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Report of working group 2: Healthcare needs in the organisation and management of infection

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ABSTRACT

Clinical microbiology should have a physical presence, but not necessarily on-site diagnostic laboratory facilities, in each hospital to ensure a quality laboratory-based infection service and strong professional interaction with clinicians. The adoption of industrial practices and the introduction of new costly molecular techniques raise the possibility that non-microbiological functions of laboratory management could be left to management professionals. This remains highly controversial; the advantages must be contrasted with the potential to disrupt the traditional managerial responsibility of the microbiologist and the links between the laboratory and clinical staff. Managers and healthcare professionals must resolve this issue, perhaps with the support of the ESCMID. Views varied, according to current professional arrangements and size of the laboratory and population served, on whether there should be a common laboratory for microbiology and other pathology disciplines with joint access to new high-technology techniques, or whether microbiology must continue as a separate facility. Clinical microbiology and infection control were viewed as core services that must be present even in smaller hospitals. Larger community hospitals and teaching centres require a full complement of expertise in laboratory and clinical practice. Integration of these disciplines within a department of infection is an emerging concept. A concern was the shortfall in trained expertise because of the ageing nature of current specialists. The importance of recruiting talented new graduates was emphasised. The importance of this topic led to a recommendation that an ESCMID working party be established to investigate the current arrangements of infection services in Europe and to make recommendations for the future organisation.

Keywords Clinical microbiology, diagnostic laboratory, healthcare management, infection control, infectious diseases

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INTRODUCTION

The repertoire of infectious disease challenges is one of constant change. Established infections may undergo shifts in virulence or acquire new resistance mechanisms. The distinction between community- and hospital-acquired infections is also becoming blurred for pathogens such as methicillin-resistant *Staphylococcus aureus* and those producing extended-spectrum β -lactamases.

Infectious complications due to travel and migration have emphasised the reality of the 'global village', which has been compounded by the emergence of new zoonotic challenges, such as severe acute respiratory syndrome. Healthcare systems responsible for the diagnosis, management and prevention of infectious disease must therefore be capable of flexibility and adaptation if they are to be effective instruments in maintaining public health.

Within Europe, a variety of specialist infection services have been developed. These in part reflect the historical approaches to the management of infection, but also the different emphases regarding this management. In broad terms,

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specialist expertise is distributed between diagnostic microbiology, clinical services and public health organisations. These three complementary specialist groups have provided a framework that has functioned with varying success in different countries for the best part of a century. However, this diversity, which also extends to standardisation, accreditation and quality assurance, poses significant problems in building an integrated and international surveillance, alert and response system.

Another crucial factor in developing meaningful surveillance data is the nature and source of specimens. There is no effective substitute for regular sampling and surveillance of a wide range of clinical samples, especially from infections arising in the community. Regrettably, community-sourced specimens now account for the minority of samples referred to many diagnostic laboratories. Too often, 'outbreaks' are recognised once the more severely affected individuals are admitted to hospital. This provides a 'tip of the iceberg' view of the extent of a problem. 'Public health' microbiology is more than limited sampling of food and water as part of a quality control arrangement.

Currently, awareness of the threat from emerging and re-emerging infectious diseases, including drug-resistant microorganisms, is increasing among the public and governments and is being translated into increasing support for improving some functions of these professional services and encouraging closer collaboration of expertise in Europe. This means that surveillance and alert systems should be reviewed and the role of national reference laboratories strengthened if they are not only to meet these new challenges but also permit close collaboration with the new European Centre for Disease Control and Prevention.

The above issues are clearly relevant to an assessment of the current and a discussion of the future arrangements for the diagnosis, treatment and prevention of infection in Europe. This working group addressed the pivotal role of diagnostic microbiology and infectious disease services through a series of challenging questions. Diverse views were expressed that, in part, reflected the current practice and professional activities of the participants. Nonetheless, some general points of principle and some specific issues and recommendations emerged from these discussions.

WHAT IS THE ROLE OF THE CLINICAL MICROBIOLOGIST WITHIN AND BEYOND THE LABORATORY?

The practice of microbiology varies widely in Europe. Indeed, the multiplicity of terms, such as academic microbiology, medical microbiology, clinical microbiology and public health microbiology, attests to variation in emphasis and professional responsibilities. However, there is a clear need to distinguish between those involved in the practice of microbiology as it pertains to humans and those whose primary responsibility lies in other fields. In many countries, the terms medical microbiology and clinical microbiology are used interchangeably, although the former is sometimes used to distinguish academic medically focused microbiology from basic science microbiology.

With regard to the professional training and practice in clinical microbiology, a medical degree is considered essential in some countries, while in others science graduates have assumed responsibility for diagnostic services. In others, there is a close professional partnership between these two graduate streams. Indeed, reference laboratories employ a variety of graduate skills, reflecting the complex nature of these organisations, where clinical, professional, epidemiological, basic science, technical and communications expertise are key to an effective service.

Likewise, there is also diversity in the arrangements of diagnostic laboratories. Historically, most large teaching hospitals have had on-site laboratories which include separate clinical microbiology laboratories. In the case of smaller hospitals, these were sometimes, and are in some countries still, contained within a single biopathology laboratory. However, in recent years, there has been increasing centralisation of diagnostic services that support several hospitals. This concept is being further developed in some countries through the establishment of 'microbiology networks', in which the repertoire of diagnostic tests necessary for supporting patient care and addressing the public health functions within a large geographical region are shared among a number of contributing laboratories. This not only offers economy of scale, but also permits the establishment of automation and new diagnostics built around expensive new technologies.

In some countries, institutes of hygiene continue to operate, in which all microbiological samples are processed distant from any referring hospital or clinic. As a result of this variety of diagnostic laboratory models, it is inevitable that the nature of the professional interaction between clinicians and those responsible for processing specimens will differ between one that permits ready professional dialogue and one that primarily communicates through the medium of a report.

While there is much diversity between countries, which extends to variation between state-provided and privately run services, there was general support for the view that clinical microbiology should have a physical presence in each hospital to ensure not only a continued high-quality laboratory-based infection service but one in which there is strong professional interaction between clinicians and microbiologists. This may not necessarily demand on-site diagnostic laboratory facilities.

One specific question debated in this category was, 'What is the role of the microbiologist within the laboratory? Should they concentrate on the professional aspects of their role by overseeing the range of tests, their application and the interpretation of the results, but defer the managerial tasks of budgeting, administration and personnel management to other professionals?' The solution is by no means simple, and the views expressed reflected the size of the laboratory in terms of number of specimens processed, the number of staff employed, and the demographics of the population served. However, it is clear that health service managers are increasingly adopting industrial management practices, and this argues for deferring non-microbiological functions of laboratory management to such professionals, while the budgetary arrangements must be defended in order to support an effective service. This remains a highly controversial issue in many countries and requires an effective and equitable solution. Managers and healthcare professionals, through dialogue and education, must urgently work together to resolve this issue, perhaps with the support of an organisation such as the ESCMID.

Another fundamental question concerned whether the microbiologist should remain entirely laboratory-based and provide professional advice on diagnostic and therapeutic matters by electronic and telephonic means, or whether a phys-

ical presence within the clinical areas of the hospital should be encouraged and become the norm.

The latter practice has emerged as standard in a number of countries where clinical microbiologists are involved in consultation work concerning specific problems, as well as regularly attending high-risk units such as intensive care, burns and transplant units and those dealing with haematological and solid tumours. This clearly has advantages well beyond the simple provision of information on diagnostic samples and therapeutic questions, since it allows the medical training and professional expertise of the clinical microbiologist to be applied to reinforcing infection control policies and practice, facilitating medical education, and supporting or leading research projects. However, this style of practice is by no means universal, and a more traditional, entirely laboratory-based role continues in some centres and indeed in some countries, with few obvious advantages over the model described above.

One final question raised under this heading was the role of clinical microbiologists in contributing to multidisciplinary teams and committee activities within their institutions. The latter often include committees such as Infection Control, Drug and Therapeutics, and Antibiotic Policy and Management. There was universal agreement that the microbiologist plays a pivotal role in all these areas, and in many instances acted as chair and lead. There appeared to be few arguments why this should not be normal practice. In the case of the Quality of Care Committees, there was less recognition of the role and involvement of clinical microbiologists. In some countries, this is known as the Audit and Governance Committee, which is integral to the corporate performance of hospitals. Infection control is one of the key components of corporate governance and will continue to require strong professional support and leadership.

HOW TO APPLY NEW DIAGNOSTIC AND INFORMATION TECHNOLOGIES COST-EFFECTIVELY IN THE MICROBIOLOGY LABORATORY

Traditionally, diagnostic microbiology has been a relatively low-budget specialty built on generally simple technology compared to other disciplines

in pathology, such as clinical chemistry. However, the past 20 years have seen rapid advancements in the development and marketing of automated systems, as well as the development of molecular- and genetic-based diagnostics, many of which have technology common to all pathology disciplines, such as PCR-based systems.

Such technological advances in diagnostics, when complemented by electronic communication of results, will continue to improve patient management provided that they are cost-effective and clinically relevant, particularly in relation to turn-around time. They have clearly permitted faster recognition of infectious disease problems, increasingly support therapeutic interventions and facilitate the public health response. However, these technological developments are often expensive, and the increasing costs have in part driven arguments for increased centralisation of expensive technology. The advantages in terms of cost and volume, quality control and repertoire of tests must be contrasted with the potential to disrupt the traditional managerial responsibility of the microbiologist and the links between the laboratory and clinical staff. The speed of change is also an issue that requires better management in order to ensure that all players, notably microbiologists, other laboratory specialists, technologists, laboratory scientists and management, are all signed up and supportive of these initiatives within a human resource framework that encourages professional development and the best fit of skills. This issue is essentially an extension of the discussion of the need for a satisfactory solution to the professional-management interface referred to earlier.

A further extension of the debate over centralised microbiological services is whether there should be a common laboratory that services microbiology and other pathology disciplines that jointly access these new high-technology techniques, or whether microbiology should continue as a separate facility, with only the most expensive equipment being shared on a 'hotel' system. New methods such as DNA-chip, microarray or gel-free DNA sequencing are relevant to this. Again, views varied according to the current professional arrangements within the countries represented, as well as with the size of the laboratory and population served. However, lessons learned once again from industry clearly

support efficient use of expensive equipment, with some centralisation and shared costs, maintenance and replacement contracts. Where this arrangement emerges there will be an increasing need for microbiological training and competence to be integral to the operation of such centralised diagnostic facilities, which must retain a robust patient- and public health-focused operating policy.

HOW TO BEST INTEGRATE THE EXPERTISE OF MICROBIOLOGISTS, INFECTIOUS DISEASE SPECIALISTS AND INFECTION CONTROL SPECIALISTS IN THE MANAGEMENT OF INFECTION TO MEET THE SPECIFIC NEEDS OF DIFFERENT HEALTHCARE FACILITIES

The clinical management of infection is delivered through a variety of healthcare professionals. The arrangements differ by country but, in general, community-based infections are managed largely through primary care and will continue to be so. Hospital-based services include a repertoire of generalists and specialists. Organ-specific infections are frequently managed by such specialties as respiratory medicine (pulmonary tuberculosis) or gastroenterology/hepatology (hepatitis), while paediatricians generally provide overall management for childhood infections. However, there is a clear and rapidly advancing knowledge base relevant to the science and practice of infectious disease that supports the sustaining and development of a distinct specialty, namely that of infectious diseases. This specialty has evolved from a traditional role of caring for infections requiring isolation, such as diphtheria, polio and formerly smallpox. However, the focus is now on the 'compromised host', who is often subject to endogenous and hospital-acquired infection. Other populations include those with serious community problems requiring hospitalisation, as well as specific diseases such as HIV/AIDS, and increasingly hepatitis C, and those with imported problems resulting from international travel.

The number and distribution of infectious disease specialists varies widely within Europe. Some are largely linked to academic centres, where research teaching and clinical practice are closely interwoven. In other countries, district

general hospitals have specialists in infectious diseases, sometimes operating as part of the general medical service, and sometimes independently. The last few years have seen a dramatic increase in interest among medical graduates to pursue careers in infectious diseases. To meet this need, as well as the clinical service requirements, additional posts have been created within both academic and non-academic centres. In some countries there has been enthusiasm for hybrids who acquire joint training in microbiology and infectious diseases (see workshop 3).

The role and function of the clinical infectious disease specialists has at times been considered a threat to clinical microbiologists, in terms of both their laboratory expertise and their role in providing professional advice on clinical management of infections. However, in many centres, it is apparent that the training and expertise of the disciplines, while sharing a common core knowledge base, provides the basis for acquiring skills in laboratory and clinical practice that are complementary and both strengthen the use of diagnostic services and improve the quality of patient care. As a consequence, it was appropriate for the workshop to discuss this final question.

This topic clearly required consideration in relation not only to the availability of expertise in the various disciplines, but also to the size and nature of the hospital facility in which the disciplines might function. Smaller community-based hospitals may not need the full repertoire of expertise, although clinical microbiology and infection control were viewed as core services. Larger community hospitals and all teaching centres require a full complement of expertise in laboratory and clinical practice. What is important is to ensure that there are adequate staff numbers within the various disciplines to deliver on the diagnostic and clinical services. Integration of these disciplines within a department of infection is an emerging concept that has been further extended by proposals for infection centres, which might be regionally based. The latter could

not only provide integration of infectious disease and clinical microbiology services but also capture specialists in infection control/epidemiology, sexually transmitted disease, travel medicine and public health. Such departments and centres could provide an ideal arrangement for better meeting hospital, community and public health needs, with the added advantages for staff training and development, education of undergraduates and postgraduates, and research and development.

The arguments against such arrangements largely focused around the differences in education and training of infection specialists in some European countries and the way in which this creates difficulties for closer integration. Likewise, the fact that clinical microbiology is considered to be a sub-specialty of laboratory medicine (biopathology) in some countries (Belgium, Luxembourg and Portugal) may make such integration more difficult. One major concern was the significant shortfall in trained expertise, which is either currently critical in some countries or is likely to become so because of the advancing age of the current specialists. The importance of recruiting talented new graduates was emphasised, together with the need to better promote the career options in the infection disciplines. The recent expansion of the European Union may encourage movement of well-trained specialists from eastern and central European to western European countries, which may in part address this professional healthcare gap, but could create other problems.

The complexity and importance of this topic led to a recommendation that a working party be established under the aegis of the ESCMID to investigate the current arrangements of infection services in Europe and to make recommendations for the future organisation of services relevant to the diagnosis, management and prevention of infection. This should take into consideration the diverse historical, professional, cultural and economic backgrounds of the many European countries.