Predictors of success in the Intercollegiate Membership of the Royal College of Surgeons (MRCS) examination

DSG Scrimgeour^{1,3,4}, J Cleland¹, AJ Lee², PA Brennan⁴

¹Centre for Healthcare Education Research and Innovation, University of Aberdeen, Aberdeen, UK

²Medical Statistics Team, University of Aberdeen, Aberdeen, UK

³Department of Colorectal Surgery, Aberdeen Royal Infirmary, Foresterhill, Aberdeen, UK

⁴Intercollegiate Committee for Basic Surgical Examinations, London, UK

ABSTRACT

INTRODUCTION The Intercollegiate Membership of the Royal College of Surgeons (MRCS, Parts A and B) is designed to safeguard patients and ensure high standards for trainees wishing to pursue a surgical career. We investigated which factors predict Part A and B success.

METHODS UK graduates who had attempted both parts of MRCS from September 2007 to February 2016 were included. Pearson correlation coefficients were used to examine the linear relationship between each part of MRCS and logistic regression analysis to identify potential independent predictors of MRCS pass/fail outcome.

RESULTS A positive correlation between Part A and B score was identified ($r = 0.41$, $P < 0.01$). In Part A, males had higher pass rates than females (odds ratio, OR, 2.78, 95% confidence interval, CI, 1.83–4.19), white candidates were more likely to pass than black minority and ethnic doctors (OR 1.70, 95% CI 1.52–1.89), foundation year 1 doctors had higher pass rates than all other grades (e.g. core surgical year 2 trainees vs. foundation year 1 doctors, OR 0.50, 95% CI 0.32–0.77) and younger graduates were more likely to pass than older graduates (OR 2.60, 95% CI 1.81–3.63). In addition to ethnicity and stage of training, Part A performance (number of attempts and score) was an independent predictor for Part B.

CONCLUSIONS Part A performance is related to Part B score. Many independent predictors of MRCS success were identified, but only stage of training and ethnicity were found to be common predictors of both parts. This article summarises the findings of our most recent MRCS study which was published in *The Surgeon* (online) in October 2017.¹

KEYWORDS

MRCS – Postgraduate examinations – Surgery – Validity – Predictors

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CORRESPONDENCE TO

DSG Scrimgeour, E: duncan.scrimgeour@nhs.net

Introduction

The Intercollegiate Membership of the Royal College of Surgeons (MRCS) examination is one of the largest postgraduate surgical examinations in the world, with up to 6000 doctors in the UK and overseas taking it annually.^{2,3} However, little is known about the factors that may influence MRCS success and most of the advice available is anecdotal.

In its current format, the MRCS consists of two-parts. Part A is a five-hour written examination divided into two papers (three hours and two hours) that uses a combination of single best answer multiple choice questions (MCQs) and extended matching MCQs designed to assess knowledge of both the principles of surgery in general and applied basic sciences.⁵

Part B is a half-day objective structured clinical examination (OSCE) consisting of 18 manned, 9-minute stations

(with two additional rest stations and two preparation stations). The OSCE tests two broad areas – knowledge (eight stations) and clinical and technical skills (ten stations). Knowledge includes anatomy and applied surgical pathology, applied surgical science and critical care, while clinical examination, communication skills and technical skills are tested over the remaining ten stations.³

For the first time, our work describes the relationship between both parts of MRCS and several independent predictors of Part A and B success.

Methods

All UK medical graduates who had attempted Part A or B MRCS from September 2007 to February 2016 were included. Data were extracted from the prospectively collected intercollegiate MRCS database held by the Royal

College of Surgeons of England. Each candidate's Part A score was merged with their Part B score (where appropriate) to create a complete MRCS history of each candidate, which included the self-declared sociodemographics of gender, first language and ethnicity. Date of graduation, date of examination, date of birth and number of attempts at each part of MRCS were also recorded.

All analyses were conducted using SPSS® version 24.0 (IBM). Pearson correlation coefficients were used to examine the linear relationship between each part of the MRCS and chi-squared test was initially employed to determine any significant differences in examination pass rates between any of the variables. Predictors of Parts A and B – first and final attempt outcomes – were assessed using logistic regression analysis. All potential predictors with a *P*-value less than 0.1 on chi-squared analysis were simultaneously entered into the logistic regression models and any variable with a *P*-value greater than 0.05 was then removed until only statistically significant predictors remained in each model. Potential interactions between any of the variables were investigated and any statistically significant ones were included in to the final logistic regression models.

Results

A total of 7896 UK medical graduates made 11867 attempts at Part A MRCS and 4310 of these candidates took 5738 attempts at Part B from September 2007 to February 2016; 61% passed Part A MRCS at the first attempt (4824/7874) and 72% passed Part B at the first attempt (3082/4301). A significant positive correlation was found between Part A first attempt score and Part B first attempt score ($r = 0.41$, $P < 0.001$).

Part A MRCS

The OR and 95% CI for passing Part A MRCS at first attempt are shown in Table 1. Men were nearly three times more likely to pass Part A compared with women

(OR 2.78, 95% CI 1.83–4.19) and self-classified white candidates were almost twice as likely to pass at first attempt compared with self-declared black and minority ethnic (BME) doctors (OR 1.70, 95% CI 1.52–1.89).

Younger medical graduates, defined as less than 29 years of age at graduation, were more than twice as likely to pass part A at their first attempt (OR 2.60, 95% CI 1.81–3.63) compared with mature graduates. Foundation year (FY) 1 doctors were more likely to pass Part A compared with all other training years (Table 1), with those attempting the examination more than 47 months after graduation at greatest risk (OR 0.47, 95% CI 0.33–0.66). Similar results were obtained for final attempt outcome in Part A MRCS (data not shown). For every additional attempt that was made at Part A MRCS, the odds of passing the examination decreased by 14% (OR 0.86, 95% CI 0.80–0.92).

A significant interaction between age at graduation (maturity) and gender was found for Part A first attempt ($P = 0.004$) and this interaction was therefore included in to the final regression analysis (Table 1).

Part B MRCS

Compared with BME candidates, white doctors were nearly twice as likely to pass Part B MRCS at their first attempt (OR 1.91, 95% CI 1.62–2.25; Table 2). FY1 and FY2 doctors were less likely to pass Part B at first attempt compared with Year 1 and 2 core surgical trainees (CST; OR 1.72, 95% CI 1.50–2.28 for CST1 and OR 1.67, 95% CI 1.24–2.26 for CST2).

The odds of passing Part B MRCS decreased as the number of attempts needed to pass Part A increased, with those requiring greater than three attempts at greatest risk of failing (OR 0.56, 95% CI 0.42–0.70, Table 2). The chances of passing Part B MRCS at first attempt increased by tenfold for every 1% increment that was made over the Part A pass mark (OR 1.10, 95% CI 1.09–1.12). Similar results were obtained for final attempt outcome in Part B MRCS

Table 1 Logistic regression model for pass at first attempt in Part A Membership of the Royal College of Surgeons for UK medical graduates ($n = 5932$).

Independent variable	Odds ratio	95% confidence interval
Gender (male vs female)	2.78	1.83–4.19
Ethnicity (white vs black and minority ethnic)	1.70	1.52–1.89
Stage of training:		
FY2 vs FY1	0.62	0.54–0.71
CST1 vs FY1	0.66	0.56–0.79
CST2 vs FY1	0.50	0.32–0.77
≥ 48 months from graduation vs FY1	0.47	0.33–0.66
Mature medical graduate (young vs mature)	2.60	1.81–3.63
Interaction term (mature medical graduate by gender)	0.53	0.3–0.81
Model constant	0.56	–

CST, core surgical trainee; FY, foundation year.

Table 2 Logistic regression model for pass at first attempt in Part B Membership of the Royal College of Surgeons for UK medical graduates ($n = 3328$).

Independent variable	Odds ratio	95% confidence interval
Part A examination performance ^a	1.10	1.09–1.12
Number of Part A attempts:	1.70	1.52–1.89
2 vs 1	0.68	0.54–0.86
3 vs 1	0.60	0.43–0.84
≥ 4 vs 1	0.56	0.42–0.70
Ethnicity (white vs black and minority ethnic)	1.91	1.62–2.25
Stage of training:	0.47	0.33–0.66
CST1 vs FY1/FY2	1.72	1.30–2.28
CST2 vs FY1/FY2	1.67	1.24–2.26
≥ 48 months from graduation vs FY1/FY2	1.03	0.72–1.40
Model constant	0.51	

CST, core surgical trainee; FY, foundation year.
^a Per cent above pass mark.

(data not shown). The odds of passing Part B decreased by 30% for every additional attempt that was made (OR 0.70, 95% CI 0.61–0.81).

Discussion

This study, the first of its kind, has identified several modifiable and non-modifiable predictors of MRCS success.

Non-modifiable predictors

> Gender:

Male UK medical graduates were almost three times more likely to pass Part A MRCS at first attempt compared with females. The reasons behind this are likely to be multifactorial but it has been suggested that men are able to acquire and retain basic science knowledge better than women,⁴ which might explain why men have been shown to repeatedly outperform women in both postgraduate and undergraduate written examinations.^{5,6} These studies have also found that women perform better in OSCE-style examinations compared with men, perhaps because they are better communicators.^{4–6} Interestingly, we found no gender-dependent difference for Part B MRCS and the reasons for this warrant further investigation.

> Ethnicity:

We found ethnicity to be an independent predictor of both Part A and B MRCS success, which is a consistent finding for many other postgraduate examinations and provides further evidence that a true differential attainment in medical assessment performance is likely to exist between different ethnic groups.^{5,7}

> Age:

One study which recently investigated whether age is predictive of an unsatisfactory Annual Review of

Competence Progression (ARCP) outcome found that older doctors are more likely achieve a worse ARCP than younger colleagues.⁸ Our multivariable analyses found that younger medical graduates (less than 29 years) are more likely to pass Part A but that age had no influence on Part B MRCS success. It has been suggested that younger graduates may have less personal commitments than their older peers,⁸ which may enable them to prepare for examinations more efficiently, but further research is required.

Modifiable predictors

> Stage of training:

The Royal Colleges of Surgeons recommend that doctors should attempt Part A MRCS in year one of CST and Part B in year two, but both parts are frequently attempted earlier.⁹ Our results found that candidates who attempt Part A in FY1 are more likely to pass than all other training years but foundation year doctors are more likely to fail Part B compared with CSTs. Similar results have also been observed for candidates attempting the Membership of the Royal Colleges of Physicians exam.¹⁰

> Number of attempts:

The more attempts candidates make at Part A MRCS, the less likely they are to subsequently pass Part B. This is consistent with other high-stakes examinations around the world.^{11–14} For example, the risk of failing step 2 of the United States Medical Licensing Examination (USMLE) increases with the number of attempts made at the Medical College Admission Test.¹² With each additional attempt required for each part of MRCS, the chances of passing that part significantly decreases (14% per attempt for Part A and 30% per attempt for Part B).

Conclusions

Candidates who perform well in Part A MRCS are more likely to perform well in Part B. Although several independent predictors of Part A and B MRCS success were identified, only stage of training and ethnicity were found to be common predictors of both.

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