The Royal College of Pathologists

Medical and Scientific Staffing of National Health Service Pathology Departments

Histopathology and cytopathology

Please note the histopathology and cytopathology chapters of this document have been superseded by the ~~July 2003~~ June 2005 College publication, *Guidelines on staffing and workload for histopathology and cytopathology departments*, available only on www.rcpath.org

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Introduction

The provision of adequate numbers of appropriately trained staff at all levels is clearly critical to the provision of pathology services, but the diversity of pathology means that there can be no simple formula for deciding what this provision should be. The different pathology specialties each encompass different working practices, with a variable and complex mix of laboratory and clinical duties.

Each histopathological specimen requires a medical opinion with the result that it might seem that medical staff numbers could be reasonably accurately tied to the numbers of specimens to be examined. However, some types of specimen require much more detailed examination than others, and the variation in case mix between different hospitals may have a considerable effect on the number of specimens that an individual pathologist can be expected to examine. In laboratories where much of the work is automated, as in clinical biochemistry and haematology, a change in workload may might seem to impinge less directly on the requirement for staff. However, a change involving an increase in specialist work or work for general practitioners, requiring more interaction between laboratory and clinical staff, or of work that requires a high level of technical skill, may have a significant effect. So, too, will any change in the level of the direct clinical work for which the laboratory is responsible - e.g., the management of patients with haematological malignancies, the provision of nutritional support, control of infection or 'one-stop' clinics that involve pathologists.

Pressures on consultants' time continues to increase in response to developments in the NHS. Participation in clinical audit, EQA, CPD are clearly essential to the provision of a quality service, but all take time. The structured training programmes for junior doctors require both that they have protected time for training and that consultants set aside time to teach their trainees.

Managers often prefer to invest in expanding clinical services rather than diagnostic and support services, without appreciating the consequences for these. Yet it is clearly essential that we provide pathology services that are both appropriate to the clinical service and allow pathologists to practise without undue pressure (and so safely), and to maintain their own education and professional development.

The College frequently receives requests for guidance on appropriate staffing levels in pathology departments. The guidelines that follow were developed by the College's SACs. They have been extensively discussed within the respective disciplines in draft form and these drafts were published in the College Bulletin for comment. We believe that they represent realistic standards for staffing. We cannot subject them to controlled trial, but they have been tested in a variety of settings and found to be appropriate. However, although they carry the authority of the College, as with any guidelines, they should not be applied without regard to the circumstances which pertain in individual Trusts and other providers of pathology services.

We appreciate that the guidelines for each discipline vary in format and the amount of detail they contain. This is largely because the nature of the work and extent of direct consultant involvement is so variable between - and sometimes even within - different specialties. Some specialties have found considerable difficulty in establishing realistic methods for measuring workloads and this is reflected in the variable degree to which the guidelines can be based on firm evidence.

With the introduction of clinical governance and revalidation and related increasing emphasis on the importance of participation by all consultants in clinical audit and continuing professional development, the time that will need to be identified for these activities in consultants' workloads may well increase, with consequent implications for staffing.

These guidelines will therefore need to be kept under review and updated on a regular basis. The College will be pleased to receive any information or comments which may facilitate this process.

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Registrar

Chemical Pathology

SUMMARY

A model has been developed which relates the senior staffing of a Clinical Biochemistry (Chemical Pathology) department in a non-teaching District General Hospital to both the number and nature of consultants and general practitioners supported by that department, and also to the special units within the hospital which require clinical liaison with Chemical Pathologists and senior Clinical Scientists. The model also takes cognisance of the job plans of staff required, and the activity of the department. The model has been validated in 34 widely differing departments in the UK. It is recommended that the model may be applied to give an independent estimate of minimal staffing to support core clinical services. The model will not be valid for teaching hospitals or highly specialised units where additional staffing will need to be agreed locally for teaching and training, research and development and specialist clinical or laboratory services. It is anticipated that the model will be of value in individual situations where uncertainty exists or change is proposed.

INTRODUCTION

In its 1992 publication on the staffing of pathology departments, The Royal College of Pathologists (RCPath) stated that 'The number of senior staff required in each discipline should relate to the number and type of beds and clinics served, the numbers and interests of senior clinicians, and the extent of the General Practitioner service provided.' This point was reinforced in the *Strategic Review of Pathology Services (1995)* which recognised the integration of pathology in clinical practice and the activities that take place both inside and outside the laboratory.

In histopathology it has proved relatively easy to relate senior staffing to workload because each item of work is reported by a consultant histopathologist. As a result, a staffing model for histopathology is now in widespread use throughout the UK.

In the pathology disciplines where there is a significant amount of automation or simple manual tests, such as clinical biochemistry, workload figures, such as Korner requests or Welcan units, are mainly of value in manpower planning for MLSO staff directly involved in the analytical process. For senior medical and scientific staff, it is more appropriate to consider the clinical groups for whom the analyses are performed, recognising the involvement of such staff as part of the clinical team. Whilst this role may be clearly seen in the context of interpretation of results in the diagnosis and management of patients, it must be remembered that the chemical pathologist and clinical scientist also have a responsibility to control demand by ensuring appropriate use of the laboratory *(Audit Commission Report on Pathology - Critical Path 1992).*

QUALITY STANDARDS

The Association of Clinical Biochemists (ACB) and the RCPath have for many years had a common view on senior staffing of Clinical Biochemistry departments although this has not been directly related to workload. There is now an urgent need for a model which relates senior staffing to clinical activity and to quality standards. The purpose of such a model is to determine the minimum number of senior staff required to ensure that quality standards are met across the full range of laboratory activity including pre- and post-analytical functions such as laboratory management, clinical liaison, report interpretation, clinical advice, provision of clinical services, scientific evaluation, clinical audit *etc.* These quality standards are best defined by reference to the standards of Clinical Pathology Accreditation (UK) Ltd (CPA). It is recognised that no simple model could apply to all types of Clinical Biochemistry departments and so the model has been developed only for the core services that might be expected from each non-teaching District General Hospital laboratory. Additional senior staff will be needed for specialist services, teaching, supporting training, research and development and dedicated clinical activities such as outpatient clinics and specialist consultations, but these will need to be agreed locally in the light of individual circumstances.

SERVICE REQUIREMENTS, JOB PLANS AND ACTIVITY

For the purposes of this paper the elements of the service are those recognised in the *Strategic Review of Pathology Services*. It is important that any model recognises these functions and that they are reflected in the job plans for the posts concerned. Appendix 1 summarises job plans for a typical large non-teaching DGH department with 1 chemical pathologist and 3 clinical scientists. It is clear from these job plans that the major part of the work commitment is directly related to clinical and scientific activity and therefore related to the demands of the users. In these job plans the 4 posts would provide 35.5 sessions (notional half days) of clinical and scientific activity, which is a high efficiency compared with some other clinical specialties. For laboratory bench workers, where Welcan units are commonly used, an efficiency of >70% is considered commendable. Appendix 1 is not a universal model and job plans for chemical pathologists and clinical scientists will vary with the size of the department, ranging from 55% clinical functions in small

departments, where management functions would constitute a significant part of the time of a single handed head of department, to 65% clinical functions for a medium sized department, and to 75% clinical functions for a large department. A small department is considered to be one with less than 100,000 requests per annum, a medium department has 100,000 - 250,000, and a large department >250,000 requests per annum (Korner definition).

In developing the model we have returned to the original advice of the RCPath and have sought to link staffing levels with the demands made of the department by the consultant clinicians and general practitioners who use that department, and by special clinical units. Clearly, not all consultant clinicians make equal use of a Clinical Biochemistry department, e.g. demand is appreciably higher from medical specialties than from surgical specialties. Therefore a system of weighting based on the time spent supporting each clinical specialty was seen as an essential element of the model.

THE METHOD

For the purpose of this document, senior staffing of a Clinical Biochemistry department has been defined as those grades of staff eligible to participate in the Continuing Professional Education scheme of the RCPath, namely consultant chemical pathologists, Grade C clinical biochemists and Grade B 17-24 clinical biochemists. In the future all new appointments to these grades may be expected to possess the MRCPath qualification. All other grades of medical and scientist staff are either in training or junior and have not been included in this model. It is envisaged that compliance with the model will, normally, ensure compliance with CPA Standards B1 and B2 which specifically relate to senior staffing.

Weighting to reflect time spent supporting each clinical specialty

Time factors may be considered as analogous to Welcan units, but related to clinical commitments and contact rather than to bench work. A working party of senior members of the profession derived time factors for each of the individual clinical specialties that use Clinical Biochemistry departments. These were tested in a pilot study but the resulting model was complex and it became clear that a much simplified system based on broad specialties gave the same information whilst being much easier to use. The time factors have been derived in terms of sessions (notional half days) so that they can be co-ordinated with job plans as described earlier. The simplified parameters, which vary from an average of 0.01 to 0.25 sessions (2 - 50 minutes) per consultant per week, are listed in Table 1.

General Practitioners are major users of Clinical Biochemistry departments. In the model a GP is regarded as a consultant clinician but a relatively low time factor has been applied to GPs in recognition of the fact that they have a smaller clinical team and so make relatively fewer demands of the Clinical Biochemistry service. However, (also see Discussion) this time factor may not be adequate to cope with the increased movement of patient care to the primary sector, and most departments are already experiencing major increases in contact with GPs.

Work related to supporting Special Units

Most DGHs operate a number of special clinical units or facilities which require a measure of direct support from a chemical pathologist or senior clinical scientist because of the special nature and demands of the treatment being offered. Examples of these are Intensive Therapy Units and Special Care Baby Units, in which there is a frequent need to liaise with senior staff on the availability and interpretation of unusual investigations. Other examples are being members of the nutrition team and organising supervision for near patient testing equipment (e.g. training and quality control). The demands of these units will vary from day to day depending on the patients being treated, but experience indicates that a time factor of 0.5 session (1.75 h) per Unit per week would be appropriate. The Units identified are listed in Table 2.

The Model

Determination of the optimal senior staffing of a Clinical Biochemistry department is a five stage process:

1. Obtain data on the number of consultants and General Practitioners (WTE) supported by the department and divide these into the broad specialties shown in Table 1.

2. Multiply the number of clinical WTE in each category by the appropriate time factor (Table 1) to determine the number of senior Clinical Biochemistry staff (SCBS) sessions required to support that broad specialty, then divide by 10 to give the number of laboratory WTEs.

3. Multiply the number of Special Units supported by the department by the time factor (0.5) to indicate the number of sessions required to support them, then divide by 10 to give the number of laboratory WTEs.

4. Add up all the laboratory WTEs, and to produce the number of whole time equivalent senior Clinical Biochemistry staff required, then divide by the appropriate job plan factor - 0.55 for a small department, 0.65 for a medium department and 0.75 for a large department.

5. Assess local needs to determine the exact composition of staff required to fill these senior posts. There must be at least one consultant level member of staff, in line with the report of the *Strategic Review of Pathology Services.*

Two examples of practical use of the model are shown below:

Validation of the Model

Data were collected from 34 Clinical Biochemistry departments throughout England, Scotland and Wales with the full knowledge and active collaboration of the senior staff at each site. Throughout the subsequent analysis of the data the identity of individual laboratories has been kept confidential. The working party selected these departments since:

- they were representative non-teaching DGH laboratories.
- they had a wide geographical distribution
- they had widely differing workloads (60 - 365K Korner requests pa)
- they provided a service of acceptable quality (e.g. by obtaining accreditation from CPA(UK)Ltd)

The model was used to determine the optimal number of senior Clinical Biochemistry staff required and this figure was correlated with the actual number of senior Clinical Biochemistry staff in post (Figure 1). In most departments there was good correlation providing validation of the model. In some departments there was a discrepancy between the predicted and actual number of senior Clinical Biochemistry staff in post. Three departments, marked '*' on Figure 1, signalled at the time of data submission that they had undergone significant change and felt that the actual senior staff in post were not sufficient to maintain adequate quality standards.

Following debate about the factor allocated to GPs, an audit of GP-related activity was performed in 6 of the laboratories. This showed considerable variation in activity, but the optimal practice range appears to be between 0.015 and 0.02 sessions/GP/week. From these data it was agreed that a factor of 0.02 should be used for the present, but as demands from GPs are increasing significantly with changes in clinical practice, this factor will need to be revised in the near future (see Discussion).

EXAMPLE 1
A large District General Hospital department

Specialty	*WTEs*	*Weighting factor*	*SCBS sessions*	*Lab WTE*
Surgery	50	0.025	1.25	
Medicine	45	0.25	11.25	
Obs & Gynae	10	0.25	2.5	
GPs	400	0.02	8.0	
				2.3
Special Units	14	0.5	7	0.7
Korner requests p.a. (,000)		290		
Job plan factor		0.75		
Total				**3/0.75 = 4.0**

In a large DGH department with 4 senior Clinical Biochemistry staff it would be in line with the recommendations of the RCPath and ACB to have one Consultant Chemical Pathologist, one Grade C Clinical Biochemist and two high Grade B Clinical Biochemists.

EXAMPLE 2

A medium District General Hospital department also serving another Trust such as a Community Trust

Specialty	*WTEs*	*Weighting factor*	*SCBS sessions*	*Lab WTEs*
Surgery	25	0.025	0.625	
Medicine	20	0.25	5.00	
Obs & Gynae	5	0.25	1.25	
GPs	150	0.02	3.00	
Other (eg Psychiatry)	12.5	0.01	0.125	
				1.0
Special units	6	0.5	3	0.3
Korner requests p.a. (,000)		130		
Job Plan factor		0.65		
Total				**1.3/0.65 = 2.0**

The staffing recommended by the RCPath and ACB would be one Consultant Chemical Pathologist and one Grade C Clinical Biochemist.

DISCUSSION

The model described is simple and easy to use. It is based on the recommendations of the RCPath and should be capable of being applied to all DGH Clinical Biochemistry departments in the UK.

It must be emphasised that the model is applicable only to the core Clinical Biochemistry service as found in non-teaching District General Hospital departments. Departments which provide specialist services, training, teaching, research or clinical activities such as in-patient or outpatient sessions will require additional senior Clinical Biochemistry staff. No model can predict the number of additional staff required for these functions because local circumstances will differ markedly. The on-going growth in direct clinical responsibilities of chemical pathologists in areas such as metabolic medicine will require to be carefully monitored and appropriate action taken. Decisions on additional staff will have to be agreed locally with knowledge of those services which are over and above the core service - Appendix 2 provides some guidelines for these discussions. On the other hand, there must be some concern about the viability of any department whose size can only justify a single handed head of department, where there is lack of adequate cover both out of hours and during the normal working day.

The working party who drew up the time factors shown in Table 1 had considerable debate about the time factor that should be used for General Practitioners (0.02 sessions = 4 min per GP per week). There is a rising demand being made by GPs on Clinical Biochemistry departments. In addition to an increasing number and repertoire of requests many GPs now require detailed interpretation and activity data and financial information formatted to their particular needs. A GP time factor of 0.05 (10 min per GP per week) may be more appropriate than 0.02 - equivalent to one extra senior member of staff for every 330 GPs served. Therefore the professions believe that the weighting factor for GPs may require to be reconsidered in the light of a wider application of the model.

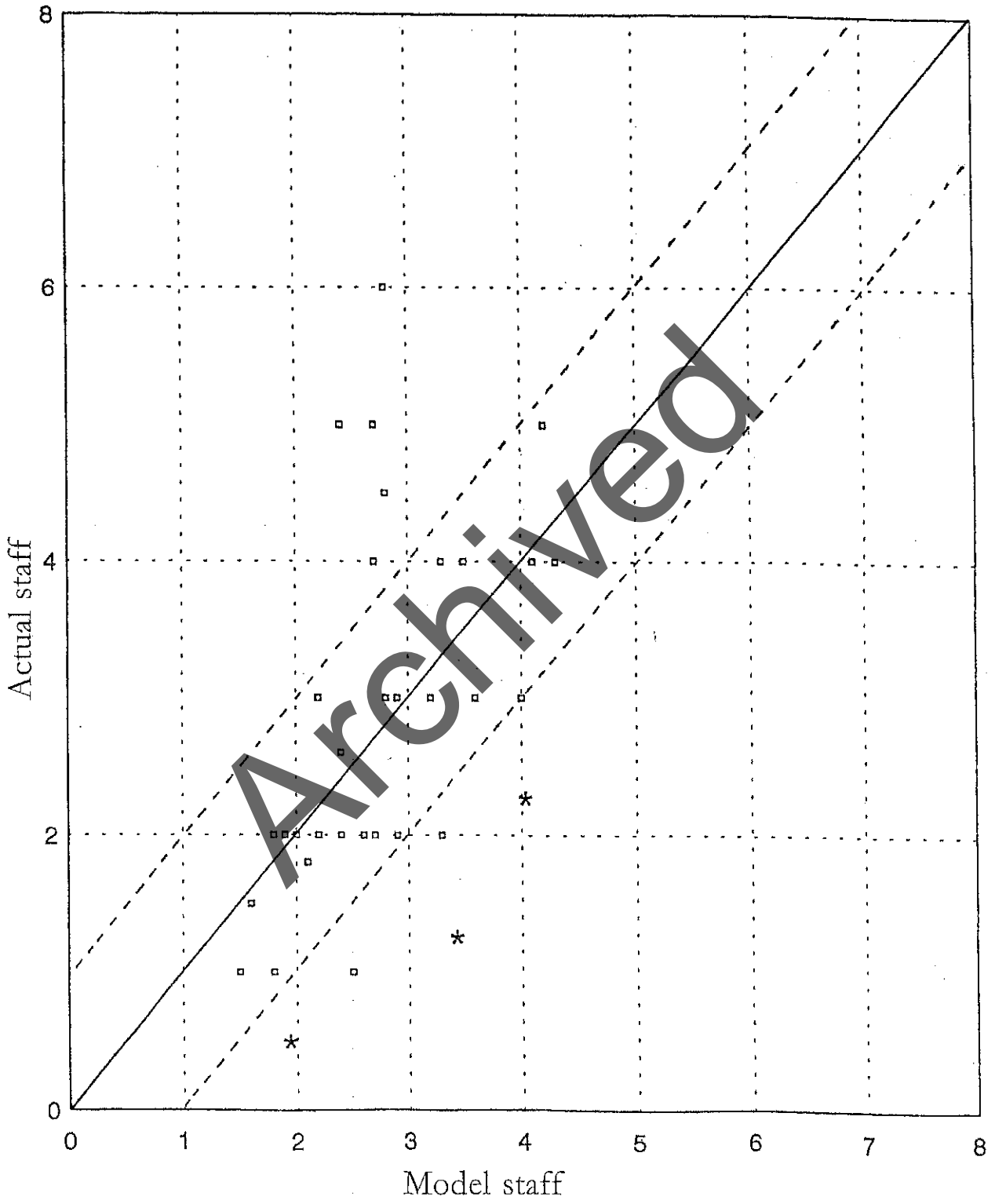
It is hoped that this model will receive widespread professional support and so achieve the status of 'Guidelines' to help determine the optimal senior staffing of Clinical Biochemistry laboratories in situations where uncertainty exists or change is proposed.

TABLE 1

Time Factors and Examples of Specific Input from Chemical Pathologists/Clinical Scientists

Specialty	*Time Factor*	*Examples of Clinical Biochemistry support (in addition to basic profile)*
Surgery	**0.025**	
General Surgery		tumour markers, tumour localisation, nutrition
Urology		tumour markers, renal calculi
Trauma & Orthopaedics		bone metabolism,
ENT		allergy testing, post laryngectomy
Ophthalmology		inborn errors
Oral Surgery		bone metabolism
Neurosurgery		endocrinology
Plastic surgery		nutrition
Cardiothoracic		tumour markers, cardiac markers, lipids
Paediatric Surgery		nutrition
Accident & Emergency		drug screening, near patient testing
Anaesthetics		cholinesterase phenotyping
Medicine	**0.25**	
General Medicine		endocrinology, diabetology, porphyrins
Gastroenterology		breathtests, malabsorption tests,laxatives,gut hormones
Endocrinology		endocrinology, dynamic function testing
Clinical Haematology		proteins, tumour markers, Hbopathies
Clinical Physiology		nutrition,muscle biochemistry,growth factors
Clinical Pharmacology		therapeuticdrug monitoring, drug kinetics
Audiology		therapeutic drug monitoring
Clinical Genetics		screening for inborn errors
Clinical Cytogenetics		screening for inborn errors
Clinical Immunology		proteins, antibody testing, allergy
Rehabilitation		muscle biochemistry
Palliative Medicine		therapeutic drug monitoring
Cardiology		enzymology, lipids
Thoracic Medicine		adrenal function, allergy, immunology
Infectious diseases		liver function, drugs of abuse
G U Medicine		drugs of abuse
Nephrology		special proteins, cyclosporin
Medical Oncology		tumour markers, nutrition
Nuclear Medicine		thyroid assessment
Neurology		endocrinology, CSF studies
Clinical Neurophysiology		endocrinology
Rheumatology		bone studies, proteins, immunology
Paediatrics		SCBU, inborn errors, neonatal screening, porphyrins
Geriatric Medicine		endocrinology, vitamins, misc biochemistry
Dental Medicine		calcium metabolism
Community Drug Teams		drugs of abuse
Obstetrics & Gynaecology	**0.25**	endocrinology, prenatal screening, diabetology
General Practice	**0.02**	everything
Other	**0.01**	
Psychiatry		endocrinology, drugs
Radiotherapy		tumour markers
Radiology		tumour markers, tumour localisation
Community Medicine		toxicology
Occupational Health Medicine		allergy

FIGURE 1
Senior Staff model
Comparison of actual staff with the model prediction for 34 laboratories in the UK



Lines indicating equivalence (—) and + / - one staff member (- -) have been shown

APPENDIX 1

Clinical Biochemistry Senior Staffing Model

Illustrative job plans for large District General Hospital Clinical Biochemistry Departments

Item	Notational half days HOD Cons CP	Grade C	Grade B 21-	Grade B 17-20	Total	Area Total
A. Clinical and Scientific						
Laboratory services						
Report signing general	1	4	4	2	11	
Report signing special	0.5	0.2	0.5	0.5	1.7	
Special interest (clinical)	0.5	0.2			0.7	
Analytical		0.5	2	4	6.5	
Clinical liaison	1	0.5			1.5	
Clinical activities						
In-patients/Wd rounds	0.5	0.5	0.5	0.5	2	
Outpatients	0.5				0.5	
Dynamic Func tests	0.5				0.5	
NPT supervision				2	2	
Clinical Audit						
Internal	0.5	0.5	0.4	0.5	1.9	
External	0.1	0.1			0.2	
On call	1	1	1		3	
QC			1		1	
R&D/special interest	0.5	0.5	1	1	3	35.5
B. Education and Training						
Teaching/education 0.4				0.2	0.2	
CPD	0.5	0.5	0.5	0.5	2	2.4
C. Management and Administration						
Management/Admin	2	1			3	
Strategic Planning	1	1			2	
Committee work	0.6	0.2			0.8	
Professional affairs	0.1	0.1	0.1		0.3	6.1
Total	11	11	11	11	44	

A head of a department may be a consultant chemical pathologists or grade C clinical scientist, and 1 session relates to HOD roles.

TABLE 2
Special Units which have a requirement for contact with Chemical Pathologists and Senior Clinical Scientists

Accident & Emergency
Intensive Therapy Unit
High Dependency Unit
Special Baby Care Unit
Neonatal Intensive Care Unit
Neurosurgical Unit
Medical Admissions Unit
Near patient testing support
Nutrition team
Day Surgery Unit
Diabetes Unit
Renal Unit
Gastroenterology Unit
Drug Dependency Unit
Coronary Care Unit
Cancer Unit / Centre
Bone Marrow Transplant Unit
Radiotherapy Unit
Assisted Conception Unit
Early Pregnancy Unit
Ante-Natal Day Unit
Community Drugs Team

APPENDIX 2
Guidelines on Senior Staffing in Teaching Hospital Departments of Clinical Biochemistry (Chemical Pathology)

The varied nature of the staff responsibilities in a teaching hospital or a major research centre means that it is impossible to produce a generally applicable model to calculate the number of senior Clinical Biochemistry staff required. Decisions on such senior staffing must be agreed locally by discussion taking into account the individual circumstances. The following guidelines are suggested as an aid to such local discussions:

1. Calculate the number of senior staff to meet the core activities of the department (to the specification for a DGH) according to the basic model for determining the minimum senior staff numbers.

2. Estimate the number of additional staff required for the provision of services on a Regional or Supraregional basis - *eg* endocrinology, toxicology, trace elements, vitamins, inborn errors of metabolism.

3. Estimate the number of additional staff required for direct clinical activities provided on a Regional or National basis - *eg* clinics and ward consultations in complex aspects of endocrinology, bone disease, nutrition, inborn errors of metabolism.

4. Estimate the number of additional staff required for training Specialist Registrars and SHOs, and for training Grade A and Grade B Clinical Scientists.

5. Estimate the number of additional staff required for teaching medical students and other undergraduate and postgraduate groups.

6. Estimate the number of additional staff required to support the hospital research and development programme. This exercise may be facilitated by analysis of the 'Culyer Returns'.

Based upon the above calculation, it might be expected that a large teaching hospital department would require 6-10+ senior staff members, 2-4+ whole time equivalents being Consultant Chemical Pathologists, and 4 - 8+ whole time equivalents being Grade C or Grade B17-24 Clinical Biochemists.

However, the actual number of Chemical Pathologists and Clinical Scientists, and the balance between them, will depend upon the particular profile of activities supported by the individual department and should be decided locally.

Haematology

BACKGROUND

To define precisely what a consultant haematologist in the National Health Service does, and how much one might reasonably be expected to do, is a difficult task compounded by a number of variables. Some of these relate to the widely different tasks haematologists have to carry out in different institutions, and some, of course, relate to individuals in terms of their efficiency and enthusiasm. The problem was examined by the British Society for Haematology in a presidential working party report in August 1992, but it was felt that the matter needed to be revisited due to the growing pressures on consultant staff from the New Deal, the continued evolution of the Health Service reforms, the requirement for CPD and audit, Calman postgraduate training and the advance of technology in the treatment of patients with blood disorders.

It is probably true to say that for the vast majority of NHS haematologists in the United Kingdom the part of their job that potentially causes stress through overwork is the clinical component - the direct care of patients with blood disorders. Any attempt to define a maximum workload should therefore concentrate on that aspect and it can arguably be assumed that if a reasonable clinical workload can be achieved then - in most instances - other duties can be coped with.

This is not, of course, to belittle the laboratory and other work of haematologists which is equally important, and indeed in some circumstances can take the majority of their time. It is just that for the *majority* of consultants' laboratory work, laboratory supervision, NHS administration, teaching and research can usually be accommodated *provided* sufficient time can be protected from encroachment by clinical duties. Exactly how much time is 'sufficient' will vary from job to job, but the Working Group has attempted to offer reasonable and, it is hoped, realistic averages *where posts do not include extraordinary managerial responsibilities or teaching commitments.*

The pattern of clinical work varies greatly depending on the subspecialty interest (if any) of the practitioner concerned. Those dealing with haemophilia, for example, will see fewer new patients than those running general clinics, but will probably have more day case attenders. For this reason it is difficult to define equivalent clinical workloads based on Finished Consultant Episodes (FCEs), or patient numbers, or in-patient days, or clinic attenders, or casemix. An early attempt to do so was abandoned by the working group after a preliminary assessment of available information from a few trusts in the North East and others in the South East from which it was concluded that the data available are not nearly detailed or reliable enough.

The group also shied away from the Notional Half Day (NHD or 'session') as this is no longer appropriate for the way most haematologists work. Eventually, and with some reluctance, the group decided instead to follow the Junior Doctors' lead in looking at hours of work. It did so also because an increasingly important component of the job of most haematologists is clinical on-call outside the normal working week, and it seemed only logical that any consideration of excessive work for juniors in posts with limited tenure should equally apply to career grade seniors with open contracts. So the starting point was the simple assumption that work in excess of 56 hours per week should be no more acceptable for seniors than juniors.

The notion that counting hours should be applied to senior medical staff will be an anathema to many colleagues, and the working group shares that distaste. It merely felt that to maintain standards, to avoid unnecessary stress and to avoid the exploitation of professional goodwill to an unacceptable degree, something along the proposed lines has become necessary and it is impossible to define workload for haematologists in any other meaningful way. It should be stressed that this is not an attempt to define a standard working week (a concept rejected both by the working group and BMA) but simply an effort to agree an acceptable *maximum.*

ASSESSMENT OF WORK OFF THE WARD AND OUTSIDE THE CLINIC

The way NHS haematologists divide their time between laboratory work, administration, teaching, CPD, audit, clinical trial paperwork and other research varies enormously. The working group felt, however, that an attempt to define a reasonable *minimum* could be made as follows:

Laboratory work, including cytomorphology and professional supervision/liaison: minimum 1 hour per day, 7 days per week.

Administrative NHS work: minimum 1 hour per day 5 days per week.

*Teaching (including preparation):

(a) Teaching Hospital: 3 hours per week.
(b) Non-teaching hospital: 1 hour per week.

*(These teaching times may be an underestimate in view of the effect of Calman training)

CPD and audit: 2 hours per week.

Clinical trial paperwork/other research/non-NHS administration/cover for colleagues' absences: 2 hours per week.

TOTAL: Teaching Hospital: 19 hours/week.
Non-teaching hospital: 17 hours/week.

The notion being put forward is that, *as a minimum* , these amounts of time should be set aside for all haematologists *before* their clinical workload is taken into account. Arguably the size of the laboratory and/or the complexity or specialised nature of its repertoire could increase the input needed from the consultant(s) under category 1 above up to a further 7 hours per week or more, though thresholds would be hard to define and the working group felt that simple but realistic global minimum figures should be applied. *It is important to emphasise again that no account in these figures is taken of extraordinary responsibilities such as clinical directorships, membership or chairmanship of special committees (such as ethics committees, training committees etc), which would obviously require more time.*

ASSESSMENT OF WORK INVOLVED IN DIRECT PATIENT CARE

On call

On call work is an increasing source of stress for haematologists. The advent of the New Deal for junior doctors has placed some consultants in smaller clinical units on regular clinical call at the equivalent of junior registrar level, and this may be at a frequency of 1 in 2 or worse. By nature of their practice, when on call such haematologists, whatever their particular interest, are not infrequently faced with seriously ill patients. They may have to attend the ward at all hours and many have to perform all the necessary bedside procedures themselves. (This is, of course, increasingly true for consultants in other acute medical specialties as well, but haematology is possibly one of the first and worst hit with its combination of small units and seriously ill patients requiring frequent emergency attention.)

Not all haematologists have such onerous on-call duties, either because they work in larger units where there is a sufficient pool of junior staff to provide middle-grade support, or because their clinical work does not include a consistent population of very sick patients. They may still be regularly on-call but are more likely to be able to deal with their calls by telephone. The group felt, however, that most consultants spend considerable time in excess of a 'normal' working week in their hospitals, and most would spend Saturday and Sunday morning at work when on-call. Most would probably be in the hospital for what would amount to a third of their on call time or time outside the 'normal' working week of 40 hours, particularly when covering for colleagues' annual leave or other absences.

On this basis it was decided that a similar calculation as used for Juniors' hours could be applied to seniors in haematology.

Ad hoc clinical work

By the nature of their practice, all consultants acknowledge that there are regular occasions when a clinical problem with a haematology patient will crop up unexpectedly. This may demand time out of the routine working day at short notice and may take an hour or more to deal with. It is impossible to measure or predict this time, and it will vary considerably between sub-specialties. The group felt, however, that an allowance should be made for it, and agreed that a reasonable average would be 4 hours per consultant per week.

Planned clinical work

Because haematologists adopt differing work patterns on different units it is difficult to define even planned clinical work in NHDs. Many do a working ward round each morning that may take an hour or so - amounting to 5 hours per week. Others do one or two larger ward rounds on a more formal basis. Some will have day cases trickling in throughout the week, others will concentrate them within fixed times. Again, an allocation of hours was thought to be the best way to cover this activity. The time should therefore include ward rounds, clinics, day cases/practical procedures/anaesthetic lists and clinical correspondence.

The group felt that the amount of time allocated to these activities should not normally exceed 19 - 21 hours per week. This is calculated on the basis of the residuum after starting with 56 hours and taking off time for non-clinical work, on-call and ad hoc activities. That figure is for consultants on a rota of 1 in 3. For those on a 1 in 2, the residual hours would be less.

How the calculations work out

Hours worked each week are composed of:

(a) non-clinical work: 19 or 17 hours (see above)
(b) 1 in 3 on call: 168-40 /3/ 3 = 14 hours.
(1 in 2 on call: 168-40 / 2 / 3 = 21 hours.)

(This is calculated on the basis of 168 hours in the week less 40 hours of the basic working week divided by 3 to give the hours on call - that gives 43 - and then dividing again by 3 to estimate the amount of that time

actually spent working - i.e. 33%. NB for junior doctors the working time on call is assumed to be 50%).

(c) Ad hoc clinical work:
4 hours

This means that before any planned clinical sessions are undertaken a haematologist on a 1 in 3 rota would be required to work 37 hours per week in a teaching hospital and 35 hours per week in a non-teaching hospital. The maximum amount of time that might be allocated to planned sessions should take this into account and therefore should not normally exceed 19 hours in a teaching hospital and 21 hours in a non-teaching hospital. (For those on a 1 in 2 rota the above figures would dwindle to 12 and 14 hours respectively.)

Calculating back to NHDs, if an NHD is assumed to be 3.5 hours, this means that full time teaching hospital consultants on a 1 in 3 rota should not be contracted for more than the equivalent of 5 clinical NHDs and non-teaching hospital consultants for more than 6. For those on a 1 in 2 the figures would be 3.5 and 4 respectively. (Note: converting a 56 hour week to NHDs gives a figure of 16).

RECOMMENDATIONS AND CONCLUSIONS

NHS consultant haematologists should not be required to work excessively long hours. 56 hours per week is the maximum junior doctors are allowed to work and it is unreasonable to demand seniors to do more. This is not by way of defining a standard working week. It is an attempt to recognise a reasonable maximum amount of time someone in a career grade post can be expected to work. Some may choose to work more, others may be in posts that demand less.

NHS consultant haematologists should not normally be on an on-call rota more onerous than 1 in 3. While under some circumstances 1 in 2 may be workable and acceptable, continuous on-call for single-handed practitioners should not be allowed and some arrangement with neighbouring services should be made.

NHS consultant haematologists should have their time on call taken into account when calculating their contractual workload. Where in-patients are involved, a reasonable figure would be 33% of the time on call (i.e outside the standard 40 hour week) counted as worked. For a 1 in 3 rota this would be 14 hours and for a 1 in 2, 21 hours.

NHS consultant haematologists should have adequate time allowed for duties other than direct patient care. This amounts to at least 17 hours per week for a non-teaching hospital consultant and 19 hours for a teaching hospital consultant. They should have due additional allowance made if extracurricular management or administrative duties are undertaken.

NHS consultant haematologists should have an allowance - a minimum of 4 hours per week - made for ad-hoc urgent clinical problem solving.

NHS consultant haematologists should, taking the above into account, have a limited amount of time devoted to planned clinical sessions. For those on a 1 in 3 rota the calculated maximum should be no more than 21 hours for a non-teaching hospital consultant, 19 hours for those from teaching hospitals.

Medical Microbiology

The duties of a consultant microbiologist are many and varied, but the development of a quantitative system of workload measurement has proved elusive. Although necessarily crude, measures based on specimen/test numbers or Welcan units (of time) have provided a basis for determining MLSO input, but they are not appropriate for allocation medical staff time. Nevertheless, a method is needed to determine the input of consultant time required for particular service needs. The previous RCPath recommendations were based upon population served, and recommend two consultants for a DGH laboratory serving approximately 250,000 population. This takes no account of the functions and areas of responsibility that generate work for a consultant microbiologist. Furthermore, this requirement has been ignored by many districts and there are still many DGH laboratories with single-handed microbiologists expected to cope with inordinate workloads. A more specific and quantifiable approach is needed in which recommendations for consultant numbers can be based, always bearing in mind the need to be cost-effective within the current financial constrains of the NHS and PHLS.

The following components of a consultant's work are relevant for defining the workload of a consultant microbiologist. Although the allocation of a numerical factor to many of these is difficult; *an assessment of the time required for the various activities can be made and a general estimate for each function is given in italics.*

The following are **indicative** assessments designed to help those who have to draw up job descriptions, assess work plans and determine manpower needs. It is not intended that a consultant microbiologist job description should include all of the components; indeed, that would constitute an inordinate overload.

1. It must be recognised that a consultant microbiologist cannot exist in total isolation. Cover is required 24h/day, 365-6 days/year. Formal rotas for single-handed consultants are rare and they have to depend on the goodwill of local colleagues. Informal arrangements for cover from nearby larger centres are common. Trusts are generally unwilling to pay for locum cover. The College recommends that every consultant should be part of a team providing some form of rota for emergency cover and that a consultant microbiologist should not have a rota of on-call duties that exceeds 1 in 2.

2. Specimen numbers/Welcan units. Although not a direct measure of consultant time, as the laboratory requires supervision and each request is, technically, a request for consultation, this does reflect an aspect of consultant input. The number of positive results requiring interpretation and advice is a roughly measurable proportion of the total. Number of staff to be supervised and number of specialist sections, e.g. virology, mycology, environmental microbiology; as levels of workload and specialisation increase, a specialist consultant or grade C clinical scientist is needed.

   At least 1h per day receiving laboratory reports for every 30,000 specimens.

3. Number of staff to be supervised and number of specialist sections, e.g. virology, mycology, environmental microbiology; as levels of workload and specialisation increase, a specialist consultant or grade C clinical scientist is needed.

   Discussion and overseeing MLSO and junior medical staff doubles the factor in (2), especially when one or more specialist sections are involved.

4. The obligation to provide teaching for junior medical staff (especially in more structured programmes), MLSOs, nurses, kitchen and other hospital staff.

   Each commitment to a seminar is 1h + preparation time; project supervision demands at least 1-2h per week

5. Number of beds served - particularly acute beds; with a weighting for the many types of specialist unit that have a higher than average rate of infection and higher demands on the microbiologist. This work includes interpretation of laboratory results and the provision of advice on patient management (particularly antibiotic treatment and the need for isolation/barrier nursing) and further investigations that may be needed.

   (a) acute general medicine (including care of the elderly)
   acute general surgery
   paediatrics
   obstetrics and gynaecology
   for a 500-bed DGH, 1-2h per day, depending on junior doctor support

   (b) Specialist Units
   - ITU
   - HDU

- SCBU
- cardiac surgery
- transplant surgery
- dialysis
- oncology unit
- haematology/oncology
- neurosurgery
- GUM/AIDS
- infectious diseases
- respiratory medicine, especially cystic fibrosis

Each specialist unit will require at least 1h of visiting time per week and often much more.

6. Infection control responsibilities including provision of advice to a range of professional colleagues
   - number of beds } as above (5)
   - special unites } as above (5)
   - need for monitoring
   - provision and revision of policies
   - attending (chairing) meetings
   - investigating outbreaks
   - support for occupational health departments
   - commissioning of wards/theatres etc
   - kitchen inspection
   - educational activities

In most hospitals a minimum of 3 sessions of consultant time (10½h) is devoted to infection control. (Depending on case mix).

7. Number of outlying hospitals served that need to be visited

1-2h travelling time per visit (at least weekly, possibly more often). And then clinical activity (see 4)

8. The relationship with and service provided to primary care in terms of:
   - laboratory workload
   - advice to GPs
   - development of policies
   - shared care protocols

1-2h per 50,000 population per week

9. Population served. This is relevant for public health microbiology, including food/water sampling and contribution to national surveillance and outbreak investigation.

Public health microbiology requires 1 session (3½h) per 250,000 population/week.

10. Relation with CCDCs and Environmental Health Departments (linked to 9)
    - number served
    - amount of routine monitoring
    - development of policies

1 session (3½h) per 250,000 population/week

11. Involvement with imported infection from abroad (if the laboratory is near a major port/airport)

12. Then add on:

• management responsibilities	1-2 sessions (3½-7h)
• audit	1h/week
• education/CPD time	1-2h/week
• R&D activities	? variable but necessary for all

- teaching responsibilities in medical school departments
- national responsibilities (PHLS committee; DoH; HSE; RCPath etc)

These generally require 3 sessions per week (10½h)

Most microbiologists find they are performing several of these functions at any one time so that the time allocations overlap, while the stress factor increases proportionally. Nevertheless, the times do indicate levels of work that are impossible to achieve when specified duties would occupy more than the hours available.

Application of the above measurements of workload are likely to result in the following general consultant staffing requirements:

Small DGH	45,000 -60,000 specimens/year one F/T consultant plus formal rota for on-call, and cover for absences
Medium DGH	60,000-100,000 specimens/year one F/T consultant plus either another consultant, associate specialist or staff grade doctor (full or part-time)
Large DGH or teaching hospital	>100,000 specimens/year two or more full-time consultants

Virology

The duties of consultant virologists and grade C scientists working in that capacity are varied and it is difficult to quantify them. The demands of a post will depend on:

- the presence locally of special clinical units where, for instance, immunocompromised patients are treated (e.g. oncology, transplant, paediatric/ neonatal, and haemodialysis units)
- the other resources available in the region for virological investigations
- administrative responsibilities where a post holder is head of department.

Most consultant virologists (and grade C clinical scientists of equivalent status) work within a teaching hospital setting for a large Trust/Hospital or for the Public Heath Laboratory Service, and they invariably provide reference facilities for other virologists, microbiologists with special responsibilities for virology, and other consultant microbiologists. Consultant virologists are often single handed, though they may have senior scientific support. They work in conjunction with consultant microbiologists on all aspects of infection and infectious disease, and provide a regional virology service for hospitals and for primary care. In addition to the investigation of virus diseases, consultant virologists investigate and advise on atypical bacterial infections eg coxiella, chlamydia and mycoplasma infections. They also advise primary healthcare and occupational health services extensively on preventive measures, and liaise frequently with CCDCs and regional epidemiologists on outbreaks of infectious disease.

The scope of clinical virology is constantly expanding, but currently there are only 40 qualified consultant virologists in England and Wales (and 13 in Scotland and Northern Ireland), and their skills are more and more in demand. Duties extend beyond the laboratory to ward and outpatient consultations in infectious disease and infection control in the hospital and community. Teaching, training and research are routinely expected because of medical school affiliations, and clinical audit and medical administration are as much a duty as they are for medical microbiologists. Consultant virologists provide advice and training for staff working in their own discipline, for microbiologists, consultants in infectious diseases, epidemiologists and infection control specialists, and for medical and nursing staff/students of most disciplines.

The Table shows the components of the workload of a consultant virologist. Although allocation of a time factor to many of these is difficult, an estimate has been made.

Typical clinical virologist's workload

Clinical diagnosis and advice	%
pre-test	5
report validation	10
advice	5
Ward visits and consultation	10
Laboratory bench work	2
Infection control	5
Occupational health advice	4
Laboratory administration	10
Technical supervision/QC/QA	5
Teaching and training of juniors	7
Primary care/community care responsibilities	7
Audit	2
R&D	10
Hospital/PHLS meetings	8
Giving talks/attending symposia	5
Writing/editing	5

Some indicative assessments follow, designed to help those who have to draw up job descriptions, evaluate work plans and determine manpower needs. It is not intended that a consultant virologist job description should include all of these components; indeed that would be an inordinate load. But the comments amplify the content of the typical workload shown in the Table.

COVER

A consultant virologist is usually single handed. Cover may be provided through the goodwill of virologist colleagues elsewhere and occasionally by consultant microbiologists or by senior medical trainees or scientists with honorary contracts. However, some competing NHS Trusts are reluctant to enter into such arrangements. Cover is required 24hr/day, 365 days/year. Informal arrangements for cover from nearby larger centres are at present common, but in the future these may need to be formalised to avoid medico-legal disputes.

SPECIMEN NUMBERS/WELCAN UNITS

Although specimen numbers/Welcan units cannot be used as a direct measure of the use of consultant time the numeric workload does reflect an aspect of consultant input, as the laboratory requires supervision for all tests undertaken and each request is, technically, a request for a consultation. The number of requests requiring pre-test scrutiny and the number of positive results requiring interpretation and advice is therefore a measurable proportion of the total workload. In general, virology

specimens require more detailed investigation than microbiology specimens, particularly transplant patients' specimens. Further examples include women who have been exposed to or have developed infections in pregnancy and patients who may have acquired or transmitted infection with the various hepatitis viruses. 'Molecular' tests are now routine and are changing work patterns, generating more urgent investigations. There is a tendency for Microbiology Departments in Trusts which do not have a specialist virology service to retain straightforward virological screening work but to refer the more onerous diagnostic tests to specialised virology departments. The time required for consultant scrutiny partly depends on the proportion of diagnostic tests to screening tests.

Though most virus laboratories provide specialised tests of a more labour intensive type than are performed in microbiology laboratories, the consultant workload assessment can be adjusted downwards to some degree if automation is being used for bulk screening and where senior technical supervision can address quality issues.

The time of a consultant spent on the scrutiny of specimens and results is put at least 2-4 hours per day for every 30,000 requests received per year (assuming there is not a disproportionately large number of screening specimens). If when virological workloads exceed 100,000 per year this usually reflects much screening work, and this large workload might be coped with if there is a single extra full time consultant or equivalent.

STAFF SUPERVISION

The number of staff to be supervised in Virology will vary with workload (20,000 - 175,000 requests per year) ie 10-40 staff of various grades including MLSO, scientific and medical trainees. There may be R&D staff who need special supervision and support. As levels of workload and specialisation increase, a specialist Grade C clinical scientist may be needed.

TEACHING

There will shortly be an obligation to provide structured training programmes for junior staff (in line with Calman). Supervision will demand at least 1-2 hours per week. Furthermore, some of the duties hitherto borne by trainees must now be carried out by consultants.

CLINICAL RESPONSIBILITIES

This depends on number of beds served - particularly acute beds - with a weighting for the many types of specialist unit that have a higher than average rate of infection and higher demands on the clinical virologist.

The work includes interpretation of laboratory results and the provision of advice on patient management (including infection control) and further investigations that may be needed. Genito-urinary medicine, general practice, adult respiratory, paediatrics and obstetrics patients provide the most test demands. They require 1 hour - 2 hours per day, depending on junior support.

In larger centres specialist units: requiring the specialist attention of the consultant virologist in larger centres may include:

- ITU
- SCBU
- Dialysis
- Transplant units (bone marrow, renal, liver, heart)
- Oncology
- Neurology
- GUM/AIDS
- Infectious diseases

Each specialist unit will require at least 1 hour of visiting time per week and occasionally much more.

INFECTION CONTROL RESPONSIBILITIES

- drafting, agreeing and revising policies
- attending meetings
- investigating outbreaks (e.g. viral diarrhoea, varicella, parvovirus B19)
- investigation of varicella/zoster contacts
- investigation of needle-stick injuries (for HIV, Hepatitis B, hepatitis C)
- educational activities. These include the teaching of junior medical staff, nurses, midwives and ancillary workers in hospitals and primary care settings.

In most hospitals 3½ to 7 hours of consultant time per week is devoted to infection control.

OCCUPATIONAL HEALTH SUPPORT

The consultant virologist plays an important role in occupational health support. This is largely due to the Hepatitis B vaccine programme and the follow up of needle-stick injuries and varicella/zoster contacts.

2 hours per week in a teaching hospital.

PRIMARY CARE SUPPORT

The relationship with and service provided to primary care in terms of:

- laboratory workload
- advice to GPs
- development of policies

amounts to 1 - 2 hours per 50,000 population per week.

As there are fewer virologists than microbiologists per population served, this activity occupies a larger share of consultant time than it does for general microbiologists.

COMMUNITY RESPONSIBILITIES AND RELATIONSHIP WITH CCDCS

The size and character of the population served is also relevant to public health microbiology. There is a large contribution to national surveillance and outbreak investigation. Most virology laboratories are in inner city settings where problems related to intravenous drug use frequently arise, and sexually transmitted infections are common.

PUBLIC HEALTH VIROLOGY typically requires 7 hours per 250,000 population/week, including a 2 hour visit per month for outbreak investigation.

To these must be added:

- management responsibilities 1-2 sessions
- audit 1 hour/week
- education/CPD time 1 2 hour/week
- R & D activities variable
- National responsibilities (PHLS Committees; DoH; HSE; RCPath, etc.

These generally require 3 sessions per week.

EXCESSIVE WORKLOAD

The details of a consultant workload vary widely with local circumstances. Most virologists are performing several functions at any one time and duties overlap, with the stress factors increased proportionally. Overtime working is the norm.

It is recommended that job descriptions are monitored to ensure that workloads are not excessive. In such cases the need to create more consultant sessions has to be considered. Because of scientific and technical advances, workloads in virology are increasing and they should therefore be regularly reviewed.

Histopathology

INTRODUCTION

Since the Royal College of Pathologists last published guidelines on staffing and workload in 1992, consultants' time has become even more pressured. Trusts frequently appoint new consultants in other specialties without taking into account the knock-on effects on the workload of pathology departments, and ever more specialised and sophisticated laboratory investigations are needed to support advances in clinical work. Although there have been a significant number of new consultant histopathology posts created during the last few years, NHS managers have their own budgetary pressures and often also a very poor understanding of the nature of the work and staffing needs of different types of pathology departments. As a result many colleagues find themselves working under extreme pressures with the obvious dangers of potential diagnostic errors possibly leading to litigation or even investigation into the quality of their professional practice. When there are disagreements between consultants and managers as to appropriate staffing levels the College may receive requests for guidance but some cases of poor staffing levels are not addressed until the standard of service of the department and/or the standard of professional practice of its consultants are called into question because a high error rate has been discovered.

Doctors in training grades are required to have protected time for studying and formal teaching sessions as well as their supervised apprenticeship. As a result, consultants with trainees in their departments have to find more time for formal teaching as well as having to handle the extra work generated by the trainees absence during protected study time.

In academic departments, pressures from the funding bodies for higher education to increase research grants and publications, and from the GMC to devise and implement new teaching methods for the undergraduate curriculum, together with pressures from Trusts to deal with ever increasing numbers and complexity of specimens without compromising turnaround times, can lead to disagreements over the way these responsibilities are divided up and debates over whether senior lecturers, readers and professors should each be counted as one wte consultant in staffing calculations or as carrying only 6 sessions of NHS work. Consideration also has to be given to the possibility that those with very heavy academic responsibilities may spend insufficient time on diagnostic work to maintain their skills and that there should be individual minimum as well as maximum workload guidelines for safe practice.

The ultimate test of whether staffing levels are adequate is whether consultants have sufficient time to deliver a high quality service including the monitoring of its reliability by participation in audit and quality assurance schemes, and to participate in enough educational activities to maintain their own professional development.

Previous College guidelines on staffing/workload ratios have been taken into account in CPA assessments for accreditation, although the CPA policy has been to look for evidence that the quality and safety of the service is being jeopardised before using too high a workload as a criterion for refusing accreditation. This approach does not take sufficient account of the stress that high workloads may cause and requires evidence of near-misses or actual errors whereas the purpose of these guidelines is to try and prevent such occurrences and reduce the incidence of stress-related illnesses and consequent early retirements.

The following guidance is based on the experience of histopathology consultants in a variety of types of department and the figures should be regarded as a maximum for workloads of average complexity, above which safe working practices may be endangered.

CALCULATION OF WORKLOAD FOR HISTOPATHOLOGY AND CYTOPATHOLOGY

Appropriate consultant staffing levels could be worked out from the 1992 guidelines by calculating the proportion of the recommended numbers handled in each of the main areas (surgical specimens, autopsies and cytology specimens) but some confusion has arisen because the numbers for surgicals and autopsies were calculated assuming that a consultant would be involved in both these activities, whereas the numbers for cytology assumed that the consultant was not also doing surgicals and autopsies as well. Most DGH consultants will be involved in all three activities to a greater or lesser extent, so the proportionate amount of consultant time needed for the cytology, surgicals and autopsies should be added together to calculate the total number of staff needed. Each of these areas of work has been related to consultant whole time equivalents (wte) and similar calculations for academic departments in university hospitals can build in factors for greater numbers of complex cases and the time

needed for academic activities.

An added factor to be considered is the number of trainee pathologists in a department. Trainees clearly make a significant contribution to the work, but under the Calman type of training this benefit is balanced by the consultant time taken up in direct supervision and checking of their work, interviewing and appraising their progress, and organising and teaching on their courses. For these reasons, trainees have been excluded from the staffing calculations.

It is therefore recommended that the appropriate consultant staffing levels for histopathology departments be calculated by adding together the nominal wte needed to cover each of the areas of service (histopathology, cytopathology and autopsies).

GUIDANCE ON LEVELS OF WORKLOAD IN 'SURGICAL' HISTOPATHOLOGY

The figure of 4000 histopathology specimens per DGH wte consultant per annum has been generally accepted as practicable. However, in view of all the extra duties which have now been imposed on consultants together with the fact that advances in technology mean that many specimens now require considerably more investigation before they can be reported, it might be considered that this figure should be reduced. On the other hand, it is clear from the job descriptions for consultant posts received in the College, from CPA inspections and from the Keele University Benchmarking survey, that many departments are dealing with considerably more than this number.

It should be noted that a 'specimen' in this instance is considered to refer to a 'case' or 'request' rather than to each individual specimen pot. It is recognised that the actual number of tissue fragments and the number of blocks will vary considerably from case to case but the guideline given is based on an average degree of case complexity for a typical department. If a department has a much more demanding case-mix (e.g. with large numbers of renal biopsies or lymphomas) then a lower number of cases per consultant is appropriate for safe practice, whereas if there are large numbers of relatively simple specimens (e.g. melanocytic naevi and seborrhoeic keratoses) then a somewhat higher workload may be tolerable and safe. The introduction of weighting factors for more complicated specimens would be one way of increasing the accuracy of workload assessment but this would quickly become very complicated. Welcan units are also a way of measuring workload but they have so far been developed only for technical work and do not take account of the pathologist's time. Another possibly simpler way of adjusting workload measurements would be to count the total number of microscope slides used since this is roughly proportional to the degree of complexity of each case (numbers of blocks, special stains, immunostains etc.). More data needs to be obtained on this method of workload measurement for the future.

Histopathologists working in cancer units will be expected to work to exacting standards of specimen description, measurement, sampling and reporting. In addition, they will be expected to prepare for and participate in regular multidisciplinary team meetings and specifically to audit their diagnostic activities. This will typically amount to one session per week per cancer.

The figure of 2000 surgical cases per consultant wte per annum for academic departments is designed to take account of the generally increased complexity of the specimens from specialist units and the fact that there are heavy commitments in relation to research and to undergraduate teaching required of those working in university departments. It is apparent that different departments have different ways of dividing up the academic and service activities. The figure of 2000 cases is based on a theoretical situation in which all academic staff with honorary consultant contracts and all NHS consultant staff in a department take an equal share of both the service and academic activities. In departments where the academic staff take a greater share of teaching and/or research activities then the NHS staff will need to take a proportionately higher share of the service work. In larger departments where considerable subspecialisation has occurred, consultants should not be required to cover for colleagues' specialist work during their leave of absence unless they are regularly working in that subspecialty. As far as minimum levels for continued safe practice are concerned, this again depends on the degree of specialisation but it is considered that anyone who is involved in general reporting who sees less than 1000 cases a year may run into problems.

In devising rotas it is also important to ensure that the daily workload does not exceed safe thresholds even if the annual workload lies within the recommended levels.

The figures of 4000 surgicals specimens per wte DGH pathologist and 2000 per academic department pathologist are considered still to be realistic. The DGH figure may need to be reduced in units with a higher than average number of complex cases and the latter figure may need modification in larger departments where considerable subspecialisation has been

implemented. Additional sessions may also be needed for the activities of cancer centres and units.

GUIDANCE ON LEVELS OF WORKLOAD IN CYTOPATHOLOGY

In respect of cytopathology practice, a distinction has to be made between diagnostic and screening work. Pathologists should report all diagnostic gynaecological and non-gynaecological specimens (including breast FNA specimens since this is not a primary screening procedure). Cervical screening specimens in which abnormal or equivocal cells are present must also be examined by a pathologist and this will represent about 10 -15% of the cervical screening cases. Taking into account the time required for laboratory management as well as the previously mentioned audit, teaching, postgraduate training, CPD and research, an appropriate cytology workload should be calculated on the basis of a total of 6000 cases (3000 diagnostic specimens plus 12% of 25 000 cervical smears) per wte consultant per annum. Additional consultant sessions will be needed if cytopathologists are running FNA clinics, taking their own aspirates, covering more than one hospital or are heavily involved in teaching and/or research. If the consultant takes on the role of co-ordinator of the screening programme extra sessions will be required, the number depending upon the size of the task in each Trust. There should be a named consultant in charge of the cervical screening service and if one or more consultants are working solely in cytology there must be adequately skilled cover for them when they are on leave.

The College recommends that a total figure of 6000 cases (12% of 25 000 cervical smears plus 3000 diagnostic cases) be taken as a suitable annual workload for a wte DGH cytopathologist and that the calculation of varying proportions of the type of cases is made by adding 12% of the cervical smear numbers to the total diagnostic case numbers. If there is a requirement for FNA clinics, teaching and research and/or screening programme co-ordination, appropriate extra consultant sessions will be required.

GUIDANCE ON NUMBER OF AUTOPSIES

In the 1992 guidelines the figure of a maximum of 300 autopsies per wte consultant was calculated to be in addition to the surgical work. This has led to some confusion because the cytology workload was calculated as though it was being done by separate consultants. A figure of 600 autopsies per annum has been suggested as being the number which could be performed to a satisfactory standard by a consultant who was doing nothing else, and which can therefore be used as a nominal figure to be added to the surgical and cytology numbers. The main problem with calculating the autopsy workload is that medico-legal autopsies are not a part of the NHS work although it can be argued that where such autopsies are performed on hospital cases, a service is also being provided to the hospital clinicians and that these are also useful for undergraduate teaching and for postgraduate training. The exact contractual arrangements for doing medico-legal autopsies vary considerably between departments. It is however, a College responsibility to ensure maintenance of good standards of practice and departments should therefore ensure that they have enough staff to carry out all their commitments.

It is recommended that the figure of 600 autopsies per annum be taken as the nominal workload for a DGH wte consultant in the workload calculations and a figure of 300 per consultant in academic departments.

STAFFING AND WORKLOAD CALCULATIONS

Based on the above guidelines, the appropriate consultant staffing levels can be calculated by adding together the recommended numbers for each of the three aspects of service work.

EXAMPLES

1) In a DGH which has 13 500 histopathology cases, 700 autopsies, 27 000 cervical screening cases and 3750 diagnostic cytology specimens (including a commitment to perform FNAs in a breast clinic) the appropriate consultant staffing level is 3.4 + 1.2 + 1.2 = 5.8 rounded up because of the aspiration clinic to 6 wte consultants.

2) In a teaching hospital which has 16 000 histopathology cases, 250 autopsies, 20 000 cervical screening cases and 5500 diagnostic cytology specimens, the appropriate number of consultant grade staff is 8 + 0.8 + 1.3 = 10.1 consultants. The cytopathology sessions would also need to be increased if there is involvement in FNA clinics, undergraduate teaching, research and/or screening programme co-ordinator, and if the hospital is designated as a Cancer Unit there would need to be sessions to cover this extra work, giving a figure of 10-11 wte consultants (including professors, readers and senior lecturers).

LOCUMS

It is not considered safe for any histopathology service to be operated by a single handed consultant. Therefore, in departments where there are only two established consultants, locums should always be recruited to cover any periods of leave. Since cover for colleagues' leave should not be allowed to increase

an individual's workload above the recommended guidelines, locums may also be required in larger departments. High quality locums may be difficult to find and since it is also more difficult for locums who are moving around from department to department, to participate in regular audit, EQA and CPD activities, it is further recommended that all departments should move towards consultant staffing levels sufficient to provide proper internal cover for annual and study leave, the total number of weeks of which can also be added into the staffing calculations.

IMPLEMENTATION AND MONITORING

Implementation of these recommendations is the responsibility of local management, acting on information and advice from the profession. The College's responsibility lies in the approval of job descriptions for consultant posts, in granting approval for regional training programmes and through its representation on CPA(UK)Ltd, in laboratory accreditation. Further work is required for the quantitation of workload complexity.

Immunology

INTRODUCTION

The application of immunology to human disease arises from scientific discoveries in biomedical immunology. This scientific endeavour is (and has been for many decades) a major international effort conducted by most developed countries. It has led to an ever more complex but increasingly rational and coherent picture of how the immune system works and is the foundation on which all clinical understanding in immunology is based. It is not possible to interpret with real insight the pathophysiology and genetics of human immunological diseases without a thorough grounding and regular updating of this fundamental immunology.

A Clinical Immunology service provides clinicians within the NHS with a consultative service relevant to the diagnosis and management of disorders of the immune system and the provision of an efficient laboratory service to support this function. The compass of the laboratory service includes the assessment of normal and abnormal components of the immune system. The principal areas of disease diagnosis catered for are immunodeficiency, allergy, autoimmune diseases (including rheumatic diseases) and lymphoid malignancies (including myelomatosis).

A single comprehensive service providing clinical and laboratory facilities has become essential as immunology has become more complicated. As recent research has revealed the complexity of the immune system, both physiologically and immuno-pathologically, the need to combine the immunochemical, autoimmune and immunodeficiency investigations has become more apparent. There is considerable overlap of patients with immunochemical and autoimmune abnormalities and a greater awareness of autoimmune manifestations in patients with immunodeficiency, as well as the previously appreciated overlap between malignant disease of the immune system and immunodeficiency.

Cumulative reporting and interpretation of immunology tests is needed to give clinicians optimum and appropriate information. In the last 15 years, the development of the clinical role of immunologists has greatly increased the impact of the clinical and laboratory aspects of the speciality on healthcare. But is has also escalated the workload of clinical immunologists. Advances in immunotherapy have led to immunoglobulin infusion clinics and home immunoglobulin treatment programmes for immune modulation as well as replacement therapy. Thus, clinical immunologists have become involved in disease diagnosis and management as well as interpretation of laboratory assays. Specialist nurses (who form an immunology group within the Royal College of Nursing) have been specifically trained over the last ten years and played an important role in these developments. Interactions with European and world-wide groups for immunodeficiency and autoimmune disease have been important to expand the knowledge of the basic science, natural history and management of immunological diseases. Increasing awareness of the spectrum and consequences of immunologically mediated diseases, resulting from the development of patient support groups, has led to more patients to treat. This has also led to a greater teaching commitment both to patients and their medical/ paramedical carers.

PATTERN OF SERVICE DELIVERY IN THE UK

There are currently 25 centres in England and Wales (7 in London and 18 outside London) and 5 in Scotland/ Northern Ireland, which provide clinical immunology services to the NHS. Twenty six of these 29 centres are based in teaching hospitals. In some centres there are 2 or more consultant immunologists, but 9 are single-handed. Outside London and a few other centres, there is a common model which involves consultant clinical immunologists appointed within the last 20 years who practice both clinical and laboratory immunology. A modern clinical immunology service provides a clinical referral service (mainly out-patients), as well as a specialist laboratory with clinical interpretation of results. This is the model in 20 of 22 UK centres outside London but in only 2 of 7 within London. Provision of such services in London is the subject of current debate.

Clinical immunology services are important to so many specialities that their provision in major teaching hospitals is essential. Specialties such as rheumatology, nephrology, neurology, respiratory medicine, dermatology and gastroenterology, as well as the more traditionally linked specialties of microbiology, infectious diseases and paediatrics are provided with immunological input in the most efficient and effective way. Opportunities for clinical researchers in these specialties, clinical immunologists and basic immunologists to investigate immunological aspects of disease are facilitated by this arrangement of a combined University and NHS setting.

CLINICAL SERVICE

A typical clinical service has out-patient sessions where adults and children with immunodeficiency, unusual autoimmune diseases or multiple or severe allergies are seen for diagnosis, treatment and management. This typically comprises of one joint clinic with a paediatrician and two adult out-patient clinics per week. A day case facility will involve specialist nurses for immunoglobulin therapy (immunodeficiency or immunomodulatory treatment for autoimmune disease), hyposensitisation therapy and challenge testing in the context of complex allergies.

LABORATORY SERVICE

A modern laboratory service provides a wide range of assays:

1. Detection of autoantibodies ranges from anti-nuclear antibodies to acetylcholine receptor or voltage gated calcium or potassium channel antibodies. Autoantibodies are measured by a variety of different techniques which include radioimmunoassays, enzyme linked immunosorbent assays and immunofluorescence as well as some functional tests. These methods require considerable technical expertise as well as interpretative skill. Clinical experience in rheumatic diseases and organ specific autoimmune diseases is needed to advise clinicians on appropriate tests and their diagnostic and management implications.

2. Immunochemical investigations usually fall within the remit of immunology, given the importance of the functions of immunoglobulins, the wide diversity of immunoglobulin production and the complexity of the complement pathways. The provision of advice on the appropriate management of patients with abnormal levels of immunoglobulins, and the detection and interpretation of hyperviscosity or cryoglobulins requires the level of clinical and laboratory experience found most readily within clinical immunology departments. The variety of complement assays available for quantitation and functional testing are relevant to immune complex diseases and for investigating patients with severe infections (e.g. Neisserial meningitis), severe autoimmune diseases (e.g. SLE) or for differential diagnoses (e.g. hereditary or acquired angioedema).

3. Cellular assays have become widely available with the advent of flow cytometers. Quantitation of lymphocyte subpopulations are essential, not only for HIV disease monitoring , but also for the diagnosis of severe combined immune deficiency, primary antibody deficiency and lymphoid malignancies. Urgent functional assays should be available in teaching centres and large paediatric departments. Likewise, tests of neutrophil function should be available for screening patients, particularly as congenital disorders such as chronic granulomatous disease are now known to present in young adulthood.

4. Histocompatibility and immunogenetic analysis is also a function of some immunology departments. Such assays are vital in supporting centres performing solid organ or bone marrow transplantation and in identifying associations between disease and HLA types.

TRAINING

Laboratory training for medical and scientific trainees as well as biomedical scientists (BMSs) encompasses the whole range of manual and machine methodologies. Training for state registration, from the Council for Professions Supplementary to Medicine, is essential for BMSs and requires regular bench and theoretical training, the laboratory must be recognised by the CPSM following inspection. Scientists' training is overseen by the British Society for Immunology Clinical Scientist Training Board and includes an obligatory MSc in Immunology. Medical graduates and scientists taking the membership examination of the Royal College of Pathologists require experience of a whole range of clinical and laboratory services as well as training in management, NHS procedures and research. Experience of research is essential and most immunology centres are in teaching hospitals where this is easily available, though additional time is needed to achieve a research degree.

Specialty trained immunologists are required to pass on this knowledge base in their role as undergraduate and postgraduate teachers. The rapid pace of advances in biomedical immunology, especially genetics, has also made it necessary for clinical immunologists to exchange phenotypic and genotypic information about patients on an international scale through clinical databases. Research and development is a vital part of an immunology service, as well as for training. New techniques and their interpretation in a clinical setting are now part of an NHS as well as a university department. When considering the development of laboratory services, increase in sensitivity in any given assay must be assessed against clinical relevance. New techniques providing additional information need the context of normal ranges for interpretation and all new assays should be assessed in a clinical setting for disease specificity. Research is part of the training programme for clinical immunologists and the importance of immunological research and the use of immunological techniques should not be underestimated. Basic immunology has played a leading

role in the development of molecular techniques and in genetic research. The study of immunodeficiency diseases is fundamental to the understanding of basic immunology.

THE PATTERN OF WORKLOAD

Immunology as practised in the United Kingdom most closely approximates to the pattern of work in haematology. Immunologists in the NHS, as well as those primarily based in academic departments, divide their time between laboratory work, clinical and other duties, the proportion varying enormously.

Many immunologists work in single consultant-led departments. Most of these departments deal with patients with immunodeficiency on long term therapy (mainly immunoglobulin replacement therapy, including home therapy). While the current workload related to any (on call) duties is typically small and variable, this workload may increase as standards of care are better defined.

Because immunology has an impact on a wide range of clinical conditions and complex immunological therapies are increasingly utilised, the need for ad-hoc clinical advice arises unexpectedly, often at short notice and can take a substantial amount of time to deal with. The second source of ad-hoc work arises from telephone enquiries about the availability, appropriateness and interpretation of immunological investigations. Those working in regional or subregional centres spend a substantial amount of time dealing with such enquiries which are unpredictable and time consuming. Furthermore, there are no mechanisms to derive income from this type of activity, which therefore may not contribute to trust income, though utilising a considerable amount of 'consultant-time'. This aspect needs to be directly recognised during negotiation of immunology contracts.

In an attempt to gauge the current workload of clinical immunologists, a questionnaire was sent to a sample of consultants in England, Scotland and Wales. It was not designed to be comprehensive but to be indicative of the relative breakdown of workload into four main categories: clinical work, laboratory and scientific duties, education and training, and management and administrative work.

Broad conclusions can be drawn as follows:

- Consultant immunologists, like consultants in other specialties, are working in excess of their 11 session contracts.
- Most immunologists carry out direct patient contact work as well as laboratory duties. Outpatient clinical work is a major responsibility but in-patient consultations and telephone consultations are of increasing significance. For consultants working at two or more sites, telephone advice can equate to two or more sessions per week.
- A substantial proportion of laboratory duties is spent on clinical liaison, interpretation and authorisation of reports. Liaison with consultants in district general hospitals served by the regional centre is of increasing importance. Consultants continue to participate in variable amounts of hands-on-scientific work, particularly related to research and development, or special areas of expertise.
- Teaching of medical undergraduate and postgraduates can make variable demands on Immunologists and this is further accentuated by the educational needs of biomedical scientists and nursing staff. The impact of specialist registrar training both in immunology and several medical disciplines on workload is proving to be significant. Being based mainly in teaching hospitals, most consultants have a steady research output.
- Management and administration of the immunology service consumes at least one to two sessions per week. Because of the supradistrict or regional nature of most services, immunologists spend a significant amount of time on regional and other professional committees representing the specialty.
- Working patterns differ between single-handed consultant-led services and those departments with two (or more) consultants. Larger departments allows some slanting towards clinical versus laboratory work or subspecialisation towards immunodeficiency, autoimmunity or allergy etc.
- Several immunologists work between two or more centres. This is a reflection of rationalisation of services between trusts and the realisation that some District General Hospitals performing immunological assays do not meet the criteria of accreditation bodies regarding appropriate professional direction. Such hub-and-spoke arrangements are increasingly common and contribute to the significant travelling time incurred by some consultants.

FUTURE DEVELOPMENTS

- The clinical work of immunologists is increasing, even dominating, and will increase further as immunologists become more interventionalist through the use of more clinically effective therapies.

- Clinical immunologists will foster better defined relationships with adjacent district general hospitals. This will become an increasing area of professional and managerial input. The downside is the significant travelling time required to support competent but remote centres.

- The provision of allergy services in the UK is underdeveloped in comparison with the rest of Europe. Close liaisons have developed with the Royal College of Physicians and other bodies through the Joint Committee on Immunology and Allergy to provide training programmes leading to a CCST in Immunology and a CCST in Allergy. A sensible development of this relationship would be the establishment of funded regional centres incorporating both clinical and laboratory aspects of immunology and allergy services.

- The College response to the document *The New NHS Commissioning Specialised Services* makes specific mention of the need to have Primary Immunodeficiency Centres recognised and designated as specialist service.

RECOMMENDATIONS

- The provision of hub and spoke arrangements has major implications for manpower. Professional supervision of several, relatively small laboratories is not efficient. The service would be more effective if laboratory immunology services were consolidated into a smaller number of larger laboratories in teaching centres or remote centres serving high populations. In contrast, the provision of clinical consultative advice on site is more easily provided and improves local clinicians' understanding of the benefits of immunological input.

- Most clinical immunologists are working significantly over their contracted sessions and in excess of the European directives on the maximum working week. However, in many areas of the UK, immunological services are underdeveloped and many conditions are under diagnosed or recognised only after significant diagnostic delay. Expansion of consultant immunologist posts is essential to meet the clinical need.

- Many consultant immunologists remain single-handed. Single-handed practice should be discouraged. Working with a colleague, especially in a field changing as rapidly as clinical immunology, helps to sustain a clinician's professional development and enables clinical governance.

- Details of a consultant's workload vary with local circumstances. Most immunologists are performing several roles at any one time. Scientific and technical advances in immunology mean that workload in immunology should be reviewed regularly.

An illustrative example of a consultant immunologist's present job plan is shown in the Table. This summarises the core roles of the consultant immunologist. It is essential that the current excessive quantity of work performed be replaced by quality work meeting safe working practices, so that patients can be assured of the highest standards of clinical immunology practice in the UK.

AN ILLUSTRATIVE JOB PLAN FOR A FULL-TIME CONSULTANT IMMUNOLOGIST

Activity	*Notional half-days*
Clinical work	
Outpatient clinics	3.0
Inpatient/day case/ad hoc	0.5
Telephone consultation	0.5
Laboratory scientific work	
Report interpretation/ authorisation	1.0
Analytical work	0.5
DGH liaison	1.0
R&D/special interest	0.6
IQC/EQA	0.2
Education and training	
Teaching - undergraduate/ postgraduate	0.6
CPD	0.4
Refereeing papers/grants	0.2
Audit	0.2
Management and administration	
Administration	1.5
Committee activities	0.5
Professional affairs	0.1
Other	
Travel	0.2
	11.0

Genetics

GENERAL CONSIDERATIONS

Clinical Laboratory Genetics consists of two closely interrelated disciplines: Cytogenetics (the study of chromosomal aberrations) and Molecular Genetics (the study of mutation at the molecular level). Related subspecialties such as biochemical genetics, Immunogenetics and the haemoglobinopathies may also be investigated in the same laboratories.

Important technical developments in genetic analysis over the past ten years have lead to an exponential increase in our knowledge of the genetic basis of disease. A genetic approach to the diagnosis of clinical problems is now being applied in an increasingly wide range of clinical disciplines from the definition of the causes of miscarriage and recurrent abortion in Obstetrics and the diagnosis and treatment monitoring of many leukaemias to the presymptomatic screening of individuals who may be genetically susceptible to disorders such as diabetes or high blood pressure.

Genetic services are unique, because, in the great majority of genetic tests the family, rather than the individual, is the focus of the investigation. Two major exceptions to this are in the diagnosis of numerical chromosome abnormalities (both in the prenatal and postnatal stages) and the genetic testing of malignant disease. Scientists and Clinicians involved in the delivery of a Clinical Genetics Service are trained in the principles of medical genetics and work as an integrated team to provide a quality patient focused process which respond rapidly to technological change and innovations.

There has been a significant move towards the establishment of regionally based Genetics Laboratories rather than the ad hoc development of smaller laboratories at a local level. This has maximised the opportunity to respond to change by developing expertise in a relatively small number of centres, minimising wasteful duplication of staff and equipment and ensuring an efficient, effective and reliable service. In general the established regional or sub-regional pattern of service delivery has continued to prevail after the NHS reorganisation.

STAFF QUALIFICATIONS AND TRAINING FOR GENETICS LABORATORIES

Recruitment to the service is mainly from science graduates or postgraduates with an academic background in the life sciences, with special emphasis on genetics. Further qualifications may be achieved following periods of appropriate training in recognised laboratories.

At a junior level, qualifications are provided by the professional bodies representing the two specialties, the Association of Clinical Cytogeneticists (ACC) and the Clinical Molecular Genetics Society (CMGS). The ACC offers clinical cytogeneticists a certificate of competence following completion of A grade training which may be supplemented by further study and project work for the award of an MSc. The ACC also awards a Diploma (DipACC) by formal examination to candidates who have successfully completed an initial B Grade training. For clinical molecular geneticists, the CMGS provides a certificate of competence for A Grade trainees successfully exiting their scheme.

Qualification at a more senior level is provided by the Membership examinations of the Royal College of Pathologists (MRCPath). The MRCPath Part 1 examination may be taken after a minimum of three years of approved training and the Part 2 after a minimum of a further two years training. For science graduates, the Part 2 examination can be taken not less than eight years after achieving their initial basic qualification.

The head of a Regional (or large sub-regional) cytogenetics or molecular genetics laboratory should be an appropriate qualified C Grade Scientists or a medically qualified clinical cytogeneticist or molecular geneticist. Other staff should include B Grade Scientists, A Grade trainees and laboratory support staff, both technical and clerical.

CYTOGENETICS

The techniques of cell culture and the methods used in cytogenetics are largely unrelated to the traditional disciplines of other hospital diagnostic services. It is therefore, recognised as an independent and separately administered specialty.

In order to fulfil the wide range of investigations which may be required, the laboratory must be capable of undertaking many different analytical procedures and of assessing the significance of constitutional and acquired chromosomal abnormalities. In addition, cytogeneticists should keep abreast of new technologies such as the application of gene probes in the characterisation of chromosomal defects, and be actively involved in development and research. The studies undertaken include the investigation of congenital malformations, mental retardation, infertility, retarded development, the cytogenetics of neoplasia,

the effect of chemical and environmental mutagens on chromosomes, etc. Prenatal diagnosis from amniotic fluid cells or chorionic villi involves fetal chromosome analysis.

The cytogeneticist has close professional links with clinical geneticists and molecular biologists and collaborates with clinicians and scientists from a wide variety of other disciplines. Senior cytogeneticists are involved in teaching, training, advisory activities and research.

Staffing levels appropriate to cytogenetic laboratories are dependent on the workload mix of individual laboratories. These should take into account the variety of laboratory procedures provided, and make use of time-based workload units (e.g. Welcan) to assess workloads. Factors such as changing referral patterns, increased management duties of senior staff, time required for staff training, and the expansion of employment of technical grades must also be considered.

MOLECULAR GENETICS

Although many disciplines now utilise molecular techniques, expertise in clinical molecular genetics is usually found closely associated with departments of clinical genetics. Because molecular diagnosis requires accurate clinical diagnosis, an informative family structure and calculations of risk that may incorporate factors other than those provided by the laboratory, specialist diagnostic service laboratories have been established in conjunction with regional clinical genetics services.

Such laboratories carry out a wide range of investigations for molecular characterisation of gene mutations, the segregation of Mendelian disorders, studies of gene expression and gene mapping. The techniques used for prenatal and postnatal diagnosis of genetic disorders include Southern blot analysis, polymerase chain reaction (PCR) and DNA sequencing, with non-radioactive analysis and automation likely to play an increasing role in the future. Scientific and technical progress in all these areas is extremely rapid and the clinical molecular geneticist has to keep abreast of new research findings and new molecular biological techniques. Molecular geneticists have close professional links with clinicians and scientists from a wide variety of other disciplines.

The very rapid pace of technical and scientific advance in molecular genetics means that an increasing number of genetic disorders are becoming amenable to molecular investigation and thus the workload of a regional molecular genetics laboratory is increasing. It also means that training and the development of new techniques are an important part of the workload of laboratories.

The staffing level required for a regional molecular genetics laboratory will depend on the workload mix of individual laboratories. Workloads are beginning to be influenced significantly by population screening and low prior risk screening programmes for cystic fibrosis and the fragile X syndrome. Further expansion of services will need to take into account the balance of workloads provided by relatively routine mass screening as opposed to detailed and specialised genetic mapping and mutation characterisation studies. The majority of laboratory staff would be trained molecular geneticists, but the skill mix of staff will need to reflect workload balances, and the availability of automated equipment. Contact pressures will dictate an economic balance of staff of the appropriate grade and capital equipment, but should not be allowed to prejudice the current high quality of service provided or the constant requirement for the development of new services and the introduction of new techniques.

Neuropathology

INTRODUCTION

Neuropathology is an essential and specialised branch of pathology dealing with the diagnosis of diseases of the nervous system. The diagnostic service is provided primarily to, and often closely integrated with, the clinical activities of neurologists and neurosurgeons, but a wide variety of other specialists - including psychiatrists, paediatricians, ophthalmologists, histopathologists, forensic pathologists and paediatric pathologists - benefit from the unique expertise of their local neuropathologist(s). Whilst this document relates principally to diagnostic work, neuropathologists also have a very important teaching and research function in relation to nervous system disease.

To ensure that staffing levels in all centres throughout the UK are adequate to meet the local service demands and maintain national expertise in the speciality, the Department of Health and Royal College of Pathologists require some method of relating consultant staffing in neuropathology to workload.

Historically neuropathology has related consultant staffing in a given centre to the catchment population served by the neurologists and neurosurgeons. Whilst this has some validity as far as numbers of biopsy specimens is concerned - numbers of muscle and nerve biopsies are roughly proportional to the number of neurologists whilst the same is true for neurosurgical biopsies - there is considerable variation in the numbers of neurologists and neurosurgeons throughout the UK with an average of one neurologist per 250,000 population and one neurosurgeon serving a population of 250-400,000. Furthermore, relating neuropathology consultant staffing to populations served fails to take account of local variations in material received from sources other than the neurologists and neurosurgeons. Autopsy work is not necessarily proportional to the population served by the neurologists and neurosurgeons with some neuropathology departments having heavy referral loads from histopathologists and forensic pathologists whilst others perform many psychiatric autopsies. Similarly, some departments receive significant numbers of muscle biopsies from rheumatologists and paediatricians and others provide a service to ophthalmologists. CSF cytology is another extremely variable area with some neuropathology departments doing none, others doing cytology for only the neurologists and neurosurgeons, and still others performing all CSF cytology for a given Trust.

Workload assessment papers for specialties such as chemical pathology and haematology, where much of the analytical phase is automated, are inappropriate as models for neuropathology, as are papers for specialties such as medical microbiology, which handle large numbers of specimens many of which require little consultant analytical input. Neuropathology, like histopathology, is a specialty in which each specimen requires a medical opinion for diagnosis. However, unlike histopathology, a high percentage of biopsies reported by neuropathologists require intra-operative diagnostic procedures (smears and frozen sections) and many require detailed clinical consultation and immunocytochemistry prior to reporting. Many neuropathological autopsies also present unique difficulties e.g. infection risk (CJD and AIDS) and technical complexity (removal of spine, examination of vertebral arteries etc.). In addition, some neuropathologists perform their own muscle and nerve biopsies. The complex and labour-intensive nature of many neuropathological investigations therefore means that workload assessments based upon numbers of 'requests' or 'specimens' are meaningless. Whilst WELCAN units are a useful way of quantifying technical input into the analysis of neuropathological specimens, they are not a useful way of measuring consultant workload as there is no clear relationship between technical and medical activity.

This section therefore proposes a system of workload measurement based upon units of time equivalent to one consultant hour. It should be noted that this system applies *only* to diagnostic work. In producing the following system of workload assessment for neuropathology, a number of assumptions have been made:

1. Neuropathological trainees are supernumerary as far as diagnostic work is concerned with consultants being primarily or ultimately responsible for the issuing of diagnostic reports.
2. The concept of 'sessions' remains valid for neuropathology because of the flexible nature of working patterns in the speciality. One session in this paper means a fixed flexible session of 3.5 hours.
3. One WTE consultant equates to a maximum of seven sessions of diagnostic work per week with the remaining three or four sessions of a WTE contract being devoted to other activities including CPD, audit, teaching, research, administration and preparation for, and participation in, clinical meetings. If the consultant has a significant academic or management workload, then less than seven sessions should be appropriately devoted to diagnostic work.

4. One WTE consultant has been assumed to work 440 sessions per year so that a maximum of 308 sessions (1078 consultant hours) per year are available in a WTE consultant's contract for diagnostic work, including the provision of cover for other consultants.

WORKLOAD ASSESSMENT

Workload element hours		*Consultant*	*See Notes*
Neurosurgical biopsy			
• frozen section/smear		0.5	
• paraffin	- complexity 1	0.25	(1)
	- complexity 2	1.0	
	- complexity 3	2.0	
	- complexity 4	3.0	
Autopsies			
• 'head only' autopsy		1.0	(2)
• standard neuropathological autopsy		3.0	
• complex neuropathological autopsy		5.0	
Autopsy Tissues			(3)
• brain/spinal cord	- <5 blocks	1.0	
	- 6-10 blocks	2.0	
	- 11-15 blocks	3.0	
	- 16-20 blocks	4.0	
	- > 20 blocks	4.0 + 1.0/5 blocks	
• other tissues	- < 5 blocks	0.5	(4)
	- 6-10 blocks	1.0	
	- > 10 blocks	1.0 + 0.5/5 blocks	
• special stains/ immunocytochemistry	- < 5 blocks	0.5	
	- 6-10 blocks	1.0	
	- 11-15 blocks	1.5	
	- 16-20 blocks	2.0	
	- > 20 blocks	2.0 + 0.5/5 blocks	
Muscle biopsies and other histochemistry			(5)
• performing biopsy		2.0	
• histochemistry/block		1.0	
• immunocytochemistry/case		0.5	
• EM/block		1.0	
Nerve biopsies			
• performing biopsy		2.0	
• standard report		1.0	
• immunocytochemistry/case		0.5	
• EM, teasing etc/case		1.0	
CSF Cytology			(6)
• simple		0.25	
• complex		0.5	
Ophthalmic Pathology			
• globe - standard		1.0	
- complex 2.0			
• periorbital/corneal biopsy	as neurosurgical		
Other Biopsies	as neurosurgical		

NOTES

The time allocated includes cutting up, orientation of specimens, etc.

(1) Complexity

level 1: e.g. diagnosis possible on H & E; < 5 blocks, etc

level 2: e.g. immunocytochemistry, levels, clinical consultation, etc, required for diagnosis

level 3: e.g. difficult or large specimens requiring orientation, photography, extensive consultation, etc, for reporting

Level 4: e.g. very difficult cases requiring EM, referral for second opinion, etc, for diagnosis

(2) Times for autopsies include study of case notes, clinical consultation, organ removal and production and validation of the macro report. A 'standard' autopsy includes removal of the brain and spinal cord. A 'complex' autopsy may be a high risk or perinatal case, or one in which a considerable amount of extra preparation or dissection is required.

(3) Total times for cases are calculated individually and include time for macroscopic examination and block selection. 'Block' means one of standard Tissue Tek size. For larger blocks an appropriate correction should be made based on the surface area of the block, e.g. a block filling a Surgipath Super Cassette, which is four times the surface area of a standard Tissue Tek block, would be counted as four blocks for workload assessment purposes.

Example: a case required examination of 14 blocks of brain, 8 of spinal cord and 2 each of heart and lung. Two special stains were performed on 10 of the brain blocks and 2 immunocytochemical procedures on 6.

14 brain + 8 cord	=	22	= 4.5 hours
2 heart + 2 lung	=	4	= 0.5 hours
2 x 10 specials	=	2 x 1.0=	2.0 hours
2 x 6 immunos	=	2 x 1.0=	2.0 hours
Total time for case			9.0 hours

(4) 'Other tissues' are any other tissues sampled at autopsy, except muscle, nerve or eye, which are calculated separately.

(5) 'Other histochemistry': rectal biopsies for Hirschsprung's disease, etc.

'Performing biopsy' includes time for clinical work-up prior to biopsy, as well as the actual surgical procedure.

The figures are additive, e.g. a muscle biopsy with two blocks upon both of which histochemistry and EM were undertaken would be assessed at 4.0 consultant hours.

(6) Simple CSF cytology: 2 cytospins

Complex CSF cytology: > 2 cytospins, cell count, immuno-cytochemistry etc for diagnosis

CONCLUSION

The figures are the product of a process of wide consultation amongst consultant members of the British Neuropathological Society and validation in a variety of different neuropathology laboratories with varying workloads and work patterns.

The minimum number of WTE consultants required to deal with a given diagnostic workload can be calculated by dividing the total annual number of diagnostic consultant hours by 1078 (see point 4, page 29). It is recommended that consultant staffing establishments are based on 3-5 year trends in workload, rather than upon single annual calculations or averages.

Forensic Pathology

There are approximately 800 homicides and 2000 suspicious deaths every year in England and Wales. These numbers are expected to rise over the next 10-15 years. There are currently nearly 40 pathologists accredited by the home Office. Of these approximately 20 are employed full-time in university posts and around a dozen are independent. The remainder undertake duties in addition to NHS consultant commitment.

The workload, case mix, and areas to be covered by these practitioners vary widely, and in terms of individual contracts also display great variation. For example, the university departments in London and the independent London Medico-Legal Centre carry out large numbers of routine Coroners' autopsies. Provincial departments, such as Sheffield, Liverpool and Cardiff, have a much lower routine autopsy commitment, but greater teaching and research obligations. An independent practitioner must have a fairly large coronial caseload to generate an income comparable to his/her university or NHS peers. Retention of fees for defence work also varies. Those who are not permitted to retain such fees tend to take on a smaller load of second post mortems and opinion work.

'Reasonable' workloads are therefore difficult to allocate, but 10-15 homicides, 20-30 suspicious deaths and 200-300 coronial autopsies seems a reasonable ideal annual workload for a typical part-time 'Home Office pathologist', bearing in mind the Coroner's and Crown Court time generated by each case. For a university appointment, these numbers could be increased somewhat. Independent practitioners would no doubt take the view that the coronial caseload could, and should be, much higher without the quality of work suffering. A large number of consultants relative to the total population will be required in Scotland where the law requires the participation of two doctors in the investigation of any suspicious or criminal death.

In the last few years there has been an increase in the number of practitioners operating outside the NHS or university departments. This change has largely been caused by the current mechanism for renumeration of pathologists undertaking routine coroners' autopsies as well as suspicious deaths and homicides. This trend, if it continues, could have serious implications for the future training of forensic pathologists since independent pathologists, either working alone or in consortia, are unable to offer the necessary training and supervision necessarily required by the College for accreditation and approval of posts for trainees. The future of the specialty can only be secured if urgent consideration is now given to the establishment of a number of posts for specialist registrar trainees in approved NHS or university institutions. Funding for such posts, at least initially, may necessarily need to be sought from the Home Office.

A substantial number of pathologists will retire on the grounds of health or age within the next five years. The Home Office is increasingly reluctant to renew accreditation for those remaining beyond the age of 65 years. We therefore anticipate that there will be a need for 8 specialist registrars in post in England and Wales by the year 2000. In addition there will be a need for 2-3 posts in Scotland and 2 in Northern Ireland.