

Title

Training in neurology: lessons learnt

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ABSTRACT

A consensus on how to structure and deliver neurology training is lacking. The General Medical Council conducts a National Trainee Survey in the UK on an annual basis and, while the results indicate significant variation in the quality of neurology training, they do not provide an explanation for this variation. In order to better understand how to train a neurologist, we used the National Trainee Survey to identify four of the highest and lowest performing sites for neurology training across the UK and conducted semi-structured interviews with groups of local trainees and, separately, local trainers in an exploratory qualitative study. We identified common themes across a range of aspects of neurology training. Here, we present our findings, share case studies from top-performing sites, and provide recommendations on how to train a neurologist.

INTRODUCTION

Specialist training in neurology involves a combination of apprenticeship, teaching and self-directed learning in parallel with clinical practice. Neurologists require an appreciation of a diverse range of symptoms, signs and diseases, and the ability to make complex diagnoses and decisions on life-changing and high-risk interventions in emergency and outpatient settings.

In the UK, neurology trainees rotate between a small number of university-based teaching hospitals and district general hospitals within a deanery over five years (*Figure 1*). There are 15 deaneries, some of which are further divided into rotations, and it is unusual for trainees to change deanery after starting their neurology training.[1] A national curriculum provides an outline of the skills, knowledge and experience expected of a trained neurologist and a professional portfolio with annual appraisals is used to monitor progress.[2] However, consensus and guidance on how to structure and deliver neurology training at a local level are lacking.

Anecdotally, trainees report significant variability in their experience of training within and outside their deanery. This is supported by open-access data from the General Medical Council National Training Survey (GMC-NTS).[3] Annual completion of the survey is mandatory for all trainees in the UK and the responses are used to derive scores for a range of training-related indicators. An *Overall satisfaction* indicator is derived by combining responses to five general questions about training (*Table 1*).

Data on neurology training are available on the GMC website for 33 of the 66 sites (hospitals) where neurologists were being trained in 2018 (*Figure 1*); the remaining 33 sites had responses from fewer than three trainees and are excluded by the GMC to maintain the anonymity of respondents. Scores for *Overall satisfaction* ranged from 42% to 98% (*Figure 2*). According to analysis by the GMC one site performed significantly above and three sites performed significantly below the national average across all non-neurological specialties (as defined by non-overlapping 95% confidence intervals).

Faced with evidence of variability in training delivery and trainee satisfaction, the key question is what determines the quality of training at a given site. In order to identify successful models for how to train a neurologist at a local level, we used the GMC-NTS data to identify the highest and lowest performing sites, and then probed the methodology and practicalities of training in these sites using semi-structured interviews in an exploratory qualitative study.

METHODS

We selected four of the highest and four lowest performing sites for the semi-structured interviews. These were chosen from the highest or lowest six sites based on mean *Overall satisfaction* scores over the last five years; our final choice of sites ensured adequate geographic variation and that both medium and large sites were included. Small sites, with fewer than three trainees, were already excluded. We chose not to disclose the names of the sites visited to maintain the anonymity of the interviewees who were informed of this prior to data collection.

Semi-structured interviews with trainees, and separately, local trainer(s) were conducted. Trainees were interviewed in groups, size ranging between three and eight, without their local trainer(s) present. Local trainer(s) were interviewed individually. One to three trainers were interviewed at each site with the exception of one site where a local trainer was not available. All interviews were conducted by one of three trainees using standardised questions and lasted between 45 and 60 minutes. Interviews were either audio-recorded or transcribed directly by the interviewer. A minority of data was collected by telephone interview and email.

The interviews focussed on training at the local level. Trainees were asked 26 and trainers were asked 20 pre-specified questions about the structure, effectiveness and safety of training at that site. Open ended questions, such as 'How would you describe your department?' and 'What is the best/worst thing about training at this trust?' were followed by more specific questions, such as 'To what extent do consultants supervise you in the following situations?' and 'How is local teaching delivered?'. The complete set of pre-specified questions is provided in the *Supplementary material*.

A thematic analysis using a combination of deductive and inductive reasoning was performed after all the interviews were completed. The three interviewers initially read each transcript independently to compare responses to individual questions and identify emerging themes over three meetings. Given the relatively small number of interviews, key themes were defined as those that occurred in at least two of four high performing sites and no low performing sites, or, in at least three of four high performing sites and one low performing site (and vice versa).

Additional analysis was performed on the GMC-NTS data. Scores for *Overall satisfaction* were compared with GMC-NTS data on clinic attendance using Spearman's correlation coefficient. Scores for *Overall satisfaction* were compared between those deaneries with trainees given unsatisfactory outcomes in their annual appraisals and those with only satisfactory outcomes using an unpaired t-test. The data were provided by the Joint Royal Colleges of Physicians Training Board. Scores for *Overall Satisfaction* were compared between 2018 and each of the five preceding years using the Wilcoxon signed-rank test. Statistical analyses were performed using Graphpad Prism 8.

CLINICAL SUPERVISION

The most discernible differences between high and low performing sites related to the form and extent of clinical supervision for inpatient neurology. Trainees at most top-performing sites would meet the supervising neurologist face-to-face to discuss ward referrals they had reviewed or telephone advice they had given that day. They would then make a shared decision about which inpatients required subsequent review by the supervisor in person. At the majority of these sites, a specific time to meet during the working day was decided in advance; this allowed trainees to manage their time more effectively. Statements from trainees at top performing sites included "every case gets discussed, even if it is a very brief summary of what we've done, we run it by the boss" and "even if I don't need to call them

there and then, I would always say these are the people I've seen, this is what I've done, are you happy?"

By contrast, access to the supervising neurologist was a problem at most low performing sites. Clinical supervision was dependent on the trainee contacting their supervisor via telephone, when s/he felt it was necessary. Statements from trainees at top performing sites included "with the majority of [supervisors] you call them as and when you need them" and that reviewing patient was "generally never volunteered". This was associated with lack of supervision across inpatient activities, including telephone triage, ward reviews and intensive care referrals. It also contributed to a marked discrepancy between the trainers' expectations of when trainees *should* contact the supervising neurologist and when trainees *did* contact the supervising neurologist.

Of concern, trainees at several of these sites reported difficulty arranging a review by the supervising neurologist on the same or following day and, in some situations, at all. Statements from trainees at top performing sites included "[supervisors] very rarely question or examine patients" and "when they do go and see a patient it tends to be very superficial; I'm getting an opinion from [them] but [they] are completely relying on what I've said".

Several working patterns that facilitated supervision were identified:

- A weekly, as opposed to daily, rota for the supervising neurologist
- Reduction or cancellation of outpatient clinics during their on-call week
- Division of responsibility for supervising different aspects of inpatient care (see *Case study 1*).

Two of the most-cited barriers to effective supervision were the supervising neurologist being off-site due to other clinical responsibilities and a lack of structure, which created uncertainty as to when, where and how the trainee should meet their supervisor. Indicative trainee comments were "sometimes they are not physically here" and "even the really good [supervisors] don't really see referrals; maybe once or twice a week they'll come to see a patient you're worried about"; "it's particularly hard for people starting their training here".

There were similar differences in supervision for training in outpatient neurology. Trainees at most high performing sites tended to have more supervision, particularly when reviewing new cases, whereas trainees at several of the low performing sites were frequently running outpatient clinics without any supervision. This was a particular problem for rapid access clinics at several sites. By contrast, trainees and trainers at top-performing sites reported it was particularly rewarding to follow up their own patients.

COMPETENCY-BASED TRAINING

Training was tailored to the experience and competency of neurology trainees at top-performing sites. Junior trainees were expected to discuss all inpatient and outpatient cases with the supervising neurologist whereas more senior trainees were encouraged to practise more independently, contacting the supervising neurologist when necessary. There were also differences in the clinical roles and approaches to induction. Examples of good practice included junior trainees shadowing senior trainees when on-call for several weeks or months

at the start of their training, being allocated specific training rotations or seeing outpatient cases selected by their supervisor in advance (see *Case study 2*).

A senior trainee, usually in their final year of training, was appointed in several sites. This role included elements of leadership and management and, where successful, formed a bridge between trainees and the lead trainer. Responsibilities included the allocation of training rotations, rota design and in some situations, clinical support for more junior trainees. This approach was viewed as a valuable learning experience for the senior trainee, and good preparation for working life after training, provided their job plans recognised their additional responsibilities.

A unique problem at top-performing sites was the risk of over-supervision and “spoon-feeding”. This was acknowledged by trainers and trainees alike and highlights the universal importance of tailored, competency-based training.

CLINIC ATTENDANCE

Neurology is predominantly an outpatient specialty and a minimum of two clinics per week is recommended for neurology trainees. Using GMC-NTS data on clinic attendance we identified large variation between sites, which could lead to significant discrepancies in the overall level of clinical experience between trainees. Median clinic attendance was calculated across 33 sites and ranged from 1 to 4 clinics per week. It was fewer than two clinics per week at 12% of sites and three or more clinics per week at 21% of sites (*Figure 3*).

There was no correlation between clinic attendance and GMC-NTS scores ($p=0.081$). However, trainees at high and low performing sites highlighted that staffing levels influenced their ability to attend clinics: unfilled posts, often for more junior doctors, meant that trainees were being diverted away from clinics where they were supernumerary in order to cover referrals, ambulatory care units and inpatient wards. One trainee said “our clinic exposure is remarkably poor; between four [trainees] we are expected to be in three clinics per week but because the workload is so intense [we] hardly manage to fit in one”.

We did not specifically examine the balance between general and subspecialty neurology and whether trainees were supernumerary or had their own patient list in outpatient clinics during the interviews. We will be exploring these issues by submitting additional questions specifically for neurology trainees in the GMC-NTS in the future.

ROLES AND RESPONSIBILITIES

Trainers at several top-performing sites clearly defined the roles and responsibilities of the supervising consultant and trainee. The supervising consultant “own[s] the episode of care and has a responsibility to support the trainee to ensure that they are able to administer their responsibilities effectively”; “the trainee is there to be trained, which involves a mixture of observation and practise but always on a supernumerary basis”. A trainee at a low performing trust explained “as a registrar, you are very often doing the job of the consultant, registrar, senior house officer and secretary”.

Protected time for trainees to complete their administrative responsibilities (reviewing clinic letters, outpatient investigations etc) was incorporated to the working week at one top-performing site. This was highly valued by the trainees and further highlights the importance of effective job planning. In contrast, a trainee at a low performing site said “we always end up doing admin rather than sitting in on clinic”.

Inadequate junior doctor staffing was a recurring theme at low performing sites with neurology trainees performing tasks such as re-writing drug charts, prescribing fluids, venepuncture, cannulation and catheterisation on a daily basis. One trainee said “we’re chronically understaffed without any [junior doctor] cover for a lot of the time, sometimes for weeks”. By contrast, inadequate junior doctor staffing was not reported at any high performing sites. Trainees at some low performing sites were asked to arrange outpatient investigations for patients who were not under their care by their supervising consultant. This incurred the risk of failing to identify contraindications or omitting key clinical information on request forms, was unlikely to enhance training and is an unsafe practice.

There was no difference in the number of educational meetings to review training portfolio progress at high or low performing sites; all trainees met their educational supervisors two to three times each year. This illustrates that the number of educational meetings does not necessarily relate to the quality of training at a local level despite these being mandatory for satisfactory outcomes at annual appraisals. We did not, however, explore the content of these educational meetings during our interviews.

SUBSPECIALTY EXPOSURE

A range of subspecialty training opportunities were available at most sites. Trainees at some low performing sites reported difficulty achieving adequate subspecialty exposure and cited competing clinical priorities due to inadequate junior doctor staffing as the main reason. Most high performing sites used elective rotations or sessions for educational time within the working week in order to ensure adequate exposure; this was highly valued by trainees (see *Case study 3*). A further, simple initiative at a top-performing site was a trainee-compiled list of valuable learning opportunities around their site (e.g. autonomic testing, neuro-ophthalmology clinics, radiology reporting sessions, multidisciplinary team meetings, theatre lists) including timings and contact details for the relevant specialists. This made it easy for trainees to quickly identify and attend suitable opportunities according to their schedules.

All neurology trainees are expected to acquire familiarity in cerebrovascular disease - it features in the Curriculum, but dedicated time on a stroke unit or completion of a stroke medicine curriculum is not mandatory for neurology trainees in the UK. While we did not specifically examine access to stroke training during the interviews, we are informally aware of significant variation in exposure to stroke across the UK. The GMC-NTS data showed that 61% of neurology trainees are involved in the delivery of acute stroke services in the UK in 2018.

LOCAL TEACHING

There was a large variation in local teaching programmes. All trainees valued teaching however it was delivered. High performing sites appeared to have more frequent and varied teaching programmes with multiple sessions each week, including small-group seminars or bedside teaching, in addition to wider departmental teaching. One site had daily teaching in a variety of formats (see *Case study 4*). By contrast, the majority of teaching at some low performing sites was provided through departmental meetings which were routinely used for clinical governance or business purposes. One trainee said “there is a teaching rota but it only happens once per month”.

Several other themes emerged at top-performing sites. First, teaching followed a fixed timetable without variation in timing or location. Second, a neurologist separate to the training lead was responsible for the departmental teaching programme. At one site this neurologist used the specialty curriculum and trainee feedback to guide topics for internal and external speakers and optimize curriculum coverage. Third, a subset of neurologists would rotate chairing departmental meetings. Fourth, trainees presenting cases would be expected to discuss the case with a supervising neurologist prior to their presentation.

At all sites it was acknowledged that the on-call trainee might be unable to attend local or regional teaching opportunities, but that this effect would be shared across all trainees during the course of the training programme.

CULTURE

There were differences in the culture and ethos within departments at high and low performing sites. There was a feeling that training was prioritised over service delivery by both trainees and trainers at top-performing sites, and that trainees knew what was expected of them and trainers knew what to expect of trainees. Other specific examples included shared coffee or tea breaks after a busy ward round or clinic and trainees feeling comfortable to knock on the door of their supervisor for advice during clinics. Trainees at both high and low performing sites valued shared trainee office space, which engendered a supportive environment with peer and near-peer supervision.

Trainers and trainees identified positive aspects of training predominantly at a single centre, where the strengths, weakness and overall trajectory of trainees is better understood and training relationships develop over several years: one trainee explained that it was “impossible to fly under the radar” training there. Where trainees were based at a single site throughout training, there was a predictably shorter commute time (under 35 minutes on average), reflecting trainees’ decisions to live closer to work. By contrast, long commutes or needing to relocate were issues raised by trainees at several low performing sites. The average commute time was over an hour, and at one site, the majority of trainees had needed to temporarily relocate mid-way through training to be closer to work. These issues were perceived as particularly onerous by trainees. They may increase the risk of burnout, a growing cross-speciality concern in the UK, and an acknowledged problem for neurologists in other countries. [4]

Finally, the culture within departments was also reflected by social activities outside work. Trainees at high performing sites reported meeting colleagues outside work on at least a

monthly, as opposed to annual, basis. Unlike low performing sites, this was usually in the context of the wider clinical team, including both supervisors and more junior colleagues. In isolation, these activities have the potential to feel artificial and onerous but they appeared to enhance the feeling of belonging, collegiality and informality for trainees and trainers alike. Understanding the wider lives of our colleagues should lead to greater appreciation for them and create an environment that most of us would prefer to work, and train, in.

CONCLUSIONS

Generation of skilled and clinically confident neurologists is the optimal training outcome for both current and future delivery of safe, timely and excellent patient care. This is especially relevant with the UK-wide shortage of neurologists.[5] Here, we share some specific approaches for how to train a neurologist. We present four case studies to illustrate some of our findings from visits to neurology departments around the UK.

Several key themes have emerged. Whilst some are intuitive, many of our findings highlight the value of particular structures or organisational features within departments that transcend technical aspects of training, such as formal teaching. These relate primarily to the interaction between the trainee and his/her supervisor, the differing needs of trainees according to their level of experience and the structure and culture in which training is embedded in a given department. While some variation in training will be determined by the need to deliver local clinical services, we suspect that other factors, such as attitudes, practices and policies within individual institutions, also play a role. Trainee satisfaction, including wellbeing, is a topical issue with increasing concern about retention, and we identified that wider (deanery-associated) issues of long commutes and short notice about rotations often exacerbated dissatisfaction with training experience.

We summarise our key recommendations in *Table 2*. We recognise that these may not be applicable to all training environments, and we are also aware that we have not addressed several important aspects of training such as rota design and access to, and integration of, research training opportunities. There are some additional limitations to our study:

Firstly, sites with fewer than three trainees were excluded from the GMC-NTS data and therefore from our study. There are likely to be specific opportunities and challenges with training in smaller sites that we have not captured, but some our themes are likely to be relevant.

Secondly, there is no published evidence demonstrating GMC-NTS results correlate with training outcomes and there is an assumption that these reliably inform us about the quality of training in the UK. We therefore compared *Overall Satisfaction* scores with the latest available data on outcomes at annual appraisals in neurology; those deaneries where at least one trainee had an *unsatisfactory* outcome had lower Overall Satisfaction scores than those where all trainees had satisfactory outcomes (80.5 vs 86.6, $p=0.018$). We also assessed whether year-by-year comparisons showed consistent patterns of performance; scores did not significantly differ between 2018 and each of the five preceding years. Irrespective of whether GMC-NTS results reliably and consistently inform us about the quality of training or not, our focus in this paper was to describe a range of different practices, some of which may

not be widely recognised, and allow neurologists to decide how they can be used to improve training locally.

With ever increasing demand for neurological care, and the prominence of stroke in the NHS 10-year plan, there is growing tension between service delivery and clinical training in the UK. A broader appreciation of effective, efficient and safe ways to train neurologists may allow trainees and trainers alike to refine their approach to training and better shape the next generation of neurologists.

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COMPETING INTEREST

None declared.

CONTRIBUTIONS

The idea for this project was conceived by SS in collaboration with SA and AZ. A proposal was presented to members of the ABN Council, including CJM and TTW, and the Neurology SAC, including TH and AP. All authors then commented on the project design. The ABN and SAC were therefore involved in the delivery of this project at an early stage. SS, AZ and SA conducted the interviews and thematic analysis. CJM reviewed the data analysis. SS, AZ and SA drafted the manuscript. All authors commented on the manuscript. AP, TTW and CJM revised the manuscript. The ABN Executive endorsed the paper on behalf of the ABN.

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TABLES

Case study 1. At one top-performing trust, the neurologist who supervises referrals rotates on a weekly basis and the neurologist who supervises inpatient care rotates on a monthly basis. Neurologists switch their routine outpatient clinics to rapid access clinics during the week they supervise referrals. In parallel, trainees would cover referrals for several half-day sessions per week and meet the supervising neurologist at a designated time to discuss cases and review inpatients. The trainee covering referrals in the morning would hand over to the next trainee ensuring adequate time to attend an afternoon clinic. Trainees at this site reported that they had “never felt unsupervised during their training”, and with reference to discussions with the supervising neurologists, “valued these interactions as training opportunities”.

Case study 2. At one top-performing trust, new trainees start on a ward-based rotation, with the most direct supervision. Clinics are structured according to the seniority of the trainee: junior trainees have fewer patients per clinic and sometimes have new and follow up patients in separate clinics. The neurologist supervising clinics would identify specific cases of interest for junior trainees and might provide guidance on how to approach difficult cases before the clinic. Senior trainees are encouraged to take more initiative but the supervising neurologist is always available to provide advice, if needed.

Case study 3. At one top-performing site, training rotations are firm-based covering different major subspecialties for four months periods. Each rotation is completed twice over the training programme and includes at least one general and subspecialty clinic. There are separate rotations based at district general hospitals but training is based at one site. Rotations are discussed with the senior trainee and then agreed with the training lead prior to allocations and according to needs of each trainee. A four-month elective period is scheduled for the penultimate or final year. This is completely flexible and provides trainees with the opportunity to gain or improve key competencies prior to completion of training.

Case study 4. At one top-performing site, a form of teaching or dedicated educational activity is available on almost every weekday. This includes separate bedside and small-group seminar-based teaching, a neurology journal club, neurophysiology training, a departmental meeting for case-based discussions (i.e. grand rounds) and external speakers and a neuroradiology meeting that incorporates teaching for trainees. Additional informal sessions for case-based discussions with the clinical lead and peer-led sessions were also arranged.

Table 1. Questions from the GMC-NTS that are used to derive *Overall satisfaction* scores.

- | |
|---|
| <ul style="list-style-type: none"> - Please rate the quality of clinical supervision in this post - How would you rate the quality of experience in this post? - How would you describe this post to a friend who was thinking of applying for it? - To what extent do you agree with the following statement? This post will be useful for my future career. - Please rate the quality of teaching (informal and bedside teaching as well as formal and organised sessions) in this post? |
|---|

Table 2. Recommendations, with specific examples, for how to train a neurologist.

Clinical supervision should involve regular face-to-face discussions and sequential consultation by the trainee and supervising neurologist in selected cases
<ul style="list-style-type: none"> - Trainees meet the supervising neurologist to discuss inpatient referrals and review selected cases at a pre-allocated time during the working day - Supervising neurologists follow a weekly, as opposed to a daily, rota - Supervising neurologists cancel clinics, or convert them to rapid access clinics, for on-call weeks - Supervising neurologists are available to review any new outpatient referral, including those seen in rapid access clinics, if needed
The level of supervision should be matched to experience and capability of the trainee
<ul style="list-style-type: none"> - Junior trainees shadow senior trainees on call at the start of their training - Junior trainees start on rotations with the most supervision - Junior trainees discuss all new and follow up cases in clinics - Supervisors identify suitable patients for trainees to see prior to clinic - Senior trainees are encouraged to see cases independently or have their own clinic lists - A senior trainee has clinical and managerial responsibilities incorporated into his/her job plan
The burden of administrative and non-training service work should be minimised
<ul style="list-style-type: none"> - Dedicated sessions are scheduled for reviewing clinic letters and investigation results - Trainees do not arrange investigations/appointments for outpatients that they do not know - Unproductive clinical tasks should be performed by appropriately trained nurses, clinical assistants or more junior members of the team
Local challenges in providing subspecialty training should be identified and addressed
<ul style="list-style-type: none"> - Protected sessions for subspecialty activities are scheduled in the weekly timetable - Elective rotations are included in the training programme - Lists of local subspecialist training opportunities are generated by, or for, trainees - Gaps in trainees' subspecialty experience are identified before allocating training rotations - Departmental teaching content is guided by the neurology curriculum and feedback
Departments should promote a culture of enquiry, learning and mutual support
<ul style="list-style-type: none"> - Local teaching has a fixed, weekly timetable including practical and seminar-based sessions - Departmental teaching is chaired by one of several neurologists with an interest in teaching - Trainees share a communal office space - Regular social activities for the wider department are encouraged

FIGURE LEGENDS

Figure 1. A map showing neurology training sites across the UK. The 66 sites identified in the GMC-NTS in 2018 are shown and colour-coded according to deanery. A table with the name of each site, rotation and deanery is provided in the *Supplementary material*. [Map adapted from https://commons.wikimedia.org/wiki/File:Uk_outline_map.png by *ChrisO* under terms of the GNU Free Documentation License, Version 1.2].

Figure 2. GMC-NTS scores for *Overall Satisfaction* in neurology training at 33 sites across the UK in 2018. The error bars indicate the median and interquartile range.

Figure 3. GMC-NTS results for average clinic attendance per week at 33 sites across the UK in 2018. The percentage of neurology trainees who attend a given number of clinics per week at a given site is represented in each horizontal bar.