

## Consultants in Clinical Biochemistry: The future

The report of a Joint Project Working Group of

The Association for Clinical Biochemistry and The Royal College of Pathologists

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## Foreword

This report contains the results of a comprehensive study of consultant staffing in NHS clinical biochemistry, which was commissioned jointly by the Association for Clinical Biochemistry (ACB) and The Royal College of Pathologists (RCPATH).

The main findings of the report are of a large increase in both the quantity (greater than 50%) and complexity of workload over the past five years, with no increase in consultant staffing. This has not been reflected in changes in roles or the numbers to support the expansion of consultants in clinical biochemistry. Primary care workload on its own has increased markedly, representing over half of that total increase.

The ACB and RCPATH recognise that 2009 is a time of great change in healthcare, with the Department of Health in England publishing its flagship policy in 2008 for the future of healthcare, *High Quality Care For All: NHS Next Stage Review final report*.

Many of the policy statements from the Darzi Report impact directly on the role of consultants in clinical biochemistry, namely:

- working with commissioners in primary care trusts
- support the Vascular Risk and Fit For Work programmes
- working more directly and closely with general practitioners
- supporting personalised care plans for patients with long-term conditions
- providing evidence on the most clinically and cost-effective drugs and treatment.

As a mode of delivery, laboratory networking has received strong endorsement from the publication of the two Carter Reports in 2006 and 2008, along with the response from the Department of Health in 2008.

In order to maximise benefits of laboratory networking, there is a need for an appreciably higher level of input from consultant staff, including strategic planning, clinical leadership and continued work with clinical users and commissioners of the service, to ensure that networked services meet the clinical needs of patients.

The ACB and RCPATH are keen to work with the four Departments of Health and Strategic Health Authorities and contribute to their workforce planning. NHS trusts (including primary care trusts) and other professional bodies need to understand and take action to implement the recommendations in the report, as only by doing so will they deliver the clinical biochemistry services that the NHS and patients will require in the years ahead.

Clinical biochemistry plays a crucial role in chronic disease management, particularly around supporting those working in primary care for cardiovascular disease, diabetes mellitus, obesity, osteoporosis and therapeutic drug monitoring of long-term conditions such as epilepsy, psychiatric illness, asthma and thyroid disorders, to name but a few. The movement of secondary care into primary care, with the loss of the juxtaposition of laboratory medicine with the clinicians engaged with these diseases, reinforces the need to ensure continuity in the quality of support and advice, and indeed expand it in primary care. Such considerations need to be factored into future workforce planning and require implementation across the primary/secondary care interface.

Furthermore, there is increasing delivery of laboratory testing at the point of care. Clinical biochemistry consultants have been at the forefront of promoting this service, both within the hospital setting and in the community, despite the lack of formal recognition of their role in the latter. The need for ensuring quality has been recognised by the Department of Health; when responding to Lord Carter's Report this increases the remit for those consultants in the specialty.

Local surveys as a requirement for Clinical Pathology Accreditation (UK) Ltd reveal that general practitioners appreciate interpretative comments, both on their reports and interactive dialogue with the clinical biochemistry consultants. It has been advocated, as a possible role, for expansion of the service with greater knowledge delivery supporting clinicians in the primary care community.

There are supporting laboratory knowledge initiatives, such as Lab Wizard, that can provide much of the comment and are allied to Lab Tests Online, Better Testing and Pathopedia knowledge-management initiatives. However, these initiatives will require a lot of input, leadership commissioning, writing, peer review, research and clinical audit from consultant-grade staff to ensure that they are used to benefit the patient. Without expansion of consultant numbers, this function is clearly going to be undermined.

It is apparent that undergraduate and postgraduate education in clinic biochemistry is being eroded, as shown by the lack of knowledge of laboratory medicine in graduating medical students and other clinical requesters (Freedman DB. 'Is the medical undergraduate curriculum 'fit for purpose'?' *Ann Clin Biochem* 2008; 45:1–2. Khromova V, Gray T. 'Learning needs in clinical biochemistry for doctors in foundation years'. *Ibid*:33–38). Requirement of laboratory clinical professional input is not only in the day-to-day service, but just as importantly at the strategic level of service design and also for those consultants to act as 'gatekeepers' to ensure the appropriate laboratory resource paradigm is used to deliver services that are of required relevance and of the required quality. It is their remit to ensure that clinically relevant and effective services are designed and delivered. This is an integral part of the primary care laboratory medicine service, but as yet is barely recognised.

In Scotland, Wales and Northern Ireland, such strategic vision is readily achievable; primary care trusts no longer exist. In England, however, this may only be achievable in laboratory medicine commissioning networks.

As part of the process of ensuring a clinically and cost-effective laboratory medicine service, we propose a 'Next Steps' document, created by us, the professionals, and this is in progress.

**Dr Ian Watson (President), Dr Graham Beastall and Mr John Kane  
on behalf of the Association for Clinical Biochemistry**

**Dr Danielle Freedman (Vice President)  
on behalf of the Royal College of Pathologists**

# 1 Summary and recommendations

## 1.1 Summary

- 1.1.1 All consultant clinical biochemists in the UK were invited to participate in an electronic survey to assess changes during the period 2001 and 2007 to workload, staffing and working practices. A return rate of 75% was achieved for departments and 67% for consultants.
- 1.1.2 64% of clinical biochemistry departments are now part of some form of laboratory network and 60% participate in some form of cross-disciplinary cooperation as denoted by the term 'blood sciences'.
- 1.1.3 21% fewer clinical biochemistry departments achieved unconditional CPA accreditation in 2007 than in 2001. This decrease reflects recent changes in the standards.
- 1.1.4 Staffing in clinical biochemistry departments remained static between 2001 and 2007, despite an increase in workload of >50%. This increase in workload included an increase in repertoire, an increase in workload outside normal working hours and an increase in point-of-care testing (POCT).
- 1.1.5 Most clinical biochemistry departments have introduced one or more changes in working practice at operational and/or reporting level to mitigate the increase in workload with the same staffing. These changes have helped to deliver marked improvement in laboratory productivity.
- 1.1.6 A serious shortfall in information technology and management support has been identified in clinical biochemistry departments.
- 1.1.7 67% of clinical biochemistry departments saw an increase in clinical incident reporting between 2001 and 2007.
- 1.1.8 A large majority of clinical biochemistry departments are struggling to cope because of inadequate numbers of staff of all grades. The inability to cope is perceived as increasing in the future unless staffing levels can be addressed. In particular, altered working practices have little impact on the rising workload for consultant clinical biochemists.
- 1.1.9 Consultants in clinical biochemistry on average work 6.5h more per week (excluding on-call) than they are contracted. Consultant workload is increasing in all clinical and management areas to the detriment of research and development.
- 1.1.10 94% of consultants in clinical biochemistry indicated that they had experienced increased levels of work-related stress in the period between 2001 and 2007. Linked to this, 37% of responders felt less confident in meeting clinical targets.
- 1.1.11 58% of consultant clinical scientists and 33% of medical consultants plan to retire before 2015.
- 1.1.12 50% of consultants have used the published consultant staffing model. Of those that have, 75% found it helpful but in only a minority of cases did it help to provide increased consultant staffing.

## 1.2 Recommendations

- 1.2.1 Professional bodies and other stakeholders in clinical biochemistry should assess the adequacy of information technology and management support and seek to ensure it is fit for purpose in supporting modern clinical biochemistry services (Section 4.1.5).
- 1.2.2 Professional bodies and stakeholders should assess the likely future demand for medical consultants accredited in chemical pathology with metabolic medicine (Section 4.2.1).
- 1.2.3 Consultants in charge of NHS clinical biochemistry departments should recognise the growing importance of knowledge management and take responsibility for ensuring implementation in a coordinated manner (Section 4.3.5).
- 1.2.4 Professional bodies and other stakeholders in clinical biochemistry should promote the availability of suitable clinical leadership programmes and recommend participation from trainees and consultants (Section 4.4).
- 1.2.5 Professional bodies and other stakeholders in clinical biochemistry should promote the opportunities for innovation, research and development and encourage consultants to increase their activity in this area (Section 4.5).
- 1.2.6 The six-step consultant staffing model is relevant to modern NHS clinical biochemistry and individual departments are recommended to employ it (Section 4.6.1).
- 1.2.7 There is a clear need for the skills afforded by both medical and non-medical consultants and we would support the need for both to be present in any given service; the balance will depend on local needs and services (Section 4.6.1).
- 1.2.8 The Joint Project Working Group estimates that there is a shortage of 80 consultants in NHS clinical biochemistry (Section 4.6.2).
- 1.2.9 Professional bodies and other stakeholders should give serious and urgent consideration to the shortage of consultants when undertaking workforce planning for NHS clinical biochemistry (Section 4.6.2).

## 2 Introduction

- 2.1 In April 2002, The Association for Clinical Biochemistry (ACB) and The Royal College of Pathologists (RCPATH) jointly published a report entitled *NHS Clinical Biochemistry: A profession under siege*.<sup>1</sup> In the subsequent seven years, there have been considerable developments in laboratory medicine and the Councils of both the ACB and RCPATH requested that the status of the profession and the future requirements for consultants be reviewed.
- 2.2 Accordingly, a small joint project working group was established (Appendix 1). It was agreed to adapt and update the survey used in the previous report<sup>1</sup> and to issue it to all consultants working in UK departments of clinical biochemistry (also known as clinical chemistry or chemical pathology). For the purposes of the survey, a consultant was defined as either a medical consultant (chemical pathologist) or a consultant clinical scientist with *Agenda for Change* Band 8c and above. Consultants were identified from the membership databases of both the ACB and RCPATH, with the approval of both organisations.
- 2.3 The survey was designed using the 'Survey Monkey' tool.<sup>2</sup> The survey was issued electronically and completed on line with a return deadline in May 2008. Part 1 of the

survey related to the department in which each consultant works and one return was requested for each department. Part 2 of the survey related to individual consultants and each consultant was requested to make a return. Data for workload and staffing were requested for the complete year to 31 March 2007.

2.4 Results from the survey were collated and analysed by the working group and key findings are recorded in Section 3 of this report. A complete version of the survey and all of the responses received will be available from the Fellows' areas of the ACB ([www.acb.org.uk](http://www.acb.org.uk)) and RCPATH ([www.rcpath.org](http://www.rcpath.org)) websites.

2.5 Section 4 of this report makes recommendations for the shape, size and roles of the consultant workforce in clinical biochemistry based on the survey findings when interpreted in the light of recent important publications relating to the organisation and delivery and laboratory medicine in the UK. These publications include:

- *High Quality Care For All: NHS Next Stage Review final report*<sup>3</sup>
- *Better Health, Better Care: Action plan*<sup>4</sup>
- *Modernising Pathology Services*<sup>5,6</sup>
- The Carter Reports on pathology services in England<sup>7,8</sup> and the response from the Department of Health<sup>9</sup>
- *The Future Delivery of Pathology Services in Wales*<sup>10,11</sup>
- *Getting Results; Pathology services in acute and specialist Trusts*<sup>12</sup>
- *Review of Specialised Pathology and Laboratory Medicine Services in Scotland*<sup>13</sup>
- *The Future of the Healthcare Science Workforce*<sup>14</sup>
- *Integration and Implementation of Diagnostic Technologies in Healthcare*<sup>15</sup>
- *Best Research for Best Health – A new national health research strategy.*<sup>16</sup>

### 3 Results of the 2008 survey of clinical biochemistry consultants

#### 3.1 Departments of clinical biochemistry

##### 3.1.1 Demographics

Survey returns were received from 170 different departments of clinical biochemistry, which represents 75% of the total. This is virtually identical to the 74% return rate from the previous survey.<sup>1</sup> The demographics of the departments making returns were as follows.

<b>Hospital type</b>		<b>Country</b>	
Children's hospitals	3%	England	74%
Main university hospitals	28%	Northern Ireland	4%
NHS district hospital	68%	Scotland	11%
Specialist units	1%	Wales	11%
<b>Laboratory networking</b>		<b>Blood sciences</b>	
Not part of a network	36%	Part of blood sciences	60%
Part of informal network	50%	Not part of blood sciences	40%
Part of managed network	14%		

The average local population served by a department was 388 000 (range 13 000–1 262 000) and the average number of inpatient beds served was 951 (range 140–1400).

The striking finding is the high percentage of clinical biochemistry departments that are part of a laboratory network and/or involved in shared service delivery with other disciplines through a blood sciences facility. Laboratory networking was a relatively new concept when the previous survey was undertaken.<sup>1</sup>

### 3.1.2 Accreditation status

<b>CPA accreditation status</b>	<b>2001</b>	<b>2007</b>
Unconditional accreditation	80%	59%
Conditional/provisional accreditation	16%	35%
No accreditation – referred	2%	2%
No accreditation – not yet applied	3%	4%

The proportion of clinical biochemistry departments with unconditional CPA accreditation fell significantly during the six-year interval between surveys. This probably reflects changes in the CPA accreditation process to align it with the international standard ISO 15189,<sup>17</sup> rather than a deterioration in the quality of clinical biochemistry services.

### 3.1.3 Staffing and recruitment

The survey revealed the following comparative staffing statistics for the years to 31 March 2001 and 31 March 2007.

<b>Numbers of specified NHS staff (whole-time equivalent)</b>	<b>2001</b>	<b>2007</b>
Consultant chemical pathologist	138	129
Consultant chemical pathologist (metabolic medicine)	5	5.5
Non-career medical staff	7	9
Trainee medical staff	49	71
Consultant clinical scientist (8c–9)	141	143
Registered clinical scientist (7–8b)	311	296
Pre-registration clinical scientist	55	72
Total biomedical scientist staff	2115	2142
<b>Numbers of unfilled posts</b>	<b>2001</b>	<b>2007</b>
Consultant chemical pathologist	4	4
Consultant chemical pathologist (metabolic medicine)	0	1
Non-career medical staff	0	0.5
Trainee medical staff	2	2
Consultant clinical scientist (8c–9)	2	7
Registered clinical scientist (7–8b)	4	13
Pre-registration clinical scientist	0	2
Total biomedical scientist staff	42	78

<b>Recruitment between 2001 and 2007</b>	<b>Tried</b>	<b>Successful</b>	<b>(%)</b>
Consultant chemical pathologist	29	24	(89%)
Consultant chemical pathologist (metabolic medicine)	4	4	(100%)
Non-career medical staff	7	6	(86%)
Trainee medical staff	27	26	(93%)
Consultant clinical scientist (8c–9)	45	37	(82%)
Registered clinical scientist (7–8b)	67	59	(92%)
Pre-registration clinical scientist	42	42	(100%)
Total biomedical scientist staff	94	80	(85%)

The above statistics are based on a 75% return rate to the survey and so multiplication of the raw data by 1.33 will give an estimate of total staffing numbers in the UK.

Allowing for small differences in the return rate between the two surveys and the introduction since 2004 of *Agenda for Change*, the main conclusion from this data is that staffing of established posts has remained virtually static. There have been small reductions in the number of chemical pathologists (5%) and registered clinical scientists (5%) and a small increase (1%) in biomedical scientists. The number of medical trainees has risen in anticipation of an as yet unrealised expansion in the number of consultant posts with metabolic medicine. The number of clinical scientist trainees has risen in line with workforce planning predictions based on age demographics.

There were relatively few unfilled posts at the time of the survey although there was a small increase in unfilled registered and consultant level clinical scientists and also biomedical scientists. The survey could not determine whether these unfilled posts were the result of employers 'freezing' posts or a lack of available qualified candidates. Recruitment data suggests that whilst there is no major problem the two areas where recruitment is most difficult are consultant clinical scientists and biomedical scientists.

### 3.1.4 Workload

<b>Average departmental workload</b>	<b>2001</b>	<b>2007</b>	<b>% change</b>
Requests	352 042	518 713	+48
Tests	2 473 072	3 767 748	+52

The percentage increase in requests (56%) and tests (65%) was even greater for those departments (n=71) that provided data in the current survey for both years.

Not only has the total workload risen dramatically between 2001 and 2007, but the nature of the work has also changed. The percentage workload from primary care rose from 36% to 44% as a result of the General Medical Services contract. The percentage workload provided outside core working hours (Monday to Friday, 08.00–18.00) also rose from 12% to 18%, reflecting greater demand for 24/7 services. Some 93% of departments have increased their departmental repertoire (on average by eleven tests) and 87% of departments now offer an expanded repertoire out of hours. A total of 98% of respondents believed that NHS guidelines had influenced workload.

### 3.1.5 Demands and solutions

The two previous sections of this report revealed that despite static staffing numbers, the workload has increased dramatically. The survey revealed that 99% of departments had experienced an increase in demand for faster turnaround time of results and 91% had been able to improve their turnaround times. The survey sought opinion on whether total staffing was adequate to cope with the current workload and with the predicted workload in 2013, assuming the same rate of increase with no additional staff.

<b>Adequacy of staff to cope with workload</b>	<b>2001</b>	<b>2007</b>	<b>2013</b>
Staffing insufficient	26%	52%	77%
Staffing sufficient or better	74%	48%	23%

#### **Adequacy of staff to cope with workload in 2007**

	<b>Networked labs</b>	<b>Non-networked labs</b>
Staffing insufficient	48%	57%
Staffing sufficient or better	52%	43%

The data shows that since 2001 there has been an increase in the number of laboratories reporting insufficient staffing to cope with the workload. This is predicted to be significantly worse in 2013. Interestingly, the data shows that networked laboratories are, at present, experiencing slightly less pressure on staffing than non-networked laboratories.

Those laboratories reporting insufficient staffing were asked to break this down by grade of staff. The results from 2007 are shown below.

#### **Insufficient staffing by grade 2007**

	<b>Networked labs</b>	<b>Non-networked labs</b>
Consultants medical and scientific	26%	13%
Registered clinical scientists	31%	17%
Biomedical scientists	42%	32%
Medical laboratory assistants	24%	28%
Administrative and clerical	23%	21%

The data shows that, at present, laboratories are reporting staffing insufficiency across all grades. Networked laboratories appear to be experiencing an increased shortage of medical and scientific staff compared to non-networked laboratories, whereas the reported shortage of medical laboratory assistants and administration/clerical staff is similar between the two groups.

Of those departments responding, 62% have been involved in workforce re-profiling during 2001–2007. The outcome from workforce profiling was reported as shown below.

<b>Outcome of workforce re-profiling</b>	<b>Decrease</b>	<b>No change</b>	<b>Increase</b>
Consultants medical and scientific	16%	65%	20%
Registered clinical scientists	37%	37%	26%
Biomedical scientists	34%	25%	41%
Medical laboratory assistants	8%	10%	83%
Administrative and clerical	45%	35%	20%

These data reveal a significant increase in medical laboratory assistants and a reduction in administrative and clerical staff. This probably reflects changing working practice.

A number of changes in practice have been adopted during the six-year survey interval to cope with the increased workload with static staffing numbers. These have created demands for improved information technology and connectivity.

<b>Changes in practice – operation</b>	<b>Not considered</b>	<b>Requested</b>	<b>Adopted</b>
Computerised ward requesting	4%	54%	42%
Computerised GP requesting	9%	69%	22%
Optical scanning of request form	18%	19%	64%
Increased automation/robotics	7%	22%	71%
Common analytical platforms	7%	27%	66%
Lab to lab computer systems linkage	11%	53%	36%

<b>Changes in practice – reporting</b>	<b>Decrease</b>	<b>No change</b>	<b>Increase</b>
Length of working day for clinical advisory service	1%	60%	39%
Interpretive advice 'out of hours'	6%	63%	31%
Reports not seen by interpretative staff	14%	31%	55%
Reports with interpretative comments	20%	33%	48%
Issue of guidelines for interpretation	1%	30%	69%
Time giving clinical advice on phone	1%	31%	68%

<b>Changes in practice – POCT</b>	<b>Decrease</b>	<b>No change</b>	<b>Increase</b>
Within the hospital	1%	11%	88%
Within the community	0%	24%	76%

68% of respondents claimed compliance with the point-of-care testing (POCT) guidelines issued by the Medicines and Healthcare products Regulatory Agency (MHRA).<sup>14</sup>

<b>IT support to departments adequate?</b>	<b>Yes</b>	<b>No</b>
Pathology department	46%	54%
Hospital informatics service	28%	72%
Manufacturer/supplier	44%	56%
Connecting for Health	8%	92%

These data reveal the widespread concern about the pressure on staffing in the face of a rapidly rising workload. Many departments have adopted changes in practice to the operation and reporting of clinical biochemistry services as part of managing a rising workload with static staff numbers. The rise in POCT has long been predicted but it is concerning that 32% of departments cannot claim compliance with MHRA guidelines. The inadequacy of support for information technology from hospital informatics services, diagnostic companies and Connecting for Health is disturbing.

### 3.1.6 Clinical incident reporting

Virtually all departments (99%) formally record clinical incidents. In the interval between surveys, 67% of departments have seen an increase in the number of clinical incidents reporting. This increase may result from the pressure of increased workload or it may reflect greater awareness and improvements in the reporting process.

## 3.2 **Consultants in clinical biochemistry**

### 3.2.1 Demographics

A total of 277 consultant surveys were completed and returned. This represents a 67% return rate (64% in the 2002 survey).

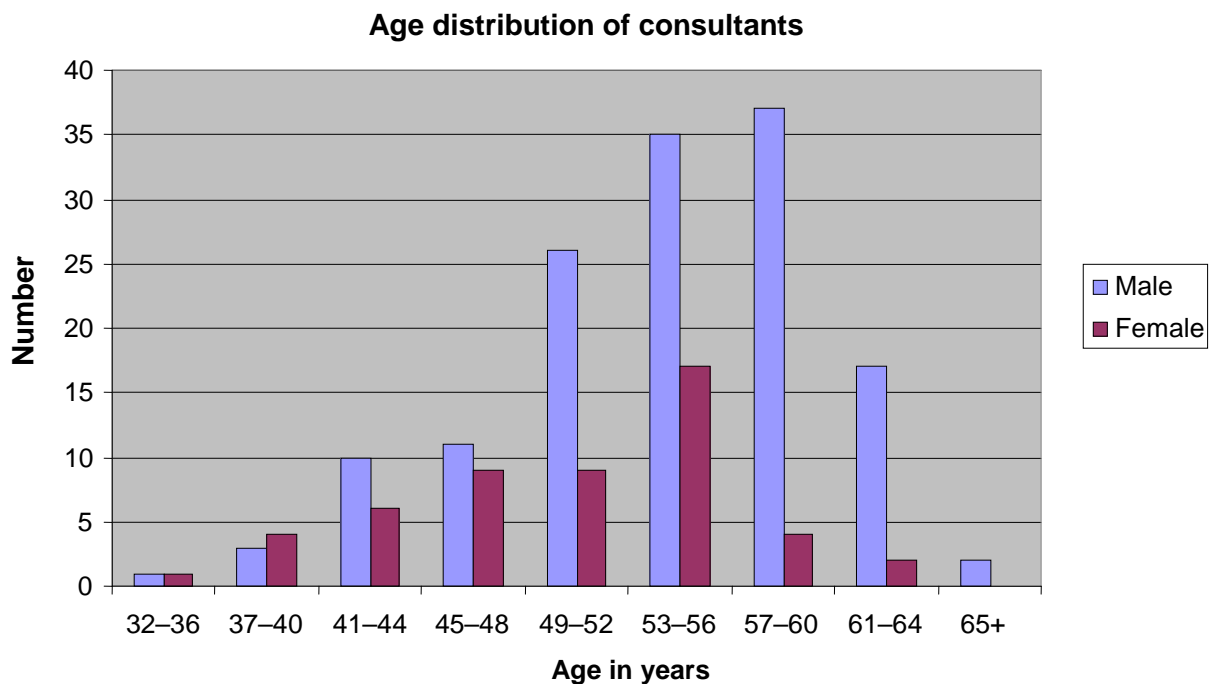
### Consultant employment status

Consultant chemical pathologists	41%
Consultant chemical pathologists (metabolic medicine)	1%
Medical consultants, university	4%
Consultant clinical scientists (8c–9)	53%
Consultant scientists, university	1%

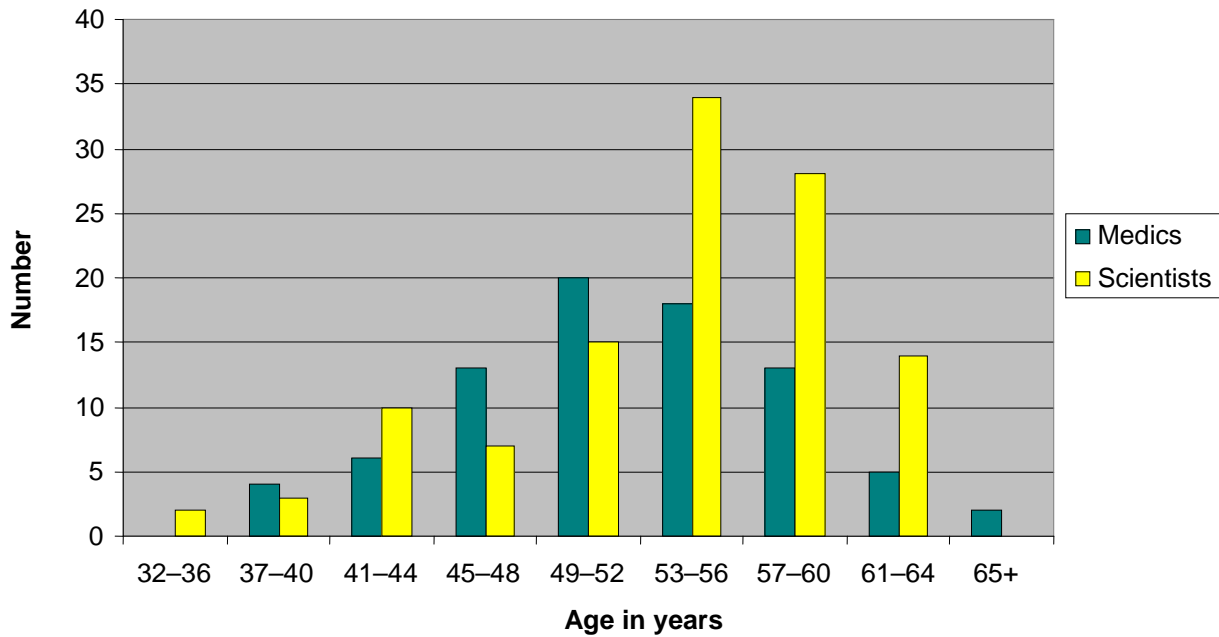
### Geographical working base

Working on one site	48%
Working across two sites	35%
Working across three sites	13%
Working across four or more sites	4%

Gender	Male	Female
Total	72%	28%
Medical consultants	79%	21%
Consultant clinical scientists	69%	31%

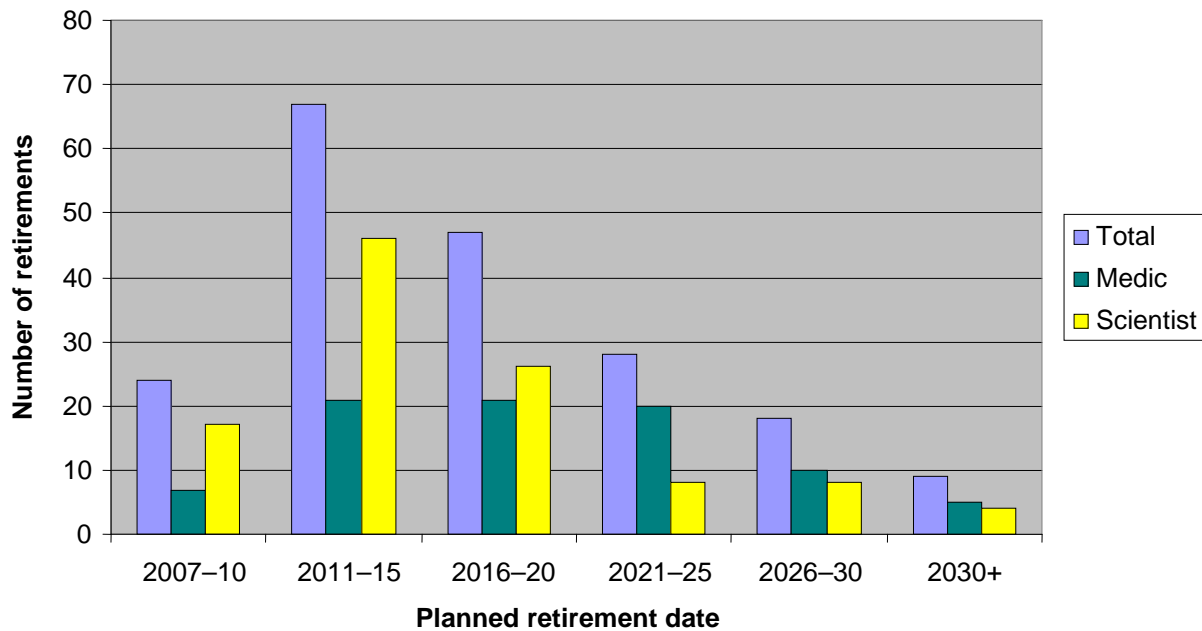


### Age comparison of consultant medics and scientists



The average age of the 194 consultants in clinical biochemistry who provided data is 51.8 years. On average, male consultants are older than females and clinical scientists are older than medical consultants. These demographics are likely to change considerably because, although not covered in this survey, approximately 80% of trainee clinical scientists are female.

### Planned retirement date of consultant staff



As would be anticipated from the age profile, more clinical scientists than medical consultants will retire in the next seven years.

### 3.2.2 Working time

Full-time consultant clinical scientists are contracted to work 37.5 hours each week. Depending on the number of contracted PAs, medical consultants are contracted to work 40-48 hours per week. In practice, the average time spent working was 44 hours for clinical scientists and 48 hours for medics, indicating that a significant proportion of consultants in clinical biochemistry work longer than their contracted hours, excluding on-call.

<b>Hours spent in average week</b>	<b>Scientist</b>	<b>Medic</b>
Direct patient care (inpatient and outpatient)	0.5	10.0
Validation and reporting	10.2	10.3
Clinical liaison – discussion of results	3.4	3.7
Clinical liaison – ward visits, face to face	1.6	2.1
Scientific insight	3.6	2.4
Quality issues	3.8	2.6
Research and development (R&D)	2.9	1.9
Teaching	2.5	2.2
Continuing professional development (CPD)	1.8	2.4
Management within department	6.1	3.9
Management elsewhere	2.4	2.8
Regional, national work	1.9	2.0
Supporting POCT	1.3	0.7
Other	2.0	1.0

These data confirm the findings from the 2002 survey. As expected, medical consultants spend significantly more time on direct patient care. Clinical scientists spend correspondingly more time working within the laboratory (providing scientific insight, dealing with quality issues, R&D and management functions).

<b>Change in working pattern 2001–2007</b>	<b>Decrease</b>	<b>No change</b>	<b>Increase</b>
Direct patient care	9%	<b>61%</b>	31%
Validation and reporting	22%	25%	<b>54%</b>
Clinical liaison	6%	36%	<b>58%</b>
Ward visits	6%	<b>62%</b>	22%
Scientific insight	5%	<b>58%</b>	37%
Quality issues	6%	28%	<b>66%</b>
R&D	<b>43%</b>	40%	14%
Teaching	11%	41%	<b>48%</b>
CPD	21%	<b>65%</b>	14%
Management in department	8%	38%	<b>54%</b>
Management elsewhere	12%	41%	<b>47%</b>
Regional, national, etc. work	13%	37%	<b>50%</b>
Supporting POCT	13%	<b>55%</b>	32%

These data reveal net increases in working time being spent on many areas of activity. Research and development, and to a lesser extent continuing professional development, are being squeezed by the pressures of work elsewhere. These findings represent a continuation of the trends first identified in the 2002 survey.

### **Cover for consultant absence**

Consultant in same department	68%
Consultant in another department/site	9%
Non-consultant in same department	22%
Employment of locum consultant	1%

<b>Change in working pattern 2001–2007</b>	<b>Decrease</b>	<b>No change</b>	<b>Increase</b>
Frequency of contact on call	13%	53%	35%

### 3.2.3 Workload

<b>Clinical origin of workload</b>	<b>Average</b>
General practitioners	37.7%
Physicians	19.3%
Paediatricians	11.7%
Surgeons	7.8%
Obstetricians/gynaecologists	4.4%
Anaesthetists/intensivists	4.6%
A&E consultants	5.9%
Psychiatrists	2.5%
Others	6.1%

These average data mask wide variation for individual returns depending on the nature of specialist units served, e.g. paediatrics, cancer units.

<b>Change in clinical origin of workload</b>	<b>Decrease</b>	<b>No change</b>	<b>Increase</b>
General practitioners	1%	22%	77%
Consultant clinicians	5%	44%	51%
Junior doctors	3%	30%	66%
Non-medical staff	1%	31%	68%
Total clinical liaison	2%	16%	82%

<b>Effect of national guidelines</b>	<b>Decrease</b>	<b>No change</b>	<b>Increase</b>
Departmental workload	0%	6%	94%
Personal workload	0%	25%	75%

<b>Effect of GMS contract</b>	<b>Decrease</b>	<b>No change</b>	<b>Increase</b>
Departmental workload	0%	9%	91%
Personal workload	1%	26%	73%

The survey has revealed that the workload for consultants in clinical biochemistry has risen between 2001 and 2007. This is not surprising, given the large increase in departmental workload with static staffing. In particular, most consultants have seen an increase in their workload from general practice, which is the work often requiring more intensive clinical liaison and verbal advice.

### 3.2.4 Demands and solutions

A massive 94% of consultants indicated that they had experienced increased levels of work-related stress in the period between 2001 and 2007. Linked to this, 37% of responders felt less confident in meeting clinical targets, compared to 17% who felt more confident with additional experience. Consultants indicated a significant reduction in their

personal and departmental scientific output into peer-reviewed journals during the six-year interval between surveys. Consultants also admitted to current shortcomings in their department because of inadequate consultant staffing.

### **Responders indicating current shortcomings due to consultant staffing levels**

Direct patient care (in and out)	16%
Validation and reporting	20%
Clinical liaison	19%
Ward visits and face to face	30%
Providing scientific insight	19%
Quality issues	23%
R&D	48%
Teaching	27%
CPD	21%
Management within department	12%
Management elsewhere	13%
Regional and national work	20%
POCT	21%
No shortcomings recorded	7%

<b>Perceived need for additional staffing</b>	<b>Decrease</b>	<b>No change</b>	<b>Increase</b>
Medical consultants 2007	2%	65%	34%
Medical consultants 2013	1%	46%	53%
Clinical scientists 2007	3%	56%	41%
Clinical scientists 2013	4%	31%	65%

The identified pressures and shortcomings translate into a perceived need for additional consultant staffing. The need for additional consultant staffing increases with time as the expectation of ever-increasing workload has an impact. There is no clear trend for additional medical or clinical scientist consultants and this probably reflects the clear belief that a one-to-one ratio best serves the need of clinical biochemistry.<sup>1</sup>

#### **3.2.5 Clinical leadership**

Only 29% of consultants responding to the survey had attended a clinical leadership course. There was a trend that medical consultants were marginally more likely to have attended a course than consultant clinical scientists. Consultants specified the courses that they had attended and passed comment on their suitability.

### **3.3 Application of consultant staffing model**

*NHS Clinical Biochemistry: A profession under siege*<sup>1</sup> included a validated model to predict the number of consultant staff required by an individual department. Consultants responding to the current survey indicated that 50% of them had used the staffing model. Of those who had used it, 75% found it useful. In terms of outcome, only 25% of those using the consultant model found that it had impacted on staffing levels.

## 4 Consultants in clinical biochemistry: future requirements

NHS clinical biochemistry is in a continuous phase of evolution and development, including new models of service provision, new ways of working, extending roles and responding to the need to facilitate research into service in a more efficient manner. These changes may reduce the skill mix required at an operational service delivery level but the resulting additional high-level functions impact significantly on consultant responsibilities and commitment. In order to cope with this evolution and development, additional consultant staff are required in clinical biochemistry as a matter of urgency.

### 4.1 New models of service provision

#### 4.1.1 Quality and choice

In June 2008, the Department of Health published its flagship policy for the future of healthcare, entitled *High Quality Care For All: NHS Next Stage Review final report*.<sup>3</sup>

Widely known as the Darzi Report, this policy document places considerable emphasis on improving quality and on giving patients and the public greater choice. Several of the policy statements impact directly on the role of consultants in clinical biochemistry, including:

- working with commissioners in primary care trusts
- supporting the 'Vascular Risk' and 'Fit for Work' programmes
- working more directly and closely with general practitioners
- supporting personalised care plans for long-term conditions
- providing evidence on the most clinically and cost-effective drugs and treatment.

Although containing significant differences in presentation and delivery, the Scottish Government Health Department's document, *Better Health, Better Care: Action plan*,<sup>4</sup> contains the same central themes of quality and choice and makes similar increased demands on consultants in clinical biochemistry. The Healthcare Commission also highlights the need for greater quality in laboratory medicine.<sup>12</sup>

#### 4.1.2 Laboratory networks

The concept of laboratory networking first appeared in 2004 in *Modernising pathology services*<sup>5</sup> and the successor document the following year.<sup>6</sup> Laboratory networking received strong endorsement with the publication of the two Carter Reports in 2006<sup>7</sup> and 2008,<sup>8</sup> together with the response from the Department of Health.<sup>9</sup> Further strong support for laboratory networking has come from Wales, with the publication in August 2008 of *The Future Delivery of Pathology Services in Wales*<sup>10</sup> and the accompanying *National Pathology Framework*.<sup>11</sup>

It is clear from Section 3.1.1 that the majority of UK clinical biochemistry laboratories are now part of a network. Laboratory networking offers great advantages to service quality and harmonisation, together with the benefits to efficiency and effectiveness that come from economies of scale. Laboratory networking may occur within a discipline of pathology across sites and/or across selected areas of different disciplines. In this latter context, 'blood sciences' is established as a multidisciplinary common service delivery area for the high-volume automated areas of clinical biochemistry, haematology and immunology.

In order to maximise the benefits of laboratory networking, there is a need for appreciable high-level input from consultant staff. This consultant contribution is crucial at the stage of strategic planning. Thereafter, there is a growing need for clinical leadership (See Section

4.4) and for continual work with users of the service to ensure that the network service meets the clinical needs of patients and the public at the broader geographical and/or disciplinary level.

#### 4.1.3 Point-of-care testing

Point-of-care testing (POCT) has been available for a number of years. POCT has become established in a limited number of areas of clinical biochemistry (e.g. blood gases and glucose testing, including home glucose testing). There are quality guidelines<sup>18</sup> and quality standards<sup>19</sup> for the performance of POCT in the hospital setting and these already demand a high level of input and commitment from clinical biochemistry laboratory personnel. It is of concern that 38% of laboratories cannot claim compliance with these guidelines (Section 3.1.5). The creation of satellite laboratories as part of laboratory networks and the demand for faster turnaround times to meet Government targets are further increasing the application of POCT in the hospital setting. Additionally, the 'polyclinics' recommended in the Darzi Report<sup>3</sup> and the general focus on personalised healthcare will lead to a further expansion of POCT in the clinic and community setting. There are quality issues involved in the expansion of POCT. This has been recognised by the Department of Health<sup>9</sup> and a formal accreditation process is under development (by the Department of Health). Any expansion of POCT, especially into new healthcare delivery settings, will create significant additional work for consultants in clinical biochemistry, who ultimately will bear responsibility for the quality of the service and the compatibility and connectivity with mainstream laboratory results.

#### 4.1.4 Specialised clinical biochemistry services

Consultants in clinical biochemistry recognise the growing challenge of maintaining existing specialised services and introducing new specialised services. Pressures arising from an ageing workforce of specialists with an inadequate career structure have been compounded by the drive for greater cost effectiveness. The age profile in clinical biochemistry has been recognised by the Healthcare Commission<sup>12</sup> and both Carter Reports<sup>7,8</sup> and the Department of Health's response<sup>9</sup> recommend that specialised services should be consolidated through referral to specialist testing centres to assure quality and future provision. Steps to introduce a national network of specialised laboratory medicine testing are under way in Scotland<sup>13</sup> and Wales.<sup>10</sup> The creation and development of specialist testing laboratories will require an expansion of consultant level scientists and this is recognised in *Modernising Scientific Careers*.<sup>14</sup>

#### 4.1.5 Connectivity

The findings recorded in Section 3.1.5 reveal an alarming lack of confidence in the adequacy of IT support for clinical biochemistry. Further data fragmentation and a loss of end-to-end connectivity is one potential consequence of a disseminated model of service delivery. Such fragmentation could compromise service quality and patient safety. This risk was identified in the Carter Reports.<sup>7,8</sup> The Department of Health has acknowledged the risk and put into place a series of measures to facilitate end-to-end connectivity.<sup>9</sup> In Wales, there has been recent agreement to fund a national IT system as part of the implementation of the agreed strategy for pathology.<sup>10</sup> The coordination of information management at local level will require additional input from consultants in clinical biochemistry, including the development of the next generation of experts in information management and bioinformatics.

**Recommendation:** *Professional bodies and other stakeholders in clinical biochemistry should review of the adequacy of information technology and management support and assess whether it is fit for purpose in supporting modern clinical biochemistry services.*

## 4.2 New ways of working

### 4.2.1 Metabolic medicine

During the past two years, the first specialists in chemical pathology with metabolic medicine have completed their specialist training and taken up consultant posts. Although it is early days, it is apparent that such consultants are, as anticipated, spending proportionately more of their time dealing directly with patients. Furthermore, early feedback is that these new consultants are appreciated by their peers. This development makes clinical biochemistry more 'clinical' and this is in keeping with recent policy initiatives.<sup>3,4</sup> It is therefore likely that more NHS trusts will seek to appoint consultants accredited in chemical pathology with metabolic medicine and a current assessment of this demand is required. This development will lead to a requirement for an increase in medical training posts, which was anticipated in *Profession Under Siege*.<sup>1</sup> Furthermore, the extra time spent outside the laboratory will increase the requirement for additional consultant staffing to ensure that clinical leadership within the laboratory is maintained or enhanced.

***Recommendation:*** Professional bodies should assess the likely future demand for medical consultants accredited in chemical pathology with metabolic medicine.

### 4.2.2 Clinical networks

A second area of enhanced clinical activity for consultants in clinical biochemistry arises from increased participation in multidisciplinary team meetings and clinical networks. Although this is occurring across the UK, the development of managed clinical networks is a central feature of healthcare delivery in Scotland.<sup>4</sup> The active involvement of consultants from clinical biochemistry in clinical networks enables harmonisation of practice, the development of evidence-based practice and clinical protocols and the effective translation of innovation into service. If this necessary and important growing role is to be realised, there are consequences for the number of consultants in clinical biochemistry.

### 4.2.3 Chronic disease management

Clinical biochemistry plays a major role in supporting the monitoring and management of patients with a range of common chronic diseases, including diabetes, cardiovascular disease, obesity, osteoporosis and thyroid disorders. The Department of Health's policy<sup>3,4</sup> is to shift the balance of responsibility for chronic disease management out of hospitals and into primary care, with the patient also taking more responsibility for his or her care. This shift of responsibility is evident in the General Medical Services (GMS) contract, but it must be accompanied by increased support from consultants in clinical biochemistry to general practitioners and their practice teams and directly to patients. There is growing pressure for patients to own their results and to be enabled to consult directly with laboratory experts on the interpretation of results and the implications for self-management.

### 4.2.4 Specialisation

In clinical biochemistry, there has been a policy of training to FRCPath across the breadth of the discipline. Possession of FRCPath is required for the overwhelming majority of medical practitioners and clinical scientists to achieve consultant status in clinical biochemistry. As a result, specialists are either scientists at sub-consultant level who operate in a narrow field of clinical biochemistry or consultants who specialise at consultant level. Future trends in healthcare as applied to clinical biochemistry are going to require more specialists at consultant level in areas that include metabolic medicine, paediatrics, primary care, informatics and in lead roles in specialist referral centres.

#### 4.2.5 Modernising scientific careers

The Department of Health has published a four-country consultation paper on the future of the healthcare scientist workforce.<sup>14</sup> Support for the proposals contained within the consultation document could lead to the creation of additional non-medical consultants in clinical biochemistry, with consultant status being confirmed by meeting the standards for a new higher specialist register for scientists that is analogous to the medical specialty register. Such consultant healthcare scientists in clinical biochemistry would be competent to undertake the same roles as medical consultants, with the exception of lead roles in direct patient care. It is possible that, in line with other healthcare science professionals, competence in non-medical prescribing may be developed at some stage in the future.

#### 4.2.6 Clinical governance

There is a growing focus on clinical governance in all areas of medicine and healthcare. In clinical biochemistry, the drive for increased quality, in the widest sense, is becoming increasingly developed. Consultants in lead roles are required to dedicate more time to setting, monitoring and assuring quality standards as part of the requirement to be registered with a laboratory accreditation body. As Section 3.1.2 reveals, there is still considerable work required in this area. The Carter Report<sup>8</sup> and the Department of Health's response<sup>9</sup> recommend that all pathology service providers, including consolidated networks, should be subject to mandatory accreditation by an organisation that is independent of the providers or the professions. Clinical audit, identifying and meeting the requirements of users, supporting training and continuing professional development, investigating clinical incidents and implementing the knowledge and skills framework are amongst the more recent additions to the clinical governance agenda.

### 4.3 **Knowledge management**

#### 4.3.1 Harmonisation and standardisation of practice

The introduction of a universal electronic patient record brings with it a requirement for greater uniformity in the presentation of laboratory medicine data, in the interests of greater patient safety. The need for harmonisation of practice is also being driven by an increasingly well-informed and mobile public, who find it hard to understand differences in practice across small geographical areas. Finally, greater uniformity is required to aid the commissioning process and the preparation of a national tariff for pathology tests. Harmonisation is required at several levels including the nomenclature of investigations; units used for reporting, reference intervals and action limits. The Carter Report<sup>8</sup> and the Department of Health's response<sup>9</sup> both acknowledge the need for greater uniformity in the presentation of laboratory medicine data and initiatives, including a national laboratory medicine catalogue, are underway to address some of these issues. The professional bodies are also giving a lead in this area, one example being the Pathology Harmony project,<sup>20</sup> which is also receiving support from the Department of Health.

Standardisation of laboratory medicine data takes harmonisation to the next level, as it requires an unbroken chain of traceability to demonstrate trueness of results. Standardisation is a global challenge that involves the *in-vitro* diagnostics industry and global standards bodies. There has been an ongoing programme of standardisation for some years and this is now gathering momentum. One recent illustration of standardisation, and the way in which the UK has responded to the initiative, can be seen with the recent consensus statement on the use of glycated haemoglobin (HbA1c) in the monitoring of patients with diabetes.<sup>21</sup>

Harmonisation and standardisation of practice have considerable implications for every clinical biochemistry laboratory. Consultants are required to demonstrate leadership to ensure that all users of the service understand the need for and implications of

standardisation and that change is implemented fully and in a timely fashion in the interests of patient safety.

#### 4.3.2 Evidence-based clinical guidelines

Evidence-based clinical guidelines are another recent form of harmonisation of practice in medicine. The purpose of evidence-based guidelines is to promote the widespread adoption of best clinical practice across the UK. Such guidelines include investigation protocols, therapeutic options and the use of approved pharmaceuticals in patient management. Consultant clinical biochemists have played a significant role in helping with the production of evidence-based clinical guidelines by the National Institute for Health and Clinical Excellence (NICE),<sup>22</sup> the Scottish Intercollegiate Guidelines Network (SIGN),<sup>23</sup> and other organisations. The initiative for evidence-based clinical guidelines was given a further boost in the Darzi Report<sup>3</sup> with the creation in April 2009 of NHS Evidence,<sup>24</sup> a web-based consolidated information source of high-quality clinical and non-clinical evidence and best practice.

At a local level, consultants in clinical biochemistry have an increasing role in facilitating the introduction and monitoring of relevant evidence-based clinical guidelines.

#### 4.3.3 Best practice in primary care pathology

Clinical biochemistry is of particular importance in supporting the shift of chronic disease management into primary care. Consequently, consultant clinical biochemists have been at the forefront of a national project to stimulate best practice in primary care pathology. This project uses the best evidence available to provide answers to questions that are frequently asked by general practitioners and their clinical teams.<sup>25</sup> At a local level, consultant clinical biochemists have an increasing role in promoting and monitoring the best practice in primary care pathology project and related projects to their users.

#### 4.3.4 Promoting the contribution of laboratory medicine

Clinical biochemists in the UK are leading the way in promoting the contribution of laboratory medicine to healthcare. This project is part of the wider programme of adding value to laboratory medicine data and it is an increasing role for consultants at local level. Two main tools are available to assist this process: Lab Tests Online UK® is an award-winning website targeted at the public and patients,<sup>26</sup> while Labs Are Vital™ UK targets other healthcare professionals, managers and politicians.<sup>27</sup>

#### 4.3.5 Optimising knowledge management

Most senior professionals in clinical biochemistry recognise the growing need for the acquisition, optimisation and transfer of knowledge as part of delivering a modern, effective clinical service. However, few see knowledge management as an area of specialisation and with an eye to the future this may be regarded as an omission.

***Recommendation:*** *Consultants in charge of NHS clinical biochemistry departments should recognise the growing importance of knowledge management and take responsibility for ensuring implementation in a coordinated manner.*

### 4.4 **Clinical leadership**

The importance of clinical leadership across medicine has been recognised in the Darzi Report,<sup>3</sup> and the Carter Report<sup>7,8</sup> emphasises its importance in laboratory medicine. In clinical biochemistry, leadership is essential in areas including strategic direction, commissioning, service quality and standards and making the best use of staff and other resources. Furthermore, the effective implementation of all the initiatives outlined in

Sections 4.1–4.3 of this report rely on consultants demonstrating clinical leadership. It is somewhat alarming, therefore, to note in Section 3.2.5 that only 29% of current consultants have attended any form of clinical leadership programme. The Academy of Medical Royal Colleges is working with the NHS Institute for Innovation and Improvement to develop a leadership programme for medical doctors. Several clinical leadership programmes are available from UK universities and NHS organisations but their suitability for consultants in clinical biochemistry is largely unknown.

**Recommendation:** *Professional bodies and other stakeholders in clinical biochemistry should promote the availability of suitable clinical leadership programmes and recommend participation from trainees and consultants.*

## 4.5 Innovation, research and development

In February 2008, the Department of Health launched a new research strategy.<sup>16</sup> Entitled 'Best Research for Best Health', this strategy sets out a vision to improve the health and wealth of the nation through research that is focused on the needs of patients and the public. To facilitate this strategy, the National Institute for Health Research (NIHR)<sup>25</sup> has been created with large amounts of funding for suitable translational research. Additionally, the vision set out in the consultation document on Modernising Scientific Careers<sup>14</sup> gives high prominence to promoting research and the Chief Scientific Officer has recently introduced a programme of NIHR-funded research fellowships for healthcare scientists.

The reality in NHS clinical biochemistry is very different. Clinical biochemistry underpins a large number of care pathways and the opportunities for collaborative research for consultants should be large and growing. However, as Section 3.2.2 reveals, consultants in clinical biochemistry are undertaking progressively less research because it is being squeezed out by the pressures of service delivery brought about by rapidly increasing workload. The situation is exacerbated by the lengthy delays involved in bringing new technology into service. This was highlighted in the Science Council's report on diagnostics,<sup>15</sup> and the Department of Health in its response<sup>9</sup> to the Carter Report<sup>8</sup> commits to the creation of a new diagnostics evaluation programme.

Clinical biochemistry contains consultants who are highly trained in science as applied to clinical medicine. They have the potential to play a major role in innovation, research and development and so help to deliver the Department of Health's new research strategy. They also have the skills to contribute to the new diagnostics evaluation programme that will help to deliver a modern, evidence-based clinical biochemistry service. In order to do this, additional consultant staff are required, including those who have research as a major part of their job plan.

**Recommendation:** *Professional bodies and other stakeholders in clinical biochemistry should promote the opportunities for innovation, research and development and encourage consultants to increase their activity in this area.*

## 4.6 Consultant staffing model

### 4.6.1 Relevance of consultant staffing model in 2008

In the 2002 document entitled *NHS Clinical Biochemistry: A profession under siege*,<sup>1</sup> a six-step model was devised, validated and published for determining the number of consultant staff in an NHS department of clinical biochemistry. Details of this model are reproduced in Appendix 2. As Section 3.3 makes clear, this model has been widely used by consultants in clinical biochemistry, who generally found it useful.

The Joint Project Working Group reviewed the appropriateness of this six-step consultant staffing model in the context of NHS clinical biochemistry in 2008. They concluded that the model is still relevant. In particular, they noted that the model anticipated:

- a continuing growth in workload
- the development of network departments
- the trend towards specialisation
- the increased role of medical consultants in direct patient care
- the need to sustain and develop research capacity.

**Recommendation:** *The six-step consultant staffing model is relevant to modern NHS clinical biochemistry and individual departments are recommended to employ it.*

Experience shows that in NHS clinical biochemistry an approximate ratio of one medical consultant to one consultant clinical scientist works well and this is confirmed by Section 3.1.3. The model cannot be used to distinguish between the merits of appointing a medical consultant or a consultant clinical scientist. This decision should be local, based on the role to be undertaken and the competences required.

**Recommendation:** *The decision on whether to employ a medical consultant or a consultant clinical scientist should be a local one, based on a careful needs assessment*

#### 4.6.2 Estimate of requirement for additional consultants

The survey reported in Section 3 of this document has demonstrated large rises in workload in clinical biochemistry, coupled with an increase in complexity. There has been no corresponding increase in consultant staffing, leading to a situation where existing consultants are struggling to cope and are having to select priority areas for work to the detriment of other areas (notably research and development).

Section 4 of the document outlines a large number of ongoing changes that are part of the evolution of NHS clinical biochemistry and that are in line with current Government health policy. Without exception, these changes necessitate greater input from consultants in clinical biochemistry.

The case for a significant increase in consultant clinical biochemists is, therefore, convincing and essential if clinical biochemistry is to play an effective role in delivering *High Quality Care for All*<sup>3</sup> and *Better Health, Better Care*.<sup>4</sup> The six-step consultant staffing model was designed for use at departmental level and its continued use is recommended.

Application of the model (see 4.6.1) at UK level can give an estimate of the number of additional consultants required in NHS clinical biochemistry. Based on the data presented in section 3 (after correction) to cover 100% of departments, it is estimated that an additional 150 consultants in clinical biochemistry are required.

However, despite over a 50% increase in workload without increasing consultant numbers, one has to take into account improvements in information technology, order communications and increased automation and review this number of 150 consultants.

In addition, implementation of pathology networks also has focused the working group to review this figure.

Based on all the relevant information, a figure of an additional 80 consultants is more realistic.

**Recommendation:** *The joint project working group estimates that there is a shortage of 80 consultants in NHS clinical biochemistry.*

The Joint Project Working Group suggests that the figure of 80 consultants in clinical biochemistry should be used as the basis for future workforce planning in the discipline. Given the time taken to train a consultant, there is an urgent need to address training numbers.

***Recommendation:*** Professional bodies and other stakeholders should give serious and urgent consideration to the shortage of consultants when undertaking workforce planning for NHS clinical biochemistry.

## 5 Appendices

### 5.1 Membership of the Joint Project Working Group

#### **Dr Danielle Freedman, Chair**

Consultant Chemical Pathologist and Medical Director, Luton & Dunstable NHS Trust  
Chair, RCPATH Specialty Advisory Committee on Clinical Biochemistry  
Vice-President of RCPATH

#### **Dr Graham Beastall**

Consultant Clinical Scientist, Department of Clinical Biochemistry, NHS Greater Glasgow and Clyde  
Past President of ACB and former Vice-President of RCPATH  
President, International Federation of Clinical Chemistry and Laboratory Medicine

#### **Dr Graham Groom**

Senior Administrator, ACB

#### **Dr John Kane**

Consultant Clinical Scientist, Department of Clinical Biochemistry, Hope Hospital, Salford  
Chair, ACB Workforce Committee

#### **Dr Ian Watson**

Consultant Clinical Scientist, Department of Clinical Biochemistry, University Hospitals Aintree, Liverpool  
President, ACB  
Member, RCPATH Specialty Advisory Committee on Clinical Biochemistry

The Joint Project Working Group acknowledges the support of the staff in the RCPATH and ACB, especially Fiona Addiscott of the RCPATH Workforce Department.

The Joint Project Working Group also acknowledges the contribution of the 277 consultants in clinical biochemistry who completed the survey.

### 5.2 Six-step model for determining consultant staffing in NHS clinical biochemistry<sup>1</sup>

1. Each department should have a minimum of 1.5 whole-time equivalent (wte) consultant staff.
2. Add 0.1 wte consultant for each increment of 25 000 requests per year above a baseline of 200 000.
3. Add 0.5 wte consultant for each department that operates from more than one substantial geographical site.
4. Add 0.5 wte consultant for each teaching hospital department, or for each children's hospital department, or for other departments that have a lead role in training medical or clinical scientist staff.
5. Add 0.15 wte consultant for each 3.5 hour session of direct clinical care above a baseline of 2 sessions per medical consultant.
6. Add 1.0 wte consultant to each department that contains a university professor of clinical biochemistry.

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