/>	X
Certificate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify)			

Prosthetic and orthotic programme provides a two-year training course of the university. Final award of the programme is the diploma in Prosthetic and Orthotic Technician. The P&O technician graduated from at least four years programme such as biomedical engineer, physiotherapy and health management of the university attend the post-graduate prosthetic and orthotic education. If P&O technicians continue their education in four year programme after taking vertical transfer examination and take the right four year programme and attend post-graduate education.

2. How many places for students do you offer each year to;

a) undergraduate students? 20

b) postgraduate students? -

(It changes according to the completion of prerequisite requirements and demands)

3. How long (in years) is the course of study for entry into practice as a clinical prosthetist or orthotist? Please do not include prerequisite courses in this figure. (If less than one year, please define as a fraction; eg. 6 months = _ year.) Please state.

1 year

4. How long (in weeks) is your academic year? Please state.

34 (30 week courses + 4 weeks clinical instructions)

5. Please state how many weeks are awarded for each year of the course to become a clinical prosthetist and orthotist.

Year 1 - 34

Year 2 - 34

6. On average how many students graduate from your program each year

15

7. Please outline the entry requirements for your course by listing the prerequisite requirements.

The entry requirements for applications is vocational technical school diploma (eg: Orthopedi technician school diploma) or high school diploma. If the student graduated from vocational technical school, the student has been enrolled in prosthetics and orthotics programme of university without taking any student selection examination. But if the student graduated from high school, the student take selection examination. Admission to the P&O programme education of university is based on the student's score on the examination as well as the high school grade of the student.

8. **Please estimate the percentage (%) of time that students enrolled in your program are required to complete in each of the following categories;**
- Theoretical training in Prosthetics and orthotics specific subjects
10%
 - Theoretical training in other subjects (eg, anatomy, physiology, material science, mathematics)
44%
 - Practical experience (with patient or simulated patient models)
7%
 - Technical training (fabrication of devices)
33%
9. **Prior to graduation, are students in your program required to complete a period of practical experience within a prosthetic and orthotic facility.**
- No ☐ Yes X (please indicate duration) – two months
10. **After graduation are your students required to complete an internship period under the supervision of an experienced clinician before being able to practice independently?**
- No ☐ Yes X (please indicate duration) - six months
11. **Are your students required to sit a national certification exam (set by an independent body) after graduating from your program?**
- No X Yes ☐
12. **Please list the names of subjects that are included in your curriculum**
- | | |
|--|---|
| Year 1 | Year 2 |
| Mathematics/Physics/Computer science | Life Science (Neurology/Vascular diseases/Public health/First care) |
| Life science | Rehabilitation |
| (Anatomy/Physiology/Orthopaedics/Patient psychology) | Kinesiology |
| Material technology | Electrotechnology |
| Technical drawing | Mechanics & Biomechanics |
| Orthotic science | Orthotics science |
| Communication skills | Prosthetic science |
| Turkish language | Prosthetic orthotic manufacturing techniques |
| Foreign language | History of Turkish Revolution |
| Physical education/Fine arts | Occupational ethics |
| Orthotic clinical practice | Prosthetic clinical practice |
13. **Is there a research project, report or thesis that is required to be completed by students in your course?**
- No X Yes ☐ (Please indicate number of hours of study)
14. **How many staff members in prosthetics and orthotics do you have at your school?**
- Full time Part time Sessional – 18 External lecturers
15. **What is the highest academic level of full and part time staff employed within your prosthetics and orthotics program?**
- number of individuals
- | | |
|---------------------|---|
| PhD | 1 |
| MSc | 1 |
| Diploma/certificate | 2 |