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REVIEW

Challenges and opportunities in academic neurosurgery

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Abstract

Clinical academia aims to bridge the gap between clinicians and scientists, by combining academic activity with clinical practice. The term 'clinical academics' generally refers to clinicians who have protected time within their job plans for undertaking academic activities. Engagement with academic activity by trainees is not only essential to fulfil necessary curriculum competencies, but also allows them to explore areas of interest outside of clinical practice and develop advanced academic skills. This article provides an overview of different routes into academic neurosurgery, and discusses the advantages and difficulties in pursuing this career path. It also covers the differences between postgraduate research degrees and explores the different job plan models available at consultant level. Academic neurosurgery is a rewarding career and opportunities should be made available to those who wish to explore it further. Developing academic careers may have a positive impact on wider workforce planning strategies and improve the delivery of high-quality evidence-based neurosurgical care.

Key words: Consultants; Curriculum; Neurosurgery; Training support

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Introduction to clinical academia

The term clinical academia is often used to describe the combination of academic activity within clinical practice and aims to bridge the gap between scientists and clinicians. The extent and formality of this combination varies widely across centres and is heavily affected by clinical research culture, the demands of clinical training and consultant job planning. For example, in order to receive the certificate of completion of training in the UK, each new consultant must be able to demonstrate evidence of having met research requirements as guided by the General Medical Council's (2017) Generic Professional Capabilities framework. These include demonstration of evidence-based practice, literature appraisal, application of basic research principles and an understanding of research governance. For neurosurgery, trainees require at least one publication in a peer-reviewed journal before receiving their certificate of completion of training. However, many trainees and consultants will be able to evidence a significantly larger quantity of academic activity throughout their career. Indeed, during specialty training applications at ST1 level, applicants are asked to list up to five publications. Even at these early career stages, there is a growing desire and expectation to undertake more formal academic experience, driven in part by the recent trainee research collaborative movement.

In 2005, the Walport review highlighted the decline in the quantity of academic clinicians and demonstrated a disproportionally higher decline within surgical specialties (Academic Careers Sub-Committee of Modernising Medical Careers and the UK Clinical Research Collaboration, 2005). This report called for new opportunities to increase access to formal research training and a recognition that participation in extensive clinical research requires dedicated protected time within clinicians' working lives. Since the report's publication, several opportunities and pathways have been developed to address these issues, some of which involve dedicated time for research alongside clinical practice. The term 'academic clinician' or 'academic neurosurgeon' more commonly refers to professionals who have this dedicated, protected time in their job plan to devote to academic activities. However, there remains a number of significant challenges associated with accessing and undertaking a clinical academic career. Many of these are acutely felt by surgical trainees and some challenges are unique to these practical skills-based specialties. These challenges must

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be understood, and potential solutions explored to improve academic training access, retention of these trainees and the creation of sustainable and impactful academic careers as consultants (Kubiak et al, 2012).

This article explores the different pathways for gaining experience in academic neurosurgery and overcoming these challenges, as well as examining different types of research and job models for academic trainees and consultant posts.

Academic neurosurgery

Academic neurosurgery is an exciting and rewarding career that allows clinical academics to focus on areas of research interest outside of strictly clinical work. However, this poses several challenges, principally the competing demands of producing academic output while maintaining clinical skills in line with non-academic contemporaries.

There is not necessarily one 'right' pathway to take in order to gain experience in academic neurosurgery. Depending on the types of research, it may be possible to undertake full-time clinical practice while gaining academic experience above and beyond one's clinical hours. Many surgeons undertake systematic reviews, quality improvement projects and observational research, for example. Or they may take part in components of larger studies such as recruiting to trials, participating in collaborative research or assisting in data analysis. However, without formal research training and protected time it is often challenging to lead research groups, deliver programmes of research and develop research autonomy and leadership (Andriole et al, 2020). Clinicians should carefully consider their personal reasons when deciding on the extent and formality of their involvement in academic neurosurgery. Formal and extensive involvement is not necessary for every neurosurgeon, but opportunities should be made available for those that wish to develop their interests further.

Advantages of undertaking more formalised and extensive academic experience within neurosurgery include development of advanced academic skills, opportunities to acquire additional qualifications including higher degrees, and exploration of interests outside of clinical practice such as science and technology. However, for many surgical trainees, this involvement poses some unique challenges including maintaining and achieving surgical competencies, ensuring the provision of protected academic time in a resource-depleted NHS and prolonged training which can be financially and mentally burdensome (Blencowe et al, 2017). Therefore it is unsurprising that there have been fewer than half as many academics in surgical specialties compared with medical specialties (Blencowe et al, 2017). In 2015, a UK review of early career clinical academics identified four key enablers to sustained involvement in academia and success as a clinical academic: mentorship, work environment, access to funding and intrinsic motivation (Medical Research Council et al, 2015). Leveraging these enablers may retain and progress more academic neurosurgeons. The ultimate aim of these efforts is to improve outcomes for neurosurgical patients, advance neurosurgical science and improve careers for neurosurgical trainees and consultants.

Integrated academic training pathways

Following recommendations from the Walport review, the National Institute of Health Research developed the integrated academic training pathway for English trainees (https://www.nihr.ac.uk/explore-nihr/academy-programmes/integrated-academic-training.htm). This well-defined career pathway provides clinical trainees at all stages with structured opportunities to undertake research alongside their clinical training. This pathway offers successful applicants run-through training in their chosen speciality so that trainees can focus on developing clinically while cultivating a genuine academic interest. While it is possible to enter the integrated academic training pathway at any stage, the career usually starts with an academic clinical fellowship post followed by an academic clinical lectureship, and ends with certificate of completion of training where consultants may apply for clinician-scientist or professorship awards. A medical student may wish to explore an initial interest before applying for an academic clinical fellowship, which they can do by entering the academic foundation programme immediately after they graduate.

An academic clinical fellowship post generally lasts for 3 years, and 25% of this time is protected for academic work. The purpose of an academic clinical fellowship post is to allow trainees to develop their academic skills and work towards an application for a higher degree or larger project grants. Academic clinical fellowship posts are limited and highly competitive, with a total of seven academic clinical fellowship jobs available in neurosurgery throughout the UK in 2020. However, completing an academic clinical fellowship can give a significant advantage when applying for further research posts, with applicants who have completed an academic clinical fellowship being more likely to be successful in applying for a National Institute of Health Research doctoral research fellowship (to undertake a PhD) than those who apply directly from clinical training (Clough et al, 2017). Nevertheless, there are challenges involved with undertaking an academic clinical fellowship, namely difficulties with balancing clinical and academic commitments, as trainees need to achieve the same clinical competencies to progress through this critical stage of training but with less clinical time. According to the pathway, after undertaking a PhD, trainees can then apply for an academic clinical lectureship post which usually results in an equal division of clinical and academic time (50% academic) where they develop a postdoctoral programme of research as they continue their higher surgical training.

Trainees working in Wales can apply for the Welsh Clinical Academic Track, which involves a run-through post from entry to certificate of completion of training, and includes 3 years out of programme time for a PhD, 30 days study leave each year and a study leave budget (https://heiw.nhs.wales/education-and-training/specialty-training/academic-medicine/wales-clinical-academic-track-wcat/). In Scotland, the equivalent is via the Scottish Clinical Research Excellence Development Scheme (http://www.scotmt.scot.nhs.uk/specialty/scottish-academic-training-(screds).aspx). To qualify for appointment to this scheme, candidates need to already have a national training number, or be in a recognised decoupled core training programme, and it covers posts from out of programme research to advanced academic development appointments (eg senior clinical fellowships).

Out of programme research and when to take it

The overall purpose of an academic clinical fellowship is to develop the necessary skills and conduct the relevant preliminary research required to build an application for a PhD. This is traditionally undertaken immediately after the 3-year academic clinical fellowship as a 3-year out of programme full-time research degree. However, the question remains about when is the best time to take the out of programme research? Within a training programme, trainees are allowed to take a specific period of time out for research, but there must be agreement between the trainee's training programme director and academic supervisors. According to the General Medical Council (2012), this can only be approved if it is considered to be contributing to the trainee's training and development overall. Ultimately, many factors determine the optimum time to undertake out of programme research and trainees should engage with their supervisors at an early stage to inform their career trajectory.

Higher degrees and research funding

When considering further research degrees, the choice is usually between undertaking a PhD, MD or an MSc. A MSc is usually 1 year (full time) and often includes scope to do one research project. A MD is a 2-year programme (full time), usually only available to medical graduates, which often involves multiple related research projects compiled into a larger thesis than for a postgraduate Masters. By contrast, a PhD is a 3-year programme (full time) which often involves more in-depth exploration of the scientific area and a larger programme of research projects, resulting in a multi-chapter thesis. The main differences between the PhD and MD are summarised in Table 1. It is important to note that both options could be taken on a part-time basis, which takes longer to complete but may make it easier to do alongside other commitments.

The key challenge with either is often acquiring the funding necessary to pay salary and research costs, as these can often total a significant amount. The following is also applicable

Table 1. A comparison between undertaking a PhD and MD

	PhD	MD
Entry requirements	Clinical experience, research experience	Medical qualification, clinical experience, research experience desirable
Length (full-time)	3 years for research. PhD awarded on submission of thesis and viva, which must happen within 4 years. Option to exit early after 1 year with MPhil, on submission of upgrade report and transfer viva	2 years for research. MD awarded on submission of thesis and oral examination, which usually happens within 3 years, but hard deadline of 4 years applies. No option for early exit
Opportunity for clinical work	Ideally minimised as much as possible, and may need to be agreed beforehand with funding body	Easier to do part time alongside clinical work, with a minimum of 40% of time undertaking research

for the majority of research funding applications including postdoctoral fellowships and programme or project grants. The first step is to identify the most appropriate funding body. Each funding body has its own remit and applicants should review these carefully and discuss with their potential supervisors before committing to a specific application or funding stream.

In order to be successful in securing sufficient funding, candidates should consider the 'three Ps' when writing their application: person, project, place:

- Person relates to the applicant's CV and this is something the individual is likely to have a large degree of control over. For example, an academic clinical fellowship will likely give you the skills and time needed to develop a strong CV and academic track record in your area of enquiry
- Project refers to the proposed programme of research in your application. This should align with the applicant's track record and be influenced by the expertise of their supervisory team
- Place refers to the location and context the proposed research will be situated within. It is important to focus on complimentary research infrastructure, equipment or special skills, potential partners and supervisory team members in this section.

Readers should not underestimate the amount of time and effort that is required to build successful grant applications for fellowships, degrees, projects and programmes of research. It is essential to plan well in advance of the intended submission and conduct preliminary studies in a strategic manner to maximise the chance of success.

Regardless of which degree is undertaken, both can greatly aid future research careers as they afford dedicated academic skills training, supervision and time to conduct in-depth research. Neurosurgeons with a PhD appear more likely than their counterparts without any further degree to acquire significant research grants at all career stages (Choi et al, 2014). Equally, neurosurgeons with either a PhD or a MD have a significantly higher academic output than those without (Wilkes et al, 2015). The majority of academic neurosurgeons will hold some form of higher research degree (Jamjoom et al, 2016).

Research activities

Many researchers will choose to focus on either basic science or applied health research. Often, undertaking a mixture of research activities allows the academic neurosurgeon to develop a range of research skills and contribute to a broader range of projects. Basic science research often involves lab-based research using pre-clinical methodologies with new devices, molecules, animal or cell models, and is focused on understanding the underlying mechanisms of mechanical, physiological and pathological processes. Basic science is a broad term, and can encompass pre-clinical work in areas including biology, engineering, physics, psychology and computing. By contrast, applied health research involves applying and expanding on that knowledge for more direct clinical purposes and may include clinical trials, observational analytical studies and qualitative research on humans. Translational research refers to academic activity that aims to bridge the gap between basic and applied health research. Academic neurosurgeons can explore a range of interests from these different categories.

Traditionally within neurosurgery, applied health research has been more popular. An analysis of papers presented at the Society of British Neurological Surgeons found that only 7% of work presented at their annual meeting involved basic science (Pallot et al, 2018). However, basic science research is more likely to be published in high impact journals (Pallot et al, 2018). Many surgeons are reluctant to undertake basic science research, as it can involve different skill sets, add extra cost and be more time intensive (Keswani et al, 2017). However, understanding the principles of basic science can help with clinical practice and inform translational work in similar areas. Surgeons are an important part of basic science research, as they can bring a clinical focus to questions, and can provide a different perspective (Filewod et al, 2018). It is becoming increasingly important that neurosurgeons who do any type of research have interdisciplinary connections to lab-based groups and clinical trials units as they are perfectly placed to bridge that gap. Moreover, this means that academic neurosurgeons are able to contribute at multiple stages of the development pathway for new therapies and diagnostics.

Additional opportunities and pathways

It is possible to undertake research outside of a structured academic programme, by organising projects in time outside clinical practice. This can provide an opportunity to build up a research portfolio and gain experience to apply for research fellowships. However, the absence of dedicated research time, as well as the lack of support from an academic institution, can make this route a challenge. Nevertheless, within neurosurgery there any many opportunities for trainees to participate in research. For example, the British Neurosurgical Trainee Research Collaborative oversees a number of multicentre studies which are co-led by trainees with consultant supervision (https://www.bntrc.org.uk). There is also a range of smaller project grant funding options available that require less experience and time to deliver. This is a very common strategy to gain initial research experience and develop a track record that may be useful for larger applications in the future.

Consultant job plan models

The overall aim of undertaking academic training is appointment as a neurosurgical consultant with time dedicated for research. Therefore, it is essential that speciality leaders ensure full career pathways with attractive consultant opportunities are developed across multiple centres. Ensuring the development of centres of excellence is important, but a geographical spread of academic neurosurgeons is required if the specialty is to conduct applied healthcare research at multicentre level to increase study power. This may take different forms. For example, consultants who wish to maintain an equal clinical academic split in order to develop a research group and lead programmes of research or large studies will likely hold university positions with honorary NHS consultant contracts. Other consultants who wish to have more clinical time but remain research active will be employed by an NHS trust and their job plan may have dedicated sessions for research.

Being employed by a university will provide access to enhanced resources, facilities, infrastructure and support. However, there are additional requirements and duties which include contribution to the institute's Research Excellence Framework and increased pressure to secure large external funding.

Consultant job plan developments are heavily impacted by the challenges highlighted in recent workforce planning studies that predict that approximately 180 post-certificate of completion of training neurosurgeons will be seeking consultant posts within the next 8 years (Whitehouse et al, 2020). This is an enormous challenge, requiring direction from national training leaders and organisations. Interestingly, academic neurosurgical career developments may provide solutions to some of the associated challenges. This may involve the extension of training to gain further academic qualifications and experience, thus staggering the arrival of trainees at the end of their training, and may aid the development of multiple academic consultant posts each with less than full time clinical commitments, thereby sharing clinical work across more consultants.

Key points

- Academic neurosurgery is a popular career pathway, providing trainees and consultants with a range of opportunities.
- There are many different routes into academia, ranging from formalised integrated training pathways to involvement in projects and quality improvement work.
- One of the main challenges for trainees undertaking academic activities is the need to balance time for research with achieving the required clinical competencies.
- Finding the right clinical academic supervisors is an essential first step to entering academic neurosurgery.
- Consider the 'three ps' of person, project and place when deciding which academic activities to pursue.

Conclusions

Academic neurosurgery is becoming increasingly popular for trainees and consultants alike, and there is a range of opportunities and pathways available to explore. Significant challenges remain and clinicians must consider their own motivations for undertaking different options. Strategies can be used to overcome these challenges, including integrated academic training pathways and improving access to formal research skills training. These efforts may have wider positive impact on workforce planning initiatives and improve outcomes for neurosurgical patients.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

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