The Role of Healthcare Scientists (HCS) within Critical Care Services

Background

There are about 40,000 healthcare scientists in the NHS in about 30 different professions. HCS work in three main Divisions, which overlap in function to some extent. Scientists from all three Divisions work in Critical Care. The Divisions are:

- Life Sciences and Genetics
- Physiological Sciences
- Clinical Engineering and Physical Sciences

Healthcare Scientists are generally employed within one of six employment grades:

1. **Clinical Scientists**: employed in disciplines in all three Divisions
2. **Biomedical Scientists (BMS)**: employed in most life science disciplines
3. **Medical Laboratory Assistants**: support workers in the Life Science disciplines
4. **Cytoscreeners**
5. **Medical Technical Officers (MTOs**): employed in all three Divisions
6. **Assistant Medical Technical Officers (ATOs**): support workers in all three Divisions

Those working in Critical Care are from all employment grades except 4. Grades 1 and 2 are subject to State Registration. The disciplines most involved in Critical Care are Physics and Engineering (Clinical Scientists, MTOs, ATOs)), Biochemistry (Clinical Scientists, BMSs), Blood Transfusion and Haematology (BMSs), Microbiology (Clinical Scientists and BMSs), Physiology (Clinical Scientists and MTOs).

Clinical Scientists enter the NHS at Grade A which is a 3 or 4 year training grade. Minimum entry qualification is a good honours degree, but most entrants now have a PhD. The in service training usually includes formal study and research for a MSc degree. Exit from Grade A for Higher Training at Grade B requires a Certificate of Competence. Higher training may include development of a specialism and emphasises the acquisition of skills in clinical interpretation, research and development and management, which normally leads to membership of the Royal College of Pathologists, MRCPath (Life Sciences) or membership of the IPEM (Physicists and Engineers). Grade C has Medical Consultant equivalence and holders may also be Head of Department or manage a specialised diagnostic area within a department.

Biomedical Scientists now enter the profession with a degree in Biomedical Sciences, which includes a year in service in a hospital laboratory, or with another appropriate degree, followed by a year of in service training leading to State Registration. There are 4 grades, BMS1 – 4 and an advanced practitioner level has recently been introduced above BMS4. Some Biomedical Scientists specialise within their disciplines and may also study for a MSc.

Many Medical Technical Officers are now graduates and enter employment in the NHS according to the subject of their degrees. Those in Critical Care mainly work in Medical Physics and Engineering.

The Role of Healthcare Scientists

Healthcare Scientists' responsibilities at **all levels of Critical Care**, include:

- **Laboratory Diagnosis** – biochemistry, haematology and blood products and microbiology. Most hospital Pathology departments perform several hundred tests a day on critical care patient specimens. Results are likely to be available to clinical areas via IT links.

- **Clinical Liaison, Interpretation and Advice –** the increasing subspecialisation of clinicians together with the growing repertoire of available diagnostic tests make an interpretation and advisory service by the laboratory essential. Many scientists are part of clinical teams and join ward rounds or case discussions, contributing to the effective use and development of the diagnostic service. Joint planning of diagnostic services ensures favourable clinical outcomes.

- **Patient investigation and monitoring -** HCS provide monitoring facilities, interpretation and analysis of results and quality assurance in neurophysiology, respiratory physiology, perfusion, radiology, anaesthesia, cardiology ultrasound and physiological measurement.

- **Point of Care Testing (POCT) –** Advances in analytical technology and IT enable clinicians to do some diagnostic testing themselves in clinical areas. Tests most frequently used to support critical care patients at levels 2 or 3, where results are required rapidly for the monitoring and treatment of patients, are pH, blood gases, electrolytes, metabolites and coagulation.

  HCS (in biochemistry, physics, haematology and microbiology) advise on equipment choice and manage the POCT service including maintenance, daily analytical quality procedures and user training. They also ensure the comparability of POCT results with those from the laboratory. POCT is fast expanding, and an effective working partnership between clinicians and scientists ensures optimum clinical and economic outcomes. Cross professional working between nurses, doctors and HCS is crucial in POCT.

- **Infection Control** - This is very important in critical care areas. Scientists from microbiology departments work in infection control teams with nurses and doctors, and may lead such teams.

- **Clinical evaluation of new devices and equipment management -** Critical care depends upon a vast range of equipment for life support, monitoring and diagnosis. Evaluation, procurement and management of equipment in keeping with directives from the Department of Health and the Medical Devices Agency, is the role of Medical Physics and Engineering departments. They ensure that equipment is fit for purpose.

  Equipment must also be carefully evaluated clinically for safety and effectiveness before being routinely used in patient care. This involves scientists from Medical Physics and Engineering working with clinicians to compare new with existing equipment for reliability and cost over extended periods of time.

- **Physiological monitoring -** Data collection is the role of physics and physiology staff, for example from ICUs and Neurosurgical HDUs, on a minute by minute basis. Data are used for audit and to review patient management on a daily basis.

- **Information technology** - Pathology, Medical Physics and Engineering departments generally work together with Trust IT departments on planning, installation and maintenance of IT systems to support their diagnostic and monitoring work. Diagnostic

test results are generally made available to clinicians in critical care areas from the laboratory information system, via results servers interfaced with hospital information systems. These professions are also at the forefront of work on the development of the Electronic Patient Record, which is a national strategic priority.

- **Research and Development -** Advances and developments in the critical care services provided by HCS are best achieved by close working between the scientific departments and the critical care clinicians. Clinical Scientists and many BMSs and MTOs have research degrees or training and experience in research. Much clinical benefit can be achieved by clinicians and scientists conducting joint research projects.

- **Teaching and Training -** HCS at senior levels in their professions may be in honorary academic posts teaching medical students and post-graduate doctors, for example in clinical biochemistry or radiology. Another important role of HCS is training clinical staff, particularly nurses and junior doctors, for example in POCT.

Examples of Improving Practice

- **Quality Assessment of clinical interpretation on Clinical Biochemistry Reports** The outcomes of this project have been used for professional education and to establish a National Quality Assessment scheme. ***Contact:*** Dr Gordon Challand, Clinical Biochemistry, Royal Berkshire Hospital, Reading
- **A study on bilateral intracranial pressure measurement** demonstrated higher-pressure levels on the side of a lesion. Clinical practice was therefore changed so that measuring devices were inserted on the side where there is a mass or lesion, instead of the non-dominant side
- **Review of oesophagectomy patients** demonstrated significant changes in blood pressure and oxygen saturation. The clinical management protocol was changed. ***Contact:*** Dr Iain Chambers, Regional Medical Physics Department, Newcastle General Hospital
- **Improvement of nurses' competencies in blood gas analysis.** Joint development and application, by nurses and scientists, of a programme to improve compliance with training and quality of practice in POCT. ***Contacts****:* Ms Connie Oldham, Staff Development Sister, ITU and Mrs Ann Fisher, Clinical Biochemistry & Immunology, Leeds Teaching Hospitals
- **Introduction of Troponin I measurement within an Integrated Chest Pain Protocol** Produced by a multidisciplinary group of cardiologists, Clinical Scientists, Emergency Department and Admission Ward physicians, with subsequent use monitored by audit. ***Contact:*** Dr Robert Beetham, Clinical Biochemistry, Frenchay Hospital, Bristol

Key Issues

- **Recruitment and retention** The Department of Health intends to increase HCS numbers. The recruitment of high quality science graduates must continue, and retention should improve with better workforce planning and improved career pathways
- **Higher training and CPD** The current project to develop an Occupational Standards framework (with the Science Technology and Mathematics Council) will build on existing training programmes, while aligning training more clearly with service need
- **More effective team-working with clinicians and managers** The professional knowledge and skills of HCS could be used more extensively in critical care areas to manage risk, improve quality and use expensive resources effectively.

Further Reading

Making the change: A Strategy for the Professions in Healthcare Science, Department of Health, Feb 2001

Medical Devices and Equipment Management for Hospital and Community- based Organisations MDA Bulletin DB 9801, January 1998

Management of In Vitro Diagnostic Medical Devices MDA Bulletin DB2002(02) March 2002

Near to Patient or Point of Care Testing Guidelines: Joint Working Group on Quality Assurance, Jan 1999

Management and Use of Point of Care Test Devices MDA Bulletin DB2002(03) March 2002