POLICY STATEMENT: The Role of the Healthcare Scientist in Rehabilitation Engineering Services

1. What is Rehabilitation Engineering?

Rehabilitation Engineering is the application of engineering principles and technology in the provision of services, research and innovation to meet the needs of individuals with disabilities and long term conditions. It reduces environmental barriers, improves the physical, mental and social abilities of a person with a disability and contributes to therapeutic interventions and rehabilitative care in the management of long term conditions.

Healthcare Scientists (HCSs) provide services to patients. They develop and implement new technologies, and drive improvements in service provision, in collaboration with many other clinical disciplines. HCSs are uniquely placed to provide scientific and technical input into these clinical settings due to their training in both engineering and clinical subjects such as biomechanics and anatomy and physiology. This combination of skills and knowledge benefits the patient by ensuring the right engineering solutions are prescribed to meet clinical needs thus improving experience and outcomes whilst reducing risks and costs.

Rehabilitation Engineering includes many different clinical services. Patients often access multiple services concurrently and an understanding of the other services leads to joined up working which in turn, for example, reduces the number of appointments a patient needs or streamlines the provision of equipment. It also ensures compatibility of equipment supplied by different services, for example safe and effective combinations of powered wheelchair, communication aid and environmental control systems. The breadth of their training enables HCSs to drive interdepartmental working, increasing efficiency and benefiting patients.

Rehabilitation Engineering Services include:

- Posture and Mobility (P&M) e.g. Wheelchair Services, Custom Seating and Postural Management
- Electronic Assistive Technology (EAT) e.g. Specialist controls for powered mobility and alternative access to the computer and other technology

- Augmentative and Alternative Communication (AAC) and Environmental Controls (EC)
- Activities of Daily Living (ADL)
- Functional Electrical Stimulation (FES)
- Prosthetics and Orthotics (P&O)
- Clinical Movement Analysis (CMA)
- Telehealth and Telecare

See Appendix 1 for definitions of these services

The IPEM Policy Statement: Leading Medical Physics and Clinical Engineering Services (July 2015) describes the importance of these services provided by its members within the healthcare sector. It provides key principles of, and recommendations for the effective and productive leadership of medical physics and clinical engineering services.

This document looks to provide more detail than the above policy statement on the types of services provided by HCSs working in Rehabilitation Engineering and the roles of those working in this field.

4. Staffing

Rehabilitation Engineering services employ Consultant Clinical Scientists, Clinical Scientists, Rehabilitation Engineers (who may be registered as Clinical Technologists or Healthcare Science Practitioners) and Healthcare Science Associates and Assistants. The mix of staff employed will depend on the type of service. For example, CMA services will typically only employ Clinical Scientists and Consultant Clinical Scientists, whereas wheelchair services incorporating specialist custom seating clinics generally utilise staff from all roles of Healthcare Science.

HCSs work with various professionals including physiotherapists, occupational therapists, speech and language therapists, medical consultants, prosthetists and orthotists.

5. Training of Healthcare Scientists in Rehabilitation Engineering

Within England, Wales and Northern Ireland those wishing to train as a HCS will typically follow the associated training scheme as detailed by the National School of Healthcare Science (NSHCS) [See References]. IPEM and the Academy of Healthcare Science (AHCS) [See References for details of both] offer alternative routes. Below is summary of the

NSHCS training routes. For those wishing to work in Rehabilitation Engineering, they will train in Clinical Engineering, which includes a specialism in Rehabilitation Engineering. In Scotland those wishing to training as a HCS will typically follow a comparable local training scheme, assessed through the AHCS's equivalence route.

Table 1. NCHCS training programs

HCS role	**NSHCS training scheme**	**Required Qualifications &/or experience**	**Content of training**	**Duration of training (years)**	**Qualifications on completion of training**
Rehabilitation Engineer	Practitioner Training Programme (PTP)		Accredited BSc in healthcare science. Competency base work-place training	50+ weeks spread over 3 years	BSc, Eligibility for professional registration e.g. Register of Clinical Technologists (RCT) or AHCS Healthcare Sciences Practitioner Register
Clinical Scientist	Scientist Training Programme (STP)	Honours Degree (1^{st}, 2:1) in relevant science or engineering subject (or 2:2 with MSc or PhD)	Masters Degree. Competency based work-place training	3	MSc, eligibility for registration with the Health and Care Professions Council (HCPC)
Consultant Clinical Scientist	Higher Specialist Scientific Training (HSST)	Registered and experienced Clinical Scientist	Bespoke training programme including professional doctorate if appropriate (depending on previous qualifications)	5	Professional Doctorate, eligibility for registration on AHCS Higher Specialist Scientific Register

HCSs must engage in structured Continuing Professional Development (CPD) to maintain their statutory and/or professional registration. Guidance is given by the Health and Care Professions Council (HCPC), AHCS, The Register of Clinical Technologist (RCT) and IPEM.

7. Clinical Activities

In Rehabilitation Engineering, clinical activity is a core component the role of a HCS. Most HCSs carry a clinical caseload, interacting with patients from referral through to discharge. Whilst the functions of HCSs may differ between services and role, their daily tasks can include postural, movement or functional assessment, collection and analysis of clinical data, clinical reporting and prescription and provision of equipment including bespoke assistive technologies and custom made medical devices. Clinics may be carried out across both acute and community services. Within Posture and Mobility (P&M), Prosthetics and Orthotics (P&O) and Electronic Assistive Technology (EAT) services Rehabilitation Engineering Services Management Group (RESMaG) has developed competencies identifying the roles of the different professionals (see References).

8. Safety

All HCSs have knowledge (appropriate to role) of health and safety principles, the role of the Medicines and Healthcare products Regulatory Authority (MHRA) and reporting adverse incidents, Quality Management standards such as ISO 9001 or ISO 13485, legal requirements such as Control of Substances Hazardous to Health (COSHH) and so on.

Clinical scientists' breadth of knowledge, understanding of standards and legislation, design and risk management skills are invaluable when providing bespoke services. They ensure that patients are not exposed to excessive risk, that equipment is fit for purpose, and that the service operates within statutory requirements.

9. Quality Management

HCSs provide safe, efficient and effective services and devices to patients. They do this by:

- Implementing and managing quality management systems, often externally audited and registered to ISO 9001 or 13485 (industry standards for device manufacturers).
- Producing detailed specifications for subcontracted work (manufacture of components, outsourced equipment maintenance)
- Testing equipment to verify its effectiveness and safety, which is often a statutory requirement.
- Ensuring devices are manufactured in house (where the department would hold responsibility in the event of an injury to a patient) meet statutory requirements.
- Responding to device failures, reporting failures to the MHRA, and responding when they report safety concerns.

- Leading improvements, and ensuring that staff, patients and their carers are competent to implement them safely.

10. Service Design and Development

Clinical Scientists lead service design and development. They bring clinical knowledge, equipment management skills, and quality management techniques. They lead the adoption of new techniques. They evaluate clinical demand for services, manage risk and resources, and critically evaluate techniques. They define service level agreements.

11. Leadership

Clinical scientists manage people, resources and budgets, perform workforce planning, and manage and develop staff to meet key performance indicators. Clinical Scientists supervise staff. They should be provided with appropriate clinical, professional and managerial supervision.

An important role for the Clinical Scientist is to act as an expert in the field, not only to clinical colleagues but to industry, charities, policy makers or advisory boards. These duties may include advising on complex patient results, making recommendations for suitable equipment purchases or advising on best practice and methodology in new diagnostic or therapeutic techniques. The senior scientist may also be called upon to act as an expert witness.

13. Provision of Education and Training

HCSs train junior staff, patients and other healthcare professionals. They contribute on groups such as Clinical Movement Analysis Society UK and Ireland (CMAS), IPEM special interest groups, The Posture & Mobility Group (PMG) and RESMaG. More information can be sought from the organisations respective websites. Clinical Scientists are often guest lecturers on undergraduate and postgraduate engineering courses.

14. Research and Innovation/Development

Clinical Scientists drive research and innovation. Their academic and clinical experience enables them to commission relevant research, and to quickly disseminate and apply its outcomes to improve services to patients, reduce risk, and improve efficiency.

Clinical Scientists integrate emerging technology, and translate technology from other fields into clinical practice to improve outcomes for patients, reduce risk, and improve efficiency.

References

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Appendix 1 Summary of Rehabilitation Engineering Services

Wheelchair Services, Custom Seating and Postural Management

Wheelchair services provide a range of manual and powered wheelchairs to patients who are unable to walk independently. Specialist services provide bespoke contoured seating to accommodate and/or correct postural abnormalities that occur due to a range of musculoskeletal, neurological and physical disorders. Services are also able to provide specialist controls for powered wheelchairs (e.g. head, foot, chin); this may be carried out in conjunction with the Assistive Technology service. The broader aspects of postural management may also fall within the remit of the Clinical Scientist, e.g. adaptations to static seating systems, or complex lying positioning systems.

Electronic Assistive Technology

Electronic Assistive Technology is an umbrella term which includes Augmentative and Alternative Communication (AAC), Environmental Control (EC), Access to Technology (e.g. alternative methods of computer access) and can include specialist controls for powered wheelchairs.

Augmentative and Alternative Communication (AAC)

Augmentative and Alternative Communication (AAC) services provide an extensive range of techniques which support or replace spoken communication. These include gesture, signing, symbols, word boards, communication boards and books, as well as Voice Output Communication Aids (VOCAs).

Environmental Controls (EC)

Environmental control services provide devices that enable the control of devices such as the television, lights or front door release, for example from the patients bed or wheelchair. They can be set up so there are multiple control systems or more commonly one device is used to control many different devices.

Activities of Daily Living (ADL)

These clinics aim to provide people with equipment, often customised, which enables them to be more independent in daily activities such as washing, dressing and preparing meals.

Functional Electrical Stimulation (FES)

FES is a method of producing contractions in muscles through the application of electrical stimulation using skin, percutaneous or implanted electrodes. The vast majority of FES equipment assumes that the muscles are paralysed due to central nervous system (CNS) lesions or injuries. Applications for FES include muscle strengthening and restoration of function e.g. correction of drop-foot following stroke.

Prosthetics and Orthotics

This service provides upper and lower limb prosthetic and orthotic devices. Whilst orthoses aim to aid limb movement or support deformity, prostheses are artificial replacements for missing limbs. There may be cases when the Clinical Scientist is involved with the Clinical Movement Analysis (see section below) to assist in the setting up and alignment of a complex prosthetic limb.

Clinical Movement Analysis (CMA)

Using a range of objective tools and relatively complex equipment, CMA services provide analysis and treatment recommendations of lower and upper limb function to enhance patient care and diagnosis; and can assess the effectiveness of interventions or monitor disease progression over time. It is important to note that CMA is often provided directly through a hospital orthopaedic service rather than as part of a rehabilitation engineering centre.