



The Royal College of Pathologists  
*Pathology: the science behind the cure*

## **Clinical Scientists in Pathology**

### **Training and Development of Skills to Become Consultants**

### **Toolkit for Bridging the Training Gap**

**July 2006**

Royal College of Pathologists  
Workforce Review Team

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## **1. SUMMARY**

### **1.1 Clinical scientists in pathology**

There are clinical scientists working across the disciplines of pathology and laboratory medicine. The numbers of clinical scientists are growing and they comprise ~25% of the UK membership of the Royal College of Pathologists (RCPath). Clinical scientists will shortly be able to gain membership of the Royal College of Pathologists (MRCPath) by examination in all disciplines of pathology. Consultant clinical scientists are accepted as medical consultant equivalents and their numbers should increase as part of role extension. Clinical scientists in pathology and laboratory medicine are part of the healthcare scientist workforce and their roles, skills, competences, learning and development may be described by the newly published 'Career framework for healthcare scientists in the NHS' [1].

### **1.2 Workforce profile: clinical scientists in pathology**

The ideal workforce profile for clinical scientists includes planned numbers of pre-registration trainees (4y) together with an equal number of post-registration (higher specialist) trainees (4y) supplying a larger number (defined by service needs) of trained clinical scientists working as independent practitioners, a proportion of whom function at consultant level. The RCPath uses the 'mushroom' model to define this workforce profile whilst the Workforce Review Team (WRT) uses the analogous 'Christmas tree' model for the same purpose. In practice the ideal workforce profile for clinical scientists has not been achieved in any of the pathology disciplines and trainees experience serious problems in completing training.

### **1.3 Training gap: clinical scientists in pathology**

The single biggest reason for the failure of trainee clinical scientists to progress is the lack of connectivity between pre-registration and post-registration training posts. Pre-registration clinical scientist trainee posts (grade A) are fixed-term, supernumerary and funded by the multi-professional education and training budget (MPET). In contrast all post-registration training posts have to be created from vacant trust clinical scientist posts and it is rare for a suitable vacant post to coincide with the completion of pre-registration training. This lack of connectivity has created a training gap (no effective run-through training), which seriously impairs the efficient completion of MRCPath and so reduces the availability of independent practitioner and consultant clinical scientists.

### **1.4 Bridging the training gap: clinical scientists in pathology**

In order to bridge the training gap there is a need for the following stakeholders to work in a co-ordinated way:

- RCPath and other professional bodies
- Strategic health authorities (SHA)
- Workforce Review Team (WRT) and National Workforce Projects (NWP)

Several practical solutions for bridging the training gap have been identified, which are capable of flexible interpretation by the stakeholders to meet locally identified need. These solutions constitute a toolkit for bridging the training gap.

## 2. CLINICAL SCIENTISTS IN PATHOLOGY

### 2.1 The life sciences and pathology

In the context of human healthcare science the life sciences are depicted in Table 1. All of these branches of human healthcare science are within the scope and practice of the RCPATH and the collective term pathology is used to describe these clinical and scientific disciplines.

**Table 1**

#### **Currently defined pathology disciplines**

In human healthcare science ten life science disciplines constitute pathology:

1. Analytical toxicology
2. Cellular science (including electron microscopy and molecular pathology)
3. Clinical biochemistry (including paediatric metabolic biochemistry)
4. Clinical embryology
5. Clinical immunology
6. Genetics (clinical cytogenetics, molecular genetics)
7. Haematology
8. Histocompatibility and immunogenetics (tissue typing)
9. Microbiology (including bacteriology, mycology, parasitology, virology)
10. Transfusion science

### 2.2 Clinical scientists in pathology

Trained clinical scientists work with medical consultants in each of the scientific disciplines of pathology. The ratio of clinical scientist to medical consultant varies between the disciplines of pathology. For example, in the newer disciplines of clinical embryology, genetics and histocompatibility and immunogenetics, the senior professionals are almost all science graduates; in clinical biochemistry there are equal numbers of consultant clinical scientists and medical consultants; and in haematology and histopathology the large majority of consultants are medical specialists. Clinical scientists now account for ~25% of the UK membership of the RCPATH and the number of clinical scientists is growing, especially in the newer disciplines of genetics and clinical embryology and in the established disciplines that don't have a tradition of clinical scientists (cellular science and haematology).

### 2.3 Roles of clinical scientists in pathology

An RCPATH document entitled 'The Clinical Scientist in Pathology' is available from the RCPATH website [2]. This document details the role of the clinical scientist; the requisite education and training; the competences that need to be acquired; and the knowledge, understanding, skills and experience to fulfil those competences.

Trained clinical scientists in pathology undertake a wide range of high level functions. At sub-consultant level clinical scientists are usually specialists in charge of the clinical and scientific delivery and development of a specialist laboratory service. Roles include quality assurance, interpretation and clinical liaison, research and development, and teaching and management. Examples of such specialist areas

include the investigation of metabolic disorders including paediatric metabolic biochemistry, biochemical endocrinology; trace elements and micronutrients; haemostasis; molecular oncology, molecular immunodiagnostics, tissue banking, immunocytochemistry, screening services and the development of molecular microbiology services.

## 2.4 Consultant clinical scientists in pathology

The consultant clinical scientist practises at the same level as a medical consultant in pathology. Many consultant clinical scientists are also clinical directors and some are associate medical directors. Examples of high level roles undertaken by consultant clinical scientists are given in Table 2.

**Table 2**

### **Illustrative roles undertaken by consultant clinical scientists**

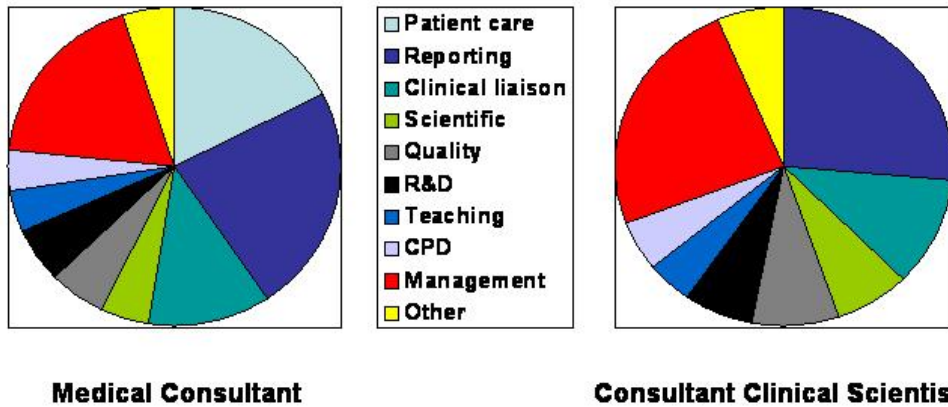
1. Clinical lead in a multi-site network department of clinical biochemistry that contains several other consultant staff, including university professors
2. Health Protection Agency (HPA) regional microbiologist who also has full clinical on-call duties
3. Consultant in charge of electron microscopy services for a major London teaching hospital
4. Lead clinical embryologist for a regional assisted conception service with responsibility for preservation of embryos
5. Director of national protein reference unit
6. Director of regional immunology service
7. Director of regional genetics unit
8. Consultant in charge of regional toxicology services
9. Lead for national delivery of nucleic acid based screening and research on transfusion transmitted infection
10. National on-call consultant clinical scientist in histocompatibility and immunogenetics
11. Lead scientist for the UK metabolic biochemistry network (MetBioNet)
12. Director of research and development for a large teaching hospital trust
13. Acknowledged international experts in their specialty field

In clinical biochemistry a detailed analysis of the relative roles of consultant clinical scientists and medical consultants was undertaken as part of the project entitled 'NHS clinical biochemistry: a profession under siege' [3]. The summary of findings, which is reproduced in figure 1, demonstrates that with the exception of the direct patient care work undertaken by medical consultants all other roles are undertaken in similar proportions by both groups of consultants.

Consultant clinical scientists are accepted as medical consultant equivalents both by the RCPATH and also by Clinical Pathology Accreditation (UK) Ltd in its standards for laboratory accreditation [4] (table 3). As a result consultant clinical scientists may be responsible for the professional direction of pathology laboratories and services. The RCPATH has approved a generic job description for a consultant clinical scientist, which is in the same format as those of medical consultants in each discipline [5].

Figure 1

### Relative Roles of Medical Consultants and Consultant Clinical Scientists in Clinical Biochemistry



(Source NHS Clinical Biochemistry: Profession Under Siege, 2001. [www.rcpath.org](http://www.rcpath.org))

Table 3

### Clinical Pathology Accreditation (UK) Ltd Standards for the Medical Laboratory

#### B PERSONNEL

##### B1 Professional direction

*Professional direction is essential for the proper performance of a laboratory*

B1.1 Each discipline shall be professionally directed by a consultant pathologist or clinical scientist of equivalent status.

Full text available from [www.cpa-uk.co.uk](http://www.cpa-uk.co.uk)

## **2.5 Changing roles for clinical scientists in pathology**

The publication in July 2000 of 'The NHS Plan: a plan for investment, a plan for reform' [6] contained a commitment to extending roles across the healthcare workforce. The February 2001 document entitled 'Making the change: a strategy for the professions in healthcare science' [7] created the staff grouping of healthcare scientists (HCS) and endorsed the commitment to extending roles within the HCS workforce. The tools to enable extension of traditional roles and flexible working within the HCS workforce are contained within the 'Career framework for healthcare science in the NHS' [1] and the supporting 'National occupational standards for healthcare science' [8]. This project is being implemented by Skills for Health [9] and implementation will include consideration of awards, qualifications and related training programmes.

Pathology contributes data to aid 60-70% of NHS patient diagnoses [10]. Pathology modernisation is an active policy of the Department of Health [10] and role extension is an integral part of this policy. Pathology has been at the forefront of introducing extended roles by setting standards to allow non-medical staff (biomedical scientists) to report normal cervical cytology results and to undertake surgical cut-up of histopathology samples. The RCPATH recognises further extension of roles previously undertaken by medical consultants. Extended roles for clinical scientists will occur in two situations:

- High level management and direction of laboratory services consequent upon medical consultants having greater roles in direct patient care. Disciplines will include clinical biochemistry, haematology, histocompatibility and immunogenetics, clinical immunology, microbiology and transfusion science.
- Introduction of new or extended specialist services that will be managed and directed by principal grade and/or consultant clinical scientists. All disciplines of pathology will be affected but the impact is likely to be greatest in cellular science, clinical embryology, genetics, haematology and histocompatibility and immunogenetics.

An expansion of the clinical scientist workforce in pathology is envisaged in the WRT Workforce Planning Recommendations for 2006/07 [11].

## **3. WORKFORCE PROFILE: CLINICAL SCIENTISTS IN PATHOLOGY**

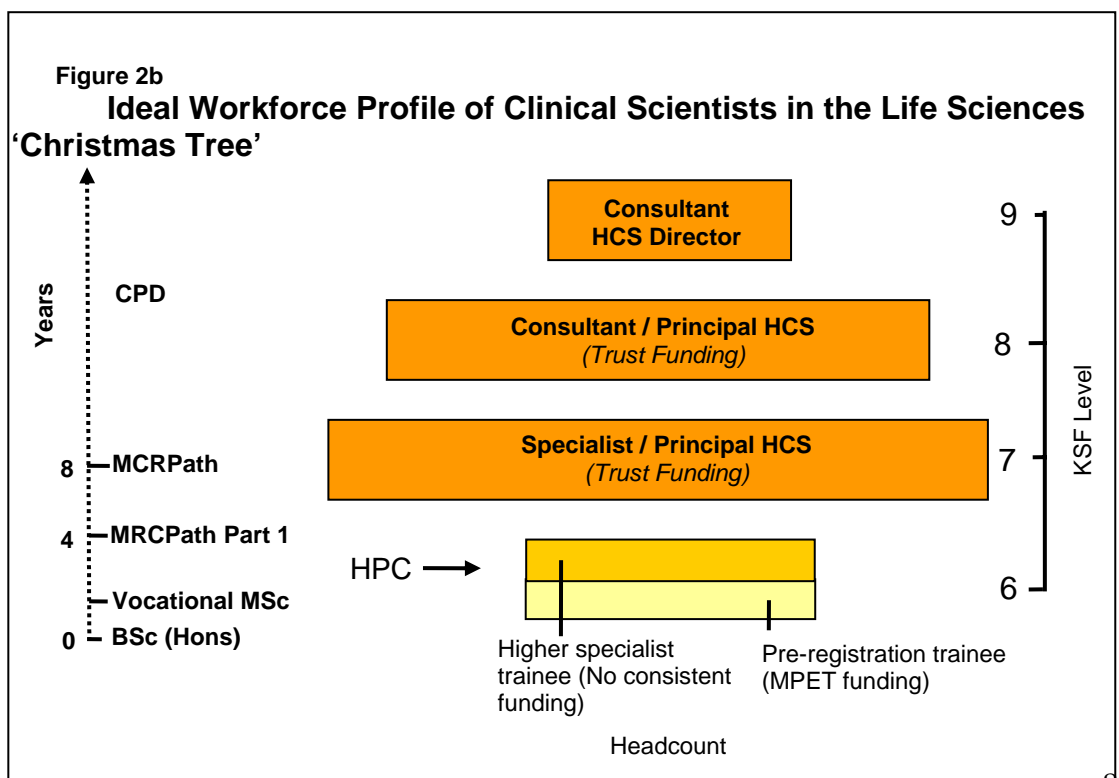
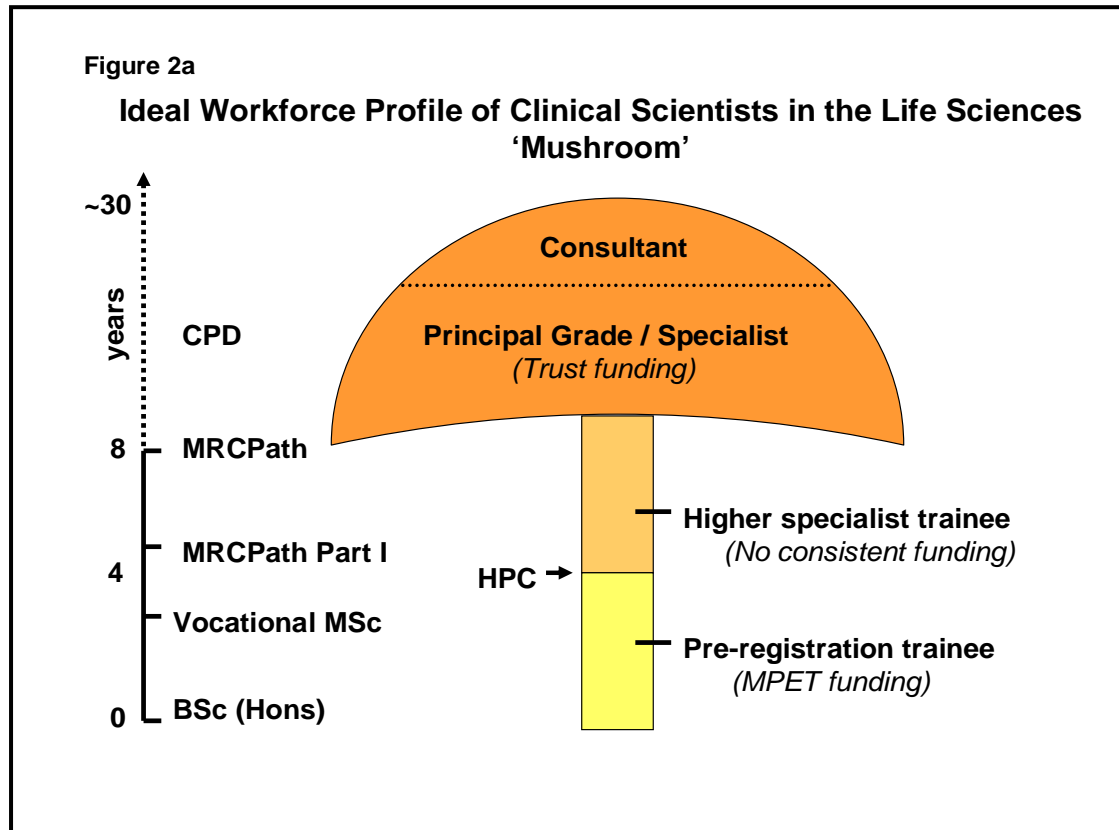
### **3.1 Idealised workforce profile: clinical scientists in pathology**

The RCPATH describes the ideal workforce profile for clinical scientists in pathology using the 'mushroom' model, as shown in figure 2a. WRT has adopted the 'Christmas tree' model for describing the workforce across the NHS and the 'Christmas tree' corresponding to figure 2a is shown in figure 2b. In both models it is clear that a large majority of clinical scientists are trained and function as independent specialist practitioners, including specialist/principal grades and consultants. The number of trained clinical scientists in each pathology discipline is determined by service needs and is reviewed on a regular basis.

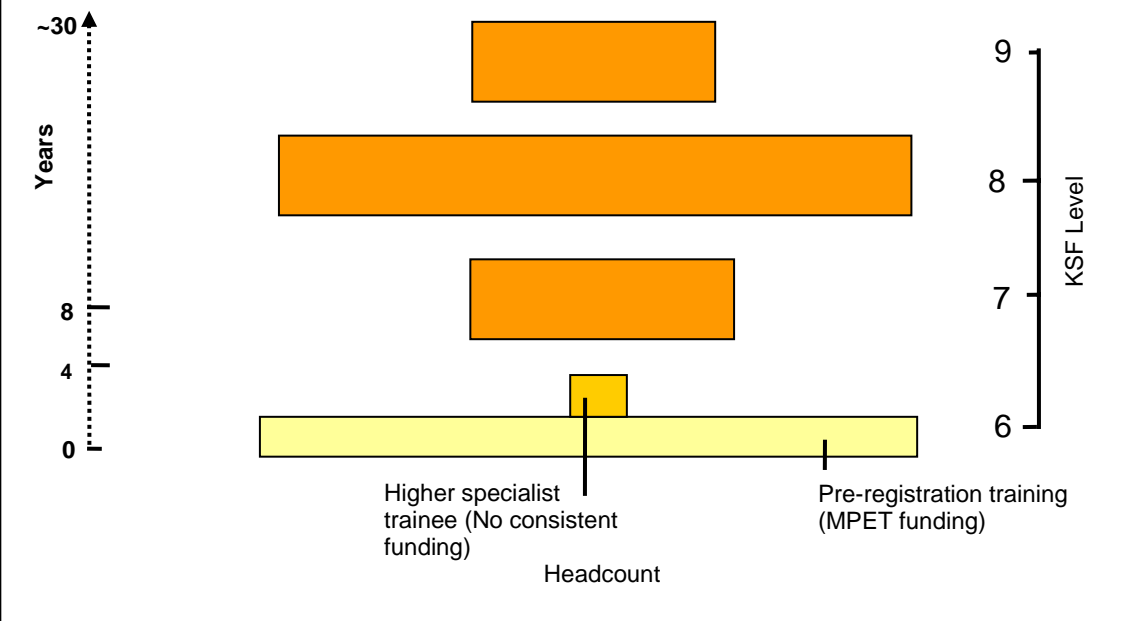
In order to deliver the appropriate number of trained clinical scientists there is an agreed number of pre-registration trainees (4y) and a matching number of post-registration (higher specialist) trainees (4y) who have both an advanced training and service delivery role.

### 3.2 Actual workforce profiles: clinical scientists in pathology

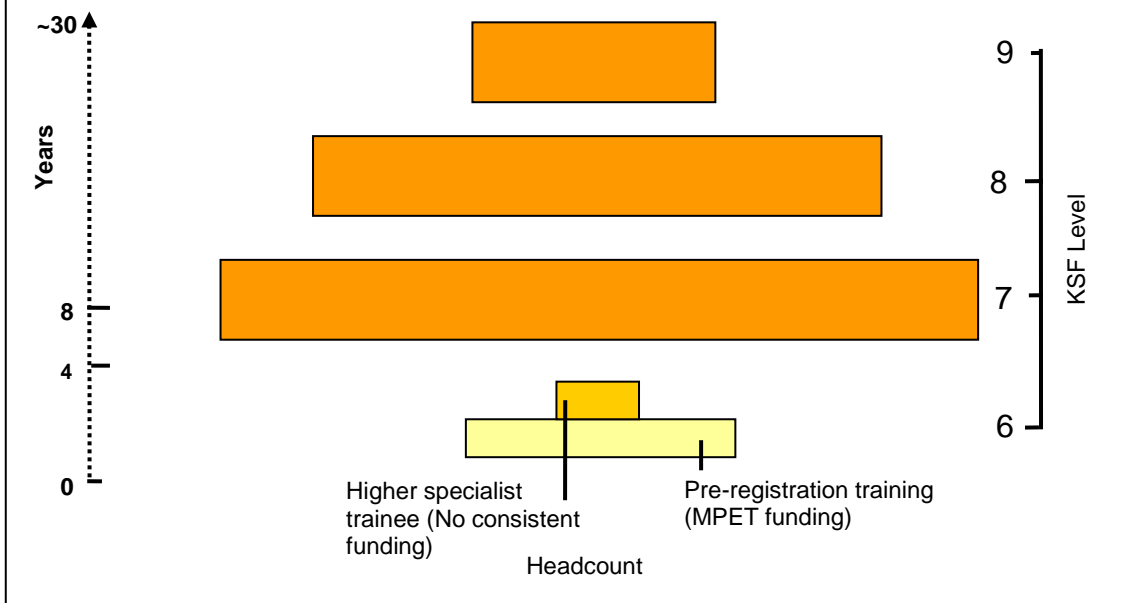
The idealised workforce profile described in figures 2a and 2b does not exist for any of the pathology disciplines. The WRT 'Christmas tree' model is the most convenient tool to depict actual workforce profiles. The 'Christmas tree' for the 2005 clinical scientist workforce profile for clinical immunology is shown in figure 3a and the corresponding 'Christmas tree' for microbiology is shown in figure 3b.



**Figure 3a**  
**2005 Workforce Profile of Clinical Scientists in Immunology**  
**'Christmas Tree'**



**Figure 3b**  
**2005 Workforce Profile of Clinical Scientists in Microbiology**  
**'Christmas Tree'**



Comparison of figures 2b and 3a reveals that the major problem with the clinical workforce profile for clinical immunology is an almost total absence of post-registration training posts. As a result very few trainees will complete training to independent practitioner level. What is not apparent from figure 3a is that the trained clinical immunologists are an ageing profession, many of whom will be retiring in the next few years. Comparison of figures 2b and 3b reveals a similar, although less extreme, shortage of post-registration trainees coupled with an inadequate number of pre-registration trainees to meet the needs of an ageing microbiology workforce.

A summary of the main features of the clinical scientist workforce profile for each of the disciplines of pathology is given in table 4. A number of factors explain the deviation from the ideal workforce profile for each discipline. Additional 'Christmas trees' to depict the clinical scientist workforce profiles described in table 4 can be found by clicking on the link below

[Link to Christmas tree model](#)

**Table 4**

**Clinical scientist workforce profiles by pathology discipline**

1. Analytical toxicology: ageing workforce with no history of workforce planning.
2. Cellular science: expansion of workforce with no MPET funded pre-registration trainees and no workforce planning.
3. Clinical biochemistry: ageing workforce with inadequate numbers of pre-registration and post-registration trainees for future workforce requirements.
4. Clinical embryology: Young and expanding workforce with no MPET funded pre-registration trainees and very limited workforce planning.
5. Clinical immunology: ageing workforce with lack of post-registration training posts leading to severe shortage of trained clinical scientists.
6. Genetics: expanding discipline with young workforce. Central funding for pre-registration trainees is not matched by funding for post-registration trainees.
7. Haematology: lack of post-registration training posts leading to shortage of trained clinical scientists and inability to address required expansion.
8. Histocompatibility and immunogenetics: lack of post-registration training posts leading to severe shortage of trained clinical scientists.
9. Microbiology: ageing workforce with inadequate numbers of pre-registration and post-registration trainees to meet future workforce requirements.
10. Transfusion science: ageing workforce with inadequate numbers of pre-registration and post-registration trainees for workforce requirements.

### **3.3 Recruitment of clinical scientists in pathology**

There is intense competition for MPET funded pre-registration training posts in all the pathology disciplines. It is quite normal to have >50 graduates applying for each nationally advertised vacancy. As a result the calibre of graduates recruited is very high, all have good quality BSc (Hons) degrees and many have relevant PhDs. This situation is in sharp contrast with the problems being experienced with the recruitment of medical graduates into some pathology specialty training posts (eg clinical biochemistry, histopathology, microbiology).

MPET funding does not currently extend to all of pre-registration training. Instead it covers two or three years (depending on the discipline) as a grade A trainee. In order to become a registered clinical scientist (with the Health Professions Council) it is, therefore, necessary for the trainee to secure funding from another source. Historically funding for the completion of pre-registration training and for post-registration training has had to be found from establishment posts in NHS trusts. Plans to revise pre-registration training are in hand (see paragraph 4.1).

## **4. TRAINING GAP: CLINICAL SCIENTISTS IN PATHOLOGY**

### **4.1 Clinical scientist training in pathology**

In all disciplines of pathology the end point of training as a medical trainee is the Certificate of Completion of Training (CCT), which usually requires acquisition of MRCPPath by examination. MRCPPath by examination is a corresponding end-point for clinical scientists in most pathology disciplines. The actual examination for MRCPPath for medical trainees and clinical scientists is identical in some disciplines (eg clinical biochemistry) and very similar in other disciplines (eg haematology). As a result it is normal practice for medical trainees and clinical scientist trainees to participate in the same approved training courses (eg those organised by the Association for Clinical Biochemistry) and to have their training assessed in an identical fashion by postgraduate medical deans.

The curricula for MRCPPath by examination for clinical scientists in each of the disciplines of pathology are available from the RCPPath website ([www.rcpath.org](http://www.rcpath.org)). The MRCPPath examination is still in the development stage for analytical toxicology, cellular science and clinical embryology.

Reference to figure 2a indicates that the minimum period of postgraduate training for a clinical scientist to gain MRCPPath is normally eight years. This training period is currently divided into four years of pre-registration training and a minimum of four years post-registration training. In some pathology disciplines a vocational MSc is a qualification gained after two or three years of pre-registration training. The part 1 MRCPPath examination is not normally taken until post-registration training has commenced.

The chief scientific officer (CSO) at the Department of Health, in association with Skills for Health and the Health Professions Council (HPC), has embarked upon a two-year project to revise pre-registration training for all healthcare scientists. For clinical scientists the revision is likely to involve a pre-registration training period of three years, which is funded by MPET and which involves an accredited vocational MSc (or possibly taught PhD) as an exit point. In pathology this exit point will need to be linked into progress towards MRCPPath by examination. If this is the outcome of the project the only change that will be necessary to Figure 2a is to shorten the pre-registration training period to three years and to extend the post-registration training to a minimum of five years. Such a revision will bring still closer alignment between medical and clinical scientist training because it will mean that post-registration training to MRCPPath will be approximately five years in each case.

The CSO and HPC are also considering the possible introduction of a higher level of registration to recognise the change in scope of practice that is achieved by the completion of post-registration training and the acquisition of MRCPPath. Such

recognition would be equivalent to entry on the specialist register for medical practitioners who gain their CCT.

## **4.2 Training gap: clinical scientists in pathology**

It is clear from table 4 that there are a number of reasons why the current clinical scientist workforce profile for each of the pathology disciplines does not match figures 2a and 2b. Foremost amongst these reasons are:

- Inadequate numbers of MPET funded pre-registration trainees – in figure 2a the ‘lower stem’ of the mushroom is absent or too narrow
- A lack of connectivity between pre-registration training and post-registration training – in figure 2a the ‘upper stem’ of the mushroom is absent or too narrow

WRT can influence the first of these training gaps by making recommendations on the required number of MPET funded pre-registration training posts.

However, there is currently no mechanism for influencing the second of the training gaps. The main reason for this is that whilst pre-registration training posts are clearly designated and funded by MPET there are few if any identified post-registration training posts. The creation of a post-registration training post almost always relies on the ability to convert a vacant trust established clinical scientist post. There is no formal mechanism in place to match exit from pre-registration training (or commonly grade A training) to the availability of suitable post-registration training. Connectivity between the two levels of training post owes much to chance in terms of the availability of suitable vacant posts and also relies on the willingness of senior professionals to recruit at post-registration training level rather than to seek trained individual at independent practitioner level.

Loss of continuity of training (effectively an absence of run-through training) has serious consequences for the patient, both through inadequate numbers of trained staff to deliver the clinical service and also through a lack of personnel to take responsibility for service development including the design, validation and introduction of new technology. Loss of continuity of training is bad news for the NHS that have invested up to £75K in each pre-registration training post, only to see the successfully part-trained individual leave the profession because there is no available post-registration training post. Finally, loss of continuity of training is bad for the profession, both as an immediate retention problem and because of the knock-on effect on future recruitment. Examples of serious problems with loss of continuity of training of clinical scientists are given in table 5.

## **5. BRIDGING THE TRAINING GAP**

### **5.1 A shared responsibility, flexible solutions**

In an ideal world the training gap for clinical scientists in pathology would be solved by the creation of the non-medical equivalent of the specialist registrar post, ie a fixed term post-registration training post that is funded by MPET and which has MRCPPath by examination as evidence of satisfactory completion of training. However, the creation of the requisite number of post-registration training posts would be very expensive and the authors of this report recognise that alternative solutions are required.

The 'one size fits all' solution is not a viable option given the diverse number and nature of pathology disciplines and the relatively small numbers of pre-registration clinical scientist trainees within each SHA. Shared responsibility and flexible solutions to meet local need are required and some examples of good practice are given in table 6.

**Table 5**

**Examples of the training gap for clinical scientists in pathology**

1. Cellular science and clinical embryology: no recognised pre-registration trainees and so no post-registration training posts have been created.
2. Clinical biochemistry: loss of ~40% of pre-registration trainees during the period 1995-2000. As a result the number of funded pre-registration training posts was reduced to a level lower than that required to meet the age-related predictions. There is currently a shortage of pre-registration trainees available to fill all the established posts that are being vacated through retirement.
3. Clinical immunology: loss of pre-registration trainees during the period 2001-2004 because there were no available post-registration training posts.
4. Haematology: loss of trainees before completion of pre-registration training because of poor career prospects arising from absence of post-registration training posts.
5. Genetics, microbiology, histocompatibility and immunogenetics and transfusion science: absence of recognised post-registration training posts means that clinical scientists have 100% commitment to service delivery with no protected training time. As a result they find it very difficult to complete MRCPPath.
6. All disciplines: shortage of trainers to support pre-registration and post-registration training.
7. All disciplines – London: approximately 50% of pre-registration trainees fail to find suitable post-registration posts and so are lost to the NHS.

**Table 6**

**Examples of good practice in bridging the training gap**

1. Scheme in North West England for the SHA and local trusts to share funding (50:50) for an agreed number of fixed term (five years) post-registration training posts in clinical biochemistry.
2. Scheme in West Yorkshire to provide 50% funding for four years for all post-registration trainee clinical scientists.
3. Funding by the National Blood Service for two to three post-registration trainees each year
4. Use of funds from the genetics white paper to create eight fixed-term post-registration training posts in paediatric metabolic biochemistry in England and to provide trainer support for these posts.
5. Draft scheme in Scotland proposing national funding to the value of 50% of salary plus training expenses for an agreed number of fixed term (four year) post-registration training posts for clinical scientists across pathology disciplines. (Scotland already provides fully funded four-year pre-registration posts.)
6. Use of MPET funds earmarked for pre-registration training in clinical immunology to create post-registration training posts.
7. Funding in South West England for non-salary support (£2Kpa) for post-registration trainees

## **5.2 Contribution of stakeholders**

The contribution of the various stakeholders to bring about solutions to the training gap may be summarised as follows:

### RCPATH and other professional bodies

- Work with WRT to produce accurate workforce data; evidence of changing requirements within the profession; appropriate numbers of pre-registration trainees
- Appoint workforce leads for each pathology discipline in each SHA that has responsibility for clinical scientist training
- Organise and deliver training programmes and courses that accommodate both medical and clinical scientist post-registration trainees and that facilitate success in the MRCPATH examination

### Workforce Review Team

- Production of workforce planning national recommendations based on good quality workforce data and knowledge of changing requirements within the profession

### Strategic health authorities

- Appointment of healthcare science workforce leads that have an understanding of clinical scientist training issues across the pathology disciplines
- Creation of one or more 'lead SHAs' for workforce planning for clinical scientists in pathology

### 5.3 Practical solutions for bridging the training gap

Table 7 contains some practical ways in which the training gap may be bridged. It is recognised that not all solutions will be suitable for all of the pathology disciplines or for all SHA. Equally, the list of suggestions in table 7 is not exhaustive and imaginative alternative local solutions may emerge from discussion between the profession and SHA workforce leads for clinical scientists in pathology.

**Table 7**

#### **Practical solutions for bridging the training gap**

1. SHA and trusts agree to share the cost of funding fixed-term post-registration training posts for clinical scientists in pathology. The percentage funding provided by each stakeholder should be agreed at local level bearing in mind that post-registration trainees make an increasing contribution to service delivery and development as their training approaches completion.
2. In pathology disciplines where it is difficult to recruit adequate numbers of medical trainees MPET money is diverted by SHA to post-registration training of clinical scientists in the same discipline.
3. Trusts that are unable to fill a vacant established clinical scientist post commit to supporting post-registration training and further development of the post-holder. In effect trusts are 'growing their own' consultants.
4. SHA and trusts agree to provide non-salary training support funding for post-registration trainee clinical scientists in pathology (estimated at ~£2K per trainee per annum).
5. SHAs, either individually or collectively to consider supporting sessions for trainers in the clinical science disciplines of pathology.
6. SHA to provide bridging finance to enable a clinical scientist who has completed pre-registration training to commence post-registration training for a limited period until an established clinical scientist post is vacated.

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