

Neurophobia in Medical Students and Junior Doctors—Blame the GIK

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Abstract

Introduction: We aimed to create a definition of neurophobia, and determine its prevalence and educational risk factors amongst medical students and junior doctors in Singapore. **Materials and Methods:** We surveyed medical students and junior doctors in a general hospital using electronic and paper questionnaires. We asked about knowledge, interest, perceived difficulty in neurology, and confidence in managing neurology patients compared to 7 other internal medicine specialties; quality and quantity of undergraduate and postgraduate neuroscience teaching, clinical neurology exposure, and postgraduate qualifications. Neurophobia was defined as ≤ 4 composite score of difficulty and confidence with neurology. **Results:** One hundred and fifty-eight medical students (63.5%) and 131 junior doctors (73.2%) responded to the questionnaire. Neurophobia prevalence was 47.5% in medical students, highest amongst all medical subspecialties, and 36.6% in junior doctors. Multivariate analysis revealed that for medical students, female gender (OR 3.0, 95% CI, 1.3 to 6.7), low interest (OR 2.5, 95% CI, 1.0 to 6.2), low knowledge (OR 10.1, 95% CI, 4.5 to 22.8), and lack of clinical teaching by a neurologist (OR 2.8, 95% CI, 1.2 to 6.6) independently increased the risk of neurophobia. For doctors, low interest (OR 3.0, 95% CI, 1.3 to 7.0) and low knowledge (OR 2.7, 95% CI, 1.2 to 6.2) independently increased the risk of neurophobia, and female gender was of borderline significance (OR 2.0, 95% CI, 0.9 to 4.6). **Conclusion:** Neurophobia is highly prevalent amongst Singapore medical students and junior doctors. Low interest and knowledge are independent risk factors shared by both groups; female gender may also be a shared risk factor. The mnemonic GIK (Gender, Interest, Knowledge) identifies the risk factors to mitigate when planning teaching strategies to reduce neurophobia.

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Introduction

Neurology is often felt to be a challenging subject. The term “neurophobia”¹ has been coined, partly in jest, to describe “a fear of the neural sciences and clinical neurology”. Several studies have explored neurophobia in different teaching environments and countries²⁻⁶ and concluded that both medical students and doctors have low confidence, knowledge, and perceived high difficulty, despite variable levels of interest in neurology, as compared to other subjects in internal medicine. Participants in these surveys postulated that insufficient or poor teaching,^{2,4,6} complexity of neuroanatomy and basic neuroscience,^{2,5-7} complexity of clinical examination^{2,5} and inadequate exposure to neurology patients^{4,6} contributed to neurophobia

based on qualitative feedback; gender was not felt to influence neurophobia.¹

Though several studies on neurophobia have been published, neurophobia has yet to be defined; associated risk factors for neurophobia have also not been fully explored. This research gap is particularly important, as it is difficult to manage neurophobia as an educational condition unless we define it and identify risk factors that we can mitigate to reduce neurophobia. While neurophobia may initially appear to be an educational curiosity of little consequence, many doctors in fact report difficulty managing patients with neurological disorders.^{4,8} This may lead to suboptimal patient care, which is particularly troubling given the burden of neurological disease.^{3,9}

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We therefore performed 2 cross-sectional surveys of undergraduate medical students and junior doctors in Singapore. Our aims were to define neurophobia, determine its prevalence, and identify factors associated with it.

Materials and Methods

We performed a cross-sectional study surveying 2 groups of respondents—undergraduate medical students and junior doctors. The first group comprised all fourth-year students from the Yong Loo Lin School of Medicine, National University of Singapore. Junior doctors—interns, residents, and registrars—from the Division of Internal Medicine, Tan Tock Seng Hospital formed the second group. Our study was approved by the Institutional Review Board of Yong Loo Lin School of Medicine, National University of Singapore (approval number 10-323) and the Domain-Specific Review Board of National Healthcare Group (approval number A/10/676).

Participants in the surveys were recruited via 3 email invitations; questionnaires were completed online (docs.google.com) or on paper. All surveys were anonymous, and conducted in December 2010 for medical students and March 2011 for doctors.

Both surveys assessed 4 attributes: (i) knowledge, (ii) interest, (iii) perceived difficulty in neurology, and (iv) confidence in managing neurology patients using questions and response choices employed in prior studies²⁻⁴ (Table 1). We also asked them to assess these 4 attributes in seven other internal medicine specialties (cardiology, endocrinology, gastroenterology, geriatrics, nephrology, respiratory medicine and rheumatology).²⁻⁴ These attributes were scored on a previously published 5-point scale;²⁻⁴ low scores indicated low interest or knowledge, great difficulty, or low confidence.

Definition of Neurophobia

As there has not been a previous definition of neurophobia, we considered these 4 attributes surveyed in prior studies²⁻⁴—difficulty, confidence, interest and knowledge—to define neurophobia. Based on the initial description of neurophobia,¹ we selected difficulty and confidence as 2 core features that defined neurophobia as a disease. We thus defined neurophobia as a combination of low scores in difficulty and confidence with neurology. We selected difficulty because in the initial description of neurophobia,¹ difficulty manifested as an inability to reason through clinical problems and to understand “how things work”, was stated as a major sign of neurophobia. We also selected confidence as intimidation and anxiety, which suggest a lack of confidence, were prominent symptoms of neurophobia.¹ Subsequent descriptive reports of neurophobia showed that

Table 1: Survey Questions Addressing Attitudes Towards Neurology (adapted from Schon et al)²

Question	Options (Please put an “X” in the box)
What is your current level of interest in Neurology?	<input type="checkbox"/> 1 = Little or no interest
	<input type="checkbox"/> 2 = Some interest
	<input type="checkbox"/> 3 = Moderate interest
	<input type="checkbox"/> 4 = Quite interested
	<input type="checkbox"/> 5 = Very interested
What is your current level of knowledge of Neurology?	<input type="checkbox"/> 1 = Little or no knowledge
	<input type="checkbox"/> 2 = Some knowledge
	<input type="checkbox"/> 3 = Moderate knowledge
	<input type="checkbox"/> 4 = Fair knowledge
	<input type="checkbox"/> 5 = Great knowledge
Do you think Neurology is difficult or easy?	<input type="checkbox"/> 1 = Very difficult
	<input type="checkbox"/> 2 = Quite difficult
	<input type="checkbox"/> 3 = Moderate
	<input type="checkbox"/> 4 = Quite easy
	<input type="checkbox"/> 5 = Very easy
When you see a patient in your clinical experience with a complaint in the area of Neurology, what do you feel?	<input type="checkbox"/> 1 = Very uneasy
	<input type="checkbox"/> 2 = Uneasy
	<input type="checkbox"/> 3 = Averagely competent
	<input type="checkbox"/> 4 = Confident
	<input type="checkbox"/> 5 = Very confident

difficulty and confidence scores were consistently poor for neurology compared to other medical specialties,²⁻⁶ suggesting that difficulty and lack of confidence are consistent core features of neurophobia.

Cases and Controls

We combined difficulty and confidence scores to form a composite score ranging from 2 to 10. We selected a composite score ≤ 4 as a neurophobic case as it indicated difficulty with neurology (very difficult or quite difficult) and lack of confidence (very uneasy or uneasy with neurology patients). Respondents with scores of >4 were considered non-neurophobic controls.

Associated Risk Factors for Neurophobia

Although interest and knowledge were surveyed in prior studies,²⁻⁶ we felt that these attributes were not part of the definition of neurophobia, but instead were possible associated risk factors. Low interest in neurology was not considered to be part of neurophobia, as low interest was hypothesised to result from neurophobia¹ and not a part of the disease description. In addition, interest in neurology was not consistently scored low in prior studies; while interest was lowest in one study,⁵ it was highest in another study³

when compared to other medical specialties. Similarly, poor neurology knowledge was not considered to be part of neurophobia as a prior description of neurophobia¹ emphasised that neurophobia entailed being unable to apply existing knowledge, rather than a lack of knowledge. Knowledge was not consistently scored low in prior studies.^{3,4} We considered knowledge and interest therefore to be possible risk factors for neurophobia.

We considered other educational risk factors related to respondents' prior learning experiences. For medical students, we evaluated the quality and quantity of pre-clinical neuroscience teaching and their clinical neurology rotations. They were asked about duration of neurology exposure, site of training, whether they were taught by a neurologist, and asked to assess the quality of teaching using a 5-point Likert scale.

The doctors' survey had similar questions but also included additional questions to evaluate potential neurophobia risk factors that may affect doctors after graduation. We enquired about the number of years of clinical practice, and whether they had done a neurology posting as a doctor. We also asked if the respondents had postgraduate Diploma of Membership of the Royal College of Physicians in the United Kingdom (MRCP) and if they had attended neurology preparatory courses for the MRCP examination.

Phobias in Other Medical Specialties

Using the definition of neurophobia, defined as a composite difficulty and confidence score of ≤ 4 , we also estimated the prevalence of phobia in the other medical specialties.

Statistical Analysis

We analysed the data as 2 separate datasets for undergraduates and doctors. For each dataset, baseline differences in proportions between cases and controls were tested using Fisher's exact test for categorical data, and differences in means were compared using the t-test for continuous data. All tests of statistical significance were two-tailed; results were considered significant if $P \leq 0.05$. Multivariate logistic regression models were constructed with neurophobia as the major dependent variable and risk factors as the independent variables for each dataset. Interactions terms were also assessed and found to be not statistically significant. Based on the logistic regression output, we also identified shared independent variables across both datasets. SPSS version 17 was used for all statistical analyses.

Results

The response rate for medical students were 158/249 (63.5%); for doctors 131/179 (73.2%), giving an overall response rate of 289/428 (67.5%). The surveys were completed online by 66.8% of respondents; 43.9% of respondents were female.

Based on our proposed definition, the prevalence of neurophobia was higher in medical students (75/158, 47.5%) compared to doctors (48/131, 36.6%); this difference was of borderline significance ($P = 0.07$).

Medical Students

For medical students, the mean interest and knowledge scores were significantly lower in those with neurophobia, compared to those without neurophobia ($P < 0.001$) (Table 2). Using a score of 2 as a cutoff, the prevalence of those scoring ≤ 2 for interest and knowledge was significantly higher in those with neurophobia. Neurophobic students were more likely to be female; this was of borderline significance ($P = 0.08$). Comparing their undergraduate educational experiences, they were also significantly more likely to have received neurology teaching by a non-neurologist during their clinical rotation; they also ranked the standard of clinical neurology teaching more poorly. Duration of clinical neurology rotations and perceived quality of pre-clinical teaching was not found to be associated with neurophobia.

Logistic regression was performed using neurophobia as the dependent variable and these 5 variables (gender, interest, knowledge, teaching by a non-neurologist, standard of teaching) as independent variables. Interest and knowledge were converted to dichotomous variables as shown in Table 2. Four variables were independent predictors of neurophobia (Table 3). The strongest association was found with low knowledge (adjusted OR 10.1, 95% CI, 4.5 to 22.8, $P < 0.001$). Female gender, low interest and teaching by a non-neurologist were also shown to be independent predictors. This model explains 41.1% of the variance in neurophobia.

Junior Doctors

Mean interest and knowledge scores were also significantly lower in doctors with neurophobia ($P < 0.001$); the prevalence of those scoring ≤ 2 for interest and knowledge was significantly higher in those with neurophobia. Neurophobic doctors were also significantly more likely to be female. Undergraduate educational experiences were however non-significantly different when comparing neurophobic and non-neurophobic doctors. Of the postgraduate risk factors surveyed, only lack of a neurology posting as a doctor was shown to be associated with neurophobia.

Table 2. Risk factors for Neurophobia in Medical Students and Junior Doctors

	Medical Students (n = 158)				Medical Doctors (n = 131)					
	Neurophobic (n = 75)	Not Neurophobic (n = 83)	Crude Odds Ratio	95% CI	P value	Neurophobic (n = 48)	Not Neurophobic (n = 83)	Crude Odds Ratio	95% CI	P value
Neurology Confidence, mean (SD)	1.88 (0.46)	3.07 (0.54)	1.83	0.97 – 3.44	<0.001	2.04 (0.46)	3.16 (0.53)	2.14	1.03 – 4.41	<0.001
Neurology Difficulty, mean (SD)	1.61 (0.49)	2.52 (0.65)			<0.001	1.63 (0.49)	2.63 (0.56)			<0.001
Common Risk Factors										
Female gender, n (%)	41 (54.7%)	33 (39.8%)	1.83	0.97 – 3.44	0.08	25 (52.1%)	28 (33.7%)	2.14	1.03 – 4.41	0.044
Neurology Interest										
Mean (SD)	2.79 (1.02)	3.51 (0.98)			<0.001	2.33 (0.91)	3.08 (1.03)			<0.001
No interest to some interest, n (%)	28 (37.3%)	13 (15.7%)	3.21	1.51 – 6.82	0.002	28 (58.3%)	21 (25.3%)	4.13	1.94 – 8.82	<0.001
Moderate to very interested, n (%)	47 (62.7%)	70 (84.3%)				20 (41.7%)	62 (74.7%)			
Neurology Knowledge										
Mean (SD)	2.00 (0.64)	2.84 (0.76)			<0.001	2.19 (0.64)	2.76 (0.73)			<0.001
No knowledge to some knowledge, n (%)	62 (82.7%)	27 (32.5%)	9.89	4.65 – 21.02	<0.001	35 (72.9%)	32 (38.6%)	4.29	1.98 – 9.31	<0.001
Moderate to great knowledge, n (%)	13 (17.3%)	56 (67.5%)				13 (27.1%)	51 (61.4%)			
Undergraduate Risk Factors										
Preclinical Neuroscience Module Teaching Standard										
Very or quite poorly taught, n (%)	40 (58.0%)*	48 (61.5%)*	0.86	0.45 – 1.67	0.74	28 (58.3%)	38 (45.8%)	1.66	0.81 – 3.40	0.21
Fair, quite or very well taught, n (%)	29 (42.0%)	30 (38.5%)				20 (41.7)	45 (54.2%)			
Duration of Undergraduate Clinical Neurology training ≤2 weeks, n (%)	62 (87.3%)†	65 (79.3%)‡	1.80	0.75 – 4.34	0.20	20 (45.5%)†	23 (33.3%)†	1.67	0.77 – 3.62	0.24
Taught Neurology By Non-Neurologist, n (%)	31 (41.3%)‡	19 (23.2%)	2.34	1.17 – 4.65	0.02	10 (20.8%)	23 (27.7%)	0.69	0.29 – 1.60	0.41
Standard of Clinical Teaching										
Very or quite poorly taught, n (%)	24 (32.0%)	6 (7.2%)	6.04	2.31 – 15.81	<0.001	9 (20.9%)§	11 (15.7%)§	1.42	0.54 – 3.77	0.61
Fair, quite or very well taught, n (%)	51 (68.0%)	77 (92.8%)				34 (79.1%)	59 (84.3%)			
Postgraduate Risk Factors										
Lack of MRCP Qualification, n (%)			NA			29 (60.4%)	43 (51.8%)	1.42	0.69 – 2.92	0.37
≤5 Years of Clinical Practice, n (%)			NA			31 (64.6%)	43 (51.8%)	1.70	0.82 – 3.53	0.20
Lack of Neurology Posting as a Medical Doctor, n (%)			NA			34 (70.8%)	43 (51.8%)	2.26	1.06 – 4.81	0.04
Lack of participation in a Neurology PACES course, n (%)			NA			38 (79.2%)	62 (74.7%)	1.29	0.55 – 3.02	0.67

* 6 neurophobic and 5 non-neurophobic students did not complete this question
 † 4 neurophobic and 1 non-neurophobic student did not complete this question; 4 neurophobic and 14 non-neurophobic doctors did not complete this question
 ‡ 1 non-neurophobic student did not complete this question
 § 5 neurophobic and 13 non-neurophobic doctors did not complete this question

Table 3. Risk Factors for Neurophobia, Modelled with Logistic Regression

	Crude Odds Ratio	Adjusted Odds Ratio	95% CI	P value
Medical Students	Male gender	1.0	1.0	
	Female gender	1.8	3.0	1.3 – 6.7
	Neurology Interest			
	Moderate to great interest	1.0	1.0	
	No interest to some interest	3.2	2.5	1.0 – 6.2
	Neurology Knowledge			
	Moderate to great knowledge	1.0	1.0	
	No knowledge to some knowledge	9.9	10.1	4.5 – 22.8
	Taught neurology by neurologist	1.0	1.0	
Taught neurology by non-neurologist	2.3	2.8	1.2 – 6.6	
Junior Doctors	Male gender	1.0	1.0	
	Female gender	2.1	2.0	0.9 – 4.6
	Neurology Interest			
	Moderate to great interest	1.0	1.0	
	No interest to some interest	4.1	3.0	1.3 – 7.0
	Neurology Knowledge			
	Moderate to great knowledge	1.0	1.0	
No knowledge to some knowledge	4.3	2.7	1.2 – 6.2	

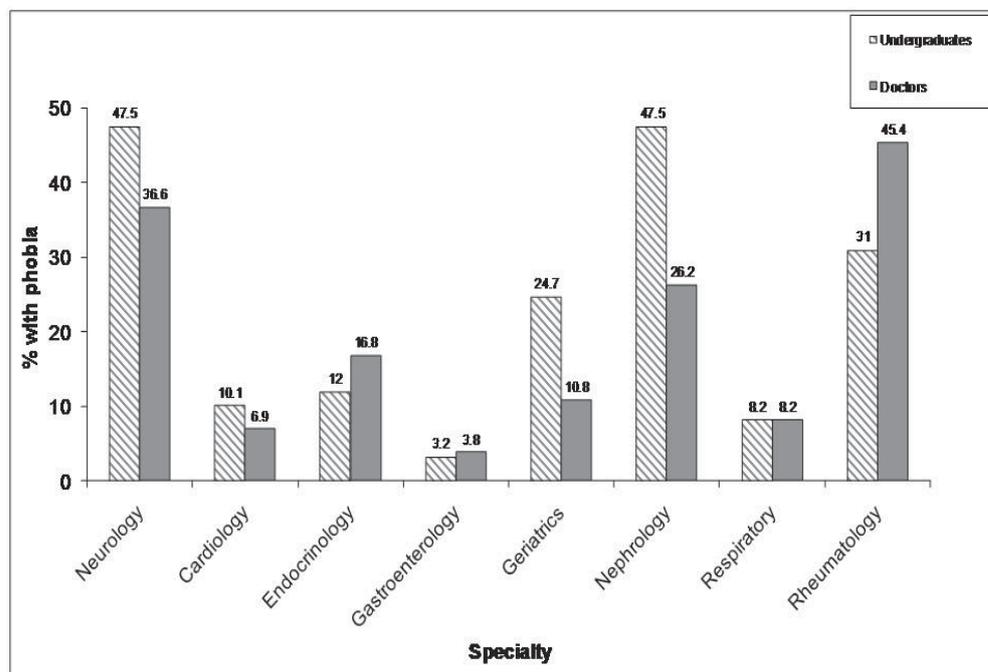


Fig. 1. Prevalence of phobias across medical specialties, expressed as a percentage. Striped bars represent medical students, solid bars represent junior doctors.

Logistic regression was similarly performed using these 4 variables (gender, interest, knowledge and lack of a neurology posting) as independent variables. Two variables, low interest and low knowledge, were shown to be independent predictors, though the adjusted odds ratio for knowledge (adjusted OR 2.7, 95% CI, 1.2 to 6.2, $P = 0.02$) was lower than in undergraduates. Female gender also appeared to be a possible predictor, though of borderline significance (adjusted OR 2.0, 95% CI, 0.9 to 4.6, $P = 0.08$). This model explains 25.4% of the variance in neurophobia.

We reviewed the independent predictors across both groups of respondents and found low knowledge and low interest to be common to both groups. Female gender was a possible third shared predictor variable, while teaching by a non-neurologist was only a predictor in undergraduates, but not doctors.

We also analysed the prevalence of phobias across different disciplines (Fig. 1). Neurophobia and ‘nephrophobia’ were prevalent in undergraduates, while neurophobia was second to ‘rheumato-phobia’ in doctors. Gastroenterology generated the least phobia amongst medical students and junior doctors. The female gender was only associated with ‘rheumato-phobia’ in doctors; all other associations of gender with phobia in disciplines other than neurology were non-significant.

Discussion

We have performed 2 surveys in medical students and junior doctors, including a total of 289 respondents, the first in an Asian medical system. Our respondents reported low confidence and perceived high difficulty scores in neurology compared to other disciplines; this is consistent with prior studies in other parts of the world.²⁻⁶

The prevalence of neurophobia, using our proposed definition, was high. Almost half of all medical students had neurophobia, while slightly more than one third of doctors had neurophobia. This is close to initial estimates by Jozefowicz, who judged that “about half of medical students experience this disorder at one point during their training”.¹ There are no prior estimates for doctors in training. While the prevalence remains high, it is heartening to note that junior doctors may become less neurophobic once they begin clinical practice. The high prevalence of neurophobia in these 2 groups suggests that neurophobia should be taken seriously, and neurology teachers should still be mindful of this condition.¹⁰

No formal definition of neurophobia was available from any of the prior studies. Our proposed working definition of neurophobia incorporates 2 key attributes—low confidence and perceived difficulty in managing neurology cases. We propose this definition as there is no antecedent

definition. We had initially considered asking respondents to self-report if they had neurophobia, but felt this might potentially be confusing as the respondents were unlikely to have heard of the term ‘neurophobia’ before the survey. We elected instead to use validated questions used in prior studies²⁻⁶ to construct a proposed definition. This allows us to objectively compare the results against prior studies. Any disease definition is of course subject to modification with time and better understanding of the disease, but we hope our working definition provides an initial step towards characterising neurophobia for further study.

Our exploration of possible associated risk factors for neurophobia suggests that low interest and low knowledge are shared independent risk factors associated with neurophobia in both medical students and doctors. Female gender was also a possible third shared risk factor; it was significant in medical students, and of borderline significance in doctors. Our finding of 3 shared risk factors is consistent with prior evidence that perceptions formed in medical school are carried over to subsequent clinical practice.²

Our finding that low interest is associated with neurophobia is interesting. Prior studies which described levels of interest in neurology have shown widely varying levels of interest in neurology, compared to other medical disciplines. Interest levels in neurology from various parts of the world ranged from being the highest,³ to third highest,² to second lowest.⁵ Its association with neurophobia was not evaluated in those studies. Our study suggests an association, but causality is difficult to determine. Perhaps low interest leads to neurophobia as learners who are uninterested are disinclined to learn and thus find the subject difficult. Alternatively, low confidence in managing neurology cases may cause frustration and apathy, and disinterest in neurology.¹ Disentangling cause and effect is challenging, and hypotheses about the direction of causality remain speculative.

Low knowledge was also a shared risk factor. We found the odds ratio for low knowledge was considerably higher in medical students compared to doctors (10.1 vs 2.7). Low knowledge in neurology may result in neurophobia by causing increased difficulty in managing neurology cases. Our findings suggest that while low knowledge is a shared risk factor, its impact is reduced after graduation. This is not entirely surprising as both our study and that by Zinchuk and colleagues⁶ have shown higher perceived neurology knowledge scores in doctors compared to medical students. This suggests that acquiring neurology knowledge while working as a doctor may help to mitigate neurophobia to some degree.

The association with female gender has not previously been explored.²⁻⁶ In his initial paper,¹ Jozefowicz reported

that men and women were equally affected. Our study is the first to show that female medical students are significantly more neurophobic, and that this state of mind may even carry over into their practicing careers. This finding is particularly relevant as the proportion of women in medical school is increasing.¹¹ If other studies are able to confirm this association, we believe that this finding is of relevance to educators, as more attention should then be paid to female learners in both undergraduate and postgraduate neurology training.

Teaching by a non-neurologist was a risk factor only in medical students, but not in doctors. Recall bias may have resulted in the discordant findings between the 2 groups. The medical students received neurology teaching 12 to 15 months prior to the survey. In contrast, the doctors had their undergraduate neurology teaching 2 to 8 years before the survey. It would thus have been more difficult for doctors to recall who their tutors were.

In our local undergraduate medical school curriculum, clinical neurology is taught as part of a general medicine rotation. As such, teaching hospitals may elect to have neurology taught by neurologists or general physicians, depending on manpower constraints. As teaching by a non-neurologist is associated with neurophobia, teaching hospitals may wish to consider having neurology taught by neurologists.^{1,4,9} This may take the form of dedicated neurology bedside tutorials, small group teaching¹ or a neurology rotation nested within the general medicine rotation⁴ as long as the teaching is conducted by neurologists. However, we do realize that this may be a challenge in some countries as the neurologist-to-population ratio (hence neurologist-to-student ratio) varies considerably.³

We also found ‘nephro-phobia’ common in undergraduates, and ‘rheumato-phobia’ common in junior doctors. This pattern is not entirely surprising as there is relatively less exposure to renal medicine in the undergraduate curriculum. Similarly, rheumato-phobia may also be due to insufficient exposure to rheumatology in postgraduate training.¹²

Our study has several strengths. We have defined neurophobia, using questions validated in prior studies to measure 4 key attributes.²⁻⁶ Using this definition, we have estimated its prevalence in our population. We have also used a case-control design to explore risk factors for neurophobia. As respondents were unaware of their case/control status, this would have reduced bias in ascertainment of case/control status, as well as ascertainment of risk factors. Our use of 2 groups (medical students and junior doctors) also allowed us to show that the majority of risk factors for neurophobia are common to both groups, which has implications for both undergraduates and postgraduate education. Limitations of our study include a survey response rate of 67.5%, and possible recall bias when the doctors were surveyed about

their undergraduate neurology teaching. Our findings will also need to be confirmed in other educational settings in different countries. Finally, though neurophobia is prevalent in many countries,²⁻⁶ there is no published research thus far linking neurophobia to assessment scores, patient care or patient outcomes.

Conclusion

By using a proposed definition for neurophobia, we have found neurophobia to be prevalent in medical students and junior doctors. Risk factors for neurophobia common to both groups include low interest, low knowledge, and female gender. Additionally, medical school clinical neurology teaching by a non-neurologist was also an associated risk factor in medical students.

Our study suggests that medical students should be taught clinical neurology by neurologists.^{1,4,9} Regardless of the level of the learner, clinical neurology teaching should focus on improving neurology knowledge and stimulating interest in the topic, using methods suggested in prior studies.^{1-3,5-7} As females appear more at risk for neurophobia, special attention should be paid to female learners during clinical teaching. Neurologists are often stereotyped as brainy but forgetful “geeks”.² Neurology teachers may want to keep the whimsical mnemonic GIK (Gender, Interest, Knowledge) in mind to remember what risk factors are important and may be mitigated to treat neurophobia when planning neurology teaching.

Neurology has a reputation for difficulty, a subject “for which only young Einsteins need apply”.² This must change, and major efforts are already underway to revamp neurology teaching.^{3,7,9,13} Neurophobia is a real and prevalent educational disease. We hope that the risk factors for neurophobia identified in this study will be helpful for educators planning and implementing neurology teaching in medical schools and postgraduate training programmes.

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