Original Research Paper

Confidence in Neurology: how Educators can help Junior Doctors fight Neurophobia

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Abstract

Aim: To study factors influencing junior doctors' confidence when managing neurological conditions.

Methods: Using a previously-validated questionnaire, residents of a Singaporean Internal Medicine residency programme were retrospectively-surveyed on their confidence when managing neurological conditions against a 6-point Likert scale. Those who considered themselves confident were compared against those who did not, studying factors contributing to differences in their confidence.

Results: 54% (94) of eligible residents completed the survey, of which only 58% felt confident when surveyed, and tended to report adequate interaction with neurologists (69% vs 31%, p = 0.004) and patients (75% vs 24%, p = 0.0001), and that the training material (75% vs 44%, p = 0.023) and bedside teaching were adequate (69% vs 38%, p = 0.026). Of note, graduates from the United Kingdom, Republic of Ireland, and Australia reported feeling less-than-confident immediately upon graduation (31% vs 6%, p = 0.043). However, during graduate medical training, those who experienced improvement in their confidence tended to be males (46% vs 23%, p = 0.024), and were likelier to have received adequate training material (41% vs 20%, p = 0.032) and bedside teaching (67% vs 46%, p = 0.035).

Conclusion: Low confidence prevails amongst junior doctors when managing neurological conditions. Female trainees, and graduates of medical schools in culturally-different countries are likelier to require increased organizational support. Equity within the medical training framework is also vital for building their confidence.

Key words: neurophobia; medical education; neurology; confidence; graduate medical training

Introduction

Neurology has a reputation of being a challenging topic amongst medical students and junior doctors. Aptly termed 'neurophobia' by Dr. Ralph Jozefowicz, it describes a "fear of the neural sciences and clinical neurology that is due to the students' inability to apply knowledge of basic sciences to clinical situations, leading to a paralysis of thought or action" (Jozefowicz *et a*l., 1994). Poor teaching, complexity of basic neuroscience, and inadequate clinical exposure to neurological disorders have been touted as significant drivers behind neurophobia (Schon *et al*., 2002). Later studies demonstrated its deleterious effects amongst practicing doctors, with neurophobia leading to increasingly excessive and inappropriate neurology referrals and tests (Hernando-Requejo *et al.,* 2020).

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Hoping to better define and study neurophobia amongst medical students and junior doctors, the authors of a Singaporean cross-sectional study adapted pre-existing definitions by Schon *et al.,* in which their level of confidence when assessing patients with neurological complaints was a core feature of neurophobia (Youssef *et al.*, 2009; Kam *et al.,* 2013). Based on these criteria, nearly half of the participating medical students and more than a third of the junior doctors had neurophobia, with female gender, low knowledge, and low interest being identified as significant risk factors (Kam *et al.,* 2013). In the succeeding decade, we witnessed significant advances in the field of neurology - the recognition of novel neurological diseases, the extension of time windows for hyperacute stroke treatments, introduction of new immunotherapeutic agents, amongst many others (Altimus *et al.,* 2020). In tandem with these developments, Singapore's medical training landscape was extensively changed when the residency training framework was introduced across its academic medical centres (AMCs) in 2010. These programmes are fully accredited by the Accreditation Council of Graduate Medical Education – International (ACGME-I), an internationally recognized body responsible for accrediting graduate medical training programmes that meet or exceed pre-established standards of educational quality. Additionally, the increased utilization of new technologies such as simulations and virtual learning platforms, rendered it opportune to reassess the prevailing perceptions of neurology amongst junior doctors.

Confidence has been reported as being a key component for effective clinical performance. Prior studies described the beneficial effects of confidence in increasing the effectiveness of healthcare workers. Motivating them to practice the skills they have learned, although a firm association of confidence with clinical proficiency remains difficult to clearly and directly establish (Porter *et al.,* 2013). While clinical competency and confidence share a complex relationship, the latter remains significantly influential over a doctor's willingness to practice the skills they have learned, conduct procedures, ask for advice, and their performance in complex clinical scenarios (Whitehouse *et al.,* 2002). Contrariwise, the lack of confidence is a defining feature of neurophobia, with intimidation and anxiety being prominent neurophobic symptoms (Youssef *et al*., 2009; Kam *et al.,* 2013). Therefore, we selectively observed junior doctors' confidence when managing neurological conditions, hoping to identify and recommend practical measures may be proposed to augment existing training methods and frameworks.

Methodology and statistical analysis

Using the relevant components of a previously-validated questionnaire, we conducted a cross-sectional study on the residents of an ACGME-I accredited Internal Medicine (IM) Residency Programme in Singapore - a three-year medical training framework designed to provide junior doctors with the necessary clinical skills and knowledge in general medicine and selected medical specialties including cardiology, respiratory medicine, critical care medicine, and neurology (Jan *et al.,* 2002). IM residents are considered junior doctors in Singapore, and will be interchangeably referred to as 'residents' or 'junior doctors' in this paper. They must undergo a mandatory three-month neurology rotation in their first and second year of training at a neuroscience facility in an AMC. Approval from our Institutional Review Board (No. 2021/2410) was obtained in 2021. All residents received three email invitations to complete an electronic questionnaire during the final quarter of the 2021-2022 academic year (Table 1).

We assessed respondents' self-reported levels of confidence when managing neurological diseases against a six-point Likert scale at two different time-points – upon graduation, and at their current point of training. The Likert scale allows for six responses in ascending levels of confidence – 'very unconfident', 'unconfident', 'somewhat unconfident', 'somewhat confident', 'confident' and 'very confident', with each response being assigned a numerical score of 1 to 6 respectively (i.e., a 'unconfident' response is given a score of 2, and a 'very confident' response is given a score of 6). These scores will be henceforth be referred to as 'confidence scores'.

Table 1. Factors influencing the junior doctors' confidence when managing patients with neurological diseases immediately after graduating from medical school

	Less than confident (n=78)	Confident (n=16)	*p*-value
Male gender, n (%)	35 (45)	9 (56)	NS
Additional undergraduate degrees, n (%)	12 (15)	0 (0)	NS
Medical schools:			
Singaporean medical schools, n (%) [a]	48 (62)	12 (75)	NS
YLLSoM, n (%)	35 (45)	12 (75)	**0.028**
Duke-NUS Medical School, n (%)	12 (15)	0 (0)	NS
LKCSoM, n (%)	1	0 (0)	NS
Malaysian medical school, n (%)	3 (4)	3 (19)	**0.026**
UK, Republic of Ireland, or Australia; n (%)	24 (31)	1 (6)	**0.043**
Undergraduate training factors:			
Interaction to neurologic patients was adequate	19 (24)	12 (75)	**0.00009**
Interaction with neurologists was adequate	24 (31)	11 (69)	**0.004**
Educational materials were adequate and relevant	34 (44)	12 (75)	**0.023**
Didactic neurology lectures:			
Didactic lectures were adequate	29 (37)	10 (63)	NS
Topics were relevant and helpful	21 (27)	5 (31)	NS
Neurology bedside teachings:			
Bedside clinical teachings were adequate	30 (38)	11 (69)	**0.026**
Topics were relevant and helpful	27 (35)	8 (50)	NS
Teaching methods were helpful	21 (27)	9 (56)	**0.022**

[a]: Singaporean medical schools include the Yong Loo Lin School of Medicine, Duke-NUS Medical School, and Lee Kong Chian School of Medicine

Abbreviations: Duke-NUS, Duke-National University of Singapore; LKCSoM, Lee Kong Chian School of Medicine; SEA; South-East Asia; UK, United Kingdom; YLLSoM, Yong Loo Lin School of Medicine.

Respondents were considered less-than-confident if they indicated 'somewhat confident', 'somewhat unconfident', 'unconfident' or 'very unconfident' on the Likert scale, and were classified as confident if they indicated otherwise. We opined that a 'somewhat confident' level of confidence falls short of what is expected of a truly confident respondent, and have thus classified those responses accordingly. At both time-points, the respondents were asked about the extent and influence played by factors during their training (e.g., training material, bedside teaching, didactic lectures, etc.) which significantly impacted their confidence levels when managing neurological conditions. Respondents were then categorized into those with and without increases in their confidence scores during the intervening period between the two time-points. For example, a respondent who was 'somewhat unconfident' upon graduation and 'confident' at the current point of training will have an increment of 2 in his/her confidence score, implying an increase in confidence whilst in the residency training programme (Table 2).

We then compared the characteristics and training factors of the respondents from both groups, so as to identify the features during their training which may be responsible for these increments. Statistical analysis was performed using Mann Whitey U, unpaired t-test, Pearson's chi-squared and Fisher's exact tests as appropriate with a two-tailed alpha of 0.05.

Table 2. Factors contributory to the increases in confidence scores

	No increase in confidence [a] (n=48)	Increase in confidence (n=46)	*p*-value
Male gender, n (%)	17 (23)	27 (46)	**0.024**
Medical schools:			
Singaporean medical schools, n (%) [b]	30 (63)	30 (65)	NS
YLLSoM, n (%)	23 (48)	24 (52)	NS
Duke-NUS Medical School, n (%)	6 (13)	6 (13)	NS
LKCSoM, n (%)	1	0 (0)	NS
Malaysian medical schools, n (%)	5 (10)	1 (2)	NS
UK, Republic of Ireland, Australia; n (%)	11 (23)	14 (30)	NS
Less than confident after graduation, n (%)	32 (67)	46 (100)	**<0.0001**
PGY at the time of the study			
PGY, years, mean (range)	4.79 (2-10)	4.61 (3-9)	NS
PGY of ≥ 5 years, n (%)	23 (48)	22 (48)	NS
Seniority in residency training:			
1st year or R1, n (%)	17 (35)	19 (41)	NS
2nd year or R2, n (%)	16 (33)	10 (22)	NS
3rd year or R3, n (%)	15 (31)	17 (22)	NS
Attained of MRCP(UK) collegiate membership	26 (54)	22 (48)	NS
PGY when undergoing training in a neuroscience facility: [c]			
Years, mean, (range)	3.222	3.152	NS
PGY ≥ 5, n (%)	10 (22)	9 (20)	NS
Post-graduate (Residency) training factors:			
Interaction to neurologic patients was adequate	42 (88)	44 (96)	NS
Interaction with neurologists was adequate	33 (69)	33 (72)	NS
Educational materials were adequate and relevant	10 (21)	19 (41)	**0.032**
Didactic lectures:			
Didactic lectures were adequate	15 (31)	16 (35)	NS
Topics were relevant and helpful	11 (23)	8 (17)	NS
Neurology bedside tutorials:			
Bedside clinical teachings were adequate	22 (46)	31 (67)	**0.035**
Topics were relevant and helpful	20 (42)	13 (28)	NS
Teaching methods were helpful	20 (42)	17 (37)	NS

[a]: Includes residents with either decreases or no change to their confidence scores

[b]: Singaporean medical schools include the Yong Loo Lin School of Medicine, Duke-NUS Medical School, and Lee Kong Chian School of Medicine

[c]: Three residents have yet to undergo training at a neuroscience facility at the time when the survey was administered.

Abbreviations: Duke-NUS, Duke-National University of Singapore; LKCSoM, Lee Kong Chian School of Medicine; MRCP(UK), membership of the Royal College of Physicians (United Kingdom); PGY, post-graduate year; SEA, South-East Asia; UK, United Kingdom; YLLSoM, Yong Loo Lin School of Medicine.

Results

A total of 94 (54%) out of 173 eligible residents completed the questionnaire. 50 (53%) of the respondents were females. Nearly three-quarters (66, 70%) were 25 to 30 years old. 36 (38%), 26 (28%) and 32 (34%) respondents were in their first (R1), second (R2) and third year (R3) of residency training respectively. All except three (97%) had completed their Neurology rotation. Most (60/94, 64%) were graduates of Singaporean medical schools – 47 from Yong Loo Lin School of Medicine (YLLSoM), 12 from Duke-NUS Medical School (Duke-NUS), and 1 from Lee Kong Chian School of Medicine (LKCSoM). YLLSoM and LKCSoM offer a 5-year undergraduate training programme, while Duke-NUS Medical School offers a 4-year postgraduate Doctor of Medicine (MD) programme, and a MD-PhD programme with additional years of research-related work. Of the remaining 34 respondents, six graduated from medical schools in Malaysia, three in the People's Republic of China, and 25 (27%) were trained in the United Kingdom (UK), Republic of Ireland (ROI), or Australia. The respondents had worked an average of 4.7 years (range 2-10) after graduating, and approximately half (48/94, 51%) have attained collegiate memberships within the Royal College of Physicians of the UK (MRCP [UK]).

Upon graduation, more than four-fifths (78/94, 83%) considered themselves as less-than-confident when managing neurological conditions. Gender yielded no influence on their confidence. Graduates of Singapore's YLLSoM (75% vs 45%, p = 0.028) and Malaysian medical schools (19% vs 4%, p = 0.026) tended to be confident. Conversely, medical graduates (IMGs) from the UK, ROI, and Australia, were much likelier to feel less-than-confident (31% vs 6%, p = 0.043). It is noteworthy that no Duke-NUS graduates considered themselves confident, although this did not reach statistical significance due to their relatively small proportion. Amongst those who felt confident, most reported adequate interaction with neurologists (69% vs 31%, p = 0.004) and patients with neurological diseases (75% vs 24%, p = 0.0001), perceived that the training material available to them were relevant and adequate (75% vs 44%, p = 0.023), the bedside teaching which they received were adequate (69% vs 38%, p = 0.026), and that the methods utilized during the bedside teaching were helpful (56% vs 27%, p = 0.022).

More than half (54/94, 57%) of respondents perceived themselves as confident at their current point of training. However, the average change in the confidence scores between the two time points was a small increase of 0.81 (SD 1.08) points, with more than half (48/94, 51%) reporting decrements or no change to their scores. Male residents (46% vs 23%, p = 0.024) and those who were 'less-than-confident' upon graduation (100% vs 67%, p = <0.0001) tended to report score increments. Their PGY whilst undergoing training in neurology and at the time of the study, their seniority within the residency programme, the location of the neuroscience facility where they were rotated to (Hospital A or Hospital B), prior attainment of the MRCP (UK) qualification, and the medical schools which they graduated from, failed to demonstrate statistically-significant impact on the changes to their scores. Respondents with increases in confidence scores were twice likelier to report that the training material available to them were relevant and sufficient (41% vs 20%, p = 0.032), and that the bedside teaching was adequate (67% vs 46%, p = 0.035). Interaction with neurological patients and neurologists, the adequacy of didactic lectures, and the methods utilized during bedside teaching did not influence changes to their confidence scores.

Discussion

With a rapidly ageing population in Asia, the burden of neurological diseases has continued to increase with time, rendering the battle against low confidence and neurophobia amongst medical professionals especially important and urgent (Kang *et al.,* 2020). Our findings demonstrate a greater tendency for graduates from medical schools in the UK, ROI, and Australia to feel less confident when managing neurological conditions. This observation amongst foreign graduates is not novel, and has been previously attributed to a lack of awareness of cultural norms, linguistic

barriers, unfamiliarity with the healthcare infrastructure, and with locally-endemic diseases which are less prevalent in their countries of study (Motala *et al*., 2019; Hall *et al.,* 2004; Klingler *et al.,* 2016). Unique to Singapore's multi-racial society, however, is its discombobulating myriad of cultures, traditions, languages/dialects, health practices and healthcare-seeking behaviour, further confounding their assimilation. With these difficulties in mind, training institutions and medical educators should proactively identify and engage such junior doctors early, so that they may receive timely organizational support in terms of induction and familiarization programmes, professional and cultural mentoring, workplace buddy systems, to name at least a few (Klingler *et al.,* 2016; Kehoe *et al.,* 2016).

In our study, female residents felt less confident than the males when managing neurological conditions, and were less likely to experience improvements in their confidence despite receiving similar training in neurology. Interestingly, an earlier study by Kam *et al*. (2013) on neurophobia revealed lower levels of confidence in female medical students, which they attributed to a greater sense of anxiety inherent amongst them, particularly over issues related to their competence (Kam *et al.,* 2013; Blanch *et al.,* 2008). They then recommended that educators pay more attention to female learners in undergraduate neurology training (Kam *et al.,* 2013; Blanch *et al.,* 2008). While it is unsurprising that our study observed similar trends in female residents, these findings further support the recommendations by Kam *et al.*, that investing more attention and resources when training female residents, such as through closer mentoring and supervision, appear to be practical measures (Kam *et al.,* 2013).

When searching for factors which are vital in building the confidence of junior doctors when managing neurological conditions, our findings revealed the importance of adequate and relevant training material, and sufficient bedside teaching towards their neurology training. Conversely, training material was deemed inadequate or irrelevant, and that the bedside teaching was insufficient by junior doctors who did not experience increases to their confidence, these despite them receiving similar training in neurology, with equal access to educational resources, tutors, and bedside tutorials as those who felt more confident. While it is tempting to directly address these shortfalls by supplementing training material and arranging more bedside tutorials, these observations raise a graver issue – equality and equity in graduate medical training. 'Equity' here refers to the realization that each learner is inherently different, and that offering of varying levels of support can help them achieve fair and equal outcomes. A standardized training structure remains essential to ensure that the core curriculum and assessments are similar for all, and that the residents are provided equal access to the same training material and resources, but the fundamental dissimilarities amongst their learners such as pre-existing clinical knowledge and skills, training needs, styles and wants must be recognized by medical educators, so that the degree of support can be tailored accordingly to the learners' differing training requirements (Shankar *et al*., 2011; Khan *et al.,* 2012). This is further echoed by the different training needs and support amongst the females, and those who graduated from medical schools in the UK, ROI, or Australia, as discussed above (Clemmons *et al.,* 2021). A good balance between equality and equity in graduate medical training must thus be struck, as the old adage 'one size fits all' clearly does not.

The limitations of our study include a response rate of 54.3%. An element of recall bias may further confound our findings, especially when the respondents were asked to recollect on their previous training experiences. Reporting of self-confidence and prior training experiences are also vulnerable to subjectivity, a problem which is difficult to eradicate in self-reported measures based on questionnaires (Tempelaar *et al.,* 2020). In addition, the applicability of our findings may vary, depending on the differences in training practices across different AMCs, although Singapore's strict adherence to the international training standards set by ACGME-I can potentially ameliorate such variances,

lending our recommendations a significant degree of applicability in medical training systems which have similar training practices or having already attained a similar level of standards set by the ACGME-I. Importantly, our study's design enabled us to look at the interval changes in their confidence during graduate medical training, itself reflective our training system's effectiveness in building confidence in the junior doctors/residents when managing neurological conditions, and thus contribute to the amelioration of neurophobia.

Conclusion

Poor confidence when managing neurological conditions remains prevalent amongst Singapore's junior doctors. Proactive engagement of IMGs from medical schools in culturally-different countries is vital, so that organizational support may be provided early. As females tended to feel less confident, and are less likely to experience improvements to their confidence through graduate medical training, investing more time and resources in them (e.g., mentoring programmes, closer supervision, etc.) are prudent measures which medical educators can implement. Importantly, the inherent differences in the learners' learning needs must be recognized, and that equity in graduate medical training remains absolutely crucial to building their confidence, so as to ameliorate the ill-effects of neurophobia on the healthcare system as a whole.

Notes on contributors

All authors involved in this study meet the authorship criteria as delineated by the ICMJE, and are wholly in agreement with the content of the submitted manuscript.

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Conflict of interest

All authors report the following conflicts of interest no conflict of interest.

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