

Chapter

1

Research During Specialist Medical Training

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Introduction

Over the last two decades, there has been a paradigm change in the structure of healthcare and the practice of medicine in the United Kingdom. Following a number of inquiries – such as those into practice at Alder Hey Children's Hospital and Bristol Royal Infirmary, the criminal behaviour of Dr Harold Shipman, the Francis report into failure of care and, more positively, Lord Darzi's report on NHS reorganisation – the NHS has placed greater emphasis and increased scrutiny on clinical governance.^{1–6} Increasing costs of healthcare, an ageing population and the increased role of clinical governance have led to the development of National Service Frameworks and the National Institute for Health and Care Excellence (NICE).^{7,8} These changes have directly and indirectly impacted upon the practice of clinical medicine by bringing into focus the use of evidence-based medicine to inform decision-making across the field.

The changing medical environment has been reflected in the evolving structure of Specialist Medical Training in the United Kingdom. Recommendations from a number of major recent reviews^{9–11} have influenced the structured development of Specialist Medical Training. These, alongside other factors such as the implementation of the European Working Time Directive (EWTD), which has enforced a maximum 48-hour working week at trainee level, have played a major role in the current shape of Specialist Medical Training.¹²

The arguments for and against the various changes in medical training are outside the scope of this chapter but certainly, as a result of all the changes, the training pathway now has a greater emphasis on research and academic medicine. The biggest testimony to this is the fact that there is a separate academic training pathway which runs parallel to the clinical pathway to offer motivated trainees structured training to develop their careers.

After completing their undergraduate degree, newly qualified doctors in the United Kingdom are required to complete a two-year foundation training programme. Those who wish to embark on an academic career may apply for one of the Academic Foundation training posts, providing them with an opportunity to experience research as a foundation doctor. All doctors then apply for their preferred speciality medical training programme.¹³ This training can be via the academic or clinical training pathways from the start of foundation training. Regardless of whether a clinical or academic career path is followed, research is an essential component which trainees need to experience in order to appreciate its crucial role in modern medicine.

Research as an Academic Trainee

The National Institute of Health Research (NIHR) was set up in April 2006 as a government body to provide funding for and coordinate NHS research.¹⁴ The NIHR has established various schemes to give a formal structure for academic medical training in the United Kingdom in order to promote research for patient benefit. Any eligible trainee can apply for these very competitive schemes (Figure 1.1).

Academic Clinical Fellowship

The first is the Academic Clinical Fellowship (ACF), also sometimes referred to as the Walport Fellowship (Sir Mark Walport led the committee recommending these schemes).¹⁵ The ACF is typically aimed at specialist trainees in years 1–3, and successful applicants have 25% of their training time protected for academic activities, the mainstay of which is research. This equates to 3 months every year, for a maximum of 3 years. The academic time is flexible and can be taken either per week, per month, per year or as a mixture of all three, to suit the trainee and supervisor/host organisation. The aim of this protected

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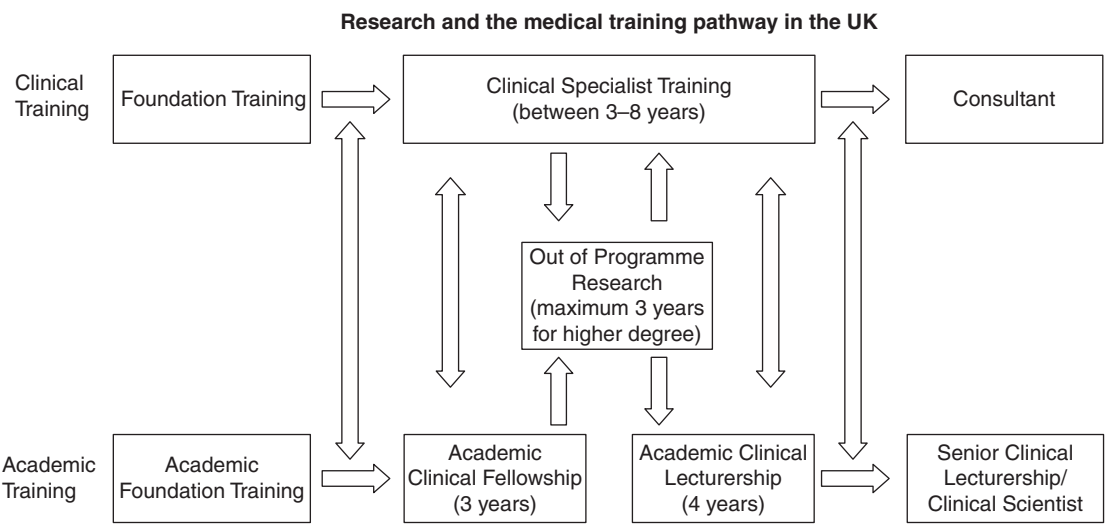


Figure 1.1: Research and the medical training pathway in the United Kingdom

time is to introduce the trainee to research with the ultimate aim of developing a training grant application for a higher research degree such as an MD or a PhD. These grants are provided by a number of government and external funding bodies such as the NIHR, Medical Research Council, Wellcome Trust, BHF etc.^{16–19} In addition, during the course of the three years, many trainees will also have the opportunity to enrol for a Master’s degree, which will provide further research experience and enhance their curriculum vitae. An example is the MMedSci, which addresses a spectrum of professional modules including research. For example, the taught MMedSci at Keele University Medical School covers modules which include ethics, law, informatics, medical education, leadership and management, speciality-specific modules and, with relevance to this chapter, statistics, research methods and a research dissertation.

The ACF is expected to complete all the clinical competencies required of the training pathway in the remaining 75% of their time, providing obvious time management challenges.

Out of Programme as an Academic Trainee

If a trainee is successful in being awarded a research training grant, they can take time (up to a maximum of three years) out of their clinical training programme (Out Of Programme, (OOP)) to complete their higher research degree before returning to their clinical training. If the trainee is not successful in achieving a training grant, they can continue with

their clinical training until further opportunities to apply for research funding arise. Alternatively, the trainee may choose to continue purely with their clinical training instead of pursuing the academic route. The ACF in most cases offers a safety net and ensures the continuation of a clinical training number even if the academic component is dropped.

Academic Clinical Lectureships

Once a trainee completes a higher research degree (DPhil, PhD or MD/DM) they are eligible to apply for the next scheme in the Academic Pathway, which is the NIHR Academic Clinical Lectureships (CL).²⁰ This is the final phase of the integrated academic training pathway. Again, this is very competitive, but the successful applicant can expect to have 50% of their training time protected for research. This can be to collaborate in an existing project or programme of work, lead or co-lead new research projects, supervise junior researchers or undertake a teaching role. However, the remaining clinical training time will be doubled, given that now the trainee will only spend 50% of their time in clinical training. The CL funding lasts for four years, and during this time they are encouraged to apply for funding to support further post-doctoral training to enable progress towards an independent academic career. The CL appointment will end after four years, or six months after completion of CCT (Certificate of Completion of Training, which marks the end of clinical training), whichever is earlier.

Career Progression After Clinical Lectureship

After the completion of the CL, most trainees would have completed their clinical training and become eligible to apply for consultant posts. At this stage, one would envisage trainees' academic careers to have also progressed such that they would be in a position to apply for a Clinician Senior Lectureship or for Fellowship from an external funding body.²¹ Additionally, Clinician Scientist scheme funding opportunities are available at this stage. In many cases, universities would employ these academics, with honorary contracts arranged with NHS hospitals with the aim of leading medical research in their respective specialities.

As described, the complete academic pathway is a long process, and trainees may invest 15 years in becoming a specialist in their field after completing their undergraduate degree. They need to be extremely motivated, competitive and patient and plan ahead to achieve this goal. Nevertheless, nowadays there is a clear progression from medical school to Professorial Chair and trainees with vision and ability can achieve this. Due to the long duration of academic training, some trainees would prefer to experience only some aspects of the academic pathway to initiate or explore their research interests, gain a higher research degree and/or develop an active research interest to accompany their clinical work, rather than become a fully fledged academic.

Research as a Clinical Trainee

The clinical training pathway is the structure which the majority of the current medical academic/clinical elite have gone through to develop their careers. A structured clinical training programme is established for all specialities and the end of training is marked by trainees being awarded a CCT, giving them access to the Specialist Register. Throughout training the focus is on achieving clinical competencies, and there is no protected time to undertake research. However, there are many opportunities for non-academic trainees to develop an interest in academia and research.

Higher Research Degree and the Clinical Trainee

A clinical trainee can undertake research projects and develop a higher research degree training grant proposal at any time during their training. Whilst clinical

trainees do not have protected research training time, any higher degree training grant proposal will be in direct competition with others on the academic pathway. This is challenging because of the time required to complete a pilot study to develop a research training grant application whilst undertaking full-time clinical employment, as well as the duration and complexity of the actual grant application process. Nevertheless, it is achieved by a number of clinical trainees every year. On the other hand, some academic supervisors have funded research projects available whereby an interested trainee may undertake their higher degree studies. It is very helpful to be seen to be keen, so identify and contact potential academic supervisors in your field of interest – you may be lucky immediately. When an obvious candidate has not already identified him/herself, these posts are often advertised through websites such as NHS Jobs or BMJ Careers and are available on a competitive basis.^{22–23} The higher degree is then completed by taking time out of the clinical training programme (OOP).

Pursuing higher research degrees such as a PhD/DPhil or an MD/DM can be of immense value for a clinical trainee because it introduces them to the research skills which are increasingly used in clinical practice. The development of NICE and the increased role of various national societies and Royal Colleges have led to the use of evidence-based medicine in the development of clinical guidelines for a range of medical problems.⁶ Where no guidelines exist, doctors are now encouraged to seek an evidence-based solution and reasoning for their clinical actions. Research skills such as literature searching, critical appraisal and medical statistics are essential in seeking a solution.

Research as a Generic Skill

The enhanced role of clinical governance has meant that research is becoming an increasingly important part of medical training, and for this reason even purely clinical trainees will encounter research at some point in their training. Clinical trainees are in the best position to identify deficiencies in current healthcare practices and their clinical systems, and often have ideas about how to improve them. Taking part in audits and quality improvement projects are also part of all medical speciality training curricula and an important part of appraisal and evaluation. Some audits do result in change in medical practice and healthcare structure improvement for patients.

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It is, however, important to follow-up the impact of audit-related change by performing a further audit at a suitable interval after the introduction of change.

Research for Career Development

Improving one's chance of further employment is high on the list of reasons for clinical trainees to engage in research. Trainees often seek opportunities to undertake research which may be presented in national/international conferences and has the potential for publication in peer-reviewed publications. Some trainees may also receive research prizes, grants or bursaries which are also of excellent value on a curriculum vitae. In addition to higher research degrees, presentations and publications will improve the trainee's curriculum vitae. Furthermore, competition for consultant posts continues: in recent times there are increasing numbers of fully trained doctors awaiting a substantive consultant appointment.²⁴ Although it varies considerably between medical specialities, enhancing one's curriculum vitae has a positive influence on the chances of being appointed as a consultant.

Research for Development of Institutes

Developing a research interest as a specialist trainee and taking this forward to consultant level potentially offers benefit to employing Trusts. Research enhances the profile of any NHS Trust and can in itself help to generate further funding from government and non-government agencies as well as pharmaceutical/private funders. Such investment may, in the long term, result in the development of Research Institutes/Parks in Trusts which enhance local services provision and improve patient care. Whilst this would mainly interest an academic trainee, a clinical trainee could also be very keen to develop such an interest to take forward to their future practice.

Whilst most clinical trainees would undertake a higher research degree and return to full-time clinical training, some continue as clinical academics, or, rarely, move into pure research. Following completion of a higher degree, clinical trainees would be able to apply for a competitive clinical lectureship post in the same way as a trainee on the academic path. 'Pure' clinical trainees who are motivated should not find it beyond them to develop research following a higher degree with the chance to apply for clinician scientist positions and/or university positions. Equally, the medical training pathway offers a budding academic

the opportunity to develop into a fully fledged clinical academic, with training along a structured framework. Either way, the role of research is pivotal.

Research Aims

A trainee's training pathway and career aims will dictate the amount and type of research that is undertaken by him/her. No matter what research is undertaken, the ultimate test of successful research is to achieve publication of some sort. Research that has been performed but not published will only partially teach a trainee about research methods, the research process being complete only when publication has been achieved. Not publishing research may be considered a waste of the researcher's, collaborator's/supervisor's and patients' time, and a waste of resources. The ethics of patient-based research that is subsequently not published is an important consideration. Additionally, unpublished research is of minimal value to a trainee's curriculum vitae.

There are many ways in which research can be published:

- as an oral or poster presentation at a general or specialised research meeting, with a published abstract (this should normally be followed by a full publication)
- as a peer-reviewed research paper
- as a higher degree thesis
- as a part of a review article
- as an electronic publication (e.g. the Cochrane Library)

All undergraduates should have been introduced to research at an early stage when producing a dissertation or mini-thesis as a part of the requirements for a degree. Additionally, medical undergraduates would have submitted essays and mini-dissertations on various special study modules or elective training projects. Therefore, even trainees who have no degrees other than their medical degree will have some experience with writing dissertations. The most common degrees in which a dissertation may be required are:

- Bachelor of Science (BSc)
- Master of Science (MSc)
- Bachelor of Medical Science (BMedSci)
- Master of Medical Science (MMedSci)
- Master of Research (MRes)
- Master of Philosophy (MPhil)

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- Doctor of Philosophy (PhD/DPhil)
- Doctor of Medicine (MD/DM)
- Doctor of Surgery (DCh/DS)
- Doctor of Science (DSc) is more relevant to senior researchers

The BSc, MSc, BMedSci, MMedSci and MRes degrees are usually taught, with a dissertation providing a proportion of the credits. The MPhil is usually a research-based degree by thesis which can be undertaken as a stand-alone degree. However, most universities require a candidate for a higher degree by research to register for an MPhil before being 'progressed' to registration for PhD on the basis of the progress of the research and the researcher. The higher research degrees can be worked for as either a clinical or an academic trainee. This can be done part-time alongside medical training or as an OOP.¹¹

Research for a PhD has previously been considered to be more scientifically oriented, and that for an MD/DM more clinically based, though from experience of examining these degrees, there is much overlap these days. PhD theses have always been closely supervised while, until recently, MD theses were not. There are historical grounds for this. Until relatively recently, the MD tended to be more of a distillation of many years' clinical research experience focused on a particular topic rather than a structured investigation. This has changed. All research theses except the DSc are now considered as research training and all are formally supervised. Much can be learned from a good supervisor, so it is worth trying to be accepted by one with whom you feel you can work – and vice versa! (see Chapter 20)

In general, research undertaken by non-medical graduates would be as part of an MPhil or PhD and usually requires three to four years of single-minded study for completion. Medical specialist trainees would do a PhD or MD/DM. A PhD is more internationally accepted as a research higher degree, and those aspiring to an academic career at a high level in the present day would perhaps be well advised to pursue this line. Furthermore, in the USA and in parts of Asia 'MD' is the name of the basic medical degree, which can give rise to confusion, and is the reason for the alternative degree title of 'DM'. The MD/DM can be, and often is, completed in two years. Either way, a PhD or an MD/DM is best completed as an OOP experience.

There have been isolated cases where trainees have engaged in part-time PhD and MD programmes alongside their basic medical training as an intercalated degree. This kind of change may be beyond most medical trainees. Such programmes require very high levels of dedication, efficiency, time management and practicality, which are outside the realms of most medical trainees and not recommended. For example, a part-time PhD would take a minimum of six years even if 50% of a trainee's time is allocated to it, which is not realistic or practical given the constraints of clinical training. Recently, some trainees who publish widely are being offered chances to pursue a PhD by publication in the form of combining their most relevant publications into a dissertation and defending it at a formal viva. These are still very new, and the jury is out regarding their suitability for medical trainees.

The MMedSci degree is a developing degree, particularly suited as part of the ACF to academic trainees and to clinical trainees who wish to experience research and enhance their curriculum vitae without pursuing a long higher research degree course such as a PhD or MD. They are also popular amongst trainees with no prior undergraduate research qualification or intercalated degree such as a BSc or BMedSci. These degrees usually contain a considerable taught element, including subjects such as:

- ethics and law
- epidemiology
- public health
- theoretical research methodology
- statistics
- medical education
- clinical effectiveness
- science and technology
- health service management

In addition, in the MMedSci, there can be speciality-specific training modules which may also be recognised for other training (but, of course, not for another degree). Examples would include recognised laparoscopic surgery training, ultrasound/imaging, and so on. Finally, there is a speciality-related research dissertation and this is what usually distinguishes a Master's degree from a Diploma. This type of degree may eventually prove to be more appropriate than an MD for the non-academic trainee, in that it provides the foundation for those skills and knowledge required by the consultant of the twenty-first century. The supervised research within this would be

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adequate to provide an understanding of research methodology by the time of attainment of the CCT.

Content of Research

The content and conduct of research should, in theory, be determined by personal interest and choice, but this is seldom the case. Research requires funding as a provision to pay for salaries and expenses of equipment and consumables. It is virtually impossible to make a successful funding application without research experience and a track record by virtue of publications, presentations and/or previous grants. Therefore, it is almost invariably the case that a junior researcher is dependent on the support of an established researcher or research unit and takes their place in the hierarchy. This may mean that the research being undertaken is not exactly what the trainee desired from the outset, but there should be opportunities arising in broad areas of interest. Substantial training and supervision is needed from the outset for the new researcher and so the most practical strategy would be to seek a post in an established unit which will provide these. As previously noted, it is most important to identify a supervisor with whom one can work, and then to 'sell' oneself to them (see Chapter 20: 'Supervising and being supervised'). These posts will almost invariably be funded externally by a grant awarding body or using 'soft' (grant) money. It takes time, perseverance and luck to get such money. Efficient, timely and decisive planning with potential supervisors and identification of a number of strategies to take forward are key to a successful grant application.

Types of Research

The range of research options open to trainees is enormous and varied. They can be in the form of clinical trials, laboratory research, basic science, epidemiology, social science, psychology, biomedical engineering and technology, imaging, screening, education, molecular medicine and so on. The research subjects can be animals, hospital or general practice patients, healthy volunteers, computer models or, indeed, libraries.

An increasing number of research units recognise detailed literature reviews and meta-analyses to be adequate for a research thesis. Whilst others would think that such research is merely the starting point for genuine research, the latest clinical guidelines,

which aid clinical decision making, are largely dependent on large meta-analyses and literature reviews. A literature review is necessary as the starting point for any type of research to determine that an important question remains unanswered and that the new trial or study is justified from an economic (time and money) and ethical standpoint.

Conclusion

Research for the academic or clinical trainee may often be seen as a stepping stone for progression of their career, enhancement of their curriculum vitae and fulfilment of curriculum competencies. However, research does teach a number of essential skills, such as concentration and focus, in-depth knowledge acquisition, team work, communication skills, patience, self-criticism and evaluation. All of these skills are transferrable and invariably important in the development of a competent clinician. Furthermore, the application of research skills is invaluable in the now-common practice of developing and using evidence-based medicine. Research performed which culminates in a further degree, publications and/or presentations shows that a trainee has developed these skills to a satisfactory level and showcases these skills to a future employer.

In summary, research experience for the specialist trainee is extremely important in the current medical environment and, depending on individual circumstances, the training pathway has evolved to facilitate as much exposure as desired. The chapters in this book expand on this introduction and will provide valuable support and a source of inspiration for both academic and clinical trainees.

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