British Journal of Medicine & Medical Research
2(3): 484-489, 2012

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Neurosurgical Knowledge of Interns in New Zealand: The Potential for Improvement

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Authors' contributions

This work was carried out in collaboration between all authors. ASK designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. AFA managed the analyses of the study, and the literature searches. All authors read and approved the final manuscript.

Research Article

Received 24th May 2012
Accepted 5th July 2012
Online Ready 19th July 2012

ABSTRACT

Aims: Insufficient exposure of students to neurosurgery and neuroradiology has often been a matter of concern in medical schools across USA, Canada, UK and Europe. When taking into account the high incidence and mortality from head injuries in the form of subarachnoid and intracranial haemorrhages, it becomes evident that core knowledge in basic neurosurgical imaging and diagnoses need to be an essential part of medical training. The aim of this pilot study was to investigate the level of basic neurosurgical knowledge with regard to image interpretation in interns who were in their first post-graduate year in New Zealand.
Study Design: Clinical and educational research paper.
Place and Duration of Study: Wellington, New Zealand from January 2011 to January 2012.
Methodology: Fifty interns in their first postgraduate year were invited to complete a neurosurgical imaging questionnaire with images of common neurosurgical findings (obvious subarachnoid and intracranial haemorrhages) randomly mixed with normal studies. Five computerized tomography (CT) scan images were required to be matched to five diagnoses.
Results: All respondents agreed to participate. The mean score for the all 50 interns was 40% (95% CI 37.3 - 42.4), with a range of 0 to 80%. Thirty-six interns (72%) had a score

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of less than 60% and thus failed to demonstrate basic competency on the examination. None of the interns scored a full 100%.
Conclusion: This study suggests that only 28% of newly qualified New Zealand doctors were able to demonstrate a basic level of competence in the evaluation of neurosurgical imaging at the start of their internship. Improvement of the undergraduate neurosurgical curriculum is strongly suggested.

Keywords: Neurosurgery; interns; knowledge; imaging; computerized tomography.

1. INTRODUCTION

Head injuries comprise approximately 5% of all Emergency Department presentations in Australasia and about 8% of these are found to have intra-cranial haemorrhages (ICH) on CT scans. Missed diagnoses can be potentially fatal and an ability to identify ICH on imaging is crucial for all graduated medical professionals (Fortune and Wen, 1999; US National Institutes of Health, 1998).

However, insufficient exposure of students to neurosurgery and neuroradiology has often been a matter of concern in medical schools across USA, Canada, UK and Europe (Fox et al., 2011). When taking into account the high incidence and mortality from head injuries in the form of subarachnoid and intracranial haemorrhages, it becomes evident that core knowledge in basic neurosurgical imaging and diagnoses needs to be an essential part of medical training. However, it is unclear what level of fundamental neurosurgical knowledge should be acceptable for general medical professionals and what areas require further attention and improvement during their first post-graduate year. Currently, medical students in New Zealand are required to have knowledge of only basic neurosurgical conditions. Minimal emphasis is placed on image interpretation and the management of neurosurgical emergencies.

It is also controversial, whether the amount of neurosurgical information taught by the specialist neurosurgical educators is perceived as sufficient by the junior doctors themselves (Aldana and Steinbok, 2009). A variety of educational options could be offered to medical students, including lectures, seminars, observation and clerkship but it would be prudent to identify the areas of deficiency and the potential for improvements.

Currently the average length of time set aside for dedicated undergraduate neurosurgical teaching in New Zealand medical schools ranges from approximately three days to two weeks. The aim of this study was to investigate the level of basic neurosurgical knowledge with regard to image interpretation in interns who were in their first post-graduate year in New Zealand. This would allow making adjustments to the undergraduate medical curriculum in neurosurgery and to identify the points of special attention.

2. METHODS

The consecutive group of the first year interns who completed their medical training in New Zealand were requested to answer the anonymous questionnaire about their neurosurgical knowledge. Only the medical school from which they obtained their medical degree was

recorded. A prerequisite was that they had not been involved in a post-graduate neurosurgical rotation at the time of answering the questions.

All interns who were approached agreed to participate and informed consent was obtained verbally from each of them. In total, 50 interns from the three main public hospitals in the Wellington region during the course of 2011 were included in the study.

The interns were given a total of 15 minutes to fill in the questionnaire in the form of a one page handout. The method of testing involved questions that was of the matching type (Appendix A). Five CT scan images were listed in order from A to E. There were five potential diagnoses for each image and each option could only be used once.

The images were Computerized Tomography (CT) scans consisting of a normal study of the head and four obvious common neurosurgical findings: an acute subdural hematoma, a traumatic subarachnoid haemorrhage, an acute extradural hematoma and an intra-parenchymal haemorrhage. The applicants had to match the appropriate diagnoses to the images displayed.

Each question was worth a maximum of one point. Marks were given out of five. There was no negative marking for incorrect or unanswered questions. The predetermined pass mark was three out of five. In order to obtain a score from 0 to 100%, the overall mark was multiplied by 20. The examination was scored anonymously according to the validated scoring system and answer key.

Knowledge of obvious CT scan findings was tested as these were basic, and should be easily interpreted by all new post-graduate interns. The authors thought it would be futile testing detailed neurosurgical conditions as these would be referred to our department regardless. We instead focussed on basic neurosurgical image interpretation as we believe that all newly graduating doctors should be able to interpret obvious images.

3. RESULTS

The mean score for the 50 interns in their first postgraduate year was 40% (95% CI 37.3 - 42.4), with a range of 0 to 80%. Thirty-six interns (72%) had a score of less than 60% and thus failed to demonstrate basic competency on the examination. None of the interns scored a full 100%.

With regards to individual component scores, the intra-parenchymal haemorrhage image was scored correctly by the majority of the interns (41 out of 50, 82%). The image of the normal CT was scored correctly by 30 of the interns (60%). The image of the acute subdural hematoma was scored correctly by 19 interns (38%) and the image of the acute extradural hematoma was scored correctly by 10 of the interns (20%). Only 4 interns correctly identified the subarachnoid haemorrhage (8%). The data analysed showed that the majority of the mistakes seemed to be confusion between extradural and subdural hematomas (44%). The second commonest mistake was misinterpretation between the normal CT and the traumatic SAH (36%).

While our study population was too small to allow any statistically significant sub-analysis, we were able to demonstrate a trend, with the interns who scored higher in the assessment coming from programmes with more time allocated to neurosurgical training and from programmes which included on-call duties for the students. The students who attended the

medical school with more emphasis on neurosurgical training (i.e. two weeks) had an average score of 48%, whereby the students who graduated from the school that recommended only three days of neurosurgical training scored an average of 32%.

4. DISCUSSION

This study suggests that the vast majority of newly qualified New Zealand doctors do not have sufficient level of competence in the evaluation of basic neurosurgical imaging. At the start of their internship, with their final undergraduate medical exams recently completed, only 28% (14 out of 50) passed the test.

This number is rather alarming given the high prevalence of trauma and other neurosurgical emergencies experienced in Australasia and there could be a few potential reasons for this. First, in most medical schools, neurosurgeons are not directly involved in face-to-face student education. As a result, the vast majority of emerging medical practitioners are taught about common neurosurgical conditions either by other specialists or not at all (Resnick, 2000a). Second, the neurosurgery-related curriculum is too short and the teaching methods are not adequate to generate and maintain the knowledge of basic neurosurgical images within the minds of new medical graduates. And third, there is not enough motivation from the side of medical students to learn the interpretation of scans, probably relying too much and hoping on the opinion of qualified radiologists.

Neurosurgeons provide definitive management for several common disease processes that are encountered by most physicians regularly. The management of refractory epilepsy, lower back pain, malignancy, head and spinal trauma are but a few examples of common conditions dealt with by neurosurgeons. The majority of these patients are initially seen by junior doctors or general practitioners and referred. Our concern is of the ability to recognize neurosurgical emergencies and to render appropriate care and timely referral to the neurosurgical service. Subarachnoid haemorrhages and severe head or spinal injuries are just a few examples of conditions that may prove fatal is referral is delayed. We believe that specialists are the best source of information with regards to their particular specialty. Primary care physicians cannot be left to shoulder the burden of medical education with regard to specialist issues because primary care physicians cannot devote the same knowledge and expertise to a specific topic that specialists can.

A review of the curriculum including aspects such as content and time allocation, as well as teaching methods and skills is essential if we are to ensure that medical students, during the course of their undergraduate training, obtain the basic knowledge and skills which will enable them to practise safe medicine in the community. Inclusion of a short neurosurgery-related curriculum as part of a combined neuroscience course has been shown to significantly improve student performance on an examination focusing on the recognition and management of common neurosurgical conditions (Resnick, 2000b). Because primary care physicians are responsible for the initial recognition and management of these disorders, the knowledge gained may lead to improved patient care.

Our findings suggest that the undergraduate medical curriculum in New Zealand should allow for more exposure to training in neurosurgery. Decreasing time devoted to neurosurgery has a clear impact on the calibre of interns today (McKeown et al., 2003; Rizzolo, 2002). The particularly poor ability to detect subarachnoid haemorrhages and extradural haematomas demonstrated by the interns in the assessment suggests that these

components should receive increased emphasis in the undergraduate curriculum. Our data clearly shows trends favouring more time spent in neurosurgery.

There are limitations to this study. Our study may have been limited by sample bias, with participants coming exclusively from three hospitals in Wellington. Our intern group did however include graduates from both of the New Zealand medical schools. The questionnaire was focussed solely on imaging and no clinical vignettes were provided. This may have placed undue emphasis on imaging modalities instead of recognizing a specific problem which may have been aided by history and examination findings.

We also acknowledge that our sample size was small and would hence prefer using our study as a pilot study so as to inspire a multicentre study within Australasia and perhaps globally to compare neurosurgical teaching at undergraduate level worldwide. We feel this would be important so as to improve the neurosurgical curriculum taught to students globally. If an international multi-centre trial was to be performed, this may allow a uniform curriculum to be produced which places more emphasis on neurosurgical teaching.

CONSENT

All authors declare that 'written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images.

COMPETING INTERESTS

There were no sources of financial support/grants for this study. There were no competing interests. All the authors performed the study and have read and approved the final manuscript.

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APPENDIX A: NEUROSURGICAL IMAGING QUESTIONNAIRE

Please match the following numbers with the CT Scan images below.
Each diagnosis may only be used **ONCE**.
There is no negative marking.
Time Allocated: 15 (fifteen) Minutes

1. Normal study
2. Acute extradural haematoma
3. Intra-parenchymal haemorrhage
4. Acute subdural haematoma
5. Traumatic subarachnoid haemorrhage

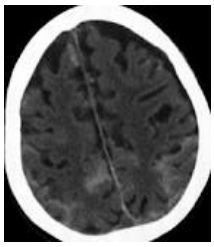
Image A

Answer__

Image B

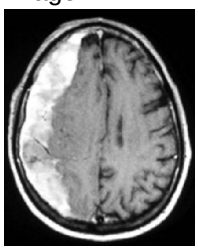
Answer__

Image C



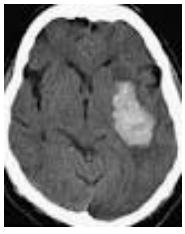
Answer__

Image D



Answer__

Image E



Answer__