Hospital scientific and technical services : report of the Committee, 1967-68.

DEPARTMENT OF HEALTH AND SOCIAL SECURITY
SCOTTISH HOME AND HEALTH DEPARTMENT

Hospital Scientific and Technical Services

REPORT OF THE COMMITTEE
1967-68
Chairman: Sir Solly Zuckerman

LONDON
HER MAJESTY'S STATIONERY OFFICE
SEVEN SHILLINGS NET

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COMMITTEE ON HOSPITAL SCIENTIFIC AND TECHNICAL SERVICES

Members of the Committee

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Terms of Reference:

The Committee was set up in July 1967 with the following terms of reference: 'To consider the future organisation and development of hospital Scientific and Technical services in National Health Service hospitals and the broad pattern of staffing required and to make recommendations'.

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The Right Honourable William Ross, M.B.E., M.P., Secretary of State for Scotland.

The Right Honourable Kenneth Robinson, M.P., Minister of Health.

Gentlemen,

I beg to submit the Report of the Committee on Hospital Scientific and Technical Services which you set up under my Chairmanship in July 1967 'to consider the future organisation and development of hospital scientific and technical services in National Health Service hospitals and the broad pattern of staffing required and to make recommendations.'

The Committee first met in September 1967, but because of its great concern with the problem, and the readiness of all to provide evidence, it has been able to complete its work during the course of the year.

I should like to record the Committee's appreciation of the patient help given us by our Secretary, Mr. R. P. S. Hughes of the Ministry of Health. We are also much indebted to the other officials of the Ministry and the Scottish Home and Health Department who attended our meetings and, in particular, to Dr. R. H. Barrett. They helped us at every turn, while leaving us free to find our own way to the recommendations we have the honour of submitting.

S. ZUCKERMAN

29th August 1968

REPORT

PREAMBLE

0.1. The functions, organisation and structure of the hospital service are at present going through a phase of critical reappraisal, and we have been fortunate in being able to formulate our views about the hospital scientific and technical services in the context of certain important reports on other aspects of the service which have recently appeared.

0.2. Some of these enquiries have been mainly concerned with organisation and functions; others deal with staffing. Of more direct concern to us are the *First Reports of the English and Scottish Joint Working Parties on the Organisation of Medical Work in the Hospital Service*, on which consultations are being carried out within the Service, and the *Report of the Royal Commission on Medical Education* about which Ministers have not, at the time of writing, announced their decisions. We were also informed of the provisional conclusions of the *Committee of the Central Health Services Council on the Function of the District General Hospital*. Other reports of interest were the *Hunt Report* on supplies organisation and reports on the recruitment and training and the management structure of particular professions—such as the *Salmon Report* for the nursing profession and the *Lycett Green Report* for administrative and clerical staff.

0.3. The Minister of Health has now published, as a basis for public discussion and consultation with representative bodies, a Green Paper on *The Administrative Structure of the Medical and Related Services in England and Wales*. The Secretary of State has circulated some proposals on the same subject informally in Scotland and is, we understand, also going to publish a Green Paper. For obvious reasons our recommendations have to be formulated to suit the present administrative structure of the hospital service. But whatever new structure may be devised, the principles we set out should still apply. Present planning is based on the concept of the District General Hospital which will provide a comprehensive service (apart from regional and sub-regional specialties) for a population of the order of 150,000–200,000. Some district general hospitals with regional or sub-regional specialties will serve larger populations in respect of these specialties. In the case of scientific and technical services, while a considerable portion of the service must be provided at the district general hospital the advantages seem to us clear of organising the service over a much wider area with a regional scientific centre serving two or more district general hospitals.

0.4. Our terms of reference are wide. It seemed to us that our task was to take stock of the present position, to forecast the trends in the hospital scientific and technical services and see what implications these might have for future patterns of organisation and staffing; to consider whether a new organisation and structure would be advantageous, but if so, not necessarily to recommend how such a structure could be applied to each individual part of the present service. Our report is therefore comparatively short and schematic; we have deliberately refrained from setting out in detail what should constitute the Hospital Scientific Service which we in fact recommend, or exactly which grades of staff should be included and at which level they should be incorporated.

This is partly because we want the new system to be flexible, and partly because we are not competent in our constitution, or sufficiently well informed of the details of particular services and grades of staff, to make judgements of this kind. We saw our task as the establishment of a framework, on which further detailed work would be needed. If our main recommendations are accepted, we would expect that the Ministers, in consultation with staff interests and with the proposed new Scientific Councils, would set up working parties to advise on the planning of particular services and on the integration of the present classes of staff into a new structure.

0.5. We have been greatly helped by the large amount of written evidence which organisations and individuals have sent to us (see Appendix I). We are grateful to those who submitted evidence for giving their views so promptly. We found a very strong body of opinion throughout the hospital service, and the many other organisations which we consulted, in favour of an integrated scientific and technical service.

1. DEFINITION OF THE HOSPITAL SCIENTIFIC AND TECHNICAL SERVICES

1.1. We were asked to concern ourselves with the organisation of hospital scientific and technical services, and with the broad pattern of staffing. We have therefore to consider, on the one hand, the organisation and administration of that part of the hospital service which is concerned with the provision of scientific and technical services, and, on the other, the classes of staff who are principally concerned. There is a wide range of these services and a large number of classes of staff are employed in them. This report is written against the background of the information contained in Appendix II which describes the organisation of the services and Appendix III which sets out information on each of the classes of staff.

1.2. In a hospital there are several broad categories of professional staff. First there are the medical staff, most of whom are clinicians directly involved in the treatment and care of individual patients. Supporting services for these clinicians, based on a variety of scientific disciplines, are provided by other members of the medical staff, by science graduates, and by technicians. Broadly speaking it is with these services and the classes of staff who provide them that we are concerned. We recognise that medical staff working in scientific departments which provide these supporting services are generally employed in the appropriate medical grades. This arrangement should continue. Our consideration of staffing structure was therefore directed primarily to the classes normally filled by science graduates and technicians.

1.3. The clinical staff, in addition to the scientific and technical staff with whom we are concerned in this Report, are supported by the nurses who have the immediate care of patients under medical supervision, as well as by members of the remedial professions, e.g. physiotherapists, occupational therapists, remedial gymnasts and speech therapists, who are concerned with the rehabilitation of patients. We also distinguished from the scientific and technical staff the hospital engineering staff engaged on maintenance of plant and equipment.

1.4. We have found it difficult to reach a precise definition of the Hospital Scientific and Technical Services. We attempted to reach a definition in three ways, first by defining the *functions* to be carried out by a scientific and technical service, second by listing the relevant *scientific subjects* and *disciplines*, and third by categorising the *staff* who work in the service. None is wholly satisfactory.

1.5. We attempted a *functional* definition listing the activities as follows:

(i) The use of apparatus in collaboration with clinicians or on behalf of clinicians for diagnostic, therapeutic or research purposes, and the calibration, care and maintenance of such apparatus;

(ii) the development of new instruments and apparatus for use in patient care or in research;

(iii) the application of fundamental physical, chemical and biological research to medicine;

(iv) examination and analysis of body tissues and fluids;

(v) patient monitoring, measurement and recording, in association with clinical departments;

(vi) the application of statistics, data processing, and computers to medicine and medical research;

(vii) the development, construction and fitting of prosthetic appliances.

But whereas these activities are undoubtedly mainly the responsibility of the scientific and technical services they are not exclusively so, since nurses, for example, can be expected to use apparatus under the supervision of clinicians for therapeutic purposes.

1.6 The main *scientific subjects* involved at present are clinical biochemistry, haematology, medical microbiology, morbid anatomy and histopathology, physics and physiology, but this again fails as a complete definition because other subjects are brought in to a greater or lesser extent.

1.7. It was clear that some groups of *staff* are providing a hospital scientific and technical service, for example physicists and biochemists, and medical laboratory technicians. But there are also about 30 other groups which might be considered. We feel obliged to leave a decision on certain groups to the Health Departments in consultation with staff interests. Suffice it to say that only by an arbitrary and perhaps unsatisfactory categorisation could we define the service by the staff, as at present classified, who provide it.

1.8. Each of our three attempts to define the service has revealed a kernel which is clearly within the definition of a scientific and technical service and a shell of varying thickness, where categorisation is more uncertain. This is of course what one might expect, *a priori*, in an organisation as complex as a modern hospital. We could formulate a precise definition within which our study should be confined, but this, if followed through into our recommendations, might result in a rigid demarcation of the future service which could thus become ossified and unable to adapt to new developments. This would merely perpetuate what we see as a real deficiency in the present system. We therefore decided not to define too closely the concept of scientific and technical services. But the main element in them is clear.

1.9. We reached the conclusion that however we defined the hospital scientific service, for clinical, scientific and administrative reasons, it would need to be organised so that medically qualified as well as non-medically qualified graduate staff would be working in it. Such medically qualified persons would come within the broad category of 'clinicians', but we also think that some medically qualified individuals may wish to work wholly as scientists. We are strongly of the view that there is an increasing need for first class medical and non-medical scientists in the National Health Service hospitals. If they are to be attracted the scientific services must be organised in such a way that they provide ample opportunities for research.

1.10. When we refer to a 'scientific service' in this report we mean this to include 'scientific and technical services'. We include in the term 'scientists' applied scientists and engineers, whether medically qualified or not.

2. MAIN POINTS IN THE EVIDENCE PRESENTED TO THE COMMITTEE

2.1. In answer to our enquiries we received much evidence about the adequacy or otherwise of the present scientific service. We also sought views on the future organisation and staffing. We were much impressed by the weight of opinion in favour of a career structure for the non-medical scientists and technicians similar to that provided by the Scientific Civil Service or Medical Research Council. It was also generally recognised that centralisation of services was tending to become more necessary in the interests of efficiency, in view of the increasing cost and sophistication of equipment and the greater application of scientific techniques.

2.2. The evidence revealed a general belief that, despite its recent considerable expansion, the present service is still inadequate in scope, personnel, equipment, accommodation and organisation. We received a number of views on likely developments in the laboratory and scientific service. The chief trends expected by those we consulted were the spread of automation (in particular in biochemistry haematology and microbiology), the development of engineering technology and instrumentation in medical physics, and the application of computer techniques to medical practice. Some examples of growing points mentioned to us were immunology (including immunochemistry), virology, endocrinology and genetics.

2.3. Although there were a few dissenting voices, there was a mass of opinion in favour of a more centralised organisation of scientific services both within hospitals and between hospitals. It was said that some services ought to remain in every district general hospital to give ease of access for, and to, the patient, and to enable clinicians to obtain ready advice and service. It was said that, in principle, specialties should not themselves be needlessly fragmented, as is the case with satellite X-ray departments or isolated biochemists employed in clinical units; but it was also recognised that there might be rare exceptions to this, especially in academic units. Many papers recommend a grouped department of 'clinical science', 'technological services', 'medical science', or 'physical science'; others favoured a grouping of physiological services in a department of 'clinical measurement'. There were few who disagreed with the view that there should be a central pool of scientific and technical staff who could, if necessary, be seconded from time to time for varying periods to a clinical team when required, rather than be permanently established in a clinical unit. Exclusive attachments to a clinical unit were said to result in the people concerned getting out of touch with the main stream of scientific developments, the service might have to depend on one individual, and the units were inadequately equipped or the equipment under-utilised. One view expressed was that new departments tend to be started by clinicians when diagnostic departments failed to supply their needs. There were several comments on the advantages to be gained from having non-medical scientists working in departments and specialties where they are seldom found at present, e.g. in the intensive care units, the diagnostic X-ray department, in haematology and microbiology.

2.4. In considering organisation *between hospitals* many papers put forward scientific 'specialties' which should be considered for regional organisation and regional centres—examples are neuropathology, some serology, automated chemical analysis, exfoliative cytology, neurophysiology, maintenance of electronic equipment, medical physics, nuclear medicine, respiratory physiology, and computer programming. Several submissions proposed multidisciplinary regional departments of medical science. There was some discussion whether biochemistry should be organised separately from morbid anatomy and histopathology, microbiology and haematology and whether biochemistry should be in the same organisation as medical physics.

2.5. There was strong support, both from medical and non-medical organisations, for the view that the relationship between the clinician and the non-medically qualified scientist should be one of collaboration, that senior scientists should have comparable status to consultant medical staff, and that they should be members of the appropriate hospital advisory committees.

2.6. The need for better opportunities and facilities for post-graduate training of non-medical scientists was frequently put to us. Other training needs mentioned were outline instructions in clinical methods, management techniques and refresher courses.

2.7. Many bodies providing written evidence considered the present staffing pattern for the non-medical scientist, which has grown up haphazardly, to be wasteful of scientific time, equipment and money. The consensus was that a structure similar to the Scientific Civil Service, with entry at Scientific Officer level for graduates with first or second class honours degrees, was the most appropriate for the hospital scientific service. The Medical Research Council staff structure was also commended, and the value of comparability was emphasised in permitting easy interchangeability of staff. The desirability of movement between University, Medical Research Council and National Health Service posts was mentioned. There was some difference of opinion as to whether all scientific staff should be appointed by Regional Hospital Boards, or whether only the senior staff should be, but it was generally agreed that the present system required some alteration.

2.8. The present multiplicity of classes of technicians was severely criticised. Simplification was recommended. The lack of an equivalent of the Experimental Officer in the Scientific Civil Service was emphasised. The development of a more versatile type of technician who could move easily from one department to another was advocated in a number of papers. Emphasis was laid upon the importance of continuous training and re-training of technicians in order to encourage them to keep abreast of changing techniques. It was suggested that when training of technical staff was under the influence of a professional body or staff association, it tended to be rigid, and to reflect the ambitions of the body concerned to advance its own status rather than a desire to meet the real needs of the service. The influence of 'state registration' in bringing order into the Professions Supplementary to Medicine was mentioned, and there were proposals that other classes of technicians should be assimilated to the present Medical

Laboratory Technician staffing structure. But several submissions severely criticised the rigidity of the present application of the 'state registration' provisions in preventing both the employment of new skills in a rapidly expanding field and the modification of training schedules to meet changing needs, and in not allowing for greater depth of training where this was desirable in specialised fields of medical laboratory technology. The most frequent distinction drawn between different classes of non-graduate staff was between technicians responsible for instrumentation, laboratory tests and maintenance of electronic equipment, and those who had close contact with patients, e.g. radiographers.

2.9. We received much evidence in favour of establishing a new class of staff to be known as 'technical aides', who would carry out simple duties and for whom training would be practical, and for whom no formal qualifications would be required.

2.10. It was alleged that scientific services did not always get their proper share of finance because of other competing demands for finance at local level.

2.11. Hospital authorities mentioned the lack of guidance and of generally acceptable yardsticks by which requests for additional staff for scientific services could be measured.

2.12. There was also a good deal of evidence relating to the possible inclusion of particular specialties and types of staff in the scientific and technical services; for example we were informed that the task of the clinical psychologist is to apply the principles of the science for the assistance of clinicians in the care and treatment of patients, and it was proposed that they should be included. We were given evidence about, amongst others, the contribution made by dietitians, orthoptists, pharmacists and radiographers. We also received evidence from engineering organisations on the place of the engineer in the hospital scientific services.

3. GENERAL COMMENTS ON THE PRESENT SITUATION

3.1. In recent years there has been an unco-ordinated growth in the size and nature of scientific services within hospitals. This growth primarily reflects a demand which emanates in the first instance from clinical staff, although sometimes it has been generated by the scientific staff themselves. Some of the growth has been due to fashion. Consultant clinicians do not always supervise the requests for laboratory and other scientific investigations, and occasionally diagnostic tests may be demanded unnecessarily. At the same time some scientific departments have not always been able to carry out the investigations needed. Growth has usually occurred in accordance with local interests and has been unequal over the country; hence the unco-ordinated nature of the service today.

3.2. The scientific service in hospitals tends to be fragmented; the staff, who are classified in a large number of rigid grades (and this brings with it a lack of flexibility), sometimes work in isolation. The various disciplines have not been

pulled together, and the service, because of its lack of planned organisation, fails to provide good career prospects for all its staff. Furthermore, graduate non-medical scientists who work in hospitals do not in general enjoy the opportunities for remuneration comparable to those of their clinical colleagues.

3.3. All this recent growth has been taking place without any clear recognition of the fact that scientists and technicians are in short supply. Unless the growth of the hospital scientific service becomes better organised than it is now, many hospitals will continue dissatisfied with the services which can be provided. At the same time, scarce resources will be used uneconomically, and unnecessary competition with other sectors of national endeavour will be generated.

3.4. The number of staff employed in these services is now about 27,000. The numbers in the main categories are shown in Table I. A net increase of over 100 per cent in the past 10 years, which has occurred, is high by any standard, but there are still shortages, and it is not easy to be clear about the true need at the present time, still less to predict future needs.

TABLE 1

Number of Staff in post in the National Health Service (England, Wales and Scotland) whole-time equivalents

	1957	*1962*	*1967*
Medical staff in pathology	866*	1,540	1882
Biochemists	220	315	519
Physicists	116	186	294
Psychologists	153	231	336
Pharmacists	1,473	1,650	1,636
Dietitians	210	222	322
Medical laboratory technicians	2,942	6,922	9,658
Orthoptists	218	235	278
Radiographers	3,578	3,893	4,913
Audiology technicians	—	259	287
Cardiology technicians	270	411	676
Dark Room technicians	876	1,155	1,204
Dental technicians	261	337	381
E.E.G. technicians	92	137	226
Medical photographers	128	167	241
Physics technicians	125	236	409
Pharmacy technicians	—	1,255	1,593

*Consultants and Senior Registrars only.

3.5. In addition to the numbers of staff given in Table I, university departments make a significant contribution to the National Health Service. For example some 15–20 per cent (in whole-time equivalents) of the biochemists and physicists working for the National Health Service are employed by Universities.

3.6. The grades are essentially the same as those taken over by the National Health Service in 1948, with some additions to the technical grades. The impact of full employment, of better education, of changes in social background, and of the increased employment of women since the last war, and the need for the National Health Service to establish recognisable careers in addition to those long established in medicine and nursing, must be taken into account in proposals for revision.

3.7. In this section of our Report, we describe some of the salient features of the present organisation as we see it, and comment on the trends. These are more fully documented in Appendices II and III.

3.8. We treat the present arrangements briefly in three main sections, *pathology* with immunology and other biological sciences, *medical physics* with nuclear medicine and biomedical engineering, and *applied physiology* including clinical measurement. As we have explained, this is not a comprehensive description. The grouping is a convenient way of looking at the present system since these three sections show differing characteristics.

3.9. *The pathology service* is well established. Apart from the rapid increase in staff, necessitated by an even more rapid increase in the demand made on the service, the most noticeable feature of recent years has been the increasing development of expensive and complicated automatic equipment, which in itself calls for more centralisation. We expect these trends to accelerate. The number of non-medical graduates in biochemistry has been increasing. We expect it to increase further, and also that more non-medical scientists will enter other branches of laboratory medicine. The universities, particularly in Scotland, make a large contribution to this service.

3.10. Outside the teaching hospitals and their associated university departments *medical physics* is well developed in only a few regions and the services are unevenly distributed geographically. The graduate staff are almost entirely non-medical, and while there is a class of Medical Physics Technician, there are other classes of technician in the hospital service performing functions in support of various clinical specialties which have a similar scientific basis.

3.11. The integration of aspects of *applied physiology* in departments of clinical measurement is a recent development which is found in only a few hospitals, although the constituent parts are available in specialised departments of other hospitals (e.g. respiratory units, neurology departments, haemodialysis units and cardiology units). There are at present very few non-medical graduates working specifically in this field, and the work tends to be directed and supervised by the clinicians in the various specialties. Different classes of technician have been brought into existence to serve each specialty, each class being small in numbers and having different terms and conditions of service and limited career prospects.

3.12. Apart from the pathology element, the present system, with exceptions in some regions, is primitive and unco-ordinated. It is a restrictive and exclusive arrangement in the sense that when a new development is introduced, existing departments and existing grades of staff tend neither to be ready nor able to

include it within their framework. New departments may then be formed in isolation, often in improvised accommodation, with new technical classes. Many of the difficulties which hospitals have experienced in staffing their technical departments are attributable to this shortcoming.

3.13. In some cases a non-medical scientist, if employed exclusively in a single clinical department within a hospital, may not be able to contribute to the general medical work of the hospital to the full extent of his capacity. This is unfortunate. It is important that all branches of medicine should take full advantage of the contribution which biochemists, physicists, engineers and other scientists can make both severally and jointly. When the work of such a scientist is carried on separately from that of scientists in other relevant disciplines, or from that of clinicians, his full potential is not realised. Research and development, particularly in the field of equipment and instrumentation, is hampered, and effort is duplicated through lack of communication. Given the wider scientific environment, as now exists in some hospital centres, the scientific contribution of the non-medical graduate is every bit as vital as the scientific contribution of the medical graduate. And there should always be scope for the graduate scientist to carry out research in his department.

3.14. We are not concerned in this report with levels of pay, and we make no recommendations on this subject. However, it is clear to us that the present status of the non-medically qualified graduate scientist is often subordinate to that of the doctor, even where their professional responsibilities imply a comparable standing. This has led to a shortage of high quality graduate scientists in the hospital service, a situation which has been made worse by the fact that administrative and scientific control of laboratories has seldom been given to non-medical scientists. The low average level of entry qualifications and the often dull routine tasks some scientists are expected to undertake have also led to the hospital service providing less satisfactory terms and conditions of service at higher levels than other comparable avenues of employment open to science graduates.

3.15. Non-medical graduates who take up posts in the National Health Service find little difficulty in adjusting to medical work. It is on good class honours graduates, who are in short supply, that the National Health Service must mainly rely for much of its basic scientific advancement in association with the Universities, and here the need for men and women of the highest intellect is vital. The non-medically qualified scientist is going to be increasingly responsible for the organisation and provision of scientific services, for introducing new ideas and techniques and for training in his field.

3.16. When a new development takes place, staff with the requisite technical experience may not be available either because there is no well developed scientific department in the hospital, or because the technical staff of other departments have been trained only for some particular purpose. Nor is there, as a rule, any administrative arrangement for re-allocating existing staff according to the changing needs of the specialties. As a result new technical occupations, each with its own limited and specialised training and function, come into being as new developments in medicine occur.

3.17. It is inevitable that within departments there will be some degree of specialisation, but this need not be incompatible with the development of a more broadly trained and more versatile class of technician. The whole range of hospital technical work could not be undertaken by a single class of technician, but it should be possible for most of it to be covered by two or three classes in place of the present multiplicity of separate occupations. Such a re-organisation would both provide a better technical service, and offer wider experience and more attractive career prospects for the technician.

3.18. There are considerable variations in the training arrangements from class to class. The basic training of technicians ranges from three years' full-time training before entering employment, or five years' part-time training whilst in employment, to little or no formal training at all. In some specialties the medical profession has played an active part in the promotion of training, while in others it has been left to the initiative of the technicians themselves, through the formation of staff associations which devise courses of training and award their own qualifications. In the case of medical laboratory technicians, radiographers, dietitians and orthoptists, training is now regulated under the Professions Supplementary to Medicine Act. In recent years the Health Departments, in collaboration with the medical profession, have recommended to hospital authorities schemes of in-service training for certain classes of technician. In very few cases has there been any systematic examination of functions in order to determine the content and form of training required. The general experience is that the establishment of a suitable training scheme follows long after the technical function for which it is required has developed. Further training and advanced qualifications are available in only a few of the classes, and there are no general arrangements by the hospital service for retraining or reorientation to meet changing needs.

3.19. Under the Professions Supplementary to Medicine Act, 1960, responsibility for approval of courses of training, training institutions and qualifications for, amongst other professions, radiographers, medical laboratory technicians, orthoptists and dietitians was placed on the appropriate Registration Boards, the Council for the Professions Supplementary to Medicine undertaking a co-ordinating role. The 1960 Act, together with Regulations made under the National Health Service Act, 1946, which required hospital authorities to employ only registered staff in the appropriate capacities, has given a degree of independent status to these professions in formulating professional standards and qualifications. It was obviously important for us to assess the effect of these provisions on the standard of training achieved, the suitability and flexibility of the requirements laid down for these professions, and their effect on the recruitment of suitably experienced staff from outside the National Health Service, particularly from industry.

3.20 The management, operation and servicing of sophisticated equipment, whether in the laboratory, operating theatre or wards, is a scientific and technical function. At present, because of the lack of the necessary scientific and technical service, these tasks often fall to clinicians and nurses, diverting them from the exercise of their proper duties. The deployment of such equipment and, even

more, its operation, should not have to be the concern of the clinician. Moreover the present fragmentation of the scientific services is uneconomic not only in the use of manpower (both technical and scientific), but also in the use of accommodation and of equipment which may be duplicated, under-used or not freely available to all departments. These defects emphasise the need for a continuing study of the organisation, staffing requirements and accommodation of scientific services by which hospital authorities might be guided in their planning policies. There have been some studies of certain services such as pathology and central sterile supply departments, which have influenced the planning of new hospitals. But the scientific and technical services as a whole have not been studied from this point of view.

4. SOME GUIDE LINES

4.1. We considered and weighed the evidence put to us, the salient features of which are given in Section 2. In doing so we agreed certain guide lines which we used when formulating the recommendations we make in later sections.

4.2. First we believe that team work needs to be encouraged and recognised in hospital organisation and practice. Clinical practice increasingly means the interplay of several disciplines, with the clinician remaining ultimately responsible for the patient. But support for the clinician by scientists in charge of teams of technicians should, wherever appropriate, replace direct support for the clinicians by narrowly specialised technicians.

4.3. The non-medically qualified hospital scientist should be recognised as a person who has responsibilities in collaboration with his medically qualified colleagues: there are functions which he is the most appropriate person to perform, and he makes his own special contribution in research and development in his own field.

4.4. The profession of hospital non-medically qualified scientist should have a suitable management and staffing structure. A fully integrated staffing structure implies some measure of unified operational organisation and planning, so that staff management and career planning can be achieved.

4.5. We strongly favour, both for operation, organisation and planning and for the classification and training of staff, an 'inclusive' system, i.e. one which permits a new development to be introduced without the generation of a new department or a new *ad hoc* grade of staff. Whilst specialisation is not inhibited by such a system, flexibility is achieved. The functional grouping of small departments and small groups of staff in a large organisation should often lead to greater efficiency and to a better use of resources whether of manpower, equipment or accommodation.

4.6. It will not be possible within the district general hospital, or in the average hospital group, to employ enough whole-time scientists and technicians either to provide for the full range of services required for the clinical departments or to offer the scientists and technicians concerned the opportunities of a wide and

enriching experience. A staffing organisation is required at the regional or national level for these purposes, as well as for the efficient deployment of highly trained staff, and to provide adequate career, promotion and training prospects. Similar considerations apply to the supply, utilisation and maintenance of equipment.

4.7. Scientific and technical services are so closely associated with medical, nursing and other hospital services that, while they need to be planned, and in some cases provided, on a scale larger than that of the hospital group, the organisation required for this purpose should be within the administrative organisation of the hospital service and not separate from it.

4.8. The growing number of posts in some scientific specialties where medical and non-medical graduates are interchangeable, together with the necessity for some posts in scientific departments to be occupied by medically qualified graduates, is a further pointer to the need for a scientific service which includes both medical and non-medically qualified personnel.

4.9. Responsibility for determining policy on recruitment and post-entry training of staff should rest with the hospital service, subject to the Health Departments' general guidance. Entry requirements should normally be aligned, as far as possible, to accepted national educational standards.

4.10. There should be national planning of the service, and the organisation must provide channels of communication for this. At the national level this would require arrangements for interchange of information on prospective developments between the Departments and hospital authorities, and for advising the Health Departments on the allocation of national resources, including manpower.

4.11. It is important that medically qualified and non-medically qualified scientists in the hospital service should have terms and conditions of service no less favourable than similar staff with comparable duties and responsibilities elsewhere in the public services. The terms and conditions of service of medically qualified scientists should be in accordance with those of National Health Service hospital medical staff, and the grading structure for non-medically qualified scientists should include provision for higher grades comparable with the higher grades in the Scientific Civil Service, where appropriate to their duties and responsibilities. Allocation of scientific posts of this senior level should be controlled by the Health Departments, as in the case with senior clinical posts.

5. A HOSPITAL SCIENTIFIC SERVICE

5.1. We recommend that certain specialties should be recognised as forming the basis of a Hospital Scientific Service which, while remaining an integral part of the whole hospital service, would be subject to special administrative and organisational arrangements to be described later in our report.

5.2. We recommend that the Hospital Scientific Service should be so designed that it incorporates for organisational and planning purposes the main scientific departments in which scientists, medical and non-medical, are employed. Many of the senior staff in a department, and in some cases all, might, as we have already said, be medical graduates with clinical responsibilities and paid as hospital medical staff.

5.3. At the outset the Service should include the following specialties (without prejudice to the addition of others): viz. Clinical Biochemistry, Computer Science and Statistics, Genetics, Haematology and Blood Transfusion, Immunology, Medical Microbiology, Morbid Anatomy and Histopathology, Physics with Biomedical Engineering, Nuclear Medicine and Physiological Measurement.

5.4. We suggest that radiologists should continue to form part of the hospital clinical services, but we recommend that the technical staff, such as radiographers and darkroom technicians, and the technical staff of other clinical departments not in the Scientific Service, such as cardiology and dental surgery, be assimilated to the new staffing structure. Career planning in consultation with the heads of the departments should be the responsibility of the Scientific Service. Scientific supervision of the equipment of these departments should also be the responsibility of the Scientific Service in association with medical colleagues.

5.5. The professional staff in the Hospital Scientific Service should have two career structures. The medical staff should normally remain, as at present, in the hospital medical staff structure. Science graduates should follow the new parallel scientific staff structure which we recommend on the lines of the scheme in Table 2. This would provide a staffing structure comprising four broad functional levels or classes, distinguished by their levels of responsibility and the training and qualifications normally required. It should be possible for medically qualified staff to join the scientific career structure at the relevant level, subject to appropriate qualifications and experience. We would expect there to be some overlapping of the classes.

5.6. Although there will be only one designation of each class, the 'specialty' of the staff, e.g. physicist, biochemist can still be recognised as in the Scientific Civil Service and, subject to our recommendations in paragraph 7.4. on the reclassification of technical functions, the professions need not lose their identity.

5.7. There should as far as possible be common initial training for technicians and the maximum flexibility of function. All members of a class should be eligible on merit for supervisory posts, and we envisage posts with managerial responsibility which would be open to personnel of any scientific or technological discipline relevant to hospital work, and for which there would be appropriate education and training.

5.8. We describe our detailed recommendations later on. It remains in this section to comment briefly on certain aspects of the scope of the Scientific Service. Certain of the present classes of staff are essentially scientific and technical and we recommend they should be included in the new scientific career

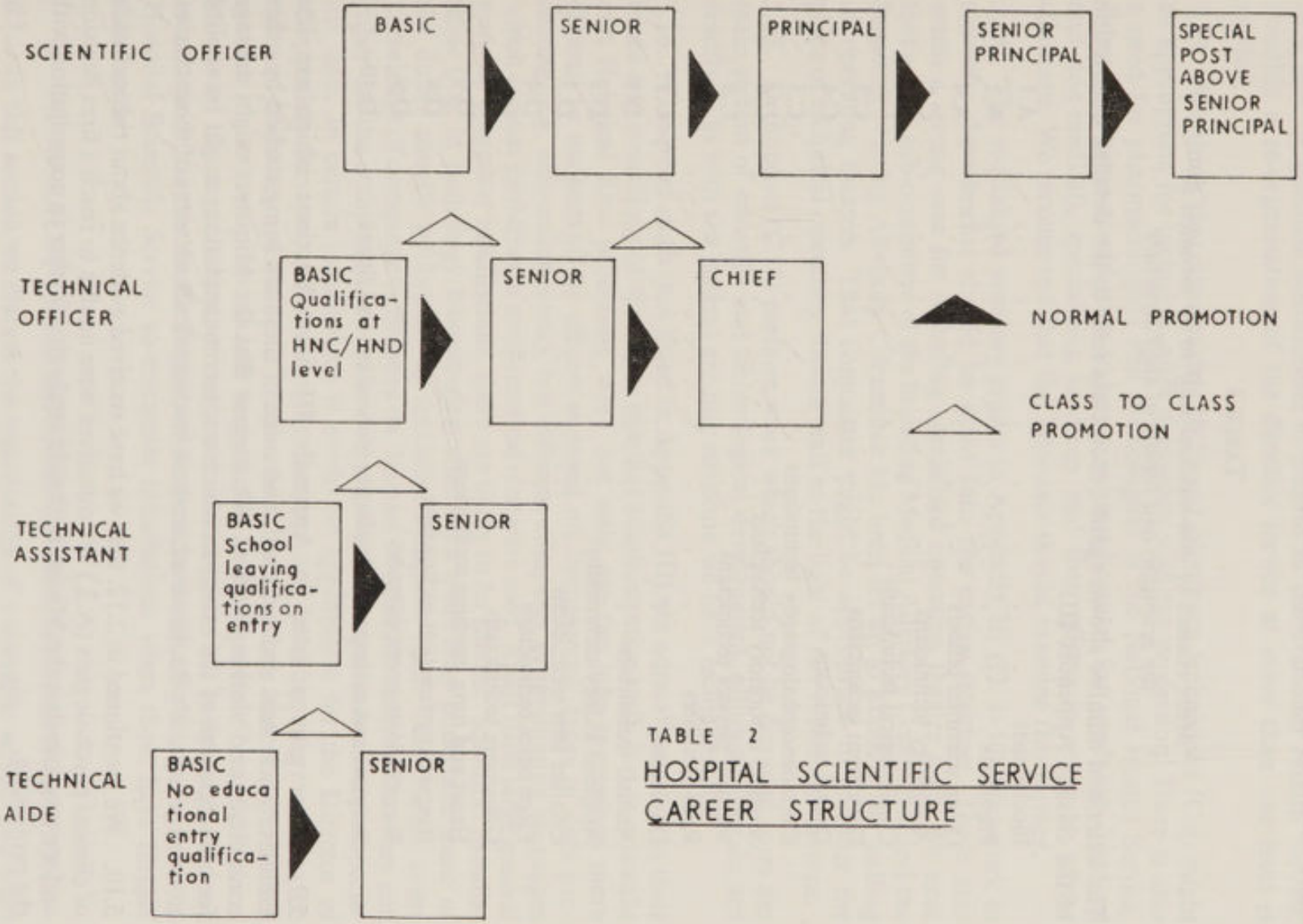

TABLE 2

HOSPITAL SCIENTIFIC SERVICE
CAREER STRUCTURE

structure, but we leave the method and level of incorporation to be decided by Ministers in consultation with staff interests. The classes are listed in Table 3; more details of each are given in Appendix III.

TABLE 3

Main classes of non-medical staff to be included in the scientific and technical staff structure

The letter and number shown against each class refer to the detailed description of the class in Appendix III.

Biochemists	A.1
Physicists	A.2
Other scientific officers	A.4
Audiology technicians	C.1
Cardiological technicians	C.2
Darkroom technicians	C.3
Dental technicians	C.4
Electroencephalography technicians	C.5
Medical laboratory technicians	C.6
Medical physics technicians	C.8
Radiographers	C.10
Dietitians	C.11
Animal technicians	D.1
Artificial kidney technicians	D.2
Contact lens technicians	D.3
Electronics technicians	D.4
Glaucoma technicians	D.5
Heart and lung machine technicians	D.6
Respiratory function technicians	D.8
Surgical instrument curators	D.9
Surgical and orthopaedic appliance technicians and fitters	D.10

5.9. Other groups listed in Appendix III have functions which are less exclusively scientific and technical, and some of these are being studied by other committees and working parties. We suggest that the Ministers might arrange for consideration of the extent to which our recommendations might be applied to these groups. We do, however, make a few comments on some of these classes.

5.10. We mentioned in 2.12. that we have received evidence about the inclusion of clinical psychologists (A.3.) We ourselves were unable to reach a firm decision and we propose that the Ministers should study this further in consultation with the profession.

5.11. We think that it would be appropriate to include departments of medical illustration in the Scientific Service, and that medical artists (D.7) and photographers (C.7) should enjoy the benefits of its career structure.

5.12. We consider that dietitians (C.11) should find a place in the Hospital Scientific Service, and we have included them in Table 3. We received evidence of a lack of graduate nutritionists at present in the National Health Service. Possibly a re-organisation of the dietetics service at more than one level is needed.

5.13. We think that pharmacists (B.1) and pharmacy technicians (C.9) might be appropriate for inclusion, after discussion with the profession. There is also a need for pharmacologists and toxicologists in the National Health Service. *Prima facie* there would seem to be a need in a hospital for graduates (medical and non-medical), specialising in drugs and their effects in order to advise clinicians. We recommend that the Ministers should examine this further.

5.14. The specialised ancillary grades in Appendix III (D. 1–10) who work in scientific departments should be fitted into the career structure. There also seems a strong case for including specialised operating theatre staff. We note that a joint sub-committee of the Standing Medical Advisory Committee and the Standing Nursing Advisory Committee has been set up to examine the staffing of operating theatres. That committee might be appropriate to consider the place of technical operating theatre staff in the light of our recommendations.

5.15. Orthoptists (C.12) perform work which should not be divorced from the main stream of scientific and technological development, although they do not readily fit in with the general grading structure we have recommended.

5.16. Computer staffs (not listed in Appendix III) are normally related in their terms and conditions of service to hospital administrative staff. But in scientific and technical data processing work not only are the jobs themselves more difficult to understand by officers engaged on 'commercial' types of data processing (e.g. accounting work), but different computer programming languages which express problems in mathematical terms are used. Apart from large general purpose computer installations, there are likely to be smaller 'scientific' installations (e.g. in pathology laboratories) where the users may undertake some of the duties usually performed by specialist computer staff. This implies some knowledge of computer techniques on the part of scientific staff, so that they can either use the computer themselves or transmit their requirements to the specialist staff. In certain installations it would be appropriate for the Director of Computing Services and for Project Leaders and possibly other staff to be science graduates (probably in mathematics or physics), and it would seem sensible that these posts should be included in the Hospital Scientific Service. However, the organisation of computer services is at an early stage, and we recommend that the Health Departments consider further the relationship of the Hospital Scientific Service to computer installations when these have further developed.

6. PROPOSALS FOR ADMINISTRATION AND ORGANISATION

6.1. In this section we discuss the organisation of a scientific service and what seem to us the consequential changes necessary at the various administrative levels. In making our recommendations we have in mind that we wish to see the Scientific Service organised in a coherent way so as to provide (*a*) a means whereby the growth of the service can be properly planned; (*b*) measures to

secure adequate career planning and training of scientific staff; (*c*) the availability of scientific advice to all levels where planning and management functions are carried out and (*d*) the same financial control for scientific services and developments as for other parts of the hospital service.

6.2.1. *Functions of the Health Departments.* The function of the Ministry of Health and the Scottish Home and Health Department in respect of the proposed Scientific Service should be to encourage efficient, economical and orderly development, within the available resources of manpower and money. The two Health Departments should be responsible for keeping in touch with other national scientific organisations and with industry concerned with medical equipment. We consider that both will need, in order to carry out the functions which we put forward, improved arrangements for obtaining advice on scientific subjects. We recommend that to this end each should consider the appointment of a chief scientist with the requisite experience.

6.2.2. *Planning and Priorities.* Information about medical scientific developments is disseminated through the medical and technical press and by professional organisations. On the basis of their own research programme and information obtained from other sources such as the universities and the Medical Research Council, the Health Departments should assess and bring to the notice of hospital authorities, and generally facilitate, the introduction of new medical scientific developments where these are desirable in the national interest. It is also important that the Departments should keep in touch with all scientific and technical research departments whose work is relevant to medicine and hospital practice. We were urged to consider the establishment of more national reference centres on the pattern of the Bio-mechanical Research and Development Unit at Roehampton or the Blood Group Reference Laboratory at the Lister Institute, and we agree that in certain cases these might be set up.

6.2.3. While in the early stages new developments might be assisted by grants from central funds available for the hospital service, the normal system should be for Regional Hospital Boards (in England and Wales in association with Boards of Governors) to assess local priorities within the finances made available to them and in the light of advice given by the Health Departments. We think it most important that the advice given should cover the implications of scientific and technical developments for medical practice and should include a recommended pattern of development. Information should also flow in the opposite direction. Hospital authorities will need to inform the Health Departments of their projected developments so that funds available for the hospital service can be distributed and scientific manpower used as equitably as possible, and so that planning of scientific manpower can be undertaken at the national level. The Departments should also give advice (which might need to be adapted to fit local circumstances) about the level of organisation of services, about the planning of accommodation, about staffing requirements and about the scale of equipment.

6.2.4. *Resources for Research and Development.* As we have already emphasised the Hospital Scientific Service will not attract first class scientists unless it provides them with adequate opportunities for advancing their subjects through

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responsible for planning the scientific services of the region, including the provision of regional centres, accommodation and the larger items of equipment. We were given much evidence in favour of more centralisation and we note that in Scotland Regional Hospital Boards already have considerable responsibilities for the laboratory services and for physics. In England and Wales they are already responsible for the Blood Transfusion Service, and some Boards also provide a physics service. We take the view that the present trends in hospital scientific services in matters such as increasing specialisation of staff, more complex training requirements, and the efficient use of expensive and sophisticated equipment, point towards the need for the organisation of these services on as large a scale as is practicable. We would distinguish between the physical *location* of these services, most of which will continue to be provided in hospitals as at present, and the *organisation* of scientific services.

6.3.2. Specialised regional scientific units may need to be in different hospitals of the region (as occurs in the case of clinical services), but we think that most regions would find it an advantage to designate a regional scientific centre which should be in a hospital, and not on an isolated site. Such a centre would also provide the scientific services of that hospital. It should be a multi-disciplinary centre which could provide specialist advice as well as services, such for example as the supervision of electronic and X-ray equipment to district hospitals. As automation of pathology develops and it becomes more efficient and economic for laboratories to serve wider areas and more hospitals, the laboratories ought to be associated with scientific centres. We took the view that, under the present organisation of the National Health Service, in some cases regional scientific centres could best be managed by the Hospital Management Committee or Board of Management in whose area they are situated; in others the Regional Board could well to advantage undertake the direct management of the services and employ all the scientific and technical staff.

6.3.3. The Regional Hospital Board should have a Regional Scientific Advisory Committee which should include medical and non-medical scientists with functions corresponding to those of the Medical Advisory Committee.

6.3.4. Each Regional Hospital Board in England and Wales should have on its staff a Regional Scientist (medical or non-medical). He should be responsible for advising the Board on the planning of the scientific services in consultation with the Senior Administrative Medical Officer and should have the same status as other senior officers of the Board. While we envisage that the Regional Scientist should have access to the Board to discuss matters affecting the planning and development of the scientific services, we consider that his relationship with the S.A.M.O. should be such as to recognise the S.A.M.O.'s overall responsibility for the planning of the services of the region as a whole. The Regional Scientist should maintain contact with district hospital authorities and heads of scientific departments, give advice and collect information so as to secure to the best advantage the deployment of manpower and the co-ordination of research and development activities in district hospitals and special centres. He should have administrative responsibilities for the training (including post-graduate training) of scientific and technical staff at all levels. Separate consideration will be required for Scotland, in view of the responsibilities of the Regional Boards for teaching

hospitals, the small size of some Boards and the predominant role of the Universities in the provision of scientific services.

6.3.5. We recommend that Regional Hospital Boards (and Boards of Governors) in England and Wales should lay down establishments of scientific and technical staff for all the hospitals in their regions. The grading and number of the posts at Consultant or above Principal Scientific Officer level should be subject to national control by the Health Departments. District hospital authorities should normally recruit staff within the approved establishment with the exception that (*a*) the appointment and employment of scientific staff above the grade of Senior Scientific Officer, and (*b*) assessment for promotion, including class to class promotion, of scientific staff and higher grades of technical staff should be reserved to the Region or Board of Governors. The Health Departments should compile lists of assessors for senior scientific posts. We recommend that the Regional Scientist or one of his staff should act as an assessor to district hospital authorities when junior scientific and technical officer appointments or promotions are made.

6.3.6. The Regional Hospital Board should be responsible for planning new accommodation. It should assess the requirements for and purchase large items of equipment. Advice should be given on other equipment to the area purchasing organisation, which would be the same as for other hospital supplies and equipment.

6.4. *The Hospital Management Committee and Board of Management.* Subject to our other recommendations, the district hospital authority should be responsible for the day-to-day management of the hospital scientific services and for the appointment of scientific and technical staff in the Scientific Service within an establishment agreed with the Regional Hospital Board.

6.5. *Division of Scientific Services.*

6.5.1. Where the services are organised at hospital level we recommend that there should be in each district general hospital a 'Division of Scientific Services' which would include all the scientific services listed in 5.3. Medical and non-medical scientific staff should be members of this Division. The Chairman of the Division should be responsible, with guidance from the Region, for staff deployment, local training and the organisation of work. The Division of Scientific Services should have a clearly defined place in the committee structure of the hospital which would enable its recommendations to be processed and presented to the managing body. The Division should review its services and resources from time to time. We believe that such a Division of Scientific Services would afford considerable advantages—it should lead to a more economic use of staff, equipment and accommodation and greater flexibility to meet new demands, as well as to greater cross-fertilisation of ideas. The Division should take over the scientific services at present dispersed among the clinical departments and should act as their focal point. Such an arrangement would halt the present trend to fragmentation of service departments which complicates the clinician's task in devising and obtaining diagnostic tests for his patients. We envisage a Division with considerable flexibility, its functions depending to

some extent on what regional services are available, and on the existing organisation. We would normally expect to see in a district general hospital, departments of clinical biochemistry, haematology, medical microbiology, morbid anatomy and histopathology, as well as of physical sciences. The latter would need to have medically qualified graduates on its staff or attached from another Division if it undertakes the functions of nuclear medicine. Specialisation within the Division of Scientific Services would of course depend on the scope and demand for work.

6.5.2. We noted that departments of 'clinical measurement' had been established in a few hospitals. Each branch of the Hospital Scientific Service is concerned with some form of clinical measurement, the clinician providing the unifying function of the applied physiologist; we do not recommend the general extension of the concept of separate departments of clinical measurement.

6.6. *Future Planning of District General Hospitals.* We have considered whether pathology departments should be joined physically to departments of physical sciences, and we believe that this should be done in the future and that Scientific Departments should be geographically associated as far as possible.

6.7. *Possible Changes in Hospital Administrative Structure.* The central proposal in the Minister of Health's Green Paper (see paragraph 0.3. above) is that the network of National Health Service authorities in England and Wales, viz. Regional Hospital Boards, Hospital Management Committees, Boards of Governors and Executive Councils should be replaced by a single tier of area authorities, possibly numbering forty to fifty in all, and each responsible for all the health services in its area. If a system of this kind is established, responsibility for the functions which we have proposed that Regional Hospital Boards should fulfil in a Hospital Scientific Service will fall to the lot of the area authorities, as indeed will the functions here proposed for Hospital Management Committees. Some services may however, be more efficiently provided by two or three area authorities making joint arrangements in the way proposed in paragraph 74 of the Green Paper. The form of the arrangement would depend on the nature of the particular service and *a fortiori* on the precise shape of the overall adminstrative structure eventually adopted.

7. FUTURE STAFFING PATTERN

7.1. In our study of the scientific and technical work performed in hospitals we have identified four broad functional levels according to the education and training normally required, the knowledge and experience that have to be acquired, and the responsibilities that are carried. We recommend that for non-medical scientists and technical staff these four classes should be adopted as a framework, and that within each class there should be such grades as might be found necessary. Entrants to any of these classes should be able to make their career within that class, subject to experience and fitness for promotion, but there should also be ample opportunity for advancement to the next higher class either by obtaining the requisite qualifications or by demonstrating the

necessary qualities to the satisfaction of an assessment panel drawn from more than one employing authority.

7.2. The four classes are:

(*a*) *Scientific Officer.* Normally recruited from graduates with 1st or 2nd Class Honours degrees or equivalent qualifications. Chartered engineers and sometimes persons with medical qualifications will also belong to this class. There should be opportunity for direct appointment to higher grades for scientists with appropriate experience outside the National Health Service.

(*b*) *Technical Officer.* Qualifications of the level of the Higher National Certificate. Some members of the class may be graduates.

(*c*) *Technical Assistant.* Training will normally include practical training, generally provided in-service, and complementary further education through courses for higher qualifications including those leading to promotion to the Technical Officer class.

(*d*) *Technical Aide.* No age limits or special qualifications. The members of this class will have the qualities required for simple routine procedures, care of equipment and other work requiring experience of hospital procedures. Training would normally be in-service and promotion by experience and length of service.

7.3. In order that Technical Officers and Technical Assistants may be readily deployed to meet new and changing requirements, we have recommended that the aim should be versatility and interchangeability and that deployment at the level of the district hospital should be the responsibility of the Division of Scientific Services. To achieve versatility and interchangeability, there should be a reclassification of present technical functions. Detailed study involving wide consultation with the interested parties will be necessary in order to determine broader vertical divisions of function, such as medical and physics laboratory work, construction and design of equipment and appliances, and the use of monitoring equipment. Those men and women who do not proceed by qualification or selection to a higher class would be eligible for higher grading within their class in respect of supervisory, advanced or specialist work.

7.4. As Table 4 illustrates, we envisage grades within each class reflecting the different levels of responsibility carried by the technician or the different degrees of knowledge, experience and skill required for the performance of his task. For example we envisage some chief posts entailing managerial responsibility for technical services in which a Technical Officer, as distinct from a Scientific Officer, is responsible for supervising technical services over a wide geographical area or in more than one of the broad functional divisions mentioned in paragraph 7.3. But we have not seen it as being our task to specify in detail the jobs to be done in each class. This job definition will necessarily be a continuous process and it will be a responsibility of the Divisions of Scientific Services to keep under review the work done, and requiring to be done, by technicians, and to provide regular information to those responsible for determining the grading structure of the service, for regulating terms and conditions of service, and for

determining the grading of particular posts by appropriate methods including job evaluation. The arrangment in Table 4 is schematic; only by the process we have just described can it be determined at any given time how many levels or grades are required within a class and how they should be defined.

7.5. Policy on recruitment to the Technical Assistant class must ensure the intake of a sufficient proportion of technicians who will pursue formal training and gain promotion to the senior level or to the Technical Officer class. Subject to this we consider there should continue to be a place in the hospital service for those who are attracted to the kind of hospital technical work which does not demand lengthy training provided, however, that such staff can:

(i) have the opportunity of undergoing either short-term in-service training for a prescribed range of duties or longer-term formal training leading to work at the senior level or in a Technical Officer class, and

(ii) be redeployed at their appropriate level of ability when technological advances alter the nature of their work and call for more highly qualified staff to be employed in their place.

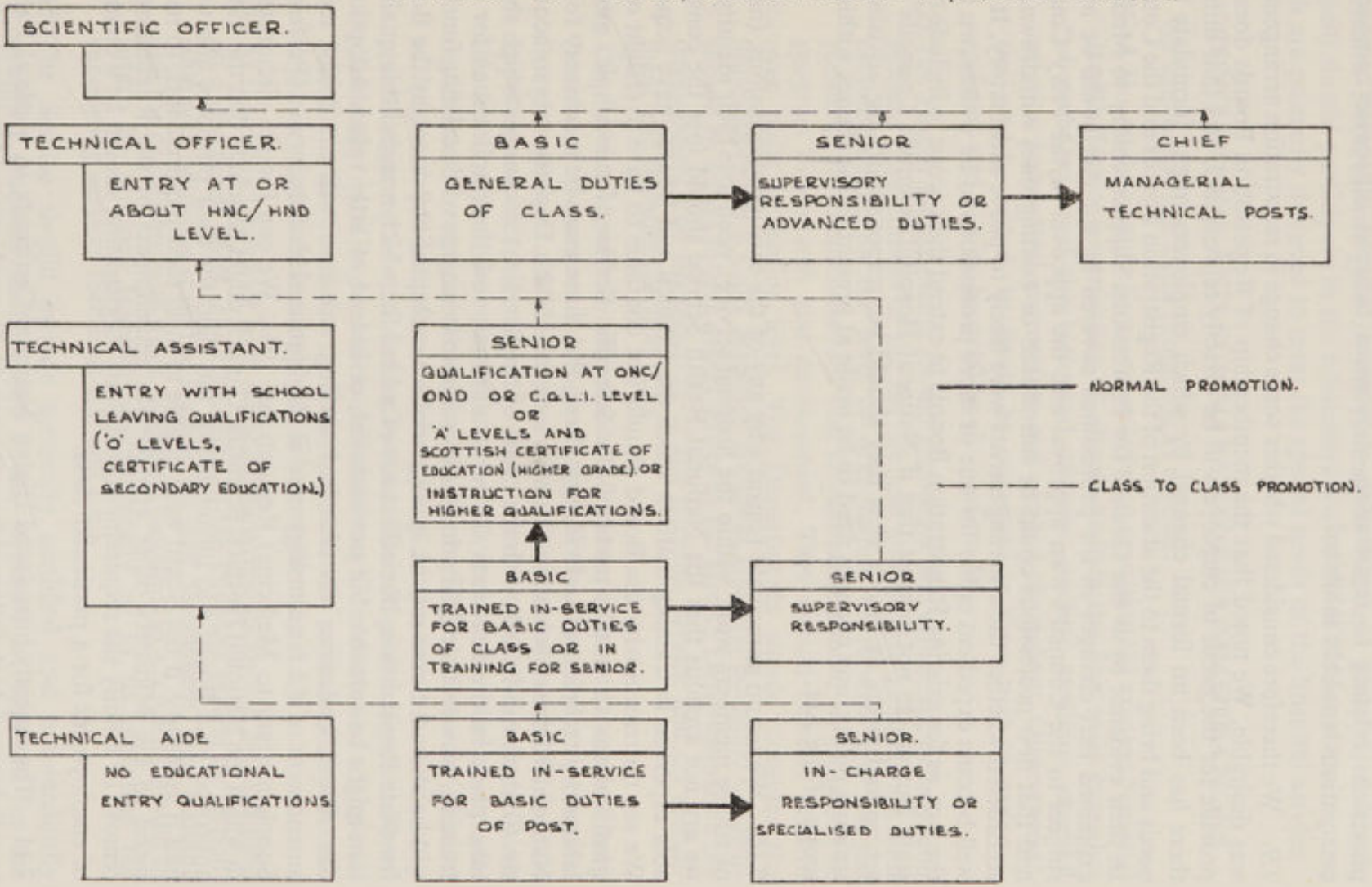
7.6. The detailed enquiries we recommend in paragraphs 7.3. and 7.4. should be associated with studies of the content, form and organisation of the training required to equip staff to carry out the wider functions we consider necessary. Consultation will be necessary with all interested parties including the medical specialties, educational and examining bodies and staff interests. Examination of the functions of existing classes where wastage is high, e.g. radiographers, and of the training required, might suggest consideration of the possibility of either providing two alternative schemes of training (i.e. choice of a predominantly practical training or of a combined practical and theoretical training) or a two stage scheme (i.e. training for a qualification at a lower level with the choice of proceeding to further training and qualification at an advanced level).

7.7. The existing facilities for day release for officers studying for approved qualifications should be continued and developed as necessary. It should be a function of the National Hospital Scientific Councils to ascertain what further post-qualification training and re-training might be necessary to meet the developing needs of the hospital service and what facilities, such as secondment for full-time, part-time or sandwich courses would be appropriate.

7.8. We considered how our recommendations on classification, grading and training of Technical Officers and Technical Assistants would relate to the machinery for state registration set up by the Professions Supplementary to Medicine Act. There is obviously a difficulty. A national body concerned with hospital staffing policies of the kind we propose should have oversight of the training of the technical classes, but this would overlap the responsibilities of some of the Boards set up under the Act (the Boards affected would be Medical Laboratory Technicians, Radiographers, Dietitians and Orthoptists). These Boards appear to have been established on the assumption that the professions were separate. But it is the essence of our proposals that the professions should be brought together into one service. Furthermore, it would be anomalous for the holders of one group of technical posts to be required to be State Registered under

TABLE 4. TECHNICAL STAFF STRUCTURE

LEVELS OF WORK, RESPONSIBILITY & QUALIFICATION.



the regulations made by the Health Ministers, whereas the holders of other posts with similar functions were not. Without some modification of the present provisions relating to registration, movement between otherwise comparable occupations would be inhibited.

7.9. We therefore considered whether some change in registration arrangements was desirable. We noted that the membership of Registration Boards does not provide for the needs of employers to be directly represented, and that hitherto there has been no formal channel by which employers might formulate their needs and bring them to the attention of the Registration Boards and the Council. In their evidence to us the Council for Professions Supplementary to Medicine explained that changes in the professions covered by the Act could be made, subject to the Council's own approval and the approval of the Privy Council, and that new professions could be introduced or existing ones withdrawn. We considered whether these arrangements were likely to prove satisfactory. It may well become expedient either for one or more professions to be withdrawn from the Act, or for existing Registration Boards to extend their scope to include other staff. But we do not suggest that if National Hospital Scientific Councils were set up and given, as in our view they should be, responsibility for advising on training policy, any changes need to be made at present in the classes within the scope of the Act.

7.10. We see no immediate reason why any of the existing professions, (not all of whose members work within the hospital service), need lose their identity and we are not anxious that the National Health Service should lose the considerable expertise in training matters which the Council and Boards have acquired. We see no reason why the Board should not continue to have oversight of the qualifications in certain parts of the Scientific Service, for example, medical laboratory technicians and radiographers. But there must be machinery for the National Hospital Scientific Councils and the Health Departments to acquaint the Council and Boards with the needs of the Service, the changes which should take place in the functions of the professions and the implications for their training. New technical functions will continue to emerge while existing functions will be altered. Some require qualifications as accepted at present by the Boards for State Registration, but others are of a kind for which a registrable qualification might be valuable but not essential, or indeed of little value. Adoption of our recommendations on technical staffing structure will no doubt require amendment of the terminology used in the National Health Service (Professions Supplementary to Medicine) Regulations, 1964. We can foresee circumstances in which the National Hospital Scientific Council might conclude that the training approved by a Board was unsuitable or too rigid for their purposes and would find it necessary, if the Board were unable to meet their requirements, to recommend to the Ministers other appropriate amendments of the Regulations to remove or modify the requirement that State Registration should be a condition of employment for a particular class.

7.11. The recently introduced Higher National Certificate in Medical Laboratory Subjects (which followed from the new Ordinary National Certificate including Medical Laboratory Science), with the possibility of other H.N.C.s involving, for instance, options of either Radiation Physics or Physiological Measurement,

points to the increasing use of national educational qualifications for technicians in the hospital service. It is important that the hospital employing authorities and the Health Departments (and in the future the National Hospital Scientific Council) should participate in the administration of those National Certificates which are primarily designed to meet the special needs of the hospital service.

8. CONCLUSIONS AND SUMMARY OF RECOMMENDATIONS

8.1. We summarise our main proposals as follows:

(1) A Hospital Scientific Service should be set up within the existing National Health Service organisation. It should include the four main branches of pathology and the biological sciences, nuclear medicine, medical physics, biomedical engineering and applied physiology. Other specialties may be added. It should be organised in three tiers at national, regional and district hospital levels (Section 5).

(2) The Health Departments should encourage the economic, orderly and efficient development of the Service and should give guidance on staff establishments, on the level of organisation of services and on the planning of accommodation. The Departments should be informed of progress in research and development. They should exercise control over posts at senior level. The Departments should consider the appointment of a Chief Scientist. National Hospital Scientific Councils should be set up to give expert advice to the Health Departments on the development and organisation of the scientific service and on recruitment and training (Section 6.2.).

(3) The Service should be organised and planned, in collaboration with Boards of Governors in England and Wales, by Regional Hospital Boards which should have as a minimum the responsibility for the appointment of senior scientific staff, control of establishments below this level, supervision of manpower deployment and training and co-ordination of research and development in the Region. The establishment of Regional Scientific Centres is suggested in the interests of efficiency and of economy of staff and equipment. Each Regional Hospital Board should appoint a Regional Scientific Advisory Committee and a Regional Scientist who would be the principal scientific officer of the Board. Separate considerations apply in Scotland (Section 6.3.).

(4) At the district hospital level scientific departments should be organised on a divisional basis. The Chairman of the Division should be responsible with guidance from the Region, for staff deployment, local training and the organisation of work. Scientific functions in a hospital should in future be grouped together geographically so as to centralise the supporting services (Sections 6.5. and 6.6.).

(5) The Service should include medically qualified and non-medically qualified graduate staff. A new career structure is suggested for the graduate non-medical scientist and technical classes, and should provide improved opportunities for promotion on a broader basis than exists at present (Section 5).

(6) The general aim should be to establish and maintain the Service as a system which offers a scientific career equivalent to those of other comparable public services. Scientists, whether medically qualified or not, should be considered on their merits in their respective fields (Section 5).

(7) The technical grades should be re-classified into a few broad functional divisions with opportunities for advancement and promotion to the higher classes according to qualifications, experience and ability, whether acquired in the National Health Service or elsewhere (Section 5).

8.2. We should expect that the proposals which we have made will allow the Hospital Scientific Service to develop in a more orderly way than in the past and that the resources made available to it would be used more efficiently in the interests of the patients and the national economy. The establishment of the service should not only remove the obstacles which impede the career prospects of non-medical scientists and technicians in the National Health Service but also improve the recruitment of staff of the requisite calibre. The National Health Service requires a more flexible and scientifically alert service to meet its future needs. This can best be provided by a unified service on the lines we have proposed.

(*Signed*) S. ZUCKERMAN (*Chairman*)
A. R. CURRIE
R. GADDIE
J. E. ROBERTS
A. B. SCOTT
J. P. SHILLINGFORD
S. SHONE

R. P. S. HUGHES (*Secretary*)
August 1968

APPENDIX I

List of Organisations and Individuals who Submitted Evidence to the Committee

(*a*) *Those submitting written evidence*

(Those marked * submitted both written and oral evidence)

Professor W. M. Arnott
Apothecaries Hall Dispensers Association
Association of Anaesthetists
Association of British Neurologists
*Association of Clinical Biochemists
Association of Clinical Pathologists
Association of Dental Hospitals
Association of Hospital Management Committees
Association of Scientific Workers
Association of Scottish Hospital Boards of Management
Mr. G. V. Ball
Dr. D. W. Barritt
Dr. J. S. Beck
Bethlem Royal Hospital and the Maudsley Hospital
Biochemical Society
Biological Engineering Society
Birmingham Regional Hospital Board
Board of Management for Glasgow Royal Infirmary and Associated Hospitals
British Association of Otolaryngologists
British Dental Association
British Dietetic Association
British Institute of Radiology
*British Medical Association
British Orthopaedic Association
British Neuropathological Society
*British Psychological Society
British Society for Haematology
British Society of Audiology
Dr. E. J. M. Campbell
Cardio-Pulmonary Technicians Association
*Dr. P. Cliffe
*College of Pathologists
Committee of Scottish Regional Physicists
Committee of Senior Administrative Medical Officers of Regional Hospital Boards in England and Wales
Dr. J. E. Cotes
Mr. G. W. Dalzell
Dr. W. G. Dangerfield
Professor P. R. Davis
Dental Education Advisory Council
Dietitians Board
Dr. G. Dutton
Eastman Dental Hospital
Electroencephalographic Society
Electrophysiological Technologists Association
Enfield Group Hospital Management Committee
*Faculty of Anaesthetists

Faculty of Dental Surgery
Faculty of Opthalmologists
*Faculty of Radiologists
Mr. A. D. Farr
Dr. L. Fisch
Mr. H. E. Gingell
Professor C. H. Gray
Mr. C. G. Green
Group Laboratories of Queen Mary's Hospital for Children, Carshalton
Guild of Public Pharmacists
Guy's Hospital
Hackney and Queen Elizabeth Group Hospital Management Committee
Hammersmith and St. Marks Hospitals
Dr. A. J. H. Hewer
Professor K. R. Hill (Chairman of the Watford Working Party on the training of Medical Laboratory Technologists)
Hospital for Sick Children, Great Ormond Street
*Hospital Physicists Association
Hospital Physics Technicians Association
Dr. J. W. Howie
Dr. P. Hugh-Jones
Dr. A. R. Hunter
Institute of Incorporated Photographers
Institute of Medical Laboratory Technology
Institute of Operating Theatre Technicians
Institute of Physics and the Physical Society
Institute of Technicians in Venereology
Institution of Electrical Engineers
Institution of Electronic and Radio Engineers
Dr. A. James
Joint Consultants Committee (Scotland)
Miss K. Jones
*Professor R. M. Kenedi
King's College Hospital
Professor A. L. Latner
Dr. G. L. Leathart
Leeds Regional Hospital Board
Liverpool Regional Cardiac Centre
Liverpool Regional Hospital Board
Mr. P. Lockwood
London Hospital
Dr. A. D. Macrae
Manchester Regional Committee of Hospital Pathologists
Manchester Regional Hospital Board
Dr. J. H. Margerison
Dr. R. Marshall
Maxillo-Facial Technicians Association
Medical Artists Association
Medical Laboratory Technicians Board
*Medical Research Council
Medical Society for the Study of Venereal Diseases
Ministry of Health Advisory Sub-Committee on Hospital Biochemists
Moorfields Eye Hospital
National Association of Public Service Dental Technicians
National Hospital for Nervous Diseases

Mr. R. W. Neill and Dr. M. G. Nelson
Newcastle Regional Hospital Board
North East Metropolitan Regional Hospital Board
North Eastern Regional Hospital Board (Scotland)
Northern Regional Hospital Board (Scotland)
Organising Committee for the Glasgow Council for Cardiographers and Cardiological Technicians
Orthoptists Board
Oxford Regional Hospital Board
Professor D. V. Parke
Dr. R. A. Payne
Dr. R. Payne
Professor J. Pepys
Mr. W. J. Perkins
Pharmaceutical Society of Great Britain
Physiotherapists Board
Public Health Laboratory Service Board
Radiographers Board
Regional Engineers Association
Professor H. H. Rosenbrock
Mr. D. Rowan and Mr. G. D. Green
Royal College of Obstetricians and Gynaecologists
*Royal College of Physicians of Edinburgh
*Royal College of Physicians of London
*Royal College of Surgeons of Edinburgh
*Royal College of Surgeons of England
Royal Institute of Chemistry
Royal Institute of Public Health and Hygiene
Royal Medico-Psychological Association
Royal National Orthopaedic Hospital
St. Bartholomews Hospital
St. George's Hospital (London)
St. Peter's, St. Paul's and St. Philip's Hospitals
Dr. E. Samuel
Dr. B. McA Sayers
Scottish Association of Medical Administrators
Scottish National Blood Transfusion Association
Mr. C. B. Sedzimir
Dr. S. J. G. Semple
Dr. A. G. Signy
Dr. A. A. Sharp
Dr. C. N. Smyth
Society of Audiology Technicians
Society of British Neurological Surgeons
Society of Cardiological Technicians
Society of Radiographers
South East Metropolitan Regional Hospital Board
South-Eastern Regional Hospital Board (Scotland)
South West Metropolitan Regional Chemical Pathology Group
South West Metropolitan Regional Hospital Board
South West Metropolitan Regional Pathologists Committee
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Staff Side of the Optical Whitley Council
Staff Side of the Pharmaceutical Whitley Council
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The Worshipful Society of Apothecaries of London
Dr. N. G. Trott
United Birmingham Hospitals
United Cardiff Hospitals
United Leeds Hospitals
United Newcastle upon Tyne Hospitals
Welsh Hospital Board
Wessex Regional Hospital Board
Western Regional Hospital Board (Scotland)
Western Region (Scotland) Pharmaceutical Advisory Committee
Westminster Hospital
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APPENDIX II

The Present Organisation of Scientific and Technical Services within the National Health Service Hospital Service

1. In this Appendix the existing organisation of scientific and technical services is described. The main hospital departments and services in which scientific and technical work takes place are listed and some comments on the work undertaken in each are given, as a background to the need for an organised service.

A. The National Health Service Hospital Service

2. The structure of the scientific and technical services has been so conditioned by the structure of the hospital service itself that a description of the scientific and technical services would be incomplete without some reference to the wider framework.

3. Under the National Health Service Acts, hospital services in England and Wales are administered on behalf of the Minister of Health by Regional Hospital Boards, Boards of Governors (of teaching hospitals) and Hospital Managment Committees; those in Scotland are administered on behalf of the Secretary of State by Regional Hospital Boards and Boards of Management. Regional Hospital Boards plan and co-ordinate hospital services in their regions, manage the capital building programme, allocate revenue expenditure and appoint senior medical staff. Some services such as blood transfusion, mass miniature X-ray, and, in certain Regions, medical physics, are operated at regional level. The population of Regions ranges from over 5 million to less than 2 million; in the case of the smallest Scottish Region, less than 200,000. There is a teaching hospital in nearly every one of the Regions (in the case of the London Regions more than one teaching hospital). The teaching hospitals themselves are, in England and Wales, independent of the Regional Boards and are administered for all purposes by Boards of Governors directly responsible to the Minister of Health. Other hospitals in England and Wales are immediately controlled and managed by Hospital Management Committees appointed by Regional Hospital Boards. In Scotland all National Health Service hospitals, including teaching hospitals, are managed by Boards of Management analogous to the English Hospital Management Committees. The Boards of Management for teaching hospitals have special provision for university representation.

4. The division between the functions of Regional Boards and those of the lower level of management is not an absolutely rigid one. There have been gradual changes in the relationship over the years.

B. The deployment of scientific and technical staff

5. This section mentions briefly the main parts of the hospital service in which non-medical scientific and technical staff work. The intention is to describe the organisational pattern in broad terms and the trends of development and to bring out a number of special factors. The services range from those to be found in each district general hospital, or even in small units, to regional and national services.

6. Non-medical scientific and technical support for medicine in the National Health Service has grown rapidly in recent years and has extended into all medical specialties to a greater or lesser extent. The use of biochemistry largely developed in pathology departments. The need for physicists arose with the use of radiotherapy in the treatment of cancer and they were originally required for the custody and calibration of

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11. A pathology laboratory may serve one or a group of hospitals. The effectiveness of any laboratory depends considerably on the accommodation available. Currently the Ministry of Health provides advice on the space requirements of hospital pathology departments in a Building Note which recommends that a full pathology service can most economically be provided for a district general hospital comprising 400, or 600 to 800 acute beds. This Note recommends that if a simple pathology service has to be provided for hospitals of less than 400 acute beds the service must be linked to a larger pathology department to supplement its facilities.

12. Until recently, all specimens referred to the pathology services were examined by hand methods. In recent years the growth in demand for pathology advice has led to the development of mechanical methods of handling and analysing some specimens, particularly those of a more routine nature. The most effective improvement of this kind so far has been the introduction of the Autoanalyser, particularly in biochemistry departments. The effect of using this equipment is shown in the following table giving the increase in work load and productivity in the biochemistry department of the Royal Infirmary of Edinburgh which is a typical example:

Year	*Work load (determinations)*	*Technicians*	*Auto-Analyser Channels*	*Productivity/ Technician*
1950	22,000	11	—	2,000
1955	57,000	14	—	4,000
1960	106,000	18	1	6,000
1963	195,000	23	3	8,500
1966	407,000	40	12	10,200

The introduction of other mechanical methods e.g. blood cell counters are having similar effects on productivity.

13. Almost all new medical developments in the hospital service generate a greater volume of specimen examination and increasingly, there are specialised examinations for diagnosis and for control therapy. Thus the development of new methods of treatment e.g. cardiac and neuro-surgery, tissue transplantation and renal dialysis, increases the demand on hospital pathology departments. It is becoming more usual for the pathology department of the hospital with a regional specialty to have a consultant with a special interest and experience in that specialty e.g. neuro-pathology. There is also specialisation between hospital pathology laboratories within a region so that one laboratory undertakes all of the particular specimen examination required for a region or a large part of it e.g. protein bound iodine.

14. Technological improvements, particularly in providing more mechanised and automatic equipment, have made it possible for the pathology service to cope with the increasing demand without a proportionate increase in staff.

15. Specialisation arising from improved medical knowledge has already been mentioned but the development of specialised techniques within pathology is leading to intensive specialisation in certain fields of work e.g. steroid determinations, protein analysis. Pathology departments are also finding a growing use for isotopes and recently constructed laboratories have a separate isotope section.

(*b*) *The National Blood Transfusion Service*

16. The blood transfusion service is organised in England and Wales as a service run by the Regional Hospital Boards with 13 regional transfusion centres, together with

two central laboratories, the Blood Products Laboratory and the Blood Group Reference Laboratory administered by the Medical Research Council on behalf of the Ministry of Health. The Blood Group Reference Laboratory maintains stocks of rare sera, accepts blood samples from the regional laboratories for the identification of irregular agglutinins and agglutinogens, and distributes all types of grouping sera. It also keeps records of a special national panel of donors having rare blood groups. The Blood Products Laboratory prepares blood products such as fibrinogen, albumen, human immunoglobulin, undertakes research into the production and uses of plasma fractions and operates the plasma drying plant. The Plasma Fractionation Laboratory (Oxford) undertakes the preparation of anti-haemophilic globulin and Christmas Factor and research and developmental work in the separation and purification of other clotting factors of clinical importance. This laboratory is about to set up in new premises.

17. In Scotland the Service is run by a voluntary association, the Scottish National Blood Transfusion Association, which is virtually completely financed by a grant from the Scottish Home and Health Department. There are five Blood Transfusion Centres in Scotland and their areas correspond with those of the five Regional Hospital Boards. There is a Blood Products Unit in Edinburgh which is part of the Regional Transfusion Centre. The Association applies national terms and conditions of service and the comments in this section are, to a very large extent, applicable to the Blood Transfusion Service in Scotland. The organisation of the Service is under scrutiny by a working group but recommendations on future organisations are not yet available.

18. The work of the blood transfusion service has increased substantially in recent years. The number of bottles of blood issued to hospitals has been increasing at the rate of about 6 per cent per annum over the last ten years. In England and Wales in 1966 a total of 1,187,789 bottles of blood were issued to hospitals. The ratio of blood issued per hospital bed and blood issued per hundred patients discharged or dying has been increasing steadily. In 1962 the number of bottles issued per acute hospital bed was 5·11 but by 1966 this had risen to 6·15. The number of bottles of blood per hundred patients discharged or dying rose by 22·33 to 24·25 in the same years. In addition to the quantitative increase in work, there has been over the years an increase in the special tasks carried out by regional transfusion centres staff, and the special products needed.

19. As an example may be mentioned the recent research on the successful use of human incomplete anti-D human immunoglobulin for preventing Rh-haemolytic disease of the newborn. The practical application of this work will involve the centres in considerable additional work—collection of anti-D plasma, and adoption of the technique of plasmapheresis (the collection of blood and the return of the separated red cells to the donor), recruitment and examination of volunteers already naturally immunized to the D antigen—and also the Blood Products Laboratory where the anti-D immunoglobulin will be separated. Much incidental *ad hoc* investigations will be necessary. Anti-D immunoglobulin is one of several specific immunoglobulins which have or are likely to find a place in the prevention of disease. Their preparation will sooner or later require the deliberate immunization of volunteers in order to obtain sufficient antibody containing plasma. There is much that will have to be learnt about the long term raising of antibodies in man. Other examples of new tasks being undertaken or likely to be undertaken by the transfusion service are: the provision of anti-haemophilic globulin, cryoprecipitate and other clotting factors for the treatment of coagulation disorders; the provision of platelets and white cells for use in association with the treatment of leucaemia by cytotoxic drugs; the preservation of red cells at subzero temperatures; histocompatibility testing for tissue and organ grafting, the investigation

of the immunoglobulin nature of blood group antibodies and the identification and estimation of certain enzymes.

20. There are altogether about 40 scientific officers employed in eight Regional Transfusion Centres most of whom hold honours degrees. Some seven of these are principal or senior scientific officers who have worked for considerable periods in the service.

(*c*) *Radiological Department*

21. The X-ray department is one which is to be found in almost every general hospital. The service demanded of an X-ray department is a reflection of the type of hospital it serves. Accordingly, X-ray departments may be divided into four types:

(i) Those with a general service load of simple examinations. Such departments are likely to be in small hospitals, will have between 1 and 4 X-ray rooms, and will do between 1–20,000 examinations annually.

(ii) Those with a general service load of simple examinations, plus some specialised examinations. Such departments will consist probably of 3–6 X-ray rooms, and will do between 15–25,000 examinations per year. An average district general hospital will have 6 rooms.

(iii) Those with a general service load plus a teaching and research function involving simple examinations and specialised investigations. These departments are likely to be central, to have 6 or more rooms, and to perform 25–50,000 examinations per year.

(iv) Those with a general service load, plus a teaching and research function of specialised investigations only. These departments are found in specialised hospitals (for example, neurosurgical), are likely to have about 4 X-ray rooms and to do some 15,000 examinations per year.

22. Since 1963 it has been found that work load in X-ray departments is increasing at a greater rate than the work load in clinical departments of hospitals. This increase in demand has not been accompanied by a proportionate increase in radiologist and radiographer staff. The demand for specialised investigations is increasing at a more rapid rate than that for simple examinations. This is aggravating the demands being made on equipment and radiographer time, but particularly on radiologist time. Technological advances in recent years have resulted in some saving of effort but not of time for radiographers and have led to a greatly increased requirement of radiologist time.

23. The last decade has seen the arrival of new methods for the anatomical mapping of diseased organs.

(1) Sophisticated radiological techniques.

(2) The use of radio-isotopes for diagnostic purposes.

(3) The use of ultrasound for diagnostic purposes.

(4) The use of thermography for diagnostic purposes.

All these techniques are complementary, but for a variety of reasons only a very small part of the use of radioisotopes for diagnostic purposes has been embraced by diagnostic X-ray departments. In the U.K. this has largely been the result of staff shortages. Equipment is constantly developing as has been mentioned above. *Pari passu*

the use of physicists and physics technicians has become more important in radiological departments.

(*d*) *Radiotherapy Services*

24. While diagnostic radiology is to be found in all district general hospitals, radiotherapy is a sub-regional specialty and in Scotland a regional specialty. The development of mega-voltage therapy has produced equipment capable of handling between 300 and 800 new patients a year.

25. Linear accelerators are made in a range between 4 to 35 MeV. They are costly to buy and install, and they require an expert team of radiotherapists and radiation physicists for their full use. Training technicians are needed for their maintenance. As a 4-MeV linear accelerator can treat from 500 to 800 new cases of malignant disease a year, such machines should be sited only at main radiotherapy centres. Units with cobalt sources normally range from 1,000 to 5,000 curies according to the volume of work and are suitable apparatus for most associated treatment centres. It is possible to have cobalt units with sources of between 5,000 and 10,000 curies, and those can be considered in the same category as the 4-MeV linear accelerators because of their high output and cost. These are only required in major centres. Betatrons provide X-rays and electron beams in the high mega-voltage range. Associated with the mega-voltage equipment, and part of the equipment of a normal radiotherapy centre would be radium and radioactive isotopes (implants, needles, wire and plaques, etc.) and a limited amount of superficial X-ray therapy and deep therapy or caesium sets.

26. Within each region in England and Wales there is a main or regional centre usually linked with a University. It has a full range of equipment normally including one or two linear accelerators. Supporting these are a physics service, research facilities, accommodation for patients and full consultant and ancillary staff. It is intended to act as the reference and advisory centre for all radiotherapy in the region, and may have a pathological reference service which is also available to the associated centres. Within the region are associated treatment centres, the number depending on the size and distribution of population, the ease or difficulty of travel, and in London, on undergraduate teaching needs. The associated centres are closely linked with the main regional centre and the senior medical and physics staff are, where possible, integrated with the regional centre and officially attached to it. These associated centres are normally equipped with one or more pieces of mega-voltage apparatus and serve an area of sufficient population to provide a minimum of 600 new patients with malignant disease requiring radiotherapy a year, although where geographical location and facility of communication makes it necessary a smaller load can be accepted. Preliminary diagnosis, consultation and follow-up examinations are the functions of peripheral clinics which are mainly in district hospitals. Here, the consultant radiotherapist discusses the case with the appropriate consultant concerned and with the general practitioner.

27. Since 1962 mega-voltage equipment has been supplied to an increasing number of radiotherapy centres. In 1967 there were 54 main and associated centres in England and Wales so equipped. Eighteen linear accelerators had been installed, and a further eight were on order. There were 50 Cobalt-60 units in use, as well as five Van de Graaff Machines, one Cyclotron and one Betatron.

(*e*) *Isotope Services*

28. The use of isotopes has increased in recent years but so far, unlike radiotherapy and radiology, no set pattern of organisation within or between hospitals has developed. Working parties are at present considering this question for the Health Departments.

29. A survey was carried out in 1964 (England and Wales) and at that time 125 hospitals were using isotopes for diagnostic purposes. Almost every branch of medical practice was mentioned including such specialties as psychiatry and obstetrics. Isotopes were used for therapy in 80 hospitals, usually by the department of radiotherapy, but dermatology and medicine were also mentioned. The dispensing of isotopes was equally scattered, being performed most commonly by a department of medical physics or of radiotherapy, but with pathology, radiology and medicine also undertaking this task. A similarly haphazard pattern applied to the departments responsible for isotope scanning. In recent years the use of isotopes has increased very rapidly.

30. In one or two areas considerable centralisation of isotope services for part or all of a region has been brought about by the Regional Hospital Boards. There have also been appointments within hospitals of consultants in 'nuclear medicine' responsible for all the isotope services of that hospital.

(f) Medical Physics

31. In those hospital groups where physicists are employed they are often attached to the radiotherapy department. In a teaching hospital, they are to be found in an independent department of medical physics. There are also several examples of regional physics services as in Sheffield, Birmingham and the Western Region of Scotland. Except where there is a regional service, when the physicist may be on the staff of the Regional Hospital Board, the physicists are employed by the groups.

32. Some of the results of a recent survey (1967) of the Hospital Physicists Association of work done in medical physics departments are shown in the table on the following page.

(g) Departments of Clinical Measurement

33. A comparatively recent development is the setting up of Departments of Clinical Measurement. Attention had been directed to the increasing applications of instrumental methods in clinical medicine, as, for example, in cardiac diagnosis and monitoring, open heart surgery and post-operative care, peripheral vascular disease, respiratory function and anaesthesia, neurology and neurosurgery, the treatment of renal failure and certain aspects of malignant disease. It was considered that the introduction of new techniques as a routine part of hospital service could be greatly facilitated by a department in which an understanding of the clinical objective might be combined with the technological requirements for its achievement. The Consultant in Clinical Measurement works in collaboration with his clinical colleagues.

34. The advantages attributed to Clinical Measurement include economy, increased efficiency and continuity of service, together with adaptability to new developments and to research. Instrumentation used in medicine becomes more costly as its complexity increases. Just as expensive equipment is centralized in an X-ray Department, so it can be in a Clinical Measurement Department which then provides a service to the whole hospital without unnecessary duplication.

(h) Cardiology and Cardiac Surgery

35. Cardiology departments are to be found in each district general hospital or in one of the constituent parts of the D.G.H. Cardiac surgery on the other hand is a regional or sub-regional specialty to be found in major centres.

(i) Audiology

36. There are Ear, Nose and Throat Surgery Departments in all district general hospitals and most have an audiology unit. Hearing tests are carried out as aids to

Survey by the Hospital Physicists Association (1967)

Analysis of work done in the 15 largest Medical Physics Departments

Percentage of time spent by graduates and technicians in each Branch of Department

Centre	Number		Percentage of Time spent on Various Activities									
			Radiotherapy		R-Isotopes		Radiological protection		Diagnostic radiology		General	
	Grad.	Techns.	Grad.	Techns.	Grad.	Techns.	Grad.	Techns.	Grad.	Techns.	Grad.	Techns.
Glasgow	51	40	32	26	35	19	7	3	4	5	22	47
Royal Marsden	22	30	23	20	20	30	11	10	4	5	42	35
Leeds	21	22	5	2	15	17	22	33	2	1	57	47
Edinburgh	16	28	22	0	22	14	15	15	9	0	33	71
Hammersmith	15	27	38	20	39	26	5	8	6	5	8	41
Middlesex	13	14	23	14	23	29	4	7	0	0	50	50
Aberdeen	12	15	7	10	28	20	15	10	14	10	35	50
Birmingham	12	18	27	40	17	14	16	15	13	11	28	20
Bristol	11	15	36	27	17	20	5	1	3	0	40	52
Christie, Manchester	11	16	43	25	19	15	25	55	8	2	6	3
Sheffield	11	15	18	13	29	37	7	10	2	0	39	40
St. Barts	9	14	37	29	33	29	11	7	8	0	11	35
St. Thomas'	8	6	46	22	43	75	7	3	0	0	4	0
U.C. Hosp.	8	10	22	30	25	30	6	10	6	5	41	25
Velindre, Cardiff	8	6	43	30	46	30	3	30	0	0	3	10

surgery, for the fitting of hearing aids and for speech therapy. Audiology technicians undertake this work. A few specialised units have been set up, for instance the unit at the Royal Berkshire Hospital, Reading where a principal physicist is employed.

(j) Intermittent Haemodialysis

37. Intermittent dialysis is an example of a recently developed technique requiring technical support. As in the case of cervical cytology development has been particularly encouraged by the Health Departments. At a conference in March 1965, it was accepted as an established and effective form of treatment for chronic renal failure and a Working Party was set up to advise how a dialysis service should be developed throughout the country as rapidly as was compatible with proper training and a high standard of patient care.

In 1967, 14 of the 15 regions in England and Wales had at least one unit operating (although some were only pilot units then). The number of units in operation in England and Wales was 19 and Scotland had 5 units.

38. At least one trained technician and a student technician are needed in a main unit. Their duties are to maintain and repair the equipment and assist in development work. Manufacturers will undertake some servicing, but there will also be a need for a hospital-based maintenance service. The number of qualified technicians with a knowledge of artificial kidney machines will have to be increased considerably to meet this future requirement. As the number of patients increases, so too will the volume of demands on pathology laboratories.

(k) Dental Laboratories

39. In a centralised hospital service, every accident centre would have a dental laboratory to enable fracture cases to be dealt with immediately. Close liaison is required between the surgeon and the technician in many of the more complex accident injuries and operations for malignancies. This association includes working with the dental surgeon and orthodontist, as well as plastic and general surgery both in the wards and in the laboratory. An accident centre having a laboratory will be able, in addition to the accident and specialist work, to supply appliances for referred cases, geriatric patients and orthodontic patients, thus providing a group service.

(l) The Central Sterile Supply Department

40. The purpose of the C.S.S.D. is to provide for all departments of the hospital served—with possible specified and limited exceptions—reliably sterilized articles, including disposables, when and where required, as economically as possible and under conditions which can be properly controlled. The main exceptions are operating theatres which often have a separate sterilizing unit (T.S.S.U.) and some sterilizing in accident and emergency departments.

41. The departments at present in existence vary widely in size and function. C.S.S.D.s owe their existence largely to the initiative of individuals, particularly pathologists and pharmacists, and some serve only one hospital; but in some areas Regional Hospital Boards have established departments serving a number of hospitals on a sub-regional basis, and in Scotland one of the Regional C.S.S.D.s produces ward packs for two of the five Regions comprising about four-fifths of Scotland's beds.

(m) Computer Services

42. All Regional Hospital Boards in England and Wales and most in Scotland are using computers for administrative applications including payroll, stores, accountancy,

payments and hospital activity analysis. There is, however, wide variation in the level of use in different regions, both in the range of work undertaken and in the extent of the geographical areas over which it has been applied. In addition, there are seven London and four provincial teaching hospitals carrying out medical development work on computers. Again, they range from those making relatively modest applications to a teaching hospital which currently has over 20 medical applications processing by computer. Particular usages which are of interest include radiation dose calculations and the analysis of data from whole body counters.

43. Technical advice on the planning, installation and operation of computers is available from the recently formed Computer Research and Development Branch of Statistics and Research Division of the Ministry of Health, who in turn can secure advice from the Treasury, the Ministry of Technology and the various companies selling computers. These latter also provide advice direct to users and prospective users.

44. The Scottish Home and Health Department has access to the Scottish Office Computer Centre. It has also set up jointly with Elliott Automation a Scottish Medical Automation Centre for a three year period at Edinburgh. The prime purpose of the Centre is to provide education, advice and assistance in the application of automation techniques to all aspects of the health and medical services and to give an opportunity for experimental work on the use of computers in medical work. The Centre runs introductory courses on medical computing. Various activities have been undertaken at the Centre including the maintenance of an electronic file of a psychiatric case register, the production of tables relating to infant feeding in Scotland, a pilot study of the setting up of a computer of deaf records and various statistical analyses of data relating to kidney function, cardio-vascular function, respiratory function and urology. In addition, a daily computing service is provided to the Department of Clinical Chemistry at the Royal Infimary, Edinburgh, by means of a teleprinter link.

(*n*) *The Public Health Laboratory Service*

45. The Public Health Laboratory Service is not strictly speaking part of the N.H.S. hospital service, being directly provided by the Minister of Health under Section 17 of the National Health Service Act, 1946 and administered by the Public Health Laboratory Service Board, constituted under the Public Health Laboratory Service Act, 1960. (The Service covers England and Wales but not Scotland.) However it is very closely linked to the hospital service in staffing and organisation and the description of science in the hospital service would not be complete without a brief reference to it.

46. The function of the Service is to make a continuous study of how communicable microbial diseases are spread and what advice may be offered about their control; thus its work is essentially bacteriological, virological and epidemiological, the aim being to apply in these fields—on a national scale—the outlook and methods of a research team to the day-to-day problems of infections as they are met in ordinary life. Apart from certain tests closely associated with bacteriological and virological examinations, chemical and biochemical tests in histological examinations are not performed. Except by special arrangements the Service does not undertake work that is rightly within the province of the hospital or clinical pathologist, but it is ready to help when facilities for such work are not otherwise available. As a matter of policy recently agreed, joint laboratories for P.H.L.S. and hospital microbiology are now being set up wherever local conditions favour such development.

47. The Service runs the Central Reference Laboratories of the Service which are situated largely at Colindale, London, and 61 regional and area laboratories in England

and Wales, together with three 'recognised' laboratories—the latter being hospital pathological laboratories which undertake the examination of sanitary specimens for the Service in areas where the facilities of a P.H.L.S. laboratory are not available, or are available only at a distance and with considerable inconvenience. Nine of the 61 laboratories are Regional laboratories, most of which are staffed by three to five medically qualified workers together with junior bacteriologists in course of training. The Regional Laboratories act, to some extent, as parent laboratories to a group of area laboratories. They provide help in the handling of special e.g. epidemiological enquiries, and in the provision of staff substitutes during periods of leave or illness.

C. Research and Development

Medical Research

48. The University medical schools and the Medical Research Council play the major parts in the promotion and support of research in medicine.

England and Wales

49. The main activities are, first, in agreement with the Medical Research Council, the operation of a scheme to encourage research by N.H.S. staff into problems of day-to-day practice, and to act as a stimulus for medical self-education. Projects are administered by the hospital authorities themselves, with the advice and guidance of local research committees. The Ministry makes contributions from central funds against annual programmes and receives reports. In 1967/68 the Ministry of Health contributed £700,000 towards programmes totalling £1 million. The balance was met by the Hospital Boards themselves from their non-exchequer funds. Boards also finance whole projects from these sources. There were about 1,000 schemes in 1967/68 programmes. They were mainly clinical studies, such as studies of diagnostic techniques, clinical trials of methods or apparatus, etc.—and about a quarter of them employed non-medical scientific or technical staff.

50. Secondly, the Ministry promotes centrally a small number of other clinical studies. These are either projects outside the normal scope of the decentralised scheme, or studies on certain themes, such as the testing of methods of early detection of cervical cancer, which have considerable service implications. The 1967/68 programme included six projects on the evaluation of methods of cervical cytology, four of automated methods in diagnostic bacteriology, an evaluation of rapid blood sugar tests, and an evaluation and bench testing of machinery used for monitoring patients with acute myo-cardial infarction. Most of the remaining studies are records, methods, studies, surveys, etc. The expenditure in 1967/68 was about £200,000.

51. Thirdly, the Ministry finances the trial of certain special medical developments (such as intermittent renal dialysis facilities, intensive coronary care units, cardiac pacemaker trials, automated pathological laboratories, etc.) which are evaluated in a limited number of places before their adoption for general use. Of these the trials in pathological laboratory automation (at Queen Elizabeth Hospital, Birmingham; Hammersmith Hospital; University College Hospital; St. Stephen's Hospital, Chelsea) are to some extent scientific or technical in character. Expenditure on special medical development in 1967/68 was £700,000.

Scotland

52. Current expenditure on medical research by the Scottish Home and Health Department is estimated at £190,000 per annum. Hospital authorities are empowered

to use their non-exchequer funds for research—subject to the terms of individual trusts. A proportion of the endowment funds of the hospitals taken over in 1948 was used for the establishment of a Scottish Hospitals Endowments Research Trust. The Trust makes grants to research workers in hospitals and universities. The annual income of the Trust is about £120,000 and allocations are again made on the advice of the advisory Committee of Medical Research.

Research and Development of Medical Equipment

53. The Health Departments support a programme of research and development on medical equipment and supplies, especially on those more sophisticated types which advances in modern technology have made possible. There is liaison between the departments to avoid unnecessary duplication. The programme covers a wide range of items, some of which do not fall strictly within the hospital field, and includes transport for the congenitally deformed, automated pathology equipment, fibre optics devices, the use of the laser in medicine, dental materials, sterilization equipment and procedures, patient monitoring devices, artificial kidney systems and components, ultrasonic equipment, thermography, and cardiac pacemakers. Although the development of new types of equipment and the application of advanced technological techniques to assist in the treatment of patients is of obvious importance in its own right, an important and related objective is the accumulation of information which, when made available to industry, will help to raise the standard of British made medical equipments and thus stimulate the export trade and reduce imports. Work is also done on the critical evaluation of equipment, usually in collaboration with hospital authorities. There is very close contact with the National Research and Development Corporation and also with the Ministry of Technology. The money allocated for this work by the Ministry of Health in 1967/68 was £425,000 and by the Scottish Home and Health Department £50,000.

54. Among the tasks facing the research and development organisation is the definition of the precise performance that is required of particular items. This is often far from straightforward and requires close co-operation between technologists and the appropriate medical experts. A great deal of attention is paid to preliminary studies of this type, since they are regarded as fundamental to the establishment of a long-term programme. Similarly, care is taken to ensure that equipments requiring clinical evaluation are assessed on a broad basis and at more than one centre, so that a representative medical opinion can be otained. Indeed the success of the whole programme depends on the collaboration of many authorities outside the department itself and prominent amongst these are the Medical Physics Department and Biochemistry Departments in the Hospitals.

55. Items for inclusion in the research and development programme come to light in consequence of surveys specially conducted in the various fields, and in the course of normal departmental work. Proposals are sometimes received from industry, from hospitals, and from individual inventors or workers. The Health Departments welcome such approaches since it is only by considering the suggestions from as wide a range of interests as possible that a well-balanced programme can be conceived. Once the programme has been laid down research and development on medical equipment proceeds, roughly speaking along the following lines:

(*a*) preliminary study or research in the laboratory,

(*b*) research and evaluation work in the clinics and hospitals in collaboration with medical and scientific staffs,

(*c*) development work within industry when the projects are approaching the production stage.

56. Although the hospital and the clinic are regarded as the ultimate proving ground for medical equipments and as the main sources of inspiration for fresh advances in the medical equipment field, there is a great deal of work that can be done outside the hospital environment.

57. The Department's supply and procurement functions (which include acting as Production Authority for the medical equipment industries) cannot be discharged without adequate professional support. This support takes the form of providing scientific and technical advice as required, rendering contracts services such as the preparation of technical specifications, tender adjudications, works inspections, quality control, liaison with bodies such as the British Standards Institute and with industry, investigating cases of failure of equipment in service, investigating accidents and so on.

58. There is also in the Ministry of Health a separate wing which is concerned solely with research and development, with special reference to electronic and electro-medical devices and the provision of scientific and technical information and liaison. But in most other areas, research and development is so closely linked with the existing and often highly specialised services described above that a separate organisation for research and development is not appropriate. The technical staff of the Scottish Home and Health Department are shortly to be strengthened by the appointment of a principal scientific officer and additional technical staff.

59. A great deal of valuable research and development work in the medical equipment field is carried out independently in many different centres up and down the country, including Medical Physics and Biochemistry Departments in Hospitals, in the Universities, and in industry. As it is important that as much as possible of the information should be made widely available a section has been set up in the Ministry of Health charged with the task of obtaining and disseminating such information.

APPENDIX III

Staff Employed in Hospital Scientific and Technical Services

1. Appendix II gave a general picture of the present arrangement of scientific and technical services within the hospital service. This Appendix complements the picture given in Appendix II by describing the various classes of staff employed in the scientific and technical services.

A. General description of the scientific and technical classes

2. The list below shows the principal classes of staff. Medically qualified staff who form part of the medical staffing structure are not shown. It does not follow because a class is included in the list that the Committee consider it should form part of the proposed Hospital Scientific Service; the question of the classes to be included is discussed in Section 5 of the Report. The letters and numbers beside each class refer to the sub-section under which it is described in Section D of this Appendix. The classes are grouped into five categories:

(*a*) scientists, whose salaries and conditions of service are negotiated in the Professional and Technical Whitley Council;

(*b*) pharmacists, who are dealt with by the Pharmaceutical Whitley Council;

(*c*) those technical staff who, like the scientists, are the concern of the Professional and Technical Council;

(*d*) the *ad hoc* classes, mainly technicians who have been recruited to meet the needs of a new specialty, whose salaries and conditions of service are laid down by the Minister of Health and the Secretary of State for Scotland; and

(*e*) those who are the concern of the Ancillary Staffs Whitley Council.

(*a*) *Scientists* (Whitley Council Professional and Technical)

A.1. Biochemists
A.2. Physicists
A.3. Clinical Psychologists
A.4. Other Scientific Officers

(*b*) B.1. *Pharmacists* (Pharmaceutical Whitley Council)

(*c*) *Whitley Council* (Professional and Technical Council)

C.1. Audiology Technicians
C.2. Cardiological Technicians
C.3. Dark Room Technicians
C.4. Dental Technicians
C.5. Electro-Encephalography Technicians
C.6. Medical Laboratory Technicians
C.7. Medical Photographers
C.8. Medical Physics Technicians
C.9. Pharmacy Technicians
C.10. Radiographers
C.11. Dietitians
C.12. Orthoptists

(*d*) *Ad hoc Classes* (Conditions laid down by the Ministers)

D.1. Animal Technicians
D.2. Artificial Kidney Technicians
D.3. Contact Lens Technicians
D.4. Electronics Technicians
D.5. Glaucoma Technicians
D.6. Heart and Lung Machine Technicians
D.7. Medical Artists
D.8. Respiratory Function Technicians
D.9. Surgical Instrument Curators
D.10. Surgical and Orthopaedic Appliance Technicians and Fitters

(*e*) *Ancillary Groups* (Ancillary Staffs Whitley Council)

E.1. Domestic Assistant in Pathological Laboratory
E.2. Hospital Porter (Special Duties)
E.3. Mortuary Attendants
E.4. Mortuary Porters
E.5. Operating Theatre Attendants
E.6. Orthopaedic Appliance Grades
E.7. Plaster Room Orderlies
E.8. Steriliser Attendants
E.9. Surgical Instrument Technicians
E.10. Surgical Shoemakers.

B. The development of the technical classes

3. This section summarises the recent history of some of these classes and, *pari passu* gives a general indication of some of their functions. The general pattern of training, and the effect of the Professions Supplementary to Medicine Act are described in Section C. The numbers employed, career structure and training requirements are described for each class individually in Section D.

4. There was rapid expansion and development of technical services in the war years and most of the main groups of technicians were already established as separate classes when the National Health Service began in 1948. Medical Physics Technicians were still closely linked with the larger Medical Laboratory Technician class but in 1956 this relationship was broken and a separate grading and salary structure agreed in view of the difference in organisation.

5. Each technician class has tended to be dealt with as a separate entity for the purposes of training, grading and organisation. Exceptions to this pattern are cardiological and E.E.G. technicians, who in 1963 were given similar grading structures while retaining separate training schemes.

Development of particular classes

(*a*) *Medical Laboratory Technicians* (C6 in Section D)

6. There has been a rapid expansion in pathological services since the war, but the structure for the class defined in the present Whitley Council agreement has remained relatively unchanged since 1949. Hospital authorities have however had discretion to recognise posts where work of special responsibility and skill is carried out.

7. A significant factor in the staffing position has been the increasing number of women in the class and, partly as a consequence of this, because of more rapid turnover, the increasing proportion of students and juniors to qualified technicians.

	1950	*1955*	*1966*
Qualified	1,589 (c.a. 7% women*)	2110	3097 (30% women)
Students/Juniors . . .	1,392 (c.a. 35% women*)	2019	4534 (70% women)

(These figures apply to staff employed by HMC's and BG's in England and Wales.)

*Information based on I.M.L.T. registers.

8. The development of higher qualifications and longer periods of study release, and the simplification of many processes have produced a demand for a less highly trained "laboratory aide" who could undertake the simpler technical tasks.

(*b*) *Medical Physics Technicians* (C8 in Section D)

9. Medical physics departments in hospitals are concerned with supplying technical assistance to radiotherapy departments (this now accounts for only about 20 per cent of the work), give assistance in the use of isotopes, and in electronic and mechanical instrumentation. In some hospitals the medical physics service extends to all specialties involved in clinical/physiological measurement including cardiology, E.E.G. and renal dialysis. The physics department may also undertake the servicing of electromedical equipment. In other hospitals a narrower view may be taken of the scope of the physics department or there may be no medical physics department as such, in which case separate grades of staff are needed to look after the services concerned (e.g. electronics technicians and artificial kidney technicians). (See Appendix II.)

10. Physics technicians, unlike medical laboratory technicians, tend to work in small units, and may be employed on individual projects or in a team led by scientists. The early Whitley agreements included mould room and electronics technicians but not technicians engaged solely on maintenance of apparatus. A new grading structure in 1967 provided for the grading of technicians according to their responsibilities and qualifications within the particular organisation of their department, and national qualifications were specified for the class. A London technical college has launched an experimental Ordinary National Certificate in sciences with an elective subject in physiological measurement which might prove suitable for the needs of the hospital service.

(*c*) *Cardiological, E.E.G. and Audiology Technicians* (C2, C5, and C1 in Section D)

11. In 1963, after some years of consultation and negotiation between the Health Departments and consultants and others concerned, a review of the training and work content of cardiological technicians and electroencephalography recordists was undertaken by two committees of leading consultants. This resulted in a new grading structure and syllabus of training.

12. Audiology technicians were originally concerned with testing and fitting hearing aids, explaining their use to patients and making minor repairs. A survey in 1965 showed that the main content of the work had changed from the fitting of aids to the elderly deaf to the ascertainment of deafness in young children, which involved skilled and complicated techniques in the operation of specialised electronic equipment and the handling of child patients. Clinical measurements by the technicians guide the aural

surgeon in the same way as those of the cardiological and E.E.G. technician guide the cardiac-surgeon and the neuro-surgeon.

(*d*) *Dental Technicians* (C4 in Section D)

13. Dental technicians in the hospital service have been drawn from a field where craft training has predominated. In 1964 maxillo-facial work was recognised by a separate grading, but as much of the work in hospitals has become specialised, the demand for skilled specialist technicians in each field of mechancial dentistry has become apparent.

(*e*) *The Ad hoc Groups* (D1–D10 in Section D)

14. Information about the non-Whitley *ad hoc* groups has been compiled from requests for special appointments made by hospital authorities to the Ministry of Health and Scottish Home and Health Department. In some cases the need has followed the development of a new specialty (e.g. heart and lung machine technicians and artificial kidney assistants), but in others the formation of an *ad hoc* class has merely recognised that the conditions of service and grade of an officer in an established class were no longer appropriate to his new work. This happened in the case of surgical appliance technicians. They were formerly paid on ancillary staff rates which did not take account of the managerial and technical content of the work, and their reclassification accounts for the fact that there were ten appointments into this class at about the same time. In some instances *ad hoc* groups have been created because the definition of an existing class could not be expanded to include a new specialty, or because a new type of work was not considered to be a proper responsibility for an existing department, or because no department existed to which the new work could be given. Each of these factors has affected the growth of the electronics technician class.

C. The training of technical classes

15. The training received by the technical classes consists of elements, the mixture of which varies from class to class, of formal whole-time training, formal part-time training and in-service training. There are some classes however in which there is no formal training. Qualifications, where they exist, are sometimes external and sometimes internal.

The Professions Supplementary to Medicine

16. Training requirements and qualifications are determined in two main ways. Four of the technical classes (medical laboratory technicians, radiographers, dietitians and orthoptists) are covered by the Professions Supplementary to Medicine Act, 1960. State registration under the Act was made a condition of employment in the N.H.S. for members of the first three professions in 1964, and for orthoptists in 1968. Training requirements are determined by the Registration Board for each profession subject to approval by the Council for Professions Supplementary to Medicine and the Privy Council. Although informal discussion takes place and the Health Departments offer advice on the functions required of the professions, neither the Health Departments nor hospital authorities have any formal standing and can exert no direct influence on the content, method or standard of training.

17. Training for technical classes not covered by the Professions Supplementary to Medicine Act has evolved through the process of Whitley Council negotiations on terms and conditions of service in which the Health Departments' representatives, usually after consultation with the medical specialties concerned, exerted an influence on grading definitions and qualifications. Recent examples are the in-service training schemes

for cardiological and E.E.G. technicians, audiology technicians and pharmacy technicians.

18. Of the 12 technical classes listed in paragraph 2 above which are classified as professional and technical staff for Whitley Council purposes:

One class (Dark-room Technicians) has no system of training and no qualification.

Three classes (Radiographers, Orthoptists, Dietitians) have formal whole-time training ranging from nine months to four years leading to external qualifications.

One class (Medical Laboratory Technicians) has formal part-time training of five years leading to external qualification.

Three classes (Cardiological Technicians, E.E.G. Technicians, Audiology Technicians) have in-service training leading to in-service qualifications, although some staff also have the opportunity to attend part-time courses leading to external qualifications.

One class (Dental Technicians) has training either by apprenticeship or by part-time training leading to external qualification although some have only on-the-job training.

Two classes (Medical Photographers and Pharmacy Technicians) have part-time training leading to external qualifications, although some have only on-the-job training.

One class (Medical Physics Technicians) has various methods of entry and training according to the skills required:

(*a*) some qualify (e.g. by O.N.C.) before entry;

(*b*) some have industrial apprenticeship or experience before entry;

(*c*) some have part-time training leading to external qualification.

Thus there are 12 different forms of training and some of these sub-divide into methods of training which differ in kind and quality. In some cases the external qualification has been developed by an outside body or professional association and has been recognised by the Ministry of Health, or by individual hospitals.

19. Taking the 10 *ad hoc* classes listed in paragraph 2 which are not classified for Whitley Council purposes, the staff in two (Glaucoma Technicians and Artificial Kidney Assistants) are trained on the job; in one (Animal Technicians) they are trained on the job, with attendance in some cases at part-time courses leading to external qualifications; and seven classes depend for training on the recruitment of persons with experience or qualifications obtained elsewhere who can be given specialised in-service training and may be encouraged to follow part-time training leading to external qualifications.

20. Of the 10 ancillary classes listed in paragraph 2, staff in three classes are required to have previous (trade) experience and on-the-job training and those in the remaining seven have only on-the-job training. An Advisory Committee on Ancillary Staff Training has recently been set up.

D. Job description of classes of staff engaged in the hospital scientific and technical services

A.1. BIOCHEMISTS

1. *Job description.* The clinical biochemist studies and advises on chemical and biochemical processes in the organs, tissues and fluids of the human body and the effect of disease and drugs on these processes. He organises the routine service of analytical and functional tests; devises and tests new methods of investigating disease processes; and applies to clinical problems all modern chemical techniques.

2. *Numbers in post* (whole time equivalent):

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
England and Wales* . . .	228	249	265	291	303	333	367	435
Scotland	44	50	50	52	56	55	65	84
Total . . .	272	299	315	343	359	388	432	519

*Figures prior to 1963 do not include R.H.B. staff.

3. *Grades:*

(*a*) *Basic.* There is a probationary period of at least two years for all new entrants to the grade. Retention in the service is conditional upon the acceptance of a certificate of proficiency by the employing authority.

(*b*) *Senior.* A biochemist who is employed in a post of greater responsibility, the duties of which might or might not include the supervision of biochemists in the basic grade and who has had at least five years experience in the basic grade.

(*c*) *Principal.* A biochemist who is in charge of the biochemical department of a large laboratory; or a biochemist in a smaller laboratory who has shown exceptional merit and is doing work of a special nature.

(*d*) *Top grade.* For special posts subject to the concurrence of the Minister of Health or the Secretary of State for Scotland.

Top grade committees for scientists

Note: In the notes about biochemists, physicists and clinical psychologists (A1, A2 and A3 in Section D of this Appendix) reference is made to the top grade which can be applied only with the concurrence of the Minister of Health or the Secretary of State. The Ministers are advised on applications to establish these posts by small committees of experts (a separate committee for each of the three groups). The Top Grade Committees normally insist (inter alia) on a postgraduate qualification before accepting a candidate as suitable for the top grade.

A.2. PHYSICISTS

1. *Job description.* Hospital physicists conduct physical measurements in the field of radiation physics, diagnostic and therapeutic use of radioisotopes, and medical electronics and instrumentation, and may have teaching and training commitments. In addition they carry out research and development on medical equipment and on physical problems arising in a wide range of clinical specialties.

2. *Numbers in post* (whole-time equivalent):

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
England and Wales* . . .	129	137	142	176	175	191	218	227
Scotland	37	41	44	48	52	63	68	67
Total . . .	166	178	186	224	227	254	286	294

*Figures prior to 1963 do not include R.H.B. Staff.

3. *Grades:*

(*a*) *Basic.* As for Biochemists.

(*b*) *Senior.* As for Biochemists.

(*c*) *Principal.* As for Biochemists.

(*d*) *Top grade.* As for Biochemists.

A.3. CLINICAL PSYCHOLOGISTS

1. *Job description.* Clinical psychologists in the hospital service are employed in psychiatric hospitals, hospitals for the mentally subnormal and at out-patients departments dealing with adults and children. They carry out tests of intelligence, temperament, personality, deterioration and aptitudes in order to help psychiatrists in diagnosis, treatment and vocational guidance. They may also undertake teaching and training and participate in development and research relating to psychological problems.

2. *Numbers in post* (whole-time equivalent):

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
England and Wales* . .	179	189	198	220	216	233	271	298
Scotland	15	22	33	29	30	32	25	38
Total . . .	194	211	231	249	246	265	296	336

*Figures prior to 1963 do not include R.H.B. staff.

3. *Grades:*

(*a*) *Basic.*

(*b*) *Senior.* A psychologist of five years' experience who holds a post of greater responsibility, the duties of which might or might not include the supervision of other psychologists.

(*c*) *Principal.* A psychologist with considerable responsibilities and duties greater than those of the Senior grade, who normally is in charge of psychological services at an institution.

(*d*) *Top grade.* For special posts subject to the approval of the Minister of Health or the Secretary of State for Scotland.

4. *Training and qualifications.* Before taking up an independent post in the National Health Service a psychologist must normally have attained the age of 25 years and satisfy one of the following probationary conditions:

(*a*) Three years full-time service under supervision.

(*b*) An approved course of post-graduate training for one year full-time followed by one additional year of full-time service under supervision.

(*c*) An approved course of post-graduate training of at least two years full-time.

(*d*) The period of service under supervision may at the discretion of the employing authority be extended by one year or reduced on account of previous clinical experience gained since obtaining an appropriate honours degree in psychology or other approved qualification.

A.4. OTHER SCIENTIFIC OFFICERS

1. *Other scientists in hospital laboratories.* In addition to biochemists, physicists and clinical psychologists, there are in the hospital service between 30 and 40 graduate scientists in other disciplines such as bacteriologists, cytogeneticists, physiologists and biologists. A hospital authority would not normally employ more than one of these scientists and there is consequently no career structure for them: in some cases they are fitted into one of the recognised classes but this is not always possible. Occasionally a scientist with a particular type of experience is appointed on a short term basis to work on a research project.

2. *Scientific officers in the National Blood Transfusion Service.* There are about forty scientific officers employed in Regional Blood Transfusion Centres. The grades used for them are the same as those for physicists and biochemists.

B.1. PHARMACISTS

1. *Job description.* The hospital pharmacist is responsible for the provision of drugs and medicines prescribed by the medical staff for use by in and out-patients. He is also responsible for specifying the quality of all drugs, dressings, chemicals, etc., to be ordered and for their proper storage to prevent deterioration. He supervises the work of pharmacy technicians and may have the opportunity to collaborate with clinicians in the trial of new drugs and techniques.

2. *Numbers in post:*

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
England and Wales . .	1,444	1,423	1,456	1,478	1,463	1,405	1,444	1,439
Scotland	183	188	200	192	186	175	186	197
Total . . .	1,627	1,611	1,656	1,670	1,649	1,580	1,630	1,636

3. *Grades:*

(*a*) *Pharmacist* (*Basic grade*).

(*b*) *Senior Pharmacist.*

(*c*) *Deputy Chief Pharmacist.*

(*d*) *Chief Pharmacist.* There are five categories of Chief Pharmacist posts (each having sole charge of and responsible for running hospital pharmaceutical departments) which are determined under a points scheme which reflects the size of the hospitals involved.

Pharmaceutical services are normally organised on a group basis and group and teaching hospital allowances are payable to Chief and Deputy Chief Pharmacists where appropriate.

4. *Training and qualifications.* All entrants to the class must be registered with the Pharmaceutical Society of Great Britain. Following a three or four year course for the degree of B.Pharmacy, B.Sc. (Pharmacy) or the Pharmaceutical Chemists Diploma, a graduate must satisfactorily complete one year's practical training under the supervision of a registered pharmacist before registration. Most schools of pharmacy are parts of universities either constituting a faculty of pharmacy or being attached to the faculty of medicine or the faculty of science. The rest form part of Colleges of Technology which conduct courses for C.N.A.A. degrees.

5. *Current staffing position.* The latest establishment figures available, obtained by a special enquiry at 1st February 1966 show the following deficiences:

	All Grades per cent	*Basic Grades* per cent
England	22	43
Scotland	18	34

C.1. AUDIOLOGY TECHNICIANS

1. *Job description.* Audiology technicians carry out the technical work of hearing aid centres, giving audiometric tests to patients, fitting hearing aids, and giving instruction on how to use the aid and other auditory training. Persons engaged exclusively on the repair of hearing aids would not be placed in this class.

2. *Numbers in post:*

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
England and Wales . .	221	219	228	226	224	231	247	253
Scotland	31	31	31	33	33	31	32	34
Total . . .	252	250	259	259	257	262	279	287

Increase 13·9 per cent since 1960

3. *Grades:*

(*a*) *Student Audiology Technician.*

(*b*) *Audiology Technician II.* A technician employed on a limited range of simple duties.

(*c*) *Audiology Technician I.* A technician employed on a wider range of more advanced techniques.

(*d*) *Senior Audiology Technician.*

(*e*) *Chief Audiology Technician.* Employed, exceptionally, with the approval of the Minister at selected centres.

4. *Training and qualifications.* The Minister of Health and Secretary of State have recommended a course of in-service training which is taken in two parts, normally during the first two years of employment. In some cases training at a recognised centre, e.g. Institute of Laryngology and Otology is recognised as equivalent to the theoretical parts of the recommended training.

The Ministers have recommended that courses of theoretical training should be organised by hospital authorities in co-operation on a regional basis or by arrangements made with local technical colleges.

C.2. CARDIOLOGICAL TECHNICIANS

1. *Job description.* A Cardiological Technician provides technical support in a hospital cardiac department, and uses electronic apparatus to record measurements of the electrical impulses and sounds generated by the contraction of the heart, and in some cases blood pressures and the amount of oxygen in the blood. Where heart surgery is carried out he may be required to monitor readings during operations.

2. *Numbers in post* (whole-time equivalent):

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
England and Wales . .	303	331	357	424	455	495	549	585
Scotland	47	55	54	56	62	74	73	91
Total . . .	350	386	411	480	517	569	622	676

Increase 93·1 per cent since 1960

3. *Grades:*

(*a*) *Student Cardiographer.*

(*b*) *Cardiographer.* Employed on electro-cardiography and in some cases simple phonocardiography.

(*c*) *Cardiological Technician.* Employed in a department where prescribed techniques are regularly used.

(*d*) *Senior Cardiological Technician.*

(*e*) *Chief Cardiological Technician.* Employed exceptionally, with approval of the Minister, or Secretary of State at selected cardiac centres.

4. *Training and qualifications.* The Minister of Health and the Secretary of State have recommended a course of in-service training which is taken in two parts, normally during the first 18 months of employment.

On conclusion of this training each student to apply for a certificate of competence in the performance of these duties from the physician in charge of the department who should apply oral, technical and written tests before granting the certificate.

C.3. DARK ROOM TECHNICIANS

1. *Job description.* Processing and development of X-ray films, in both wet (manual) and automatic dark rooms. Occasionally some cine-films are processed.

2. *Numbers in post* (whole time equivalent):

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
England and Wales								
H.M.C./B.G. . .	937	963	1,001	974	992	1,031	1,019	1,049
R.H.B./M.R.U. . .	25	26	32	34	38	34	14	25
Scotland	106	111	122	119	127	126	127	130
Total . . .	1,068	1,100	1,155	1,127	1,157	1,191	1,160	1,204

Increase 12·7 per cent since 1960

3. *Grades.* A single grade class.

4. *Training and qualifications.* In-service experience on the job.

C.4. DENTAL TECHNICIANS

1. *Job description.* Dental technicians work in hospital and dental laboratories, and may be required to construct both routine, and highly specialised, appliances for patients.

2. *Numbers in post* (whole-time equivalent):

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
England and Wales . .	244	252	282	274	284	295	307	308
Scotland	50	56	55	57	63	67	75	73
Total . . .	294	308	337	331	347	362	382	381

Increase 29 per cent since 1960

3. *Grades:*

(*a*) *Apprentice or Student Dental Technician.* A person who is employed in a dental laboratory and who is training to become a dental technician through a recognised apprenticeship scheme.

(*b*) *Dental Technician.*

(*c*) (i) *Senior Dental Technician.*
(ii) *Senior Dental Technician* (*Maxillo-Facial*).

(*d*) *Chief Technician I.* In charge of 6–9 technicians.

(*e*) *Chief Technician II.* In charge of at least 10 technicians.

4. *Training and qualifications.* By recognised apprenticeship normally combining day release training with in-service experience or under an approved training scheme lasting four years, including one year's in-service experience.

Entrants to the Technician grade are expected to have completed an apprenticeship, or equivalent training, or hold the Final Certificate in Dental Technology of the City and Guilds of London Institute. For higher grades the Advanced Certificate in Dental Technology of the City and Guilds of London Institute is an appropriate qualification together with relevant experience.

5. *Recent changes in class structure.* In 1964 a specialist grade of maxillo-facial technician was created. In the agreement reached in May 1968 specialist skills other than maxillo-facial were recognised by a senior grade for dental technicians who are regularly engaged on advanced work and also have supervisory responsibilities.

C.5. ELECTRO-ENCEPHALOGRAPHY TECHNICIANS

1. *Job description.* E.E.G. technicians work in conjunction with the neurosurgical, neurological or psychiatric departments of hospitals, and use apparatus to obtain records of the electrical impulses from the brain.

2. *Numbers in post* (whole-time equivalent)

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
England and Wales . .	121	119	124	151	160	172	185	209
Scotland	13	14	13	15	13	17	18	17
Total . . .	134	133	137	166	173	189	203	226

Increase of 68·7 per cent since 1960

3. *Grades:*

(*a*) *Student Electro-encephalography Technician*

(*b*) *Electro-encephalography Technician.* A technician who produces records of a routine nature without direct supervision and who may be expected to assist under supervision in work of a non-routine character.

(*c*) *Senior Electro-encephalography Technician.* A technician who produces records without supervision and devises electrode systems to suit given circumstances (e.g. for the location of lesions). He must be able to select and apply the appropriate provocative stimuli other than those for which the medical staff are responsible.

(*d*) *Chief Electro-encephalography Technician.* Employed exceptionally, with the approval of the Minister of Health or Secretary of State for Scotland, as the technician in charge of a Department where it is necessary to employ an officer who is highly trained and skilled in electronics.

4. *Training and qualifications.* The Minister and Secretary of State have recommended a course of in-service training lasting not less than twelve months, which is taken during the first two years of employment.

C.6. MEDICAL LABORATORY TECHNICIANS

1. *Job description.* Carrying out laboratory tests on specimens of body tissues and fluids for the purpose of diagnosis and treatment, The branches of this work include microbiology, chemical pathology, histopathology and cytology, and in a few hospitals, parasitology.

2. *Numbers in post* (whole-time equivalent):

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
England and Wales								
Students/Juniors in H.M.C.s/B.G.	2,587	2,750	2,949	3,600	3,814	4,157	4,534	4,760
Qualified M.L.T.s in H.M.C.s/B.G.	2,729	2,789	2,985	2,599	2,702	2,860	3,097	3,334
All grades, in R.H.B.s	147	275	267	339	352	352	365	397
Scotland	645	658	721	847	917	992	1,040	1,167
Total	6,108	6,472	6,922	7,385	7,785	8,361	9,036	9,658

Increase 58·1 per cent since 1960

3. *Grades:*

(*a*) *Student Technician.*

(*b*) *Junior Technician.* A Junior Technician is a Student Technician who:

(i) holds a qualification at the level of the Ordinary National Certificate; or

(ii) is 30 years of age.

(*c*) *Medical Laboratory Technician.* A state registered technician

(*d*) *Senior Technician I.* In charge of a small laboratory or a small division of a large laboratory or a peripheral laboratory of a group of associated laboratories linked administratively.

(*e*) *Senior Technician II.* In charge of four technicians.

(*f*) *Chief Technician I.* In charge of eight or more but less than 20 technicians.

(*g*) *Chief Technician II.* In charge of 20 or more technicians or of a specialised laboratory mainly engaged on complex examinations or research not of a routine nature and requiring the highest degree of technical skill.

4. *Training and qualifications:*

(1) In order to become a registered Medical Laboratory Technician, a technician has to obtain one of the qualifications recognised by the Medical Laboratory Technicians Board:

(*a*) The Associate (Final) Examination of the Institute of Medical Laboratory Technology; or

(*b*) an H.N.C. or U.K. degree, in specified science subjects;

(*c*) an H.N.C. in medical laboratory subjects is under consideration.

Training normally takes five years, and students or junior technicians attend day release/evening classes in Colleges, obtaining experience of practical techniques during their service in the pathological laboratory.

(2) In order to enter the Institute of Medical Laboratory Technology's Intermediate examination, or the O.N.C. course, a student must have four 'O' level passes including two in science subjects. Technicians who obtain the Intermediate Institute of Medical Laboratory Technology examination or the O.N.C. in Sciences with a pass in Medical laboratory science (normally after two or three years) or who have two 'A' levels in science subjects, may be graded as Junior Technicians.

(3) Senior and Chief Medical Laboratory Technicians are required to have passed the Fellowship examination of the Institute of Medical Laboratory Technology.

C.7. MEDICAL PHOTOGRAPHERS

1. *Job description.* Photographic recording of patients and/or pathological material in monochrome or colour, in still or cine photography. (*Not* routine repetitive processing, e.g. microfilming of case records, photoprinting of documents, developing and printing.)

2. *Numbers in post:*

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
England and Wales . .	121	136	142	185	193	213	206	211
Scotland	16	22	25	25	24	26	31	30
Total . . .	137	158	167	210	217	239	237	241

Increase 76 per cent since 1960

3. *Grades:*

(*a*) *Trainee Medical Photographer.*

(*b*) *Medical Photographer.*

(*c*) *Senior Medical Photographer I.* Single-handed or in charge of one Medical Photographer or Trainee.

(*d*) *Senior Medical Photographer II.* In charge of a medical photography department with two or more Medical Photographers or Trainees.

4. *Training and qualifications.* No specific guidance on training has been given, but where courses are available trainee photographers attend day or evening release classes at colleges of Further Education for a qualification of the Institute of Incorporated Photographers or City and Guilds.

C.8. MEDICAL PHYSICS TECHNICIANS

1. *Job description.* Medical Physics Technicians provide technical assistance to the physicists and doctors who are concerned with the application of physics and nuclear physics, to medicine. Their duties cover a wide range of techniques depending on the size and scope of their department. Duties may include the construction, maintenance and operation of electronic and mechanical apparatus used in the diagnosis and treatment of patients—including that depending on the use of radiation and radio isotopes—the construction and operation of patient monitoring equipment, and the application of computer and display techniques. There may be an overlapping of responsibilities with other associated technical groups engaged in clinical measurement generally.

2. *Numbers in post:*

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
England and Wales								
H.M.C./B.G. . . .	143	164	182	225	247	269	285	333
R.H.B.	7	9	9	13	17	24	25	28
Scotland	20	42	45	43	47	52	46	48
Total . . .	170	215	236	281	311	345	356	409

Increase of 130 per cent since 1960

3. *Grades:*

(*a*) *Student Technician.*

(*b*) *Junior Technician.* Simple assistance in the use of radium or radioisotopes for therapy and investigation *or* simple clinical or other laboratory measurements.

(*c*) *Medical Physics Technical Grade V.* Construction and operation of mechanical or electronic apparatus used for clinical measurement, including the construction of casts, moulds and other protective equipment used in radiotherapy departments, *or* assistance in the use of radium or radioisotopes for therapy and investigation in the observation and measurement of radio-active or other materials and in the interpretation of results.

(*d*) *Medical Physics Technician Grade IV.*

(*e*) *Medical Physics Technician Grade III.*

(*f*) *Medical Physics Technician Grade II.* In full technical charge of a major branch of work in a laboratory in which there are employed three or more technicians for whom he is responsible *or* a technician of outstanding skill and ability who is engaged on exceptionally important and difficult work.

(*g*) *Medical Physics Technician Grade I.* In charge of the whole of the technical work of a laboratory under a Regional Hospital Board, Hospital Management Committee, Board of Governors or Board of Management, providing a full range of services for a regional or sub-regional area.

4. *Training and qualifications.* Because varied skills are required in this class no scheme of training has been laid down, but entrants to Grade V and above are expected to hold an O.N.C. or H.N.C. in an appropriate subject (Electronic or Mechanical Engineering or physiological measurement or applied physics). In certain cases two 'A' levels in Science subjects or a City and Guilds final Certificate, or the Science Laboratory Technicians Certificate, or an apprenticeship in an approved trade with subsequent experience, may be accepted as a suitable qualification for some of the qualified grades.

Student technicians are expected to study for an approved qualification by day release study.

5. *Equipment used:*

(*a*) Mechanical and electronic workshop equipment.

(*b*) Apparatus used in radiation protection, including monitoring apparatus, and equipment used to construct protective shields and carry out dose planning.

(*c*) Large variety of automatic and electronic apparatus used in clinical measurement. (Cardiac pacemakers, foetal cardiographs, and pressure pills have been developed in Medical Physics Departments.)

C.9. PHARMACY TECHNICIANS

1. *Job description.* The Pharmacy Technician assists under professional supervision in the preparation and compounding of therapeutic agents and the dispensing of prescriptions in hospital pharmacies.

2. *Numbers in post* (whole-time equivalent)

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
England and Wales	1,034	1,081	1,150	1,203	1,288	1,340	1,384	1,455
Scotland	100	105	105	116	119	139	144	138
Total	1,134	1,186	1,255	1,319	1,407	1,479	1,528	1,593

Increase 40·4 per cent since 1960

3. *Grades:*

(*a*) *Student Technician.*

(*b*) *Pharmacy Technician II.*

(*c*) *Pharmacy Technician I.*

4. *Training and qualifications.* The Minister and the Secretary of State have asked Regional Boards to co-ordinate training to enable unqualified staff to take the examination of the Society of Apothecaries (or a special examination in Scotland). Students normally attend day release classes at their local technical college and obtain practical experience in-service.

5. *Recent changes in class structure.* With effect from 1st July 1966, a grading structure was introduced for this class. Prior to that time it had been a single-grade class with an allowance for possession of the Certificate of the Scciety of Apothecaries or another specified qualification.

C.10. RADIOGRAPHERS (diagnostic and therapeutic)

1. *Job description.* Diagnostic radiographers work under the direction of diagnostic radiologists in the handling and positioning of patients and the selection of exposure factors for the taking of X-ray pictures. They are employed also in examinations involving the diagnostic use of isotopes.

Therapy radiographers assist radiotherapists in treating patients by means of X-rays, radium and radioisotopes or, in some procedures, give treatment as prescribed by the radiotherapist.

2. *Numbers in post* (whole-time equivalent):

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
England and Wales . .	3,313	3,331	3,411	3,584	3,780	3,977	4,142	4,370
Scotland	453	467	482	504	494	516	538	543
Total . . .	3,766	3,798	3,893	4,088	4,274	4,493	4,680	4,913

Increase of 30·4 per cent since 1960

3. *Grades.* No distinction in grading, salary or conditions of service is made between radiographers engaged in diagnostic work and those engaged in therapeutic work.

(*a*) *Radiographer.*

(*b*) *Senior Radiographer.* A radiographer of three years' experience working single-handed, or in charge of one or two assistants.

(*c*) *Superintendent Radiographer I.* A radiographer of six years' experience in charge of three to seven assistants, or in charge of a mobile or a static mass radiography unit, or, in charge of one or two assistants and undertaking highly skilled and specialised work.

(*d*) *Superintendent Radiographer II.* A radiographer of eight years' experience in charge of eight to nineteen assistants or in charge of three or more assistants and undertaking highly skilled and specialised work.

(*e*) *Superintendent Radiographer III.* A radiographer of eight years' experience in charge of 20 or more assistants.

Teachers. Teachers are radiographers appointed for teaching duties in a School of Radiography, viz. a training establishment recognised by the Society of Radiographers for the purpose of organising and supervising complete theoretical and practical training of students for the Society's qualifying examination in radiography and/or radiotherapy. A School may comprise a single hospital or a number of hospitals. The following grades apply:

(*f*) *Assistant Teacher.*

(*g*) *Teacher* (other than at a hospital where there is a teacher principal).

(*h*) *Teacher Principal.*

4. *Training and qualifications.* The training for either a therapeutic or a diagnostic radiographer is currently two years full-time. The first year is common to both branches of the work and the student specialises in the branch of his choice during the second year. Entry qualifications are currently four passes at ordinary level in the G.C.E. or the equivalent.

C.11. DIETITIANS

1. *Job description.* Dietitians act as advisers on the nutrition of patients generally and are concerned with their treatment through the modification of diet both in the ward and the out-patient clinic.

2. *Numbers in post.* There are about 260 dietitians in post in England and Wales and 61 in Scotland.

3. *Grades:*

(*a*) *Dietitian*

(*b*) *Senior Dietitian.* A dietitian of three years' experience working single-handed, or in charge of one dietitian.

(*c*) *Deputy Chief Dietitian.*

(*d*) *Chief Dietitian, Grade I.* In charge of two or three dietitians.

(*e*) *Chief Dietitian, Grade II.* In charge of four or more dietitians.

Allowances are paid to Chief Dietitians responsible for the training of student dietitians at a hospital and to other dietitians in the hospital who take an active part in the training of one or more such students.

4. *Training and qualifications.* The usual Training Course lasts for four years and is taken at a Technical College (there is one University Course), but shortened courses are available for applicants with University Degrees or certain other qualifications.

5. *Staffing position.* There has been a rapid increase in the numbers of dietitians entering training in recent years. Numbers in employment have also risen, but there are still many vacancies, particularly in the Supervisory Grades.

C.12. ORTHOPTISTS

1. *Job description.* Orthoptists undertake the diagnosis and treatment of squint and other eye conditions under the direction of an ophthalmologist or of a doctor.

2. *Numbers in Post.* About 245 in England and Wales, and 32 in Scotland. Numbers have risen by about 10 per cent since 1964.

3. *Grades:*

(*a*) *Orthoptist.*

(*b*) *Senior Orthoptist.* An orthoptist of three years' experience working single-handed or in charge of one orthoptist.

(*c*) *Head Orthoptist.* An orthoptist of three years' experience in charge of two or more orthoptists.

(*d*) *Teachers in Training Schools for Orthoptists.* The following grades apply: Student Teacher, Teacher, Head Teacher I and II.

4. *Training and qualifications.* Students take a full-time course of training lasting for just over two years, normally in hospital schools in the National Health Service. The minimum educational requirements for acceptance is G.C.E. or equivalent in five subjects at 'O' level.

5. *Staffing position.* The intake of student orthoptists has increased rapidly in recent years. This is an entirely female profession, though theoretically men may be accepted for training. Some orthoptic work is carried out by ophthalmic opticians.

D.1. ANIMAL TECHNICIANS

1. *Job description.* Under supervision animal technicians undertake the care of the health of stock, including feeding and cleaning, and they assist in the breeding of special strains and give technical assistance during operations or research projects.

2. *Numbers in post.* About 12.

3. *Grades.* Student, Technician and subject to the prior approval of the Minister of Health or Secretary of State, Senior Technician and Higher Posts.

4. *Training and qualifications.* Technicians are expected to study for the Preliminary and Associate examinations of the Institute of Animal Technicians. No special provisions for training are made but in certain centres courses for the approved examination are run on an evening or day release basis.

5. *Current staffing position.* Hospitals have reported difficulties in recruiting technicians and in many centres unqualified animal assistants are employed. In hospitals with only a few animals, a medical laboratory technician may exercise general supervision over the animal house.

D.2. ARTIFICIAL KIDNEY ASSISTANTS

1. *Job description.* Artificial Kidney Assistants work in units where chronic renal failure is treated, where they may prepare and monitor the dialysing apparatus, connect patients to the machines, and adjust the apparatus during treatment. Normally the assistants would work under the supervision of a Nursing Sister in charge of the unit.

2. *Numbers in post.* About 20 (September 1967). As new centres are opened it is expected that up to 150 full-time assistants will be needed.

3. *Grades.* Only one grade of Assistant is recognised at present, although in units without a nurse in charge, a higher senior grade salary may be given to the Assistant-in-charge.

4. *Training and qualification.* Assistants are expected to be mature people at least 21 years of age and should complete 3–6 months of training on the job immediately after appointment.

5. *Note on equipment used.* Dialysing apparatus including monitor, tank and kidney.

6. *Current staffing position.* The staffing of units where chronic renal failure is treated is still experimental. Besides Artificial Kidney Assistants some units also employ Dialysis Orderlies (ancillary grades) to clean the dialysing panels, or Technicians to maintain and develop the equipment. Where technical help cannot be obtained from the Medical Physics Department, the technicians are appointed on an *ad hoc* basis as artificial kidney or dialysis technicians.

D.3. CONTACT LENS TECHNICIANS

1. *Job description:*

   Shell Technicians. Making of plastic shells for plaster moulds.

   Ophthalmic Technicians. Deal with plastic lens, translating measurement details on patient's card into terms of lens power, angle and thickness.

2. *Numbers in post.* About six.

3. *Grades and training.* There is no formal grading structure. Salary scales are determined by the Minister of Health or Secretary of State on an individual basis, having regard to the work undertaken and the qualifications and experience of the technician.
   Training is on the job.

D.4. ELECTRONIC TECHNICIANS

1. *Job description.* The maintenance and repair of electro-medical, electronic, and X-ray equipment in hospitals. In some cases the electronics technician will work under the general supervision of the physicist or consultant concerned, in others the Hospital Engineer may exercise indirect control over the electronics technician.

2. *Numbers in post.* At least 40.

3. *Grades, qualifications and training.* There is no formal grading structure. Appointments are authorised by the Minister of Health or Secretary of State on an individual basis.

Training is normally completed before entry to the class.

D.5. GLAUCOMA TECHNICIANS

1. *Job description.* Glaucoma investigations such as tonometry, provocative tests and visual fields.

2. *Numbers in post.* About six.

3. *Grades, qualifications and training.* There is no formal grading structure. Salary scales are determined on a personal basis having regard to the work undertaken and the qualifications and experience of the technicians. Training is on the job.

D.6. HEART AND LUNG MACHINE TECHNICIANS

1. *Job description.* Heart and lung technicians maintain, assemble and operate under varying degrees of supervision, the by-pass and respiratory function apparatus used during heart operations. They will assist in the theatre during operations, and at the higher levels may carry out research work.

2. *Numbers in post.* England and Wales in 1965 about 38 and in 1967 about 54.

3. *Grades:*

(*a*) *Student.* A person training to become a technician.

(*b*) *Junior.* A technician who is responsible under supervision for the dismantling, cleansing and reassembly of the machine and for simple maintenance.

(*c*) *Technician basic grade.* A technician who is responsible for the dismantling, cleansing and reassembly of the machine, for routine maintenance, and for operating the machine with a minimum of supervision. He may also be responsible for maintaining respiratory apparatus, for giving instruction on routine procedures to students and for assisting in research and experimental work.

(*d*) *Senior Technician.* A technician who is engaged on more advanced work requiring exceptional skill and ability.

Appointments are authorised by the Minister of Health or Secretary of State on an individual basis.

4. *Qualifications and training.* Advice has been given to hospitals that heart and lung technicians should be encouraged to undertake a broad training leading to a national

qualification (O.N.C., City and Guilds Certificate in an appropriate subject etc.) and technicians appointed to the basic and senior grades will normally be expected to hold an approved qualification though other relevant experience may be accepted as equivalent.

5. *Note on equipment used.* Heart and lung machines, oxygenators, respirators, humidifiers and monitoring equipment.

D.7. MEDICAL ARTISTS

1. *Job description.* Responsible for presenting visually facts relating to operative techniques, anatomical structures and medical conditions which cannot be demonstrated suitably by photographic means.

2. *Numbers in post.* About 20.

3. *Grades.* No formal definition. A Medical Artist who is undertaking work of exceptionally high quality can be graded as 'Senior'.

4. *Training and qualifications.* Suitable art training would be required before appointment. The Medical Artists' Association arranges training courses.

D.8. RESPIRATORY FUNCTION UNIT TECHNICIANS

1. *Job description.* These technicians may undertake the testing of a patient's respiratory function, analysing the results. Tests include the diffusion test of pulmonary mechanics, spirometry and blood gas analysis. The technicians may also be responsible for maintenance and development of apparatus. This is an undefined field, and Medical Laboratory Technicians, Medical Physics Technicians with some knowledge of pathological techniques, or Cardiological Technicians with some additional training may likewise be called upon to carry out these duties.

2. *Numbers in post.* About 15.

3. *Grades.* There are no formal definitions. Salary scales are determined on an individual basis having regard to the qualifications and experience of the technician.

4. *Training and qualifications.* There is no formal training, and appointments are normally made to meet a specific need, with further in-service instruction being given as required.

D.9. SURGICAL INSTRUMENT CURATORS

1. *Job description.* Maintenance and repair of surgical instruments. Design and manufacture of prototype equipment. Purchase and issue of instruments.

2. *Numbers in post.* About 20.

3. *Grades:*

   (*a*) *Assistant Curator.*

   (*b*) *Curator* (lower grade).

   (*c*) *Curator* (higher grade).

4. *Training and qualifications.* Normally, an Instrument Curator should have served for a number of years in the surgical instrument industry or in a hospital surgical department where he was engaged in the duties and responsibilities of the above grades. A Diploma of Fellow or Licentiate of the Institute of British Surgical Technicians is considered desirable.

D.10. SURGICAL AND ORTHOPAEDIC APPLIANCE TECHNICIANS

1. *Job description.* Measuring and fitting patients with all types of appliances, and making appliances of an experimental or special nature. In many cases these technicians will also have supervisory responsibility for an appliance workshop in which appliance makers (ancillary grade) are employed.

2. *Numbers in post.* England and Wales. About 20.

3. *Grades, qualifications and training.* There is no formal grading structure, Salary scales are determined by the Ministry of Health or Secretary of State on an individual basis having regard to the work undertaken and the qualifications and experience of the technician. Although technicians mainly involved in experimental work would be expected to hold a suitable qualification in electrical or mechanical engineering, long experience in surgical appliance making with proven ability to originate designs and undertake responsibility for other staff may be reckoned as equivalent.

E.1. DOMESTIC ASSISTANT IN PATHOLOGICAL LABORATORY (Women)

1. *Job description.* Cleaning scientific instruments and glassware.

2. *Numbers in post.* No information available.

3. *Grades.* Single grade.

4. *Training and qualifications.* Training and experience on the job.

E.2. HOSPITAL PORTER—CLASS I

1. *Job description.* Special duties particular to special departments—operating theatre, X-ray, laboratory, dispensary etc.

2. *Numbers in post.* England and Wales, 1965—2,720 (sample survey). No other information available.

3. *Grades.* Single grade.

4. *Training and qualifications.* Training and experience on the job.

E.3. MORTUARY ATTENDANTS

1. *Job description.* Assisting in the mortuary and at post mortems, including duties involving:

(i) opening up and reconstituting of bodies and their disposal;

(ii) disposal of specimens;

(iii) care of post mortem instruments.

2. *Numbers in post.* England and Wales, 1965—315 (sample survey). No other information available.

3. *Grades.* Single grade.

4. *Training and qualifications.* Training and experience on the job.

E.4. MORTUARY PORTERS

1. *Job description.* Assisting in the mortuary and at post mortems. Duties not involving the opening up and reconstituting of bodies, disposal of specimens or the care of post mortem instruments but including the disposal of bodies.

2. *Numbers in post.* England and Wales, 1965—130 (sample survey). No other information available.

3. *Grades.* Single grade.

4. *Training and qualifications.* Training and experience on the job.

E.5. OPERATING THEATRE ATTENDANTS

1. *Job description.* General care and preparation of operating theatre equipment and instruments.

2. *Numbers in post.* England and Wales, 1967—2,044. No other information available.

3. *Grades:*

Class II (General care of equipment and instruments; sterilizing and sharpening instruments, preparation of patients, dressings etc; disposal of specimens and general assistance).

Class I (General care of anaesthetic machines, diathermy equipment etc.; preparation of trolleys and laying out of instruments; other duties superior to Class II).

4. *Training and qualifications.* Training and experience on the job. Courses of training organised by hospital authorities as recommended by the Ministry of Health.

E.6. ORTHOPAEDIC APPLIANCE GRADES

1. *Job description.* Making and repairing orthopaedic appliances.

2. *Numbers in post:*

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
England and Wales . .	241	233	223	228	201	208	199	171
Scotland	56	59	59	59	61	59	59	60
Total . . .	297	292	282	287	262	267	258	231

3. *Grades:*

(*a*) *Metal Workers.*

(*b*) *Appliance Coverers.*

(*c*) *Corset Makers.*

4. *Training and qualifications.*

Metal workers. Engineering background followed by training on the job.

Appliance Coverers. Experience in saddlery, handbag making etc., followed by training on the job.

Corset making. Experience in machining followed by training on the job.

E.7. PLASTER ROOM ORDERLIES

1. *Job description.* Making and applying plasters and splints and performing general duties in the plaster room.

2. *Numbers in post.* England and Wales 1967—162. No other information available.

3. *Grades:*

(*a*) *Class III* (making plaster bandages, obtaining splints, keeping room and instruments clean).

(*b*) *Class II* (class III duties and removing plasters).

(*c*) *Class I* (class II duties and applying simple plasters, making plaster casts and beds and light splints).

4. *Training and qualifications.* Training and experience on the job.

E.8. STERILISER ATTENDANTS

1. *Job description.* Sterlising instruments, equipment etc.

2. *Numbers in post.* No information available.

3. *Grades.* Single grade.

4. *Training and qualifications.* Training and experience on the job.

5. *Equipment used.* Various types of autoclaves.

E.9. SURGICAL INSTRUMENT TECHNICIANS

1. *Job description.* Manufacture and repair of surgical instruments.

2. *Numbers in post.* No information available.

3. *Grades.* Single grade.

4. *Training and qualifications.* Engineering background followed by training on the job.

E.10. SURGICAL SHOEMAKERS

1. *Job description.* Manufacture and repair of surgical footwear and surgical adaptation to normal footwear.

2. *Numbers in post.* England and Wales 1967—57. No other information available.

3. *Grades:*

Grade 4 (repairs to all surgical footwear and adaptations to normal footwear);

Grade 3 (adaptations to normal footwear including cutting and fitting corks; skilled machine operators);

Grade 2 (manufacture of surgical footwear);

Grade 1 (as grade 2 but also making and fitting casts and measuring patients).

4. *Training and qualifications.* Surgical shoemakers are tradesmen whose training will probably have included a period of apprenticeship.

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