Predicting success in graduate entry medical students undertaking a graduate entry medical program (GEM)

Background

In 2000, the first two four year Graduate entry medical courses (GEM) were introduced at two UK medical schools, St George's Hospital, London and Warwick Medical School, Coventry (then part of Leicester-Warwick medical school).The aspirations for these courses were to embrace the mature learner, to respect prior learning and to foster self directed learning. By accepting students with more life experience, it was hoped that the diversity of students would be increased, thereby increasing diversity in doctors. [1-3] There are now 14 universities offering accelerated graduate entry programs in the UK, accounting for nearly 10% of the current UK medical school intake. [3]

In the UK, the majority of medical students enter medical school after completing their secondary school education. Selection for undergraduate medical schools is largely based on predicted or actual A level results (examinations taken by students age 18 before leaving school). In studies looking at UK undergraduate medical courses, A levels results have been shown to predict success at final examinations.[4-6] There is also evidence from several studies that A level results correlate with dropout rates, career progression, post graduate membership and Postgraduate Royal College fellowship examinations. [4, 5, 7, 8] There is no literature regarding predictors of success in graduate medical students undertaking the new UK GEM programs.

Graduate entry courses are not new in an international context. In the United States of America, students move from high school, to University and then onto medical school. Australian medical schools began fast track courses for GEM students around five years before the UK.

Research relating to GEM programs has shown that students with either a science degree or a background in one of the health professions perform better in assessments in years 1-3, than those with other academic backgrounds.[9] GEM students have been shown to be at least as well prepared for work as their counterparts from undergraduate courses, and to feel better prepared in interpersonal skills, confidence, collaboration, holistic care, and self directed learning.[10]It has been demonstrated that graduate students perform as well as undergraduate students in their primary medical qualification examinations.[11]

Aims

The aim of the study was to explore the examination performance of GEM students to look particularly for factors which might predict success.

At the study medical school, the selection process at the time of the study was distinct with A level examinations not being used for selection purposes. Instead, students were required to have an upper second class honours degree or above in a science subject. The justification for this was that using A level scores could disadvantage individuals from lower achieving schools and those who may have developed later in life and would thus inhibit attempts to increase diversity.[2]

GEM programs at other universities have been shown to recruit students with very high academic achievements and who are therefore exceptionally qualified.[12] Our study is therefore an opportunity to examine whether A level scores predict subsequent success in this population of graduate entry medical students.

Methods

Ethical approval was granted by the local ethics committee. Written consent was sought from students.

Study design
A retrospective quantitative cohort study looking at three cohorts of GEM students.

Setting
Data were collected retrospectively for all students who graduated in the years 2004, 2005, and 2006. All data were collected, checked and verified by the two principal researchers (TH and MS).

Participants
All GEM students from the cohorts were eligible. Only those giving written consent were included in the analysis.

Variables
Demographic and prior academic achievement data were collected from the UK national University College Admissions Service (UCAS) forms and student records held at the university. This comprised age, gender, A level results, and previous highest degree.

A level examinations grade candidates A-E for each examination they sit. In this study these grades were converted into continuous data by scoring them using the standard point scoring conversion used by UCAS at the time the data was collected. An A was given 10 points, B, 8 points, C=6 points, D=4 points, and E=2 points). These points were added together for each candidate to give a total A level score. Highest awarded degree was classified as BSc, or a higher degree (MSc or PHD).

Outcome measures
The structure of the course and timing of examinations were as illustrated in figure 1. Students sat written examinations at the end of 18 months of study (phase 1 written) and at the end of the course (final written examination), and clinical examinations at the mid-point of their clinical training (intermediate clinical examination or "ICE") and at the end of the course (final clinical examination or "FPE"). The award of honours was based on performance in all examinations on the basis of a points system.

Written examinations
Pass/ fail data were available for both written examinations and percentage marks were also available for the final written examination.

Clinical examinations

In the clinical examinations, students saw a number of patients (a minimum of two for the intermediate examination and 4 for finals clinical) scored using to the Leicester Assessment Package (LAP) [13, 14]. The LAP is a validated and reliable method of assessing clinical performance. It was originally designed for general practitioners, and has been adapted for undergraduate examinations[13]. Students' results were taken from original examiner mark sheets.

Students receive marks from two examiners in several domains for each patient they see. These grades are converted into points. (A=6 points, B=5 points, C+=4 points, C-=3points, D=2 points, E=1 point). A total score was calculated for each student in each examination. The range of scores for any one student was therefore 16 to 96 in the intermediate clinical examination and 40 to 240 in the final clinical examination.

Study size

The study size was the number of students graduating in the years 2004, 2005 and 2006. After this time the course structure and selection processes changed so future cohorts were not comparable with those included in this study. Students who had changed years were included in the analysis if they graduated in one of the three relevant cohorts.

Statistical analysis

Data were collected and analysed using SPSS 15.

Continuous data were obtained for clinical examinations and finals written percentage data. ANOVAs were performed to evaluate associations between examination results and demographic details. For this analysis A level scores were split into three groups of equal size, and age into two groups of equal size. For completeness ANCOVAs (a statistical test similar to an ANOVA but where one continuous input variable may be analysed) were also performed for continuous demographic variables. These have not been included in this paper as the results demonstrated the same effects.

For both the written examinations pass/fail results were available. Logistic regression analysis was performed using the same variables as for the other analyses. To evaluate the award of honours, logistic regression was performed.

Results

During the study, 320 students graduated from Warwick Medical School. 35 students (11%) did not consent to take part in the study so 285 students are included in the analysis.

Clinical examinations

Examination results for both the clinical examinations were confirmed to be normally distributed. ANOVAs of the two clinical examinations against the studied demographic variables (tables 1 and 2) showed no statistically significant variables. In particular A levels were not

shown to be significant (Intermediate clinical examination, p=0.820, final clinical examination, p=0.519).

Written examinations
Logistic regression analysis of the pass-fail data for the written examination results (table 3) for the studied demographics showed gender to be a significant variable in the phase 1 examination, with females performing better than males. (OR= 0.160, p=0.036). A levels were not found to be significant in either of the written examinations when looking at the pass/fail data (OR 1.60, p=0.456 and OR=1.080, p=0.160 respectively). No other demographic variables were found to be statistically significant.

ANOVA analysis performed for the finals written examination (table 4) demonstrated that A level score was significantly associated with performance. The group with A level scores in the range 27-40 points scoring 4% better than those in the two groups 2-20 and 21-26 points ($p<0.001$). This analysis also showed gender to be statistically significant (p=0.013) with females performing better than males.

Honours
Logistic regression analysis was performed to look in more detail at those students who excelled and achieved honours (table 5). A level score was highly statistically significantly associated with the achievement of honours ($p<0.001$).

Discussion

The most important findings in our study were those relating to A level grades.

A level score was not a significant predictor of passing or failing either of the written examinations. However, the group scoring highest at A level (27-40 points) was shown to perform better in the final written examination than the groups with A level points in the range of 2-26 points. Translating these point scores into grades, this means that students achieving higher than AAB at A level performed much better than those who achieved lower scores. This high prior academic achievement was also associated with the award of honours. This reflects what has been demonstrated elsewhere in the performance of GEM students.[12]

Looking at the students who performed in the lower two groups (those scoring one E to ABB), there was no statistically significant difference in examination performance between those scoring 2 to 21 points and 21 to 26 points. This suggests that students who have performed less well at A level can perform well enough in an undergraduate degree to receive the offer of a place at medical school and then go on to succeed at medical school. This is interesting as this group of students would not traditionally have been accepted into medical school. Although there is no direct comparison of this group of students with those undertaking a traditional undergraduate course, we have shown 3 cohorts of GEM student to perform as well as the equivalent 3 cohorts of undergraduate students undertaking the same examinations.[11]. This demonstrates that the performance of these students is comparable to those on traditional courses and is not the result of them being measured against lower standards.

An additional important finding is that A level scores do not predict subsequent performance in clinical examinations. Given that there is evidence that the clinical examinations conducted in the Leicester assessment package format reflect performance as a doctor well, [13, 14] it suggests that A level scores in GEM students do not predict clinical performance as a doctor.

Age

Age was not shown to be a significant variable in this analysis. This is surprising as older students with additional life experience have been shown to perform better in interviews and therefore it may have been thought that they would perform better in clinical examinations. [15] Previous studies have shown GEM students at Warwick to be generally younger than GEM students at other schools.[3] This is reflected in the distribution of ages in this study, with half the students clustered in a very narrow age bracket (20-22). It may be that any effect of age is masked by the distribution of age in this study. It is interesting that with increased age A level results become less significant than in the undergraduate population. This suggests that age or prior life experience must have some effect on performance at medical school. No effects were seen when looking at previous degree and performance, although the numbers in this study with a higher degree are very small, potentially masking significant effects.

Sex

The finding of a statistically significant difference between the two sexes in written examinations is in keeping with previously published data regarding performance at medical school where small differences in percentages between men and women have been demonstrated [16, 17]

Limitations

The study is limited in the demographic information which was available for the students included in the study. The demographic and prior academic performance data were collected retrospectively and thus were restricted to the information available in student files. There were very small numbers of students with higher degrees and therefore this group was difficult to analyse. Also where students had higher degrees there was no record of their undergraduate qualifications. It was therefore not possible to accurately analyse whether there was an effect of undergraduate degree grade on performance.

This study was conducted prior to the addition of MCAT or UKCAT admissions tests in selection processes at the study medical school and we therefore have no such test data to compare with.

Generalisability

Our findings apply to GEM students and cannot be generalised to undergraduate students undertaking traditional courses.

Conclusions

The initial aspiration for the introduction of GEM courses in the UK was to increase diversity and broaden the intake of medical students and therefore doctors. This study has demonstrated

that excluding academic achievements at the end of school provided the student has achieved an upper second class honours degree is an acceptable selection method. Students perform as well and do not seem to be disadvantaged. The study also demonstrates that consistently top-echelon performance from A-levels, through first-degree classification to honours in a GEM medical degree might well distinguish future high-fliers.

Implications for further research

Since the time of this study selection methods have changed. Candidates are now required to sit the UKCAT examination and the interview process is different. It would be interesting to compare this new selection method to subsequent success and to compare performance in the UKCAT to both prior academic achievement data and to subsequent success.

What this study adds

- Students with a wide variety of A level scores including very low scores can succeed in GEM courses
- Very high A level scores were associated with excelling in written examinations and in the award of honours.

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