

Education and Training for Engineers working with Assistive Technology

Workforce titles and State Registration

Clinical Scientist

A clinical scientist oversees the provision of specialist tests for the diagnosis and management of disease. They advise doctors on the use of tests and interpretation of data and perform scientific research to understand disease processes and devise new therapies. The Health Professions Council (HPC) [www.hpc-uk.org] regulates the statutory registration of many professions allied to medicine. Among its protected titles is *Clinical Scientist*.

Clinical Scientists will have attained a good Honours Degree relating to their specialisation and many will have achieved a specialist MSc as part of their initial training. Some will achieve a PhD as part of higher specialist training. They will have demonstrated their experience and competence in giving scientific and clinical advice that has a direct bearing on the management of patients. A particular responsibility of Clinical Scientist is to introduce and advance new scientific and clinical procedures

The umbrella body that represents all branches of Clinical Science and handles the registration of Clinical Scientists is the Association of Clinical Scientists (ACS) [www.assclinsci.org]. Its members are the professional bodies and groups that represent particular branches of Clinical Science and have individual members.

The Department of Health recognises three grades of Clinical Scientist. Grade A is a training grade, Grade B is the career grade (with experience, demonstrated competence and, usually, a specialist MSc) and Grade C is the senior Consultant Grade (with further experience, demonstrated innovation and leadership and, often, a PhD).

Clinical Technologist

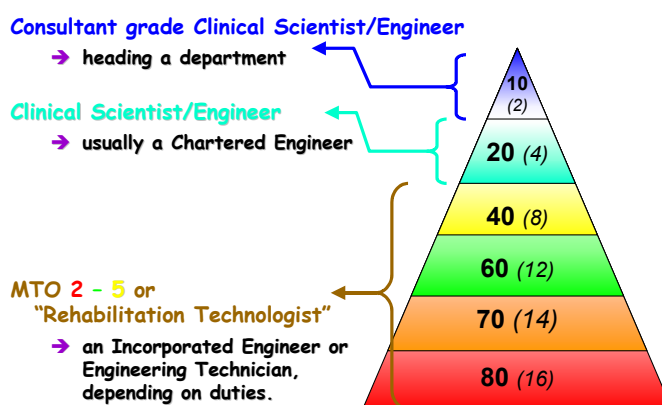
Clinical Technologists both support Clinical Scientists in the provision of services and also provide services in their own right. Working closely with doctors and other health care professionals, they are involved in technical innovation that is directly beneficial to patients.

Clinical Technologists will have attained a BTEC Higher National Certificate or Higher National Diploma or Degree relating to their specialist area of work. They normally will have of not less than three years work experience including two years formal in-service training.

The majority of staff working with patients in the field of specialist assistive technology provision will be at the Clinical Technologist level, supported in turn by technicians, see Figure 1.

Currently the title of Clinical Technologist is not protected. However, the Department of Health recognises that health care staff who have the potential to cause harm to patients should be regulated within a professional framework, i.e. they must demonstrate that they have been trained fit for purpose, be regulated through a professional code of conduct, and, be entered on to a register of professionals who are eligible to practice in a specific area of activity.

The Institute of Physics and Engineering in Medicine (IPEM) has taken an initiative to establish a Voluntary Register of Clinical Technologists, which it now operates in partnership with the Institution of Incorporated Engineers' medical engineering division, and the Association of Renal Technologists. It is hoped that this will form the basis of a Statutory Register



Estimated workforce: **National** (London)

Figure 1 Estimated employment of rehabilitation engineers and technologists in the wheelchair services

regulated by the Health Professions Council by 2005 (however the regulation branch of the Department of Health sets the priorities for the consideration for registration of non-registered groups). The necessary parliamentary time has already been laid aside to enable currently unregistered Healthcare Scientist groups, such as Clinical Technologists, to come under HPC regulation sometime during the 2004/2005 parliamentary session. As a consequence, state registration for Clinical Technologists is likely to occur around January 2005.

The Healthcare Science workforce

The Healthcare Science workforce is an umbrella term used by the Department of Health to describe Clinical Scientists, Clinical Technologists, Technicians, and all technical workers allied to medicine. These employees are sometimes loosely referred to as *healthcare scientists*.

Chartered Engineer and Incorporated Engineer

The Engineering Council, EC(UK) [www.engc.org.uk], is the umbrella organisation for the professional engineering institutions, which includes Institute of Physics and Engineering in Medicine (IPEM) [www.ipem.org.uk]. EC(UK) sets registration standards for and holds the Register of Chartered Engineers, Incorporated Engineers and Engineering Technicians, which are protected titles. A Clinical Scientist will often be a Chartered Engineer and a Clinical Technologist will often be an Incorporated Engineer.

Existing training and qualifications

The majority of rehabilitation engineering staff in the NHS have qualified in a non-medical engineering discipline and gained professional a life experience elsewhere before taking up their present post. It is entirely appropriate that more mature staff should be employed in this field in which sensitivity and significant interpersonal skill is required in addition to technical skill.

For these staff, suitable further education is available through

- an undergraduate Certificate in Rehabilitation Engineering (King's College London) funded for free places by the Department of Health;
- numerous Masters courses in Medical Engineering which include rehabilitation options (including University of Aberdeen, Imperial College London, University College London, King's College London, Queen Mary and Westfield College London, University of Leeds, University of Sheffield, University of Surrey, University of Wales, Cardiff), and
- a multidisciplinary Masters course in Assistive Technology (King's College London)

In order to achieve State Registration, students on all these courses require a programme of practical training and experience that can be best acquired in their place of work under supervision of an experience Clinical Scientist. IPEM accredits suitable training centres and specialist MSc courses.

For new graduates aiming for Corporate Membership of IPEM and Chartered Engineer registration there is a comprehensive programme of initial professional development. The first two-year programme of training, leading to the award the IPEM's Postgraduate Diploma (DipIPEM) is referred to as 'Basic Training'. Beyond this, a Programme of Advanced Training and Responsibility (PATR) is a higher specialist training that leads to Corporate Membership. State Registration is achieved within PATR, not earlier than four years from the commencement of Basic Training. For technologists there is an equivalent Period of Orientation and Supervised Training (POST). A further Period of Extended Responsibility and Training (PERT) leads to Incorporated Membership of IPEM and Incorporated Engineer registration.

For new entrants without qualifications from higher education IPEM has proposed that a *vocational* degree in Clinical Engineering Technology would be an appropriate qualification, providing practical competence as well as basic education and would permit State Registration on completion. This degree

programme is at an early stage of development and no course has yet been accredited that contains appropriate options for those working in rehabilitation engineering and assistive technology.

At the end of the vocational degree course, technologists would be eligible for entry onto the Voluntary Register for Clinical Technologists. There is then a Period of Orientation and Supervised Training (POST), leading to the award of the IPEM Diploma in Clinical Technology. A further Period of Extended Responsibility and Training (PERT) leads to Incorporated Membership of IPEM and Incorporated Engineer registration. The IPEM training scheme for Clinical Technologists recognises that this is a flexible workforce and allows for a variety of routes (e.g. from industry with relevant experience) to registration and the Incorporated Membership. It is likely that the voluntary register will become a statutory requirement by 2005.

National Occupational Standards (NOS)

Government strategy relating to rehabilitation engineering services has been based on the important document “Making the Change” [www.doh.gov.uk/makingthechange/making.pdf]. One of the key aspects of the Education and Training Strategy is a major project to develop a National Occupational Standards Framework for those working in healthcare science. The overall mission of this project is the consolidation of a heterogeneous workforce into an identifiable structure, which will enable healthcare scientists to become a recognised workforce alongside doctors, nurses and therapists. It is expected that the project will play a key role in defining education and training strategies for the workforce. The Standards will be ready for piloting later in 2003.

The idea is not to replace existing training arrangements, wherever they may be and whichever institution is organising them, but to change how training is assessed. The aim is to ensure that all Institutions should operate to the same standards. The competencies will become compulsory, under the control of the relevant professional body, which for assistive technology is IPEM.

Standards exist not only for rehabilitation engineering specifically but also for generic competencies such as equipment management, research, education, and general management.

The Future

Initial Training

Clinical Scientists in engineering have a training programme that is funded by the NHS. However, the bulk of the work force in the field of assistive technology is at technologist level, which does not have such supernumerary posts. A major problem in training technologists arises therefore from the concurrence of three factors: (i) that competence direct from basic education is not possible (i.e. staff have to be employed *before* they can be trained), (ii) their pressure of work; and (iii) the very small working groups (sometimes isolated individual engineers). It is difficult for all but the larger and better-managed services to release their staff for necessary training.

A supernumerary training arrangement for rehabilitation technologists is required.

Career requirements

The assistive technology engineering workforce in the NHS is relatively small, probably no more than 500 throughout the UK. Health service engineers tend to stay in their job and most services employ very few engineers and are unable to offer a graded career structure. There is a wide variety of employment practice amongst service providers, some employ technicians to assist therapists whilst others employ engineers who work at all levels, from the bench to clinical decision making. Career progression therefore generally requires geographical relocation.

Uniform standards for staff, as defined by IPEM and the NOS will enable a clear career structure to be developed across the nation and enable rational movement of staff between services.

ICES and changing specialisation

The introduction of a wider range of equipment and evermore sophisticated electronic and information technology is introducing fresh demands on the skills of assistive technology engineers, whose basic education is usually mechanical or electrical engineering.

Life-long training programmes are necessary if effective integration of mechanical, electronic, and information technology is to be effective.