Curriculum guidance

For the pre-registration education of prosthetists and orthotists

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2024

Contents

Executive Summary

Prosthetists and orthotists are important members of the Allied Health Professions workforce. They deliver prosthetic care to people with limb amputations and deficiencies, and orthotic care to people with impairments of their limbs or spine. Thus, prosthetists and orthotists support people to achieve their best mobility and dexterity to be able to participate in society.

This first publication of *Curriculum guidance for the pre-registration education of prosthetists and orthotists* is a key reference document that is part of a portfolio of work on workforce reform by the British Association of Prosthetists and Orthotists (BAPO). It is responsive to the profile of the UK prosthetic and orthotic workforce and mapping of the workforce for the 21st Century (Eddison et al, 2023) and is needed to encourage not only sustainability but also much-needed growth and innovation in pre-registration education to meet growing demands on services associated with the ageing population.

It takes a community to educate a professional, as such this guidance was written in collaboration with prosthetics and orthotics educators from the University of Derby, Keele University, the University of Salford, and the University of Strathclyde. It was reviewed by prosthetists, orthotists, a podiatrist, employers involved in BAPO's various committees, a project steering group, and members of a Training and Education Network for Prosthetics and Orthotics.

The document is intended for use by programme leads, educators, and reviewers. It will also help to inform the Health and Care Professions Council (HCPC) programme and apprenticeship accreditations. It is structured around an orthotic and prosthetic education framework that was designed as part of the early development of the guidance and that includes three areas of person-centred care:

(1) Population needs
(2) Prosthetics and orthotics
(3) Prosthetists/orthotists professional practice.

The curriculum section of the guidance draws strongly upon the three areas of person-centred care and includes content on programme content, structure, environment, and quality assurance. The reference section of the guidance provides links to a rich source of information which can be used for further reading.

Report authors

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This *Curriculum guidance for the pre-registration education of prosthetists and orthotists* was produced in collaboration with prosthetic and orthotic programme leads from the University of Derby, Keele University, the University of Salford, and the University of Strathclyde. Members of the BAPO Education Committee and the Training and Education Network for Prosthetics and Orthotics UK all helped to shape this document.

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- Peter Iliff, Chair of BAPO
- Dr Nicky Eddison, Vice-Chair of BAPO
- Dr Beverley Durrant, Co-Project Lead/Director and Consultant, Vectis Healthcare Solutions

In addition, thanks are due to Stephen Bennett (BAPO administrator), research assistant James Kell from Staffordshire University for supporting the data analysis, and The Royal College of Speech and Language Therapists (RCLST) for sharing their curriculum guidance document (RCSLT, 2021) as a model publication.

Glossary of terms

Assistive products	Any external product (including devices, equipment, instruments and software), specially produced or generally available, the primary purpose of which is to maintain or improve an individual's functioning and independence and thereby promote their well-being. Assistive products are also used to prevent impairments and secondary health conditions (WHO, 2016).
Assistive technology	Organised knowledge and skills related to assistive products, including systems and services. Assistive technology is a subset of health technology (WHO, 2016).
Disability	An umbrella term for impairments, limitations of activity, and restrictions on participation (WHO, 2001).
Disability Adjusted Life Year (DALY)	A time-based measure that combines years of life lost (YLLs) due to premature mortality and years of life lost due to time lived in states of less than full health, or years of healthy life lost due to disability (YLDs). One DALY represents the loss of the equivalent of one year of full health.
Orthosis, orthotic device or product	An orthotic device or product. An externally applied device used to compensate for impairments of the structure and function of the neuro-muscular and skeletal systems (ISO, 2020).
Orthotics	The science and art involved in treating persons through the use of orthoses (ISO, 2020).
Orthotist	A person who, having completed an approved course of education and training, is authorised by an appropriate national authority to assess persons referred for orthotic treatment and to design, measure and fit orthoses (ISO, 2020).
Prosthetics	Science and art involved in treating persons with the use of prostheses (ISO, 2020).
Prosthetist	Person who, having completed an approved course of education and training, is authorized by an appropriate national authority to assess persons referred for prosthetic treatment and to design, measure and fit prostheses (ISO, 2020).
Prosthesis, prosthetic device	An externally applied device is used to replace wholly, or in part, an absent or deficient limb segment (ISO, 2020).
Rehabilitation	A set of interventions designed to optimise functioning and reduce disability in individuals with health conditions in interaction with their environment (WHO, 2017b).
Simulation	A technique, not a technology, to replace or amplify real experiences with guided experiences, often immersive in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion (Gaba, 2007).

List of abbreviations

AHPs	Allied Health Professions
BAPO	British Association of Prosthetists and Orthotists
CSP	Chartered Society of Physiotherapy
DALY	Disability-adjusted life year
DHSC	Department of Health and Social Care
GBD	Global Burden of Diseases
HCPC	Health and Care Professions Council
ICD	International Classification of Diseases
ICF	International Classification of Functioning, Disability and Health
ISO	International Organization for Standardization
ISPO	International Society for Prosthetics and Orthotics
NHS	National Health Service
OfS	Office for Students
PBL	Practice-based learning
POP	Prosthetic and Orthotic Process Model
QAA	Quality Assurance Agency
RCOT	Royal College of Occupational Therapists
RCSLT	Royal College of Speech and Language Therapists
UK	United Kingdom
WHO	World Health Organization
YLD	Years lived with a disability
YLL	Years of life lost

Introduction

This is the first publication of *Curriculum guidance for the pre-registration education of prosthetists and orthotists*. It was written as part of a programme of work by the British Association of Prosthetists and Orthotists (BAPO) funded by NHS England (formerly Health Education England) as part of a wider Allied Health Professions (AHPs) initiative to identify workforce reform priorities for the 21st century relating to the prosthetics and orthotics occupations. It is part of the programme area "AHP modernisation and reform" which also covers modernising the career framework to optimise the professional body and the profession's engagement in advancing practice and clinical academic careers.

The guidance was co-created by BAPO with Higher Education Institutions (HEIs) that offer pre-registration prosthetist and orthotist offerings (namely the University of Derby, the University of Keele, the University of Salford and the University of Strathclyde). The guidance was created by considering the population in need of prostheses and orthoses and by matching their needs to the role of the prosthetist and orthotist. It was informed by a workforce survey (Eddison et al, 2023) and by an analysis of the driving forces shaping pre-registration prosthetist/orthotist education as summarised in Figure 1 and discussed throughout the document.

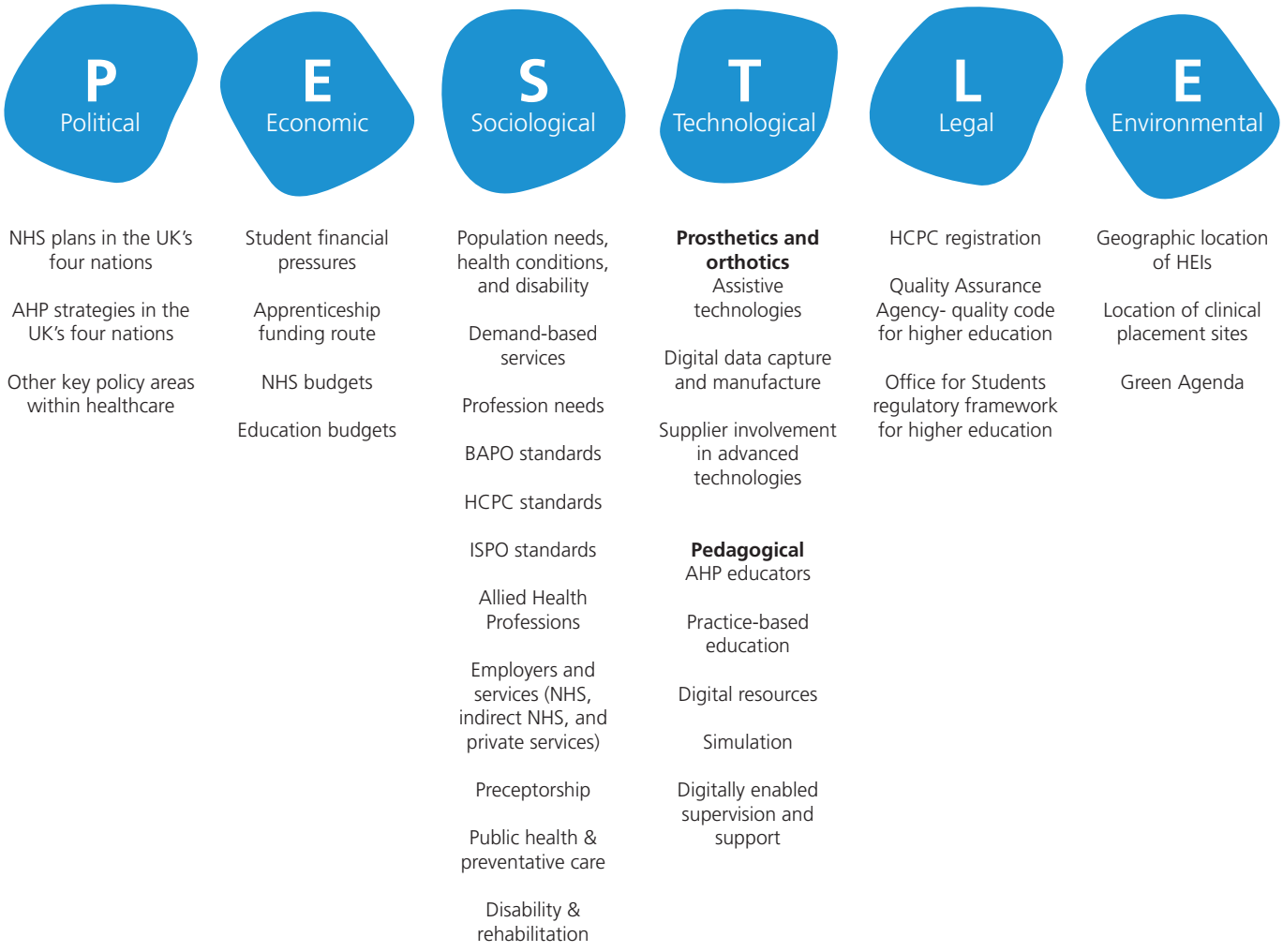


Figure 1: A PESTLE analysis of the driving forces impacting the education of UK prosthetists and orthotists.

Aims and purpose of the curriculum guidance

This *Curriculum guidance for the pre-registration education of prosthetists and orthotists* is intended to support the embedding of the knowledge, skills, and attributes of the 21st-century professional in the pre-registration curricula for prosthetists and orthotists in the UK. It can be used as a key reference document for:

- UK providers of pre-registration education for prosthetists/orthotists when undergoing curriculum development or review.
- BAPO representatives and others advising institutions on the development of pre-registration education.
- BAPO representatives and others engaged in quality assurance visits of pre-registration prosthetist/orthotist educational offerings.
- External examiners of student or apprentice prosthetists and orthotists.

About the British Association of Prosthetists and Orthotists

BAPO is the professional body that represents the interests of UK prosthetic and orthotic professionals and associate members to their employers, other AHPs, and all groups that are involved in the field of prosthetics and orthotics. BAPO has an interest in education and has an Education Committee that reports to the BAPO Executive Committee.

While BAPO has not previously published curriculum guidance, members of BAPO and its Education Committee have participated in past approvals and reviews of pre-registration programmes of education. BAPO is sometimes approached by potential new entrants to the provision of prosthetic/orthotic education for advice and to nominate representatives who review curricula for prosthetists/orthotists' education.

1. About this document

Service users are at the heart of curriculum design. The *Curriculum guidance for the pre-registration education of prosthetists and orthotists* should respond to the needs of the service user and develop professionals able to deliver services and integrate into the workplace as Allied Health Professionals. A useful conceptual framework for orthotic and prosthetic education as shown in Figure 1 proposes that restructuring educational curricula around important clinical reasoning variables (i.e., factors that may influence outcomes) could improve teaching, learning, and clinical practice (Spaulding et al 2019). The framework includes three areas within the context of patient-centred care, namely (1) the state of functioning, disability, and health according to the International Classification of Function (ICF) (WHO, 2001); (2) orthotic and prosthetic technical properties, procedures, and appropriateness; and (3) professional service as part of orthotic and prosthetic interventions. It integrates patient-centred care throughout the clinical reasoning process.

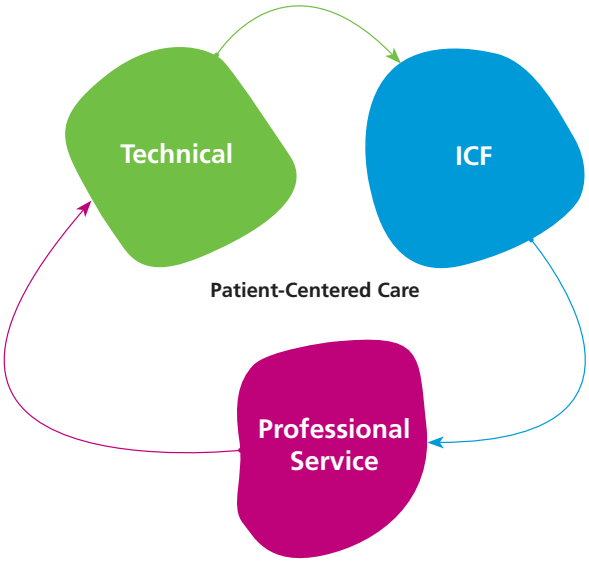


Figure 2. The orthotic and prosthetic education framework (Spaulding et al, 2019).

This curriculum guidance is structured around an adapted conceptual framework that more clearly describes the three areas of person-centred care. The three areas in the guidance are (1) Population needs (2) Prosthetics and orthotics and (3) Prosthetists/orthotists professional practice.

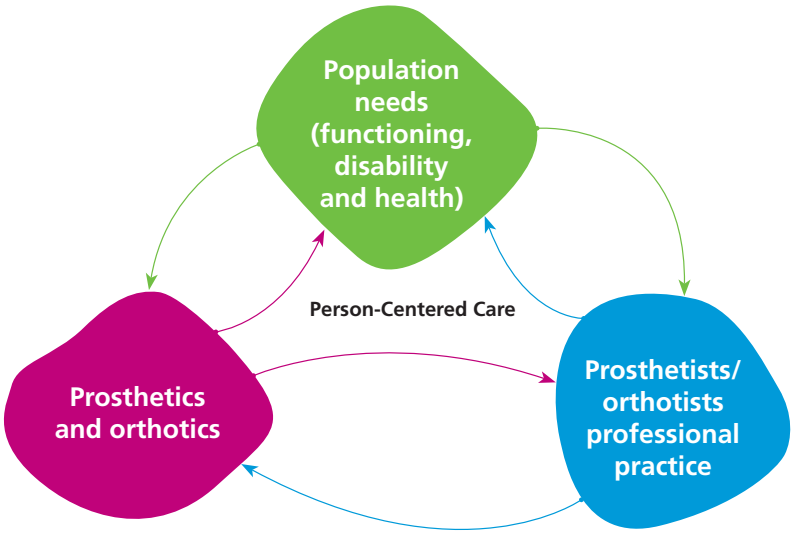


Figure 3. The adapted orthotic and prosthetic education framework

2. Population needs

2.1 Functioning, disability, and health

The population of people in need of prosthetic and orthotic services can be described by the ICF (WHO, 2001) as shown in Figure 4. The ICF provides us with a biopsychosocial model that replaces an outdated medical model of disability and has long been established as applicable to prosthetic and orthotic services (Burger, 2011). Health conditions may affect body functions and structures causing impairment of function and changes in the skeleton and/or soft tissues. These impairments lead to activity limitations and ultimately restrict participation in school, work, home, and social life. Prostheses and orthoses are used to overcome other environmental barriers in the treatment of people with mobility or dexterity limitations associated with different health conditions.

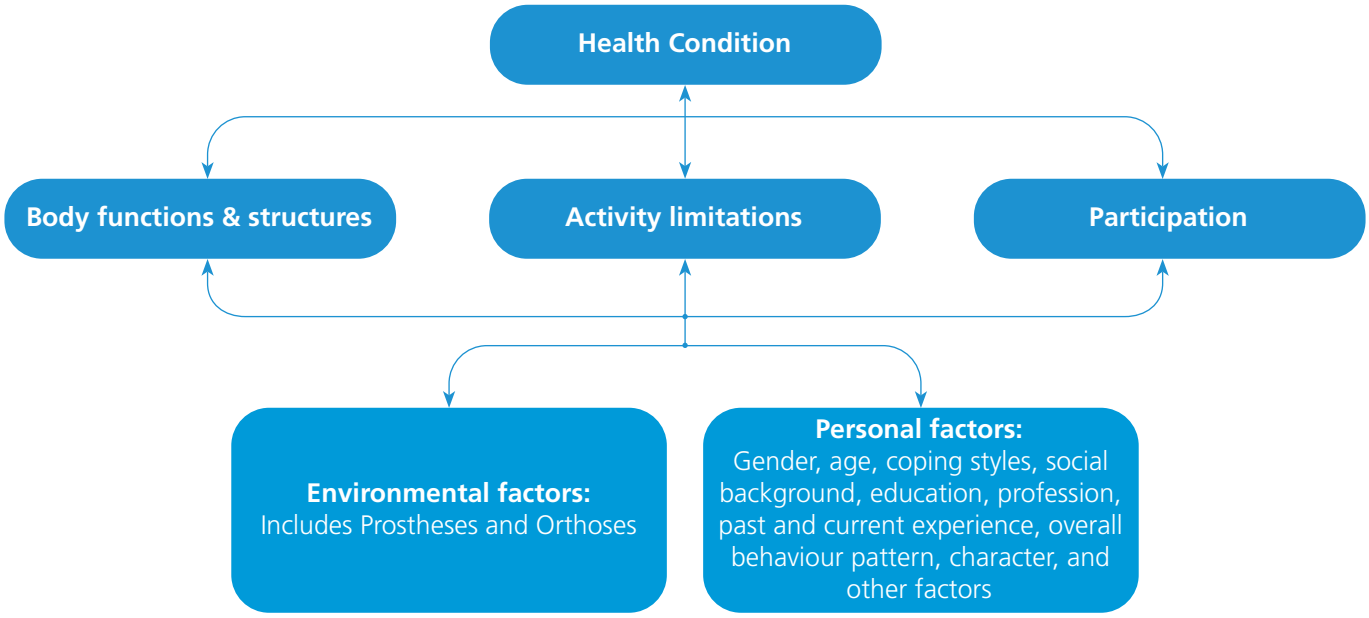


Figure 4: Prostheses, orthoses and The International Classification of Functioning, Disability and Health (ICF)

It is important for student prosthetists/orthotists to learn about the parts and concepts of the ICF as shown in Table 1. Using the ICF helps in not only describing functioning and disability but also considering personal and environmental factors and promotes holistic and person-centred care.

Parts	Concepts	Definitions	Coding letter	Examples of relevance in P&O
Part 1: functioning and disability	Body functions	Physiological functions of body systems (including psychological functions)	b	Pain, functions of bones, joints, muscles, movement, and gait
	Body structures	Anatomical parts of the body	s	Structures related to movement (bones, joints, muscles, etc.) and skin
	Activity	Executions of a task or an action	a	Manipulating objects and walking
	Participation	Involvement in a life situation	p	Self-care, household tasks, maintaining P&O devices, interpersonal relationships, education, and work
Part 2: contextual factors	Environmental factors	The physical, social and attitudinal environment in which people live and conduct their lives	e	P&O devices, mobility assistive devices, support and attitudes of family and friends
	Personal factors	The particular background of an individual's life and living	(not coded)	Gender, age, character, experience, interests, profession, and lifestyle

Table 1: Parts and concepts of the International Classification of Functioning, Disability and Health (ICF) relevant to prosthetics and orthotics (Jarl and Ramstrand, 2018).

2.2 Health Priorities

It is important to consider the health priorities of the population to ensure that the health workforce has appropriate competencies to be able to meet their needs. The NHS Long Term Plan (2019) refers to the Global Burden of Disease Study (GBD) and the top causes of early death including cardiovascular disease – particularly stroke and diabetes.

As well as early death, such health conditions also cause a significant burden of disability that can be expressed as Disability Adjusted-Life Years (DALYs). One DALY represents the loss of the equivalent of one year of full health. DALYs for a disease or health condition are the sum of the years of life lost (YLLs) due to premature mortality and the years lived with a disability (YLDs) due to prevalent cases of the disease or health condition in a population. Using the Institute for Health Metrics and Evaluation (2019) data visualisations we can explore GBD for UK data to see the top-ranked health conditions leading to disability. Table 2 shows the top ten ranked health conditions by DALY. This is derived from information in Appendix 1 which shows a 25-year comparison of the top-ranked health conditions causing disability. Of note is the rise of diabetes as a condition contributing to a greater burden of disability.

Prosthetist/orthotist education should not only equip students to be able to identify, assess, and treat people with mobility disability arising from common health conditions (neoplasms, cardiovascular disease, musculoskeletal disorders, neurological conditions, diabetes, and injury (in order of prevalence)), but should also ensure that students are aware of comorbidity in the people that they serve.

While the needs of the population of people with the most common health conditions should be considered, it should be noted that people with rare diseases also need prosthetic and orthotic care. Although rare diseases are individually rare, they are collectively common with 1 in 17 people being affected by a rare disease at some point in their lifetime. This large and diverse patient population must have access to the best possible care (DHSC, 2021). Prosthetists and orthotists have a role to play in delivering the UK rare diseases framework by increasing awareness and delivering services.

UK Top 10 ranked health conditions causing disability
Non-communicable diseases
1. Neoplasms
2. Cardiovascular diseases
3. Musculoskeletal disorders
4. Mental disorders
5. Neurological disorders
6. Chronic respiratory
7. Other non-communicable
8. Digestive diseases
9. Diabetes and Chronic Kidney Disease
Injuries
10. Unintentional injury

Table 2: Top ten ranked health condition by Disability Adjusted Life Year in the UK (IHME, 2019)

2.3 Demand-based population data

Although there are no comprehensive published UK-wide data sets about the prevalence of people accessing prosthetic and orthotic services, there are some useful sources of information that help to inform prosthetic and orthotic curricula.

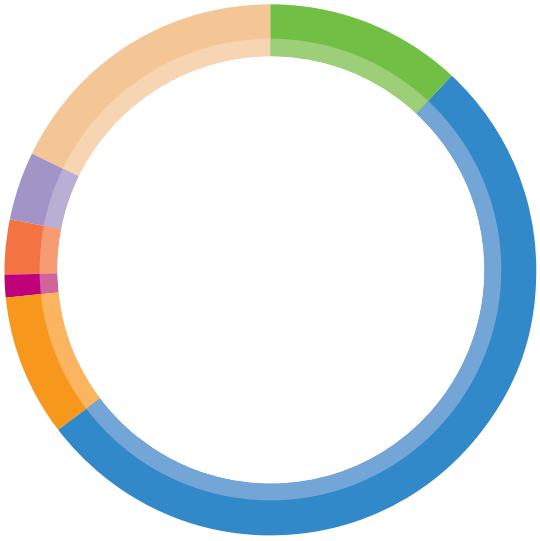
Prostheses and orthoses may be used to treat limb and spinal impairment in people with a wide range of different health conditions. These conditions may be classified under categories according to the International Classification of Diseases ICD-11 for Morbidity Statistics (WHO, 2022). The most common categories of morbidity that relate to impairment and an associated need for prosthetics and orthotics treatment were selected from ICD-11 by an experienced prosthetist/orthotist to generate *Tables of pathologies and prosthetic or orthotic treatment possibilities by level* as shown in Appendix 2. The selections were reviewed by the BAPO Education Committee as being representative of health conditions seen in UK prosthetics/orthotics practice. The final analysis revealed that 63 different health conditions are seen in UK prosthetics/orthotics practice. A summary of the health conditions listed in the tables in Appendix 2 is shown in Table 3.

Summary of health conditions seen in UK prosthetics/orthotics practice	
Table	**Number of conditions listed**
Infections	**4**
Neoplasms	**2**
Endocrine, nutritional or metabolic diseases	**2**
Diseases of the nervous system	**15**
Diseases of the circulatory system	**4**
Diseases of the musculoskeletal system or connective tissue	**14**
Developmental anomalies	**11**
Injury	**11**
Total No. of conditions listed which are seen in UK prosthetics/orthotics practice	**63**

Table 3: Summary of health conditions seen in UK prosthetics/orthotics practice (See Appendix 2 for more information)

Prosthetic service data:

There are no recent publications about prosthetic service data. The best available data is from Limbless Statistics and their 2011-2012 Annual Report (University of Salford, 2013) which shows data for new referrals to prosthetic services. Figure 5 shows that 52.9% of amputations were due to dysvascular disease, followed by trauma (12%), infection (8.5%), congenital limb deficiency (4.2%), neoplasia (3.2%), and neurological disorders (1.5%). 0.5% of people referred had a congenital limb deficiency but had not had an amputation. It should be noted that 17.7% show no data reported with no explanation of this. More detail is provided in Appendix 4.



Causes of amputation among people referred for prosthetic treatment in England

Trauma	**12.0%**
Dysvascular	**52.9%**
Infection	**8.5%**
Neurological Disorder	**1.5%**
Neoplasia	**3.2%**
Congenital	**4.2%**
No Data	**17.7%**

Figure 5. Causes of amputation among people referred for prosthetic treatment. (derived from Limbless Statistics, 2013)

Information about levels of amputation in the population referred for prosthetic treatment in the UK is also important in determining priorities for curricula. Figure 6 (and Appendix 4) illustrates the percentage of people with different amputation levels (Limbless Statistics, 2013). 92.1 % of all people referred need lower limb prosthetic treatment compared to 8.3% requiring upper limb prosthetic treatment. Of all cases, the most common referrals are because of transtibial amputation (50.7%) and transfemoral amputation (34.8%).

Amputation levels of people referred for prosthetics treatment (UK)

Derived from Limbless Statistics (2013)

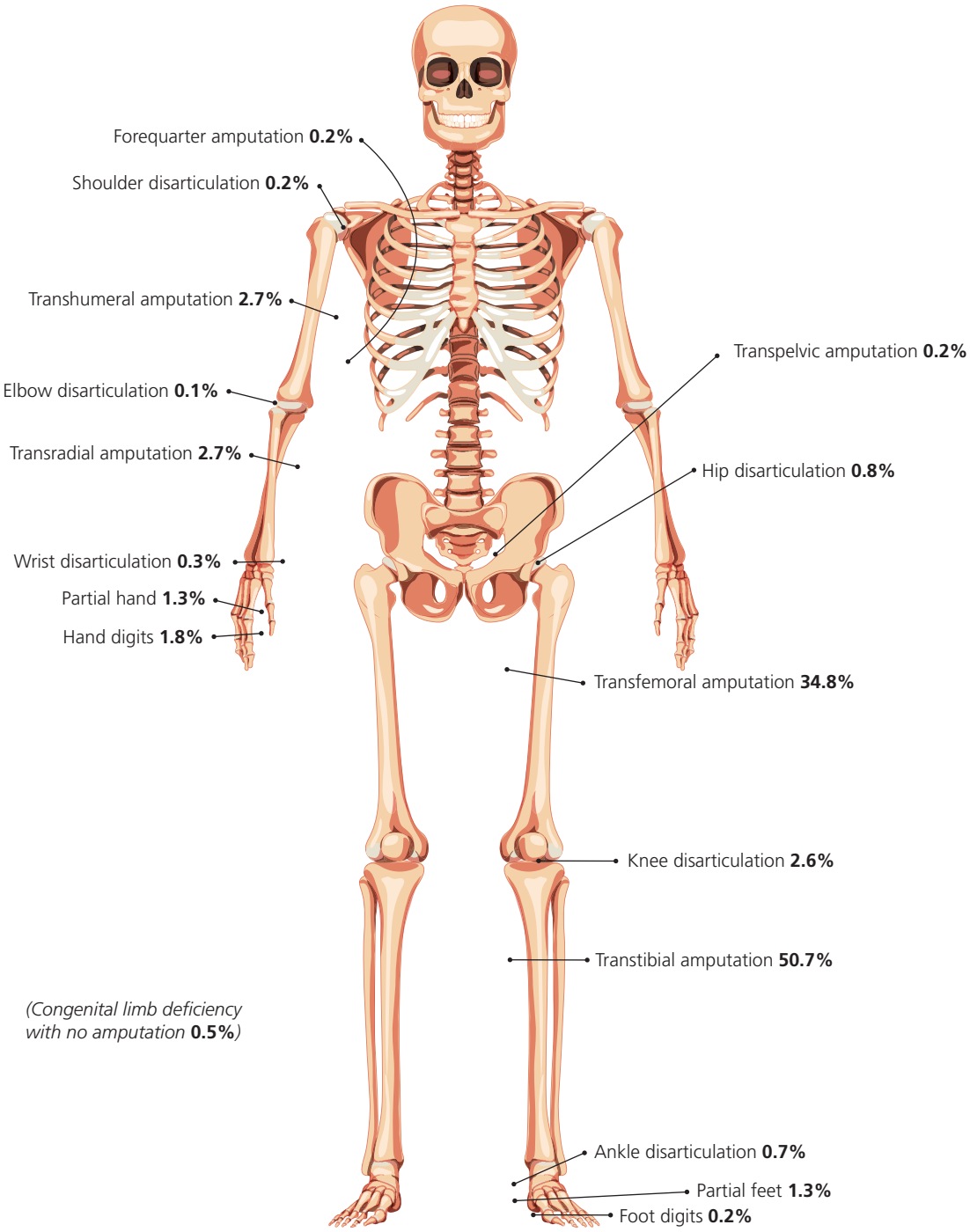


Figure 6. Amputation levels of people referred for prosthetics treatment (UK). Derived from Limbless statistics (2013)

Orthotic service data:

There is no published data on the health conditions of people referred for treatment to orthotic services in the UK. In Scotland, the Rehabilitation Technology Information Service (ReTIS) provides a data collection and analysis service for prosthetic and orthotic services, but only three Scottish services use ReTIS software daily.

Workforce reported information about populations treated

A workforce survey by Eddison et al, 2023 provided details on the frequency of clinical populations treated by age by UK prosthetists and orthotists working in a clinical role. (Figure 7). This highlights that prosthetists and orthotists treat people with a wide range of health conditions across all ages.

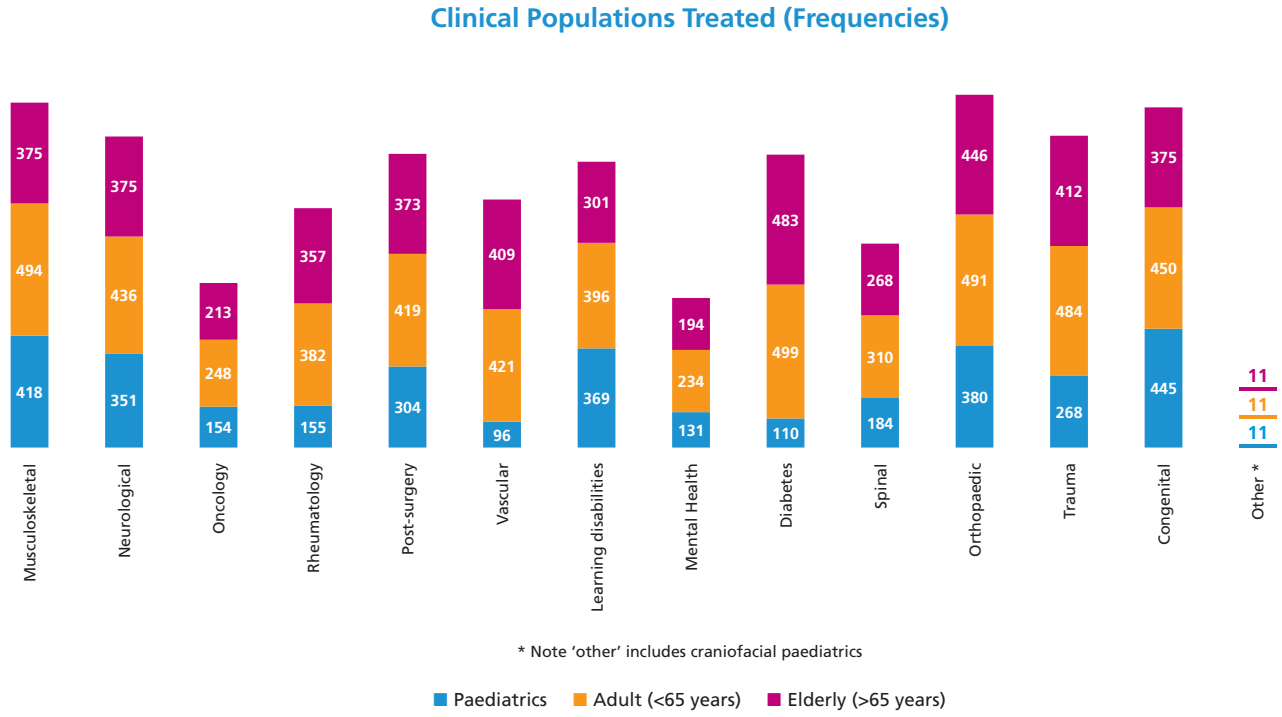


Figure 7: Frequency of clinical population treated by age (Eddison et al 2023)

3. Prosthetics and orthotics

Prosthetics and orthotics involve the science and art of treating people with the use of prostheses and orthoses (ISO, 2020). Prostheses and orthoses are classified as mobility devices and are part of the family of assistive products within the field of assistive technology as shown in Figure 8 (WHO, 2017a). Student prosthetists/orthotists should focus their learning on prostheses and orthoses, but also become familiar with other mobility devices (wheelchairs, walking aids, and crutches) to best support the people that they care for who have mobility limitations. Mobility devices may be used together so the influence of using combinations of devices should be understood. People with mobility impairments may also present with impairment of the other domains of disability and students should be aware of the use of other assistive products.

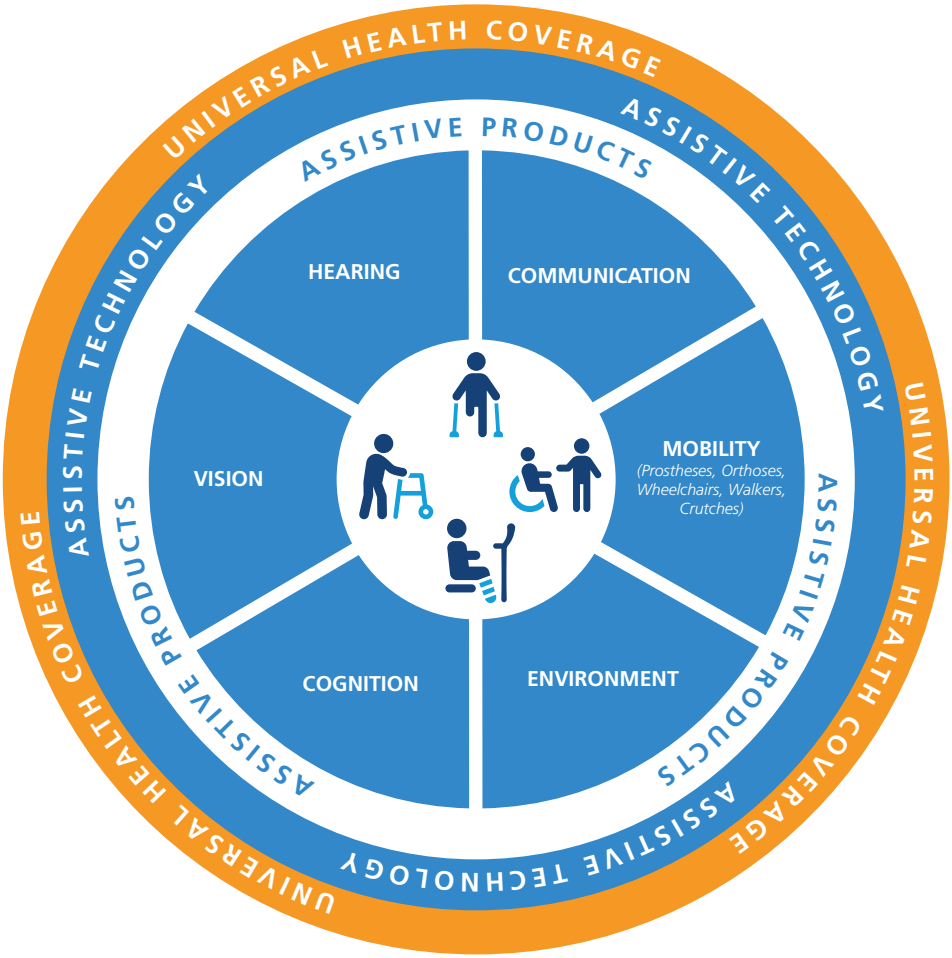


Figure 8. Family of assistive products (WHO, 2017a)

In the UK, different types of prostheses and orthoses may be prescribed by prosthetists and orthotists. Students should be supported to develop competence and confidence in the most commonly prescribed devices which are classified by level and by technology type. They should also have an awareness of less commonly prescribed devices and be equipped with clinical reasoning and problem-solving skills so that upon graduation they have the confidence to learn about and adopt new or different technologies into their practice.

It is essential for students to learn about devices in a staged approach and to use internationally recognised terminology to describe them.

Classifications by level

The International Organization for Standardization upholds the terminology used in the sector (ISO, 2020a, 2020b and 2020c).

Prosthetic and orthotic interventions are part of the environment in the ICF model. They may be categorised by level as:

- Lower limb orthoses
- Upper limb orthoses
- Spinal orthoses
- Lower limb prostheses
- Upper limb prostheses

A more detailed list of classifications is provided in Appendix 3.

Classifications by type

Table 4 shows a typology of prostheses and orthoses. Students should be aware of basic, intermediate, and advanced prostheses and orthoses and understand their relative design parameters (geometric configuration, materials, resistance to movement, powering of movement, use, and cost). They should gain skills in prescribing, specifying, producing, customising, fitting, reviewing, and adjusting basic and intermediate types of prostheses and orthoses as part of education and practice-based learning. They should acquire sufficient reasoning and problem-solving skills to be ready to appraise, learn about, and ultimately adopt all levels of technology and associated techniques after graduation.

Working methods - *Working methods are similar across levels. E.g., Computer-aided design and manufacture (CADCAM)*			
	Basic level	**Intermediate level**	**Advanced level**
Geometric configuration	Single axis joints. Prostheses with SACH feet. Orthoses with sidebars.	Prostheses with four-axis knee joints and articulated feet. Orthoses with more advanced sidebars and polycentric joints.	Prostheses with four-axis knee joints and articulated feet. Orthoses with more advanced side bars and polycentric joints.
Materials	Made from a narrow range of materials including thermoplastics, steel and/or aluminium.	Made from a wider range of materials including thermoplastics, thermosetting (composites), steel, aluminium, and titanium.	Made from a wider range of materials including thermoplastics, thermosetting (composites), steel, aluminium, and titanium.
Resistance to movement	Simple elastics or springs.	Friction, pneumatic or hydraulic components. Swing phase control or stance phase stability.	Friction, pneumatic or hydraulic components. Swing phase control or stance phase stability. Additional smart controls
Powering of movement	None.	Body powered movement	Additional smart controls.
Use	All countries. Reaching large populations in need.	The standard product in most high-income countries.	Production methods require a higher level of skills.
Cost	Lowest cost.	The standard product in most high-income countries.	Usually more expensive.

Table 4. A typology of prostheses and orthoses (derived from WHO, 2017)

4. Prosthetist/orthotist professional practice

Prosthetists and orthotists are clinicians who work in prosthetics and orthotics services. Such services are clearly positioned as health services (WHO, 2017a) and are part of rehabilitation in health systems. Rehabilitation is a set of interventions designed to optimise functioning and reduce disability in individuals with health conditions in interaction with their environment (WHO, 2017b).

4.1 Prosthetists and orthotists are Allied Health Professionals

Prosthetists and orthotists are the smallest allied health profession in the UK. As AHPs, they have a part to play in delivering against AHP strategies across the UK (NHS, 2022; NHS Education for Scotland, 2015; Welsh Government, 2020). While each of the four nations has its strategy, common themes are reflected in The AHP Strategy for England 2022 – 2027 (NHS, 2022). As AHPs prosthetists and orthotists are expected to:

- champion and promote diverse and inclusive leadership.
- be in the right place, at the right time, with the right skills.
- commit to research, innovation, and evaluation.
- further harness digital technology and innovation through data.

In implementing the strategy, prosthetists and orthotists should be engaged with five areas of focus:

1. people first.
2. optimising care.
3. social justice: addressing health and care inequalities.
4. environmental sustainability: Greener AHPs.
5. strengthening and promoting the AHP community.

Pre-registration curricula should prepare prosthetist/orthotist students to participate in and contribute to the AHP strategy and support workforce training plans such as the NHS long-term workforce plan (NHS England, 2023) and the Allied Health Professions Education Strategy 2015 – 2020 (NHS Education for Scotland, 2015). Engagement in interprofessional learning and multi-professional practice-based learning supports students to develop an AHP identity and appreciate their professional role.

Public health

AHPs have a clear role to play in contributing to public health (AHPF, 2019; Scottish Government, 2022). The AHP UK Allied Health Professions Public Health Strategic Framework was used to construct a model of how prosthetists and orthotists may contribute to public health in four areas as shown in Figure 9. The model can be used to develop content about public health for preregistration curricula.

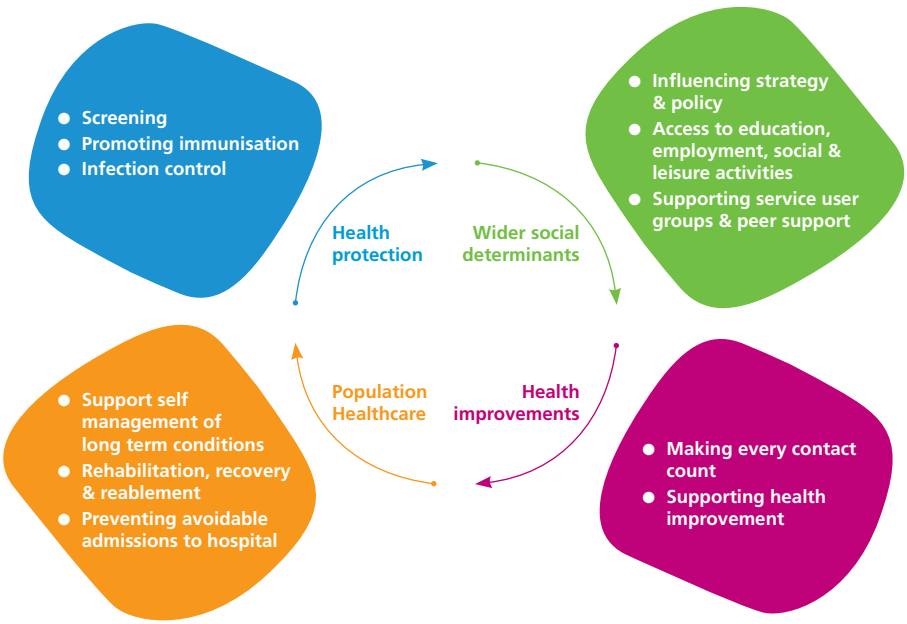


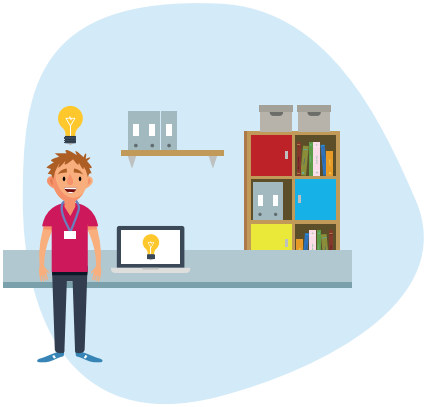
Figure 9: A model of how prosthetists/orthotists contribute to public health in four areas.

The four pillars of practice for prosthetists and orthotists

The four pillars of practice were originally used to describe advancing practice for the AHPs and have more recently come to describe practice at all levels of the AHP workforce. The four pillars of practice are now used for prosthetists/orthotists with the domains and sub-themes as shown in Figure 10. The four pillars are integral to career development among all AHPs and should be integrated into the pre-registration curriculum so that students can identify with them in readiness for working in and developing NHS services.

Pillar 1
Clinical and Technical Practice

Knowledge, skills, and behaviours are needed to provide effective and person-centred prosthetic and orthotic care.

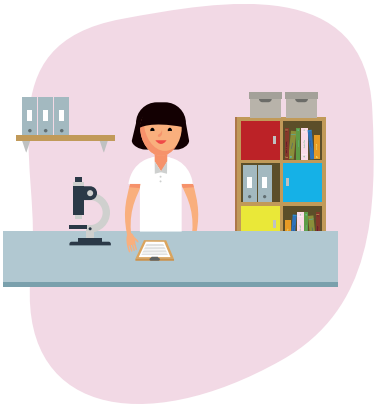


Pillar 2
Education and Facilitating Learning

Knowledge, skills, and behaviours needed to enable effective learning in the workplace.

Pillar 3
Leadership and Management

Knowledge, skills, and behaviours needed to lead and fulfil management responsibilities.



Pillar 4
Evidence, Research, and Development

Knowledge, skills, and behaviours needed to use evidence to inform practice and improve services.

Figure 10: The 4 pillars of prosthetic and orthotic practice.

4.2 Professional practice

The BAPO Standards for Best Practice explains the role and scope of practice of the prosthetist/orthotist. Prosthetists and/or orthotists in the UK are regulated by HCPC and they must meet their Standards of Proficiency for Prosthetists/Orthotists (HCPC, 2023). Depending on their registration status, prosthetists/orthotists may work across both prosthetics and orthotics or may practice in one discipline.

Prosthetic and orthotic services comprise similar steps in service delivery and similar tools, equipment, and working methods and are therefore usually taught and promoted together (WHO, 2017a). However, in the UK they are not normally practised together. Graduates work as an orthotist (67%) or prosthetist (26%), with only 7% of clinicians working in dual practice as a prosthetist/orthotist as shown in Table 5 (Eddison et al, 2023). This may be due to several factors including the way services are commissioned, budgeted, and located as well as the way that service users access treatment. For example, prosthetic services fall under the umbrella of rehabilitation and the professional practice of prosthetists is guided by amputee and prosthetic rehabilitation – standards and guidelines (BSRM, 2018). Orthotic services are for service users from a more diverse range of clinical populations so budget lines and provision of services are more complex and fragmented.

Staff group	Prosthetist	Orthotist	Dual practicing prosthetist/orthotist	Total
NHS employed	81	243	4	328
Vacancies in the NHS	3	24	0	27
Private company employed	151	325	59	535
Private company vacancies	4	22	4	30
Total (n=)	**239**	**614**	**67**	**920**
Total (%)	**26%**	**67%**	**7%**	**100%**

Table 5: Prosthetist and orthotist employment status in the UK (Eddison et al, 2023)

Professional practice incorporates a recognised service delivery process as shown in Figure 11 (WHO, 2017a). This involves not only prosthetists/orthotists but also technicians, support workers, and the wider multidisciplinary team. Complicated prosthetic and orthotic treatments and care of complex cases should be provided by a multidisciplinary team of professionals with complementary skills (Standard 26, WHO, 2017a).

Service delivery process

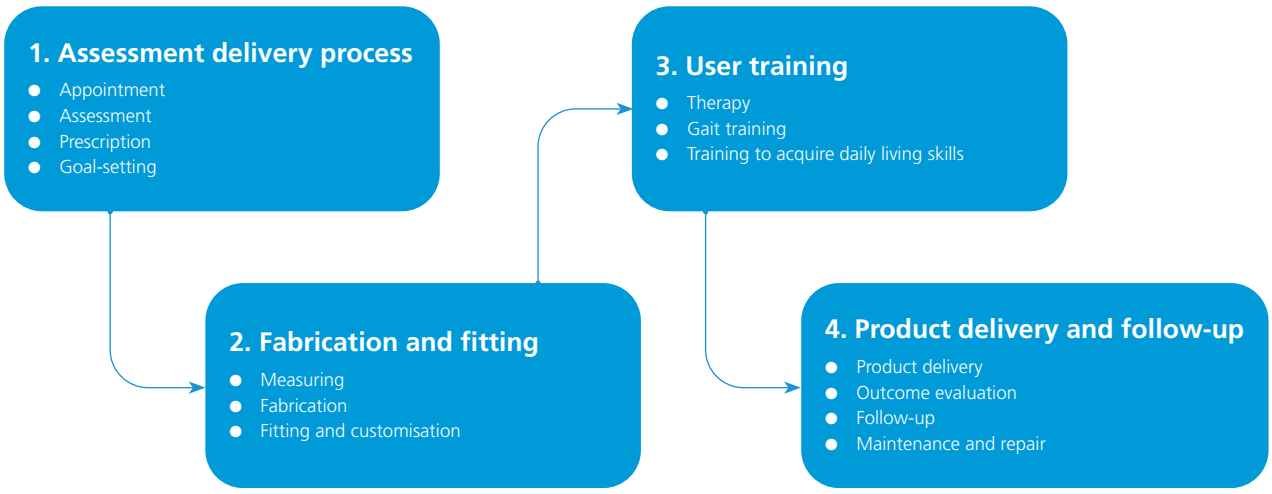


Figure 11. The prosthetics and orthotics service delivery process (WHO, 2017a)

Building on the service delivery process (WHO, 2017a), the Prosthetic and Orthotic Process (POP) model (Jarl and Ramstrand, 2018) offers a useful tool to help implement the ICF into professional practice. It is based on the concepts of the ICF and comprises four steps in a cycle:

Step 1: Assessment, including the medical history and physical examination of the patient.

Step 2: Goals, specified on four levels including those related to participation, activity, body functions, structures, and technical requirements of the device.

Step 3: Intervention, in which the appropriate course of action is determined based on the specified goal and evidence-based practice.

Step 4: Evaluation of outcomes, where the outcomes are assessed and compared to the corresponding goals.

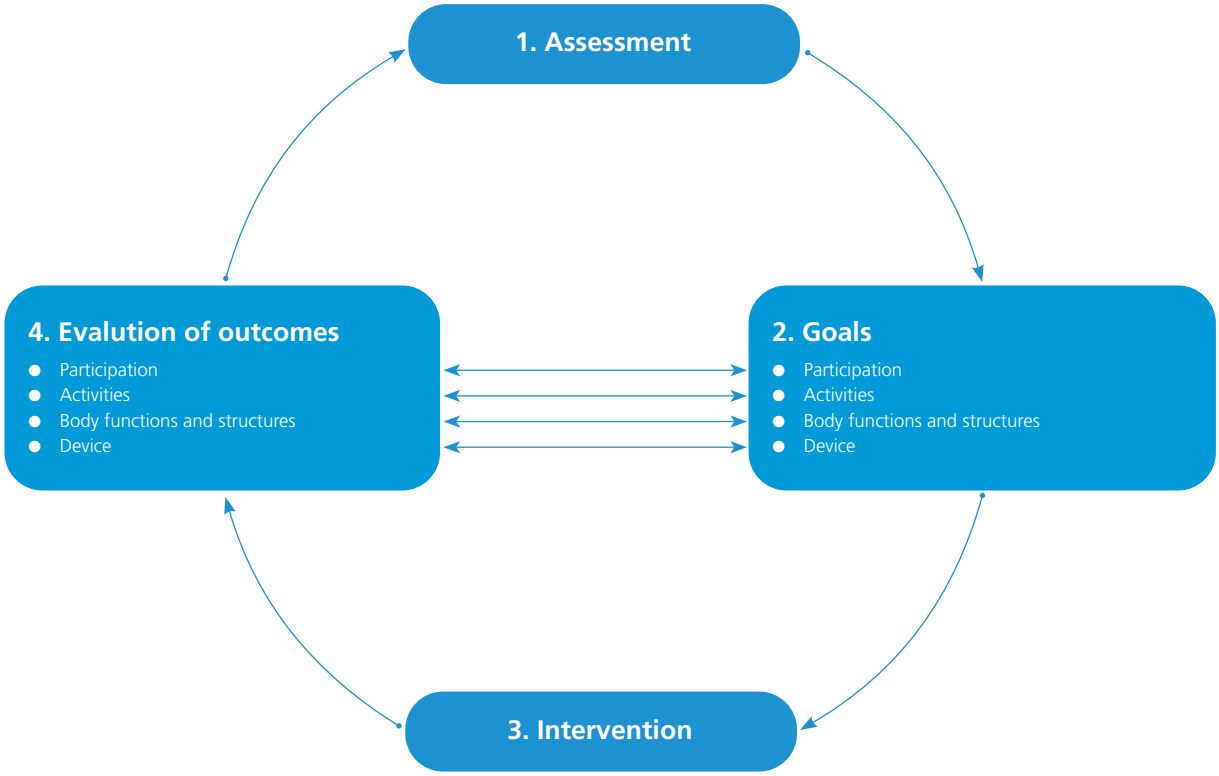


Figure 12. The Prosthetic and Orthotic Process (POP) model (Jarl and Ramstrand, 2018).

The POP model can help to frame student learning.

5. Curriculum

5.1 Programme goals

By the end of the prosthetist/orthotist pre-registration education and with the right preceptorship (BAPO, 2023d), the graduate should be able to fulfil the professional role of the prosthetist/orthotist as specified in the BAPO Standards for Best Practice (2018). The graduate prosthetist/orthotist should be able to take the lead in the assessment and provision of prosthetic/orthotic interventions, effectively supervise assistants, and provide consulting expertise to medics, other health care workers, and service users.

The graduate should be able to:

- Abide by the standards of conduct and proficiency for prosthetists/orthotists as determined by HCPC.
- Work within the scope of practice as described in this document.
- Actively contribute to the promotion of progress within the profession for the benefit of the service user.
- Gain informed consent to treatment from the service user or their representative and exercise a professional duty of care.
- Be committed to continuing professional development (CPD) and reflective practice.
- Be able to provide upon request a written CPD portfolio.
- Integrate the best available evidence into their practice.
- Be aware of current pertinent research evidence.
- Contribute to audit, research, and development relevant to their clinical practice and the service users they care for.
- Maintain service user confidentiality.
- Ensure current competence and awareness of local clinical risk management, basic life support, manual handling, infection control, and safeguarding.

5.2 Learning domains

Learning domains are cognitive, affective, and psychomotor.

Cognitive learning domains

LD1 Understanding, appraising, and explaining the challenges of people with acute and chronic health conditions and disabilities affecting the limbs and spine.

LD2 Assessing the needs of each service user relating to prostheses and orthoses.

LD3 Developing treatment goals with the service user based on the best available evidence from the clinical assessment, review, and published literature pertaining to evidence-based practice.

LD4 Informing the production processes for prostheses and orthoses by routinely referring to the best available evidence. This includes clinical and technical information in the form of internationally published standards, national protocols, and published literature as well as empirical evidence and the experience of lecturers and instructors.

LD5 Evaluating the outcomes of prosthetic or orthotic provision and in particular comfort, fit, and function.

Affective learning domains

LD6 Demonstrating empathy towards service users.

LD7 Listening with respect and attending to service users and professionals.

LD8 Participating in learning activities that reflect internalised values.

Psychomotor learning domains

LD9 Developing manual skills, coordination, and the use of motor skills to be able to carry out the procedures and techniques for safe, effective, patient assessment, prosthetic/orthotic manufacture, and fitting.

LD10 Achieving a quality fit by controlling five elements of the product throughout the production process, namely: 1. Volume, 2. Shape capture and modification, 3. Alignment, 4. Suspension, 5. Materials.

5.3 Learning outcomes

Learning outcomes express what a student should be able to do at the end of a programme of education. They include the use of active verbs to reflect an active learning approach. Figure 13 shows the order of learning and cognitive processes in Anderson's 2001 revision of Bloom's 1956 taxonomy with the use of the verbs remember, understand, apply, analyse, evaluate, and create.

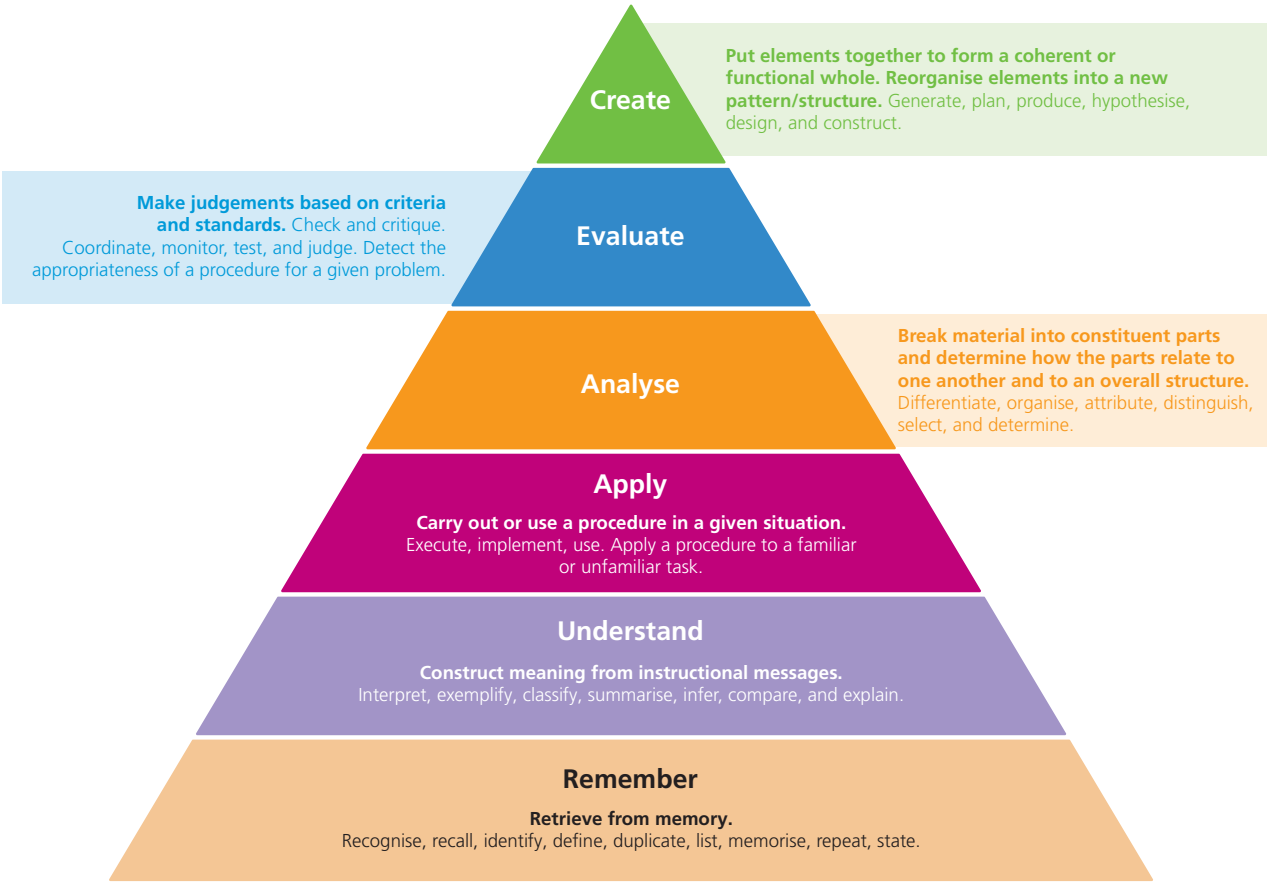


Figure 13: The orders of learning and cognitive processes (Anderson et al, 2001).

When designing or reviewing curricula, detailed learning outcomes should be written considering the latest pedagogical theory supported by the host educational institution. This means that learning outcomes may vary from programme to programme to reflect the character of the teaching/learning. The following provides overarching learning outcomes as guidance about professional practice for programmes to incorporate based on the BAPO Standards for Best Practice (2018).

By the end of prosthetist/orthotist training the graduate should be able to fulfil the following:

Assessment, diagnosis, and treatment planning

In formulating a treatment plan and deriving a prescription the graduate prosthetist/orthotist should be able to:

- Participate as a full and equal member of the clinical team; conduct the examination, refer for additional tests/images, formulate differential diagnosis and determine the prescription; design the prosthetic/orthotic intervention, including the socket or body/device interface, suspension, and selection of proper components required for treatment.
- Make the best use of available resources to realise the best outcome for the service user without compromising the service user's safety or the clinical effectiveness of the intervention.
- Assist and advise on all relevant aspects of pre-surgical, post-surgical, medical, and therapeutic management of the prosthetic/orthotic intervention required for treatment.
- Record and report any pertinent information regarding the service user and their family or carers, including a determination of expectations and needs.
- Communicate appropriate information to the service user and their family or carers.
- Include the service user and their family or carers in treatment planning and decision-making.

Fabrication, provision, and treatment

During the process of device fabrication and provision the graduate prosthetist/orthotist should be able to:

- Identify physical and other relevant characteristics that may affect the treatment of the service user.
- Formulate prosthetic or orthotic designs, including selection of materials and components which may include mechanical or electronic assistive mobility devices, postural management systems, and wheelchairs.
- Capture anthropometric data including casts, scans, measurements, kinetic and kinematic data, and imaging, required for appropriate design, fabrication, and fitting.
- Specify, perform, and direct modification of physical or virtual, positive or negative models to obtain the optimal design, functions, fit, cosmesis, and comfort of devices.
- Communicate design specifications effectively to ensure correct provision by the device supplier and/or manufacturing technician(s).
- Conduct the fitting, static and dynamic alignment, and initial check-out of devices, and where appropriate, the preliminary training of the service user.
- Supervise the activities of clinical and technical as outlined in section 2 of this standard.

Evaluation and review

During the evaluation and review of prosthesis/orthosis provision the graduate prosthetist/orthotist should be able to:

- Advise the team and participate directly in the final check-out and evaluation of fit, function, cosmesis, and comfort.
- Instruct the service user or carer in the use and care of the device and provide written information as appropriate.
- Lead follow-up, review, maintenance, and replacement procedures.
- Assess, record, and communicate achieved outcomes in relation to treatment goals.

Management and supervision

Within a defined career position and level of practice, the graduate prosthetist/orthotist should be able to:

- Delegate tasks to others and supervise the activity of support staff as appropriate.
- Manage clinical and laboratory/workshop activities assigned to him/her including:
  a) Use and maintenance of tools and equipment.
  b) Maintenance of a safe working environment and procedures
  c) Inventory and stock control
  d) Personnel matters
  e) Financial matters
  f) Appropriate record keeping
  g) Total quality management
- Identify and introduce operational efficiency as necessary.
- Interact with professional groups and appropriate external stakeholders, influencers, or agencies.

Participation in training and Education

The graduate prosthetist/orthotist should be able to:

- Share skills and knowledge to ensure the education, training, and mentoring of prosthetic/orthotic students and clinical and technical assistants within clinical protocols. When appropriate, the practitioner should be prepared to take the role of practice educator and support practice-based learning once their preceptorship is completed.
- Lecture and demonstrate to colleagues in their profession and other professionals concerned with prosthetics/orthotics and to other interested groups.
- Take part in and contribute to the process of continuing professional development.
- Critically evaluate new developments in prosthetics/orthotics for inclusion in a teaching syllabus.
- Be familiar with new techniques, materials, components, and products.
- Make a professional contribution to and take part in community programmes related to prosthetics/orthotics

Participation in research and development

The graduate prosthetist/orthotist should be able to:

- Conduct continuing evaluations of their activities.
- Develop and actively participate in service evaluation and research programmes.
- Participate in scientific/professional meetings and contribute papers to scientific/professional journals.
- Use and/or develop appropriate outcome measures to review treatment procedures to determine best practices as outlined in BAPO's 'Measuring Change' publication.

Participation in the multidisciplinary team

When working in a multidisciplinary team the graduate prosthetist/orthotist should be able to:

- Give professional guidance to the team regarding appropriate prosthetic and orthotic intervention, referral, assessment, prescription, specification, design, and sourcing and how this may impact overall treatment or management.
- Participate in the evaluation of the service users' needs and goals to develop an effective and appropriate treatment including considerations of device/treatment function and design.
- Document pertinent information in the service users' clinical records.
- Assist in the pre-and post-operative management of the service user.
- Make cross-boundary referrals to other healthcare professionals or departments as appropriate.
- Participate in multidisciplinary training, research, and audit.

Medical, legal, and ethical requirements

The graduate should be able to:

- Provide service user care which complies with medical, legal, and ethical requirements including those that are specific to data protection and access to health record requests.
- If/when in private practice, maintain insurance cover commensurate with minimum requirements This should include (a) Professional indemnity (b) Public liability (c) Medical malpractice (d) Product liability.
- Comply with Disclosure & Barring Service (DBS) or similar national certification as appropriate.
- Comply with BAPO's Ethical Code and the HCPC Standards of Conduct, Performance, and Ethics (HCPC, 2022).
- Comply with relevant Health and Safety legislation.
- Comply with relevant national laws.

Current and future skills and knowledge

When designing and reviewing curricula it is pertinent to consider emerging trends and developments in clinical practice as it takes some years to train a prosthetist/orthotist and they need to be prepared for the world of work upon graduation. Appendix 6 shows the survey results of participants about their current and perceived future skills and knowledge (Eddison et al, 2023).

5.4 Recruitment and admissions

Programmes should have quality-assured admission processes so that they recruit learners who have the potential to fulfil the role of prosthetist, orthotist, or prosthetist/orthotist. (BAPO, 2018). They should follow the programme admissions requirements of HCPC (HCPC, 2017a).

They should have transparent recruitment and admissions procedures that are equitable and inclusive and follow published admission criteria. Programme providers should promote realistic content descriptions about the nature of the programme and the profession so that applicant expectations are well managed. This will help to minimise attrition and support progression into a professional life as a prosthetist and/or orthotist.

Applicants should be advised that clinical placement allocations are finite and that they may be placed anywhere in the UK. There may also be some placement possibilities overseas (for example, in the Republic of Ireland). Similarly, they should be aware that although there are currently excellent employment opportunities upon graduation, the location of jobs means they cannot be guaranteed employment in any locality or discipline (prosthetist, orthotist, or dual practising prosthetist/orthotist post).

5.5 Length and structure of programme leading to registration

The length and structure of programmes or apprenticeships leading to registration as a prosthetist and orthotist should be of sufficient length and design to enable students to achieve the learning outcomes outlined in section 5.3. If the period of study must be extended, learners should be supported by the host institution to maintain knowledge and skills already gained.

Programmes of study and apprenticeship must be explicit about mandatory attendance, and this should be transparent in the rules for progression through study from one level to another.

Accelerated routes of study in prosthetics and orthotics may be permitted for people with prior qualifications that demonstrably map over to the programme learning outcomes.

Study duration for students following a university route should adopt the following approach:

- Full-time undergraduate pre-registration programmes must be no shorter than three academic years and ideally not exceed four academic years. Students may require longer periods of study due to academic suspension, or periods of voluntary suspension for health/personal reasons.
- Full-time postgraduate pre-registration programmes must take place over at least two academic years of full-time study.

For students attending an apprenticeship route, at least 20% of their time should normally be spent in academic learning. In the busy workplace and the current climate of workforce shortages, it is more important than ever to ensure that apprentices get the protected time they need to learn.

5.6 Practice-based learning

Practice-based learning (PBL) is a fundamental part of competence development for prosthetists and orthotists. PBL provides learning environments that enable the application of theoretical knowledge in clinical, patient-facing, and non-patient-facing contexts (BAPO, 2023c).

Partnership in practice education provision and apprenticeship delivery is essential. It takes a community of stakeholders to nurture a new professional, sharing values and creating a learning environment where the student can gain competence and confidence in practising new skills. The new *Practice-based learning framework for pre-registration prosthetic and orthotic learners* (BAPO, 2023c) provides a structure around which practice-based learning activities can be organised.

BAPO supports the seven principles of PBL shown in Table 6. The principles, originally published as a collaboration by the Chartered Society of Physiotherapy and the Royal College of Occupational Therapists (CSP and RCOT, 2022), support the development of quality and sustainable placement opportunities.

7 principles of practice-based learning	
Principle 1:	Practice-based learning opportunities are co-produced.
Principle 2:	Practice-based learning takes place across all areas, pillars, and levels of practice.
Principle 3:	Practice-based learning environments must be inclusive and welcoming to all.
Principle 4:	Practice-based learning uses flexible, appropriate, and supportive models of supervision and delivery.
Principle 5:	Practice-based learning is designed with a whole team approach.
Principle 6:	The practice education team are valued, respected, and recognised within their roles.
Principle 7:	Practice-based learning is evaluated; capturing data to drive improvement and demonstrate impact.

Table 6: The 7 principles of practice-based learning (CSP and RCOT, 2022)

Further to this, BAPO also supports the PBL consensus statements published by NHS Education Scotland which are:

1. All AHPs have a responsibility to support practice-based learning – regardless of their grade, occupational role, practice setting, or specialism.
2. Practice-based learning can occur in any environment, setting, or specialism.
3. A wide range of student supervision models can be used to deliver and support practice-based learning.
4. Resources to support practice-based learning must be embedded in service plans and our infrastructure to meet the needs of everyone involved.

Practice-based learning with demonstration service users

The curriculum design should ensure that students engage with people in need of prostheses and orthoses at all levels of study. Programme providers should design their curriculum so that students gain competence through learning with demonstration service users under the supervision of a prosthetist/orthotist faculty member or clinical practice educator. They should practice each step of the service delivery process (Figure 11).

In a university-based study, a pool of demonstration service users representing the most common levels of practice and most commonly presented health conditions in both prosthetics and orthotics should be invited to participate in supervised teaching/learning. Demonstration service users should be recruited following ethically approved processes with appropriate advertising local to the place of study.

For students following the apprenticeship route, programmes should collaborate with the employer and with other clinical placement sites to ensure minimum coverage of practical work in both prosthetics and orthotics.

Practice-based learning in clinical services

Students should participate in compulsory practice-based learning in clinical services, working with people across a range of common conditions and amputation levels. They should practice each stage of the delivery process (Figure 11) and experience this through all steps for a sufficient number of service users so that they can learn about the cause and effect of treatment planning, prescription, shape capture, modification, fit, alignment, and function. By the time the student graduates, they should be competent in doing this and able to enter a period of preceptorship where they will gain confidence in their practice with their caseload.

Simulations and Practice-based Learning

Simulations of the real service user/clinician interface are increasingly being used among AHP educators. Simulation is "a technique to replace or amplify real experiences with guided experiences, often immersive in nature, that evoke or replicate substantial aspects of the real world in a fully safe, instructive and interactive fashion" (Gaba, 2007). Standards on simulation in healthcare should be followed to uphold the quality of simulation (Association for Simulation Practice in Healthcare, 2023).

Simulated practice in prosthetics and orthotics is used as a teaching and learning tool. It can be used as an adjunct to clinical placements and provides a safe, controlled environment for student learning. Simulations include scenario-based case studies for learning with subjective and/or objective information about cases. Simulation examples include:

- Written or audio information about a medical and social history.
- Videos or animations of history taking and human movement (usually gait).
- Mannequins of body segments. For example, simulated polymer amputation stumps for casting or Ponsetti models of the various stages of club foot.
- Peer models where the students themselves act as demonstration service users. An example is students being models for foot assessment, casting, and foot orthosis fitting.
- Actors playing demonstration service users. An example is actors portraying distressed service users or how to deal with conflict.
- Digital simulations using avatars.

5.7 The learning environment

Programmes should provide an active learning environment that embraces equality, diversity, and inclusion for students. The values of the programme should mirror that of the profession and the recommendations of the report Anti-racism in AHP education should be followed (Council of Deans for Health, 2023). Guidance on practice-based learning for neurodivergent students is also available (Health Education England, 2022).

Faculty

Programmes of prosthetics and orthotics must be supported by adequate levels of clinically qualified prosthetists/orthotists, subject matter experts from other disciplines (including bioengineering), and technical and administrative support staff.

It is not a BAPO or HCPC requirement that the programme leader should be a prosthetist/orthotist. The International Society of Prosthetics and Orthotics (ISPO) standards expect that leaders are educated and proficient in prosthetic/orthotic competencies, experienced in administration and have a minimum of three years of experience as an educator. BAPO expects that all programme leaders have a sufficient understanding of the profession to perform the role and engage with the professional body on national matters relating to the workforce.

Moving from a clinical role to that of an educator can be challenging. Members of the Faculty team should participate fully in the host university staff development programme for academic practice to develop their pedagogical knowledge, skills, and understanding. This in turn will enable them to create the right learning environment for their students. Bridging the gap between practice and academic roles. Members of the clinical educator team should participate in training organised by the host university.

Both Faculty and the wider clinical educator team can benefit from advice found in the new AHP Educator Career Framework published by the Council of Deans for Health in 2023. The framework helps to bridge the gap between clinical and academic roles. It includes six guiding principles and six domains and is shown in Figure 14.

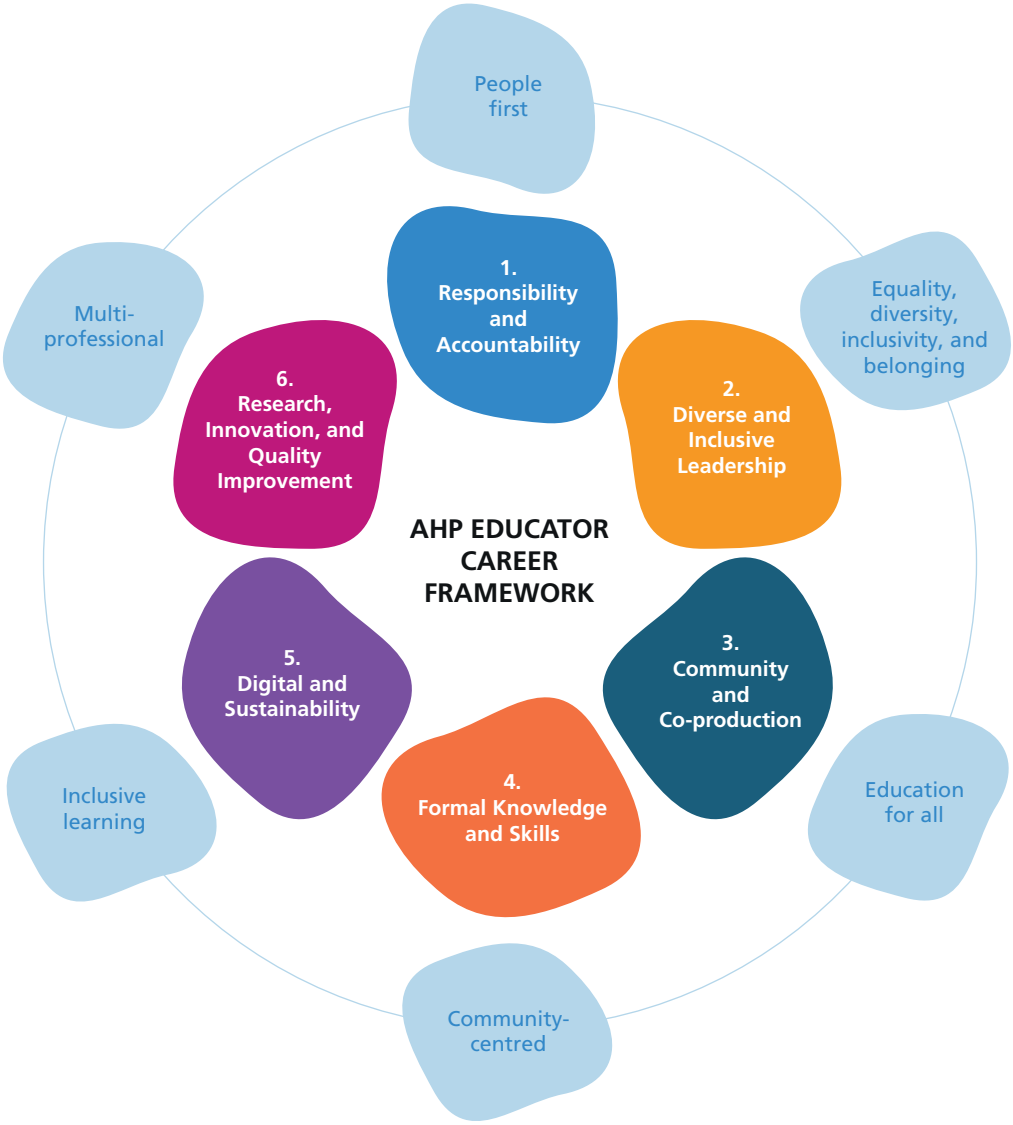


Figure 14: The AHP Educator Career Framework Domains and Guiding Principles (Council of Deans for Health, 2023)

Materials

A supply chain and stock of materials, components, and consumables are needed for programmes of prosthetics and orthotics so that custom-made devices can be prescribed, designed, manufactured, and fitted. In addition to this, access to a range of prefabricated devices is important for student learning.

Space

The real and virtual learning environment should be fit for purpose. Programmes of prosthetics and orthotics need access to both clinical and workshop physical space that is adequately equipped for device production.

5.8 Quality assurance

Prosthetic and orthotic programmes must comply with the quality assurance processes for education. Curriculum writers and reviewers should be aware of these processes. In the UK, quality assurance takes place at two levels of the system of professional education of prosthetists and orthotists: at the institutional (university) level and the programme level. Programmes of prosthetics and orthotics are influenced by their host university's quality assurance processes.

Quality assurance at the institutional level

Two UK bodies are independently involved in the regulation and quality assurance of universities. These are The Office for Students (OfS) and the Quality Assurance Agency (QAA).

In England, the Office for Students (OfS) provides a regulatory framework for higher education. OfS has four primary regulatory objectives so that students:

1. Are supported to access, succeed in, and progress from, higher education.
2. Receive a high-quality academic experience, and their interests are protected while they study or in the event of provider, campus, or course closure.
3. Can progress into employment or further study, and their qualifications hold their value over time.
4. Receive value for money.

The Quality Assurance Agency (QAA) is active at the university level across the UK. A key part of their role is to review how providers of higher education maintain their academic standards and quality. Relevant reports for the four universities currently offering pre-registration degrees in prosthetics and orthotics are available on the QAA website (QAA 2013a, 2013b, 2016, 2019).

QAA recently published The UK Quality Code for Higher Education (QAA, 2023). This quality code is based on two distinct elements:

1. Expectations
2. Core and common practices

At present, the UK Quality Code for Higher Education is mandatory and regulatory in Scotland, Wales, and Northern Ireland and voluntary in England. Figure 15 shows a graphic of the quality code.

Figure 15: The Quality Code is based on several elements that together provide a reference point for effective quality assurance (QAA, 2013).

The quality code itself is reproduced in Appendix 5 of the guidance as programme reviewers must understand the context of quality assurance in educational institutions.

Quality assurance at the programme level

BAPO has an interest in the quality assurance process and this document is the first publication to highlight driving forces and priorities for the 21st century relating to the education of prosthetists and orthotists.

HCPC is active at the programme level in the recognition and review of pre-registration programmes of prosthetics and orthotics. Graduates of HCPC-recognised programmes are eligible to apply to enter the HCPC register. HCPC protects the public by regulating prosthetists and orthotists.

Aligned with the UK quality assurance model, HCPC publishes standards of education and training (HCPC, 2017a, 2017b) which apply at both institution and programme levels. These are due for review in 2024. These standards are generic and apply to all educators of the HCPC-registered professions.

HCPC's Institution level standards include:

- Level of qualification for entry to the register
- Programme admissions
- Programme governance, management, and leadership
- Programme design and delivery
- Practice-based learning
- Assessment

HCPC's programme-level standards include similar topics with more detail:

- Programme admissions
- Programme governance, management, and leadership
- Programme design and delivery
- Practice-based learning
- Assessment

ISPO has a voluntary system of programme accreditation and has useful education standards for prosthetic/orthotic occupations (ISPO, 2018).

5.8.1 HCPC recognised programmes for prosthetist/orthotist education

At the time of publication, four programmes are recognised by HCPC as shown in table 7.

Award title	University	Duration	Study type
BSc (Hons) Prosthetics and Orthotics	University of Derby	3 years	Degree Apprenticeship
MSc Prosthetics and Orthotics	Keele University	2 years	Postgraduate
BSc (Hons) Prosthetics and Orthotics	University of Salford	3 years	Undergraduate
BSc (Hons) Prosthetics and Orthotics	University of Strathclyde	4 years	Undergraduate

Table 7: HCPC recognised pre-registration programmes for prosthetists and orthotists

6. Preparing students to enter the workplace

Whilst the entirety of student life is not just about preparing students to be prosthetists/orthotists, specific teaching/learning should take place to prepare them to enter the workplace. Programme providers should again reiterate the career information given on the application and guide students on job opportunities. This will inform them about the realities of working in the UK and beyond and prevent any misunderstandings, thus reducing the risk of early attrition. The Early Career Guidance Framework for Prosthetics and Orthotics (BAPO, 2023d) has useful information on pre-preceptorship.

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Appendices

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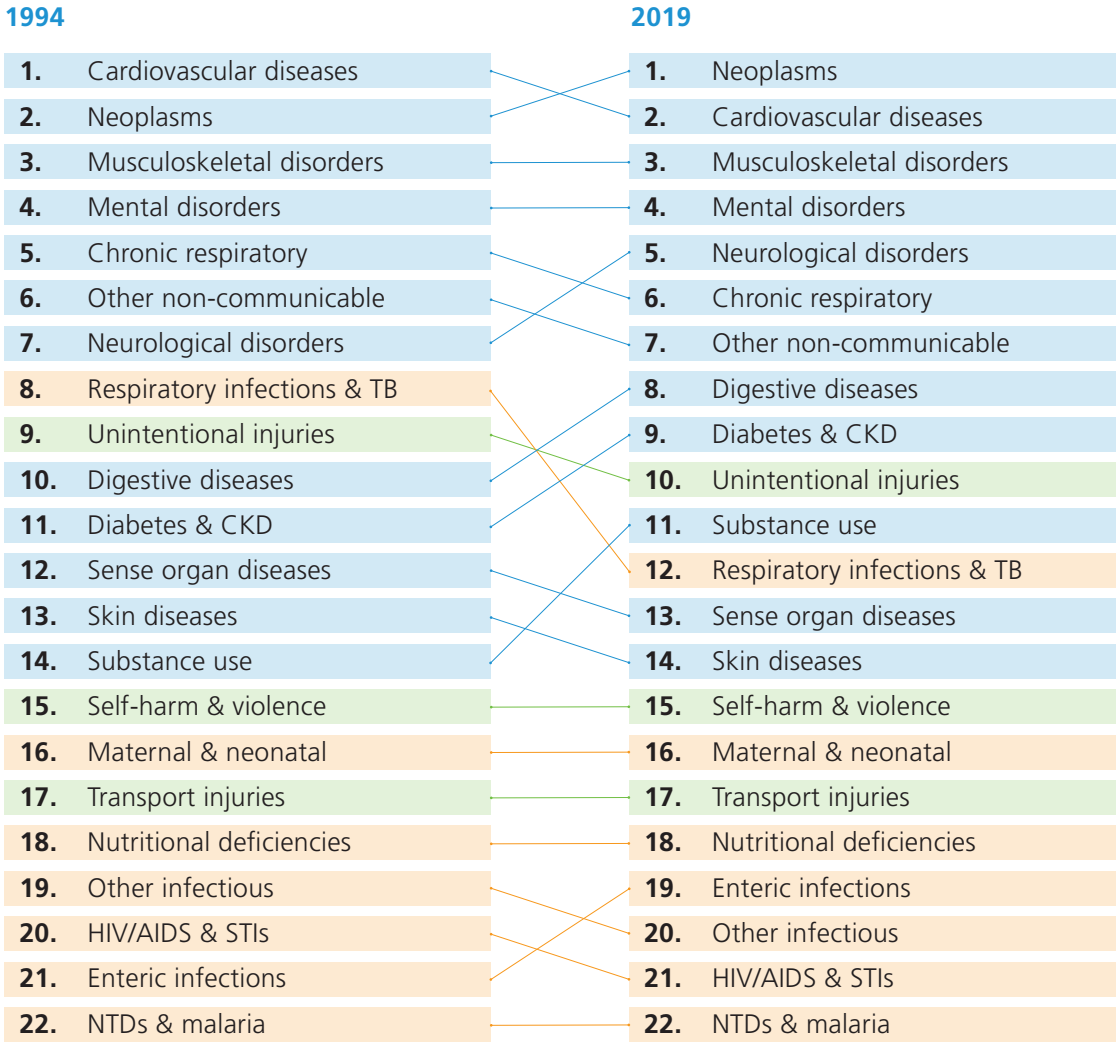
Appendix 1

Top-ranked health conditions by Disability-Adjusted Life Year – 25-year comparison.

United Kingdom - both sexes, all ages, DALYs per 100,000



Source: Institute of Health Metrics and Evaluation, 2019 GBD Compare

Appendix 2

Tables of pathologies and prosthetic or orthotic treatment possibilities by level.

Key:

LLO Lower limb orthotics
ULO Upper Limb Orthotics
SO Spinal Orthotics
LLP Lower limb prosthetics
ULP Upper limb prosthetics

Table 1. Infections	Treatment possibility *(Y=yes)*				
	LLO	**ULO**	**SO**	**LLP**	**ULP**
Meningitis				Y	Y
Gas gangrene				Y	Y
Poliomyelitis	Y				
Sepsis				Y	Y

Table 2. Neoplasms	Treatment possibility *(Y=yes)*				
	LLO	**ULO**	**SO**	**LLP**	**ULP**
Neoplasms of the brain or central nervous system	Y	Y			
Other neoplasms				Y	Y

Table 3. Endocrine, nutritional or metabolic diseases	Treatment possibility *(Y=yes)*				
	LLO	**ULO**	**SO**	**LLP**	**ULP**
Diabetes Mellitus	Y			Y	Y
Overweight, obesity	Y		Y		

Table 4. Diseases of the nervous system	Treatment possibility *(Y=yes)*				
	LLO	**ULO**	**SO**	**LLP**	**ULP**
Multiple Sclerosis	Y				
Stroke	Y	Y			
Myelitis			Y		
Motor neuron diseases	Y				
Nerve root or plexus disorders	Y	Y			
Neuropathy	Y	Y			
Guillain Barre syndrome	Y				
Myasthenia gravis	Y				
Muscular dystrophy	Y				
Cerebral palsy*	Y	Y	Y		
Parkinson's disease					
Charcot Marie Tooth *(types 1 demyelinating and 2 axonal)*	Y				
Other hereditary motor and sensory neuropathy	Y				
Spinal muscular atrophy	Y	Y	Y		
Duchenne's muscular dystrophy	Y				

Table 5. Diseases of the circulatory system	Treatment possibility *(Y=yes)*				
	LLO	ULO	SO	LLP	ULP
Diabetic foot ulcer	Y			Y	
Peripheral vascular disease *(PVD)*				Y	
Lymphoedema	Y				
Gangrene				Y	

Table 6. Diseases of the musculoskeletal system or connective tissue	Treatment possibility *(Y=yes)*				
	LLO	ULO	SO	LLP	ULP
Osteoarthritis *(includes Stills disease, gout)*	Y	Y	Y		
Rheumatoid arthritis	Y	Y	Y		
Spondylosis			Y		
Spinal deformities			Y		
Degenerative conditions of the spine			Y		
Disorders of muscles	Y	Y	Y		
Disorders of synovium or tendon *(includes achilles tendonitis, Achilles Tendinopathy, Sever's disease, Tibialis posterior tendon dysfunction (adult acquired flat foot))*	Y	Y	Y		
Osteonecrosis	Y				
Osteoporosis			Y		
Osteomyopathies or chondropathies *(for example, Osgood Schlatter disease, Perthes disease, patellofemoral pain syndrome, Freiberg's infraction)*	Y				
Osteomyelitis	Y				
Paget disease	Y				
Acquired deformities	Y				
Ehlers-Danlos syndrome		Y			

Table 7. Developmental anomalies	Treatment possibility *(Y=yes)*				
	LLO	ULO	SO	LLP	ULP
Developmental delay	Y	Y	Y		
Structural developmental anomalies affecting one body system including pectus excavatum	Y	Y	Y	Y	Y
Multiple developmental anomalies or syndromes	Y	Y	Y	Y	Y
Scoliosis			Y		
Spina bifida	Y		Y		
Constriction rings (amniotic band syndrome)				Y	
Proximal Focal Femoral Deficiency	Y			Y	
Arthrogryposis	Y	Y			
Scheuermans disease			Y		
Transverse deficiencies of the limbs				Y	Y
Longitudinal deficiencies of the limbs				Y	Y

Table 8. Injury	Treatment possibility *(Y=yes)*				
	LLO	ULO	SO	LLP	ULP
Fractures	Y	Y	Y		
Dislocations	Y	Y			
Strains or sprains of joints or ligaments	Y	Y			
Nerve injuries	Y	Y			
Injury of muscle, fascia, tendon or bursa	Y	Y			
Amputation	Y			Y	Y
Traumatic blast injuries				Y	Y
Burns	Y	Y			
Complex regional pain syndrome	Y	Y			
Post-operative knee replacement	Y				
Post-operative hip replacement	Y				

Appendix 3

Classifications of prostheses and orthoses

Prostheses are classified in a hierarchy according to the level of amputation that they treat, and orthoses are classified by the segment of the body that they directly cover (ISO, 2020a, 2020b and 2020c).

Terms relating to external limb prostheses and wearers of these prostheses

Lower limb:

- partial foot amputation
- toe phalangeal amputation
- metatarsophalangeal disarticulation
- metatarsal amputation
- tarsometatarsal disarticulation
- tarsal amputation
- ankle disarticulation
- transtibial amputation
- below knee amputation
- knee disarticulation
- transfemoral amputation
- above knee amputation
- hip disarticulation
- trans pelvic amputation
- hindquarter amputation

Upper limb:

- partial hand amputation
- thumb amputation
- finger phalangeal amputation
- metacarpophalangeal disarticulation
- metacarpal amputation
- carpometacarpal disarticulation
- carpal amputation
- wrist disarticulation
- transradial amputation
- below elbow amputation
- elbow disarticulation
- transhumeral amputation
- above elbow amputation
- shoulder disarticulation
- forequarter amputation

Limb deficiencies present at birth:

- deficiency
- transverse deficiency
- longitudinal deficiency
- hypoplastic
- ray

Terms relating to orthoses

Classes of lower limb orthoses:

- toe orthosis TO
- foot orthosis FO
- ankle-foot orthosis AFO
- knee orthosis KO
- knee-ankle-foot orthosis KAFO
- hip orthosis HO
- hip-knee orthosis HKO
- hip-knee-ankle-foot orthosis HKAFO

Classes of spinal orthoses:

- cervical orthosis CO
- cervico-thoracic orthosis CTO
- cervico-thoraco-lumbo-sacral orthosis CTLSO
- thoracic orthosis TO
- thoraco-lumbo-sacral orthosis TLSO
- lumbo-sacral orthosis LSO
- sacro-iliac orthosis SIO

Classes of upper limb orthoses:

- finger orthosis FO
- thumb orthosis TO
- hand orthosis HO
- wrist-hand orthosis WHO
- elbow orthosis EO
- elbow-wrist-hand orthosis EWHO
- shoulder orthosis SO
- shoulder-elbow orthosis SEO
- shoulder-elbow-wrist-hand orthosis SEWHO

Classes of head orthoses:

- facial orthosis FO
- cranial orthosis CO

Appendix 4

Cause of amputation against the level of amputation for England 2011-2012 (from p112, Limbless Statistics, 2013)

		Forequarter	Shoulder disartic	Trans-humeral	Elbow disartic	Trans-radial	Wrist disartic	Partial Hand	Hand digits		Hemi pelvectomy	Hip disartic	Trans-femoral	Knee disartic	Trans-tibial	Ankle disartic	Partial feet	Foot digits	Co no amp	All
Trauma	No detail: Trauma		3	8		6	1	16	7				48	6	69	1	3			168
	Mechanical		2	22	1	25	2	11	45			7	118	14	233	6	12	1		499
	Thermal	1		3		2	1		1						6					14
	Electrical			4		3		2	2				3		4					18
	Chemical					1	1					1	2		4					9
	Radioactive																			0
Dysvascular	PVD no Diabetes			2		2			1				466	25	530	1	4	1		1032
	PVD with Diabetes			2		3			2		1	2	411	24	873	1	11			1330
	Acute vascular Incid			2		3	1	2				1	59	3	43	2	3			119
	Other Dysvascular			3		6			2		1	1	291	24	307	3	5			643
Infection	No detail: Infection			1		3	1	2	1		1	2	42	5	100		2	1		161
	Soft tissue	1		4		4		3	5		1	9	56	4	68		2			157
	Bone	1		1		1						2	59	7	90		1			162
	Joints												17		5					22
Neurological Disorder	Congenital Neuro Abnormality												8	1	18	2				29
	Injury			1					1				1		3					6
	Infection												4		7					11
	Systemic Disease			1					1					1	19					22
	Other Neurol Disorder	1		1				1					7	1	11	1				23
Neoplasia	No detail: neopl			1									7		2					10
	Benign Tumour								1				1		4					6
	Malignant Primary Tumour	5	4	8		7			6		6	11	58	2	35		5	1		148
	Malignant Secondary Tumour	2	1	4								2	12		3					24
Congenital	Congenital Absence - No Amputation		2	3	1	52	7	25	12			1	6	3	26	2	5	2	29	176
	Congenital Anomaly - Surgical Amputation					3	1		1			1	5	5	25	12	1			54
	Acquired deformity			1				1					1		11	2				16
	No data	1	2	29	1	38	1	15	19		3	5	373	29	498	9	21	3		1047
	All	12	14	101	3	159	16	78	107		13	45	2055	154	2994	42	75	9	29	5906

Summary cause of amputation against level of amputation - UK (Limbless Statistics, 2013)

		Trauma	Dysvascular	Infection	Neurological disorder	Neoplasia	Congenital	No Data	All (n=)	All (%)	
Upper limb	Forequarter	1	0	2	1	7	0	1	12	0.2%	
	Shoulder disarticulation	5	0	0	0	5	2	2	14	0.2%	
	Trans-humeral	37	9	6	3	13	4	29	101	1.7%	
	Elbow disartic	1	0	0	0	0	1	1	3	0.1%	
	Trans-radial	37	14	8	0	7	55	38	159	2.7%	8.3%
	Wrist Disartic	5	1	1	0	0	8	1	16	0.3%	
	Partial Hand	29	2	5	1	0	26	15	78	1.3%	
	Hand digits	55	5	6	2	7	13	19	107	1.8%	
	Hemi Pelvectomy	0	2	2	0	6	0	3	13	0.2%	
	Hip Disarticulation	8	4	13	0	13	2	5	45	0.8%	
Lower limb	Trans-femoral	171	1227	174	20	78	12	373	2055	34.8%	
	Knee Disartic	20	76	16	3	2	8	29	154	2.6%	
	Trans-tibial	316	1753	263	58	44	62	498	2994	50.7%	91.2%
	Ankle Disartic	7	7	0	3	0	16	9	42	0.7%	
	Partial Feet	15	23	5	0	5	6	21	75	1.3%	
	Foot Digits	1	1	1	0	1	2	3	9	0.2%	
	Congenital no amp	0	0	0	0	0	29	0	29	0.5%	0.5%
	All (n=)	708	3124	502	91	188	246	1047	5906	100.00%	
	All %	12.0%	52.9%	8.5%	1.5%	3.2%	4.2%	17.7%	100.0%		

Appendix 5

The UK Quality Code for Higher Education (QAA, 2023)

<table>
<tr><th colspan="2">Expectations for standards</th><th colspan="2">Expectations for standards</th></tr>
<tr><td colspan="2">The academic standards of courses meet the requirements of the relevant national qualifications framework.

The value of qualifications awarded to students at the point of qualification and over time is in line with sector-recognised standards.</td><td colspan="2">Courses are well-designed, provide a high-quality academic experience for all students and enable a student's achievement to be reliably assessed.

From admission through to completion, all students are provided with the support that they need to succeed in and benefit from higher education.</td></tr>
<tr><td>Core practices

The provider ensures that the threshold standards for its qualifications are consistent with the relevant national qualifications frameworks.

The provider ensures that students who are awarded qualifications have the opportunity to achieve standards beyond the threshold level that are reasonably comparable with those achieved in other UK providers.

Where a provider works in partnership with other organisations, it has in place effective arrangements to ensure that the standards of its awards are credible and secure irrespective of where or how courses are delivered or who delivers them.

The provider uses external expertise, assessment, and classification processes that are reliable, fair, and transparent.</td><td>Common practices

The provider reviews its core practices for standards regularly and uses the outcomes to drive improvement and enhancement.</td><td>Core practices

The provider has a reliable, fair, and inclusive admissions system.

The provider designs and/or delivers high-quality courses.

The provider has sufficient appropriately qualified and skilled staff to deliver a high-quality academic experience.

The provider has sufficient and appropriate facilities, learning resources and student support services to deliver a high-quality academic experience.

The provider actively engages students, individually and collectively, in the quality of their educational experience.

The provider has fair and transparent procedures for handling complaints and appeals which are accessible to all students.

Where the provider offers research degrees, it delivers these in appropriate and supportive research environments.

Where a provider works in partnership with other organisations, it has in place effective arrangements to ensure that the academic experience is high quality irrespective of where or how courses are delivered and who delivers them.

The provider supports all students to achieve successful academic and professional outcomes.</td><td>Common practices

Common practices
The provider reviews its core practices for quality regularly and uses the outcomes to drive improvement and enhancement.

The provider's approach to managing quality takes account of external expertise.

The provider engages students individually and collectively in the development, assurance, and enhancement of the quality of their educational experience.</td></tr>
</table>

Appendix 6

Current and future skills and knowledge

Q7.2 – Please let us know (1) if you currently have the following prosthetics skills/knowledge, and (2) which prosthetics skills/knowledge do you think will be required for fulfilling your role(s) in the future?

The skills/ knowledge with the largest discrepancy between skills currently possessed by respondents and skills which respondents feel will be required in the future are:

- Neuro implants for control of prosthetic movement *(diff: 90)*
- 3D printing *(diff: 83)*
- Ability to carry out mental health and wellbeing *(MHWB)* checks *(diff: 73)*
- Knowledge of robotics *(diff: 61)*
- Osseo-integration *(diff: 59)*
- Artificial muscles *(materials or devices that mimic natural muscle) (diff: 58)*
- X-ray interpretation *(diff: 55)*
- Interpretation of lab-based gait assessment reports *(diff: 54)*
- Ability to provide trauma-informed care *(Having an understanding of trauma and acknowledging that patients may have experienced trauma) (diff: 51)*
- Novel control systems for prostheses *(diff: 51)*

Do you currently have this skill/knowledge?	**Yes** *(% of Total)*	**No** *(% of Total)*
Technological and digital competency *(i.e., telehealth)*	**130** (71.0%)	**53** (29.0%)
Leadership and management	**103** (56.3%)	**80** (43.7%)
Public health *(e.g., educate people on health issues, contribute to health, and prevention, offer information about physical and mental health and well-being)*	**91** (49.7%)	**92** (50.3%)
Research skills	**65** (35.9%)	**116** (64.1%)
Effective communication and behaviour change skills	**160** (87.9%)	**22** (12.1%)
Ability to carry out mental health and wellbeing *(MHWB)* checks	**41** (22.5%)	**141** (77.5%)
Ability to provide trauma-informed care *(Having an understanding of trauma and acknowledging that patients may have experienced trauma)*	**74** (40.9%)	**107** (59.1%)
Person-centred care *(focusing care on the needs of the individual)*	**156** (85.7%)	**26** (14.3%)
Prescribing rights (*Can make decisions about patient clinical management, including prescribing. We are referring to controlled medicines and drugs e.g., steroid injections or anti-inflammatory medicines)*	**32** (17.6%)	**150** (82.4%)
Advanced clinical skills *(A level of practice characterised by a high degree of autonomy and complex decision making. This is underpinned by a master's level award or equivalent)*	**62** (34.1%)	**120** (65.9%)
X-ray interpretation	**33** (18.1%)	**149** (81.9%)
Interpretation of lab-based gait assessment reports	**51** (28.2%)	**130** (71.8 %)

Do you currently have this skill/knowledge? *(cont.)*	**Yes** *(% of Total)*	**No** *(% of Total)*
Computer-aided design *(CAD)*	**128** (70.3%)	**54** (29.7%)
3D imaging for capturing body segment	**102** (56.4%)	**79** (43.6%)
Material science *(the understanding of material structure and failure)*	**124** (68.1%)	**58** (31.9%)
New materials to enhance product design	**90** (50.0%)	**90** (50.0%)
Adaptive prostheses *(e.g., seating and high-performance devices)*	**97** (54.2%)	**82** (45.8%)
Devices designed for high-performance recreation/vocational pursuits *(this will require knowledge of biomechanics or the ability to work with professionals versed in the art of biomechanics)*	**112** (61.9%)	**69** (38.1%)
Motion analysis	**90** (49.5%)	**92** (50.5%)
Knowledge of robotics	**24** (13.2%)	**158** (86.8%)
Novel control systems for prostheses	**51** (28.2%)	**130** (71.8%)
Myoelectric control	**120** (65.9%)	**62** (34.1%)
Neuro implants for control of prosthetic movement	**23** (12.7%)	**158** (87.3%)
More life-like coverings of prostheses	**126** (69.6%)	**55** (30.4%)
Liner technology	**147** (80.8%)	**35** (19.2%)
Rapid manufacture technologies	**77** (42.5%)	**104** (57.5%)
3D printing	**43** (23.9%)	**137** (76.1%)
Artificial muscles *(materials or devices that mimic natural muscle)*	**14** (7.7%)	**167** (92.3%)
Osseo-integration	**73** (40.1%)	**109** (59.9%)
Microprocessor componentry	**156** (86.2%)	**25** (13.8%)

Do you think this skill/knowledge will be required for fulfilling your role(s) in the future?	**Yes** *(% of Total)*	**No** *(% of Total)*	**I don't know** *(% of Total)*
Technological and digital competency *(i.e., telehealth)*	**139** (79.4%)	**12** (6.9%)	**24** (13.7%)
Leadership and management	**127** (72.2%)	**25** (14.2%)	**24** (13.6%)
Public health *(e.g., educate people on health issues, contribute to health, and prevention, offer information about physical and mental health and well-being)*	**137** (77.4%)	**21** (11.9%)	**19** (10.7%)
Research skills	**102** (57.6%)	**37** (20.9%)	**38** (21.5%)
Effective communication and behaviour change skills	**163** (92.6%)	**7** (4.0%)	**6** (3.4%)
Ability to carry out mental health and wellbeing *(MHWB)* checks	**114** (65.1%)	**24** (13.7%)	**37** (21.1%)

Do you think this skill/knowledge will be required for fulfilling your role(s) in the future? *(cont.)*	**Yes** *(% of Total)*	**No** *(% of Total)*	**I don't know** *(% of Total)*
Ability to provide trauma-informed care *(Having an understanding of trauma and acknowledging that patients may have experienced trauma)*	**125** (71.0%)	**22** (12.5%)	**29** (16.5%)
Person-centred care *(focusing care on the needs of the individual)*	**150** (85.2%)	**13** (7.4%)	**13** (7.4%)
Prescribing rights *(Can make decisions about patient clinical management, including prescribing. We are referring to controlled medicines and drugs e.g., steroid injections or anti-inflammatory medicines)*	**58** (32.4%)	**86** (48.0%)	**35** (19.6%)
Advanced clinical skills *(A level of practice characterised by a high degree of autonomy and complex decision making. This is underpinned by a master's level award or equivalent)*	**90** (50.3%)	**61** (34.1%)	**28** (15.6%)
X-ray interpretation	**88** (48.9%)	**57** (31.7%)	**35** (19.4%)
Interpretation of lab-based gait assessment reports	**105** (59.3%)	**44** (24.9%)	**28** (15.8%)
Computer-aided design *(CAD)*	**153** (86.9%)	**17** (9.7%)	**6** (3.4%)
3D imaging for capturing body segment	**140** (79.5%)	**25** (14.2%)	**11** (6.3%)
Material science *(the understanding of material structure and failure)*	**134** (75.7%)	**26** (14.7%)	**17** (9.6%)
New materials to enhance product design	**139** (78.5%)	**19** (10.7%)	**19** (10.7%)
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Motion analysis	**126** (71.2%)	**23** (13.0%)	**28** (15.8%)
Knowledge of robotics	**85** (47.5%)	**46** (25.7%)	**48** (26.8%)
Novel control systems for prostheses	**102** (57.6%)	**30** (16.9%)	**45** (25.4%)
Myoelectric control	**135** (76.7%)	**27** (15.3%)	**14** (8.0%)
Neuro implants for control of prosthetic movement	**113** (63.5%)	**27** (15.3%)	**14** (8.0%)
More life-like coverings of prostheses	**136** (76.8%)	**23** (13.0%)	**18** (10.2%)
Liner technology	**152** (86.4%)	**14** (8.0%)	**10** (5.7%)
Rapid manufacture technologies	**125** (70.2%)	**27** (15.2%)	**26** (14.6%)
3D printing	**126** (70.4%)	**22** (12.3%)	**31** (17.3%)
Artificial muscles *(materials or devices that mimic natural muscle)*	**72** (40.2%)	**50** (27.9%)	**57** (31.8%)

Do you think this skill/knowledge will be required for fulfilling your role(s) in the future? *(cont.)*	**Yes** *(% of Total)*	**No** *(% of Total)*	**I don't know** *(% of Total)*
Osseo-integration	**132** (74.6%)	**22** (12.4%)	**23** (13.0%)
Microprocessor componentry	**160** (90.4%)	**11** (6.2%)	**6** (3.4%)

Q7.3 – Please let us know (1) if you currently have the following orthotics skills/knowledge, and (2) which orthotics skills/knowledge do you think will be required for fulfilling your role(s) in the future?

The skills/ knowledge with the largest discrepancy between skills currently possessed by respondents and skills which respondents feel will be required in the future are:

- Ability to carry out mental health and wellbeing *(MHWB)* checks *(diff: 189)*
- Rapid manufacture technologies *(diff: 177)*
- 3D printing *(diff: 167)*
- X-ray interpretation *(diff: 161)*
- New materials to enhance product design *(diff: 155)*
- Prescribing rights *(Can make decisions about patient clinical management, including prescribing. We are referring to controlled medicines and drugs e.g., steroid injections or anti-inflammatory medicines) (diff: 153)*
- Artificial muscles *(materials or devices that mimic natural muscle) (diff: 150)*
- Knowledge of robotics *(diff: 143)*
- Ability to provide trauma-informed care *(Having an understanding of trauma and acknowledging that patients may have experienced trauma) (diff: 141)*
- Advanced clinical skills *(A level of practice characterised by a high degree of autonomy and complex decision making. This is underpinned by a master's level award or equivalent) (diff: 134)*

Do you currently have this skill/knowledge?	**Yes** *(% of Total)*	**No** *(% of Total)*
Technological and digital competency *(i.e., telehealth)*	**322** (74.7%)	**109** (25.3%)
Leadership and management	**265** (61.2%)	**168** (38.8%)
Public health *(e.g., educate people on health issues, contribute to health, and prevention, offer information about physical and mental health and well-being)*	**239** (55.6%)	**191** (44.4%)
Research skills	**179** (41.7%)	**250** (58.3%)
Effective communication and behaviour change skills	**374** (87.0%)	**56** (13.0%)
Ability to carry out mental health and wellbeing *(MHWB)* checks	**73** (17.1%)	**355** (82.9%)
Ability to provide trauma-informed care *(Having an understanding of trauma and acknowledging that patients may have experienced trauma)*	**151** (35.4%)	**275** (64.6%)
Person-centred care *(focusing care on the needs of the individual)*	**379** (88.8%)	**48** (11.2%)
Prescribing rights *(Can make decisions about patient clinical management, including prescribing. We are referring to controlled medicines and drugs e.g., steroid injections or anti-inflammatory medicines)*	**41** (9.6%)	**386** (90.4%)

Do you currently have this skill/knowledge? *(cont.)*	**Yes** *(% of Total)*	**No** *(% of Total)*
Advanced clinical skills *(A level of practice characterised by a high degree of autonomy and complex decision-making. This is underpinned by a master's level award or equivalent)*	**107** (24.9%)	**322** (75.1%)
X-ray interpretation	**145** (34.0%)	**282** (66.0%)
Interpretation of lab-based gait assessment reports	**209** (48.8%)	**219** (51.2%)
Computer-aided design *(CAD)*	**190** (44.5%)	**237** (55.5%)
3D imaging for capturing body segment	**278** (65.0%)	**150** (35.0%)
Material science *(the understanding of material structure and failure)*	**330** (77.3%)	**97** (22.7%)
New materials to enhance product design	**216** (50.5%)	**212** (49.5%)
Devices designed for high-performance recreation/vocational pursuits *(this will require knowledge of biomechanics or the ability to work with professionals versed in the art of biomechanics)*	**204** (48%)	**221** (52.0%)
Motion analysis	**244** (57.1%)	**183** (42.9%)
Knowledge of robotics	**34** (8.0%)	**392** (92.0%)
Rapid manufacture technologies	**97** (22.6%)	**332** (77.4%)
3D printing	**158** (37.1%)	**268** (62.9%)
Artificial muscles *(materials or devices that mimic natural muscle)*	**24** (5.6%)	**402** (94.4%)

Do you think this skill/knowledge will be required for fulfilling your role(s) in the future?	**Yes** *(% of Total)*	**No** *(% of Total)*	**I don't know** *(% of Total)*
Technological and digital competency *(i.e., telehealth)*	**358** (84.8%)	**17** (4.0%)	**47** (11.1%)
Leadership and management	**335** (79.0%)	**41** (9.7%)	**48** (11.3%)
Public health *(e.g., educate people on health issues, contribute to health, and prevention, offer information about physical and mental health and well-being)*	**342** (80.9%)	**37** (8.7%)	**44** (10.4%)
Research skills	**284** (67.6%)	**55** (13.1%)	**81** (19.3%)
Effective communication and behaviour change skills	**385** (92.3%)	**12** (2.9%)	**20** (4.8%)
Ability to carry out mental health and wellbeing *(MHWB)* checks	**262** (62.2%)	**63** (15.0%)	**96** (22.8%)
Ability to provide trauma-informed care *(Having an understanding of trauma and acknowledging that patients may have experienced trauma)*	**292** (69.2%)	**53** (12.6%)	**77** (18.2%)
Person-centred care *(focusing care on the needs of the individual)*	**378** (90.9%)	**19** (4.6%)	**19** (4.6%)

Do you think this skill/knowledge will be required for fulfilling your role(s) in the future? *(cont.)*	**Yes** *(% of Total)*	**No** *(% of Total)*	**I don't know** *(% of Total)*
Prescribing rights *(Can make decisions about patient clinical management, including prescribing. We are referring to controlled medicines and drugs e.g., steroid injections or anti-inflammatory medicines)*	**194** (46.0%)	**133** (31.5%)	**95** (22.5%)
Advanced clinical skills *(A level of practice characterised by a high degree of autonomy and complex decision making. This is underpinned by a master's level award or equivalent)*	**241** (57.4%)	**99** (23.6%)	**80** (19.0%)
X-ray interpretation	**306** (72.7%)	**60** (14.3%)	**55** (13.1%)
Interpretation of lab-based gait assessment reports	**302** (72.6%)	**62** (14.9%)	**52** (12.5%)
Computer-aided design *(CAD)*	**323** (77.3%)	**50** (12.0%)	**45** (10.8%)
3D imaging for capturing body segment	**358** (85.9%)	**25** (6.0%)	**34** (8.2%)
Material science *(the understanding of material structure and failure)*	**361** (87.0%)	**31** (7.5%)	**23** (5.5%)
New materials to enhance product design	**371** (88.8%)	**25** (6.0%)	**22** (5.3%)
Devices designed for high-performance recreation/ vocational pursuits *(this will require knowledge of biomechanics or the ability to work with professionals versed in the art of biomechanics)*	**304** (72.4%)	**57** (13.6%)	**59** (14.0%)
Motion analysis	**324** (77.5%)	**38** (9.1%)	**56** (13.4%)
Knowledge of robotics	**177** (42.0%)	**122** (29.0%)	**122** (29.0%)
Rapid manufacture technologies	**274** (65.7%)	**55** (13.2%)	**88** (21.1%)
3D printing	**325** (77.9%)	**41** (9.8%)	**51** (12.2%)
Artificial muscles *(materials or devices that mimic natural muscle)*	**174** (41.3%)	**105** (24.9%)	**142** (33.7%)

Q7.4 – Please let us know (1) if you currently have the following prosthetic/orthotic skills/knowledge, and (2) which prosthetic/orthotic skills/knowledge do you think will be required for fulfilling your role(s) in the future?

The skills/ knowledge with the largest discrepancy between skills currently possessed by respondents and skills which respondents feel will be required in the future are:

- 3D printing *(diff: 24)*
- Neuro implants for control of prosthetic movement *(diff: 22)*
- Knowledge of robotics *(diff: 21)*
- Rapid manufacture technologies *(diff: 21)*
- Ability to carry out mental health and wellbeing *(MHWB)* checks *(diff: 19)*
- Novel control systems for prostheses *(diff: 19)*
- X-ray interpretation *(diff: 18)*
- Artificial muscles *(materials or devices that mimic natural muscle) (diff: 18)*
- 3D imaging for capturing body segments *(diff: 16)*
- Prescribing rights *(Can make decisions about patient clinical management, including prescribing. We are referring to controlled medicines and drugs e.g., steroid injections or anti-inflammatory medicines) (diff: 14)*

Do you currently have this skill/knowledge?	**Yes** *(% of Total)*	**No** *(% of Total)*
Technological and digital competency *(i.e., telehealth)*	**40** (69.0%)	**18** (31.0%)
Leadership and management	**33** (55.9%)	**26** (44.1%)
Public health *(e.g., educate people on health issues, contribute to health, and prevention, offer information about physical and mental health and well-being)*	**35** (60.3%)	**23** (39.7%)
Research skills	**36** (62.1%)	**22** (39.7%)
Effective communication and behaviour change skills	**48** (82.8%)	**10** (17.2%)
Ability to carry out mental health and wellbeing *(MHWB)* checks	**14** (23.7%)	**45** (76.3%)
Ability to provide trauma-informed care *(Having an understanding of trauma and acknowledging that patients may have experienced trauma)*	**26** (44.1%)	**33** (55.9%)
Person-centred care *(focusing care on the needs of the individual)*	**45** (76.3%)	**14** (23.7%)
Prescribing rights *(Can make decisions about patient clinical management, including prescribing. We are referring to controlled medicines and drugs e.g., steroid injections or anti-inflammatory medicines)*	**14** (23.7%)	**45** (76.3%)
Advanced clinical skills *(A level of practice characterised by a high degree of autonomy and complex decision making. This is underpinned by a master's level award or equivalent)*	**21** (35.6%)	**38** (64.4%)
X-ray interpretation	**16** (27.1%)	**43** (72.9%)
Interpretation of lab-based gait assessment reports	**27** (45.8%)	**32** (54.2%)
Computer-aided design *(CAD)*	**37** (62.7%)	**22** (37.3%)
3D imaging for capturing body segment	**31** (52.5%)	**28** (47.5%)

Do you currently have this skill/knowledge? *(cont.)*	**Yes** *(% of Total)*	**No** *(% of Total)*
Material science *(the understanding of material structure and failure)*	**41** (69.5%)	**18** (30.5%)
New materials to enhance product design	**32** (55.2%)	**26** (44.8%)
Adaptive prostheses *(e.g., seating and high-performance devices)*	**22** (37.3%)	**37** (62.7%)
Devices designed for high-performance recreation/vocational pursuits *(this will require knowledge of biomechanics or the ability to work with professionals versed in the art of biomechanics)*	**28** (47.5%)	**31** (52.5%)
Motion analysis	**27** (45.8%)	**32** (54.2%)
Knowledge of robotics	**10** (16.9%)	**49** (83.1%)
Novel control systems for prostheses	**20** (33.9%)	**39** (66.1%)
Myoelectric control	**33** (55.9%)	**26** (44.1%)
Neuro implants for control of prosthetic movement	**8** (13.6%)	**51** (86.4%)
More life-like coverings of prostheses	**36** (61.0%)	**23** (39.0%)
Liner technology	**36** (61.0%)	**23** (39.0%)
Rapid manufacture technologies	**26** (44.1%)	**33** (55.9%)
3D printing	**24** (40.7%)	**35** (59.3%)
Artificial muscles *(materials or devices that mimic natural muscle)*	**5** (8.5%)	**54** (91.5%)
Osseo-integration	**24** (40.7%)	**35** (59.3%)
Microprocessor componentry	**37** (62.7%)	**22** (37.3%)

Do you think this skill/knowledge will be required for fulfilling your role(s) in the future?	**Yes** *(% of Total)*	**No** *(% of Total)*	**I don't know** *(% of Total)*
Technological and digital competency *(i.e., telehealth)*	**45** (78.9%)	**5** (8.8%)	**7** (12.3%)
Leadership and management	**46** (79.3%)	**10** (17.2%)	**2** (3.4%)
Public health *(e.g., educate people on health issues, contribute to health, and prevention, offer information about physical and mental health and well-being)*	**40** (70.2%)	**10** (17.5%)	**7** (12.3%)
Research skills	**35** (61.4%)	**10** (17.5%)	**12** (21.1%)
Effective communication and behaviour change skills	**49** (86.0%)	**5** (8.8%)	**3** (5.3%)
Ability to carry out mental health and wellbeing *(MHWB)* checks	**33** (56.9%)	**11** (19.0%)	**14** (24.1%)
Ability to provide trauma-informed care *(Having an understanding of trauma and acknowledging that patients may have experienced trauma)*	**35** (60.3%)	**12** (20.7%)	**11** (19.0%)

Do you think this skill/knowledge will be required for fulfilling your role(s) in the future? *(cont.)*	**Yes** *(% of Total)*	**No** *(% of Total)*	**I don't know** *(% of Total)*
Person-centred care *(focusing care on the needs of the individual)*	**47** (81.0%)	**8** (13.8%)	**3** (5.2%)
Prescribing rights *(Can make decisions about patient clinical management, including prescribing. We are referring to controlled medicines and drugs e.g., steroid injections or anti-inflammatory medicines)*	**28** (48.3%)	**24** (41.4%)	**6** (10.3%)
Advanced clinical skills *(A level of practice characterised by a high degree of autonomy and complex decision making. This is underpinned by a master's level award or equivalent)*	**33** (56.9%)	**17** (29.3%)	**8** (13.8%)
X-ray interpretation	**34** (58.6%)	**19** (32.8%)	**5** (8.6%)
Interpretation of lab-based gait assessment reports	**35** (60.3%)	**15** (25.9%)	**8** (13.8%)
Computer-aided design *(CAD)*	**48** (82.8%)	**6** (10.3%)	**4** (6.9%)
3D imaging for capturing body segment	**47** (81.0%)	**8** (13.8%)	**3** (5.2%)
Material science *(the understanding of material structure and failure)*	**40** (69.0%)	**10** (17.2%)	**8** (13.8%)
New materials to enhance product design	**41** (71.9%)	**5** (8.8%)	**11** (19.3%)
Adaptive prostheses *(e.g., seating and high-performance devices)*	**35** (60.3%)	**8** (13.8%)	**15** (25.9%)
Devices designed for high-performance recreation/ vocational pursuits *(this will require knowledge of biomechanics or the ability to work with professionals versed in the art of biomechanics)*	**38** (65.5%)	**7** (12.1%)	**13** (22.4%)
Motion analysis	**41** (70.7%)	**9** (15.5%)	**8** (13.8%)
Knowledge of robotics	**31** (54.4%)	**13** (22.8%)	**13** (22.8%)
Novel control systems for prostheses	**39** (68.4%)	**7** (12.3%)	**11** (19.3%)
Myoelectric control	**46** (79.3%)	**7** (12.1%)	**5** (8.6%)
Neuro implants for control of prosthetic movement	**30** (51.7%)	**11** (19.0%)	**17** (29.3%)
More life-like coverings of prostheses	**48** (82.8%)	**7** (12.1%)	**3** (5.2%)
Liner technology	**43** (74.1%)	**8** (13.8%)	**7** (12.1%)
Rapid manufacture technologies	**47** (81.0%)	**5** (8.6%)	**6** (10.3%)
3D printing	**48** (82.8%)	**4** (69%)	**6** (10.3%)
Artificial muscles *(materials or devices that mimic natural muscle)*	**23** (39.7%)	**20** (34.5%)	**15** (25.9%)
Osseo-integration	**36** (62.1%)	**13** (22.4%)	**9** (15.5%)
Microprocessor componentry	**46** (79.3%)	**5** (8.6%)	**7** (12.1%)