MEDICAL PRACTICE

Medical Education

Audit of admission to medical school: I—Acceptances and rejects

I C McMANUS, P RICHARDS

Abstract

A prospective study of the process of application, selection, and admission to medical school was performed. St Mary's Hospital Medical School received 1478 UCCA applications for admission in October 1981: 94 (6·4%) applicants entered St Mary's in October 1981, 436 (29·5%) entered other medical schools, 176 (11·9%) read a subject other than medicine, and 772 (52·2%) did not enter university. The study included 12·6% of all applicants and 12·9% of all entrants to British medical schools in October 1981.

Educational qualifications, demographic variables, type of schooling, family background, and the manner of application were examined in relation to overall selection. A level achievement was the major determinant of acceptance. O level achievement, early application, and medical parents had significant but smaller independent effects on the chance of acceptance. Social class, age, sex, and school type did not predict acceptance when corrected for academic and other factors. Few differences in personality, career preference, cultural interests or attitudes were found between those accepted and those rejected.

Introduction

During the period September to December 1980, 10 810 persons applied to UCCA (the Universities Central Council on Admissions) to study medicine, of whom 63% were rejected.[1] Medical student selection is criticised by the profession itself, by prospective students, by school teachers, and by the press.[2] We wish to open selection to scrutiny, to ask questions about its fairness, and to reopen the debate on possible methods of improvement.

In this first paper we describe how one medical school, St Mary's in the University of London, selected students in 1980-1, and we report the outcome of those applications to all of the schools mentioned on the UCCA form.

St Mary's Hospital Medical School, London W2 1PG
I C McMANUS, MB, PHD, lecturer in psychology as applied to medicine
P RICHARDS, MD, FRCP, dean and professor of medicine
Correspondence to: Professor Richards.

Methods

Between 1 September and 15 December 1980, 1478 applicants named St Mary's as one of their five UCCA choices, of whom 1361 gave a United Kingdom postal address and were included in the main study. All individuals in the study were sent questionnaire 1 (Q1) within a day or two of receipt of their UCCA form. A covering letter emphasised that the questionnaire was entirely for educational research and that the dean (PR) would not see the replies until selection was complete.

Q1 asked about social, educational, and family background; reasons for studying medicine; and interests in medicine, many questions being based on the survey of the Royal Commission on Medical Education (the "Todd report").[3] Q1 also contained a measure of syllabus boundness.[4] Q1 covered nine sides of A4 paper. The final sheet of the questionnaire was left blank, and applicants were encouraged to write at length about their views on selection, many doing so with great feeling.

One thousand one hundred and fifty one (84·6%) applicants completed Q1. Since most questionnaires were completed within a few days of receipt and before applicants had received offers or rejections from other medical schools, the survey is prospective, in contrast to previous retrospective studies.[5,6]

Each UCCA form was read by the dean within a few days of its arrival in the medical school; he completed a proforma on each applicant and selected candidates for interview.

A second questionnaire (Q2), was given to all 338 interviewees, and was completed by 337. Q2 consisted of nine A4 pages, and asked about previous interviews; about cultural, sporting, and other interests; and about ethical, political, and social attitudes. The questionnaire also contained the Eysenck personality questionnaire[7] and the state-trait anxiety inventory.[8]

A level results of applicants were obtained from A level examining boards, and the final destination of each applicant was supplied by UCCA.

Statistical analysis was by unpaired *t* tests, one way ANOVA, and χ^2-squared tests as appropriate.

Results

The 1361 applicants comprised 12·6% of all applicants to British medical schools in autumn 1980 and 23·8% of all applicants to London medical schools. They formed a smaller proportion of applicants to provincial schools. The 517 applicants who went to a medical school represented 12·9% of all medical school entrants in October 1981. Our study contained at least 28 applicants (median = 141) and at least two entrants to each British medical school (median = 13).

OUTCOME OF APPLICATIONS

Of 1478 applicants to St Mary's, 94 (6·4%) eventually arrived there in October 1981. A further 436 (29·5%) went to other medical schools. Two applicants accepted for their first choices of veterinary medicine and natural sciences were counted as "acceptances." One hundred and seventy six (11·9%) applicants entered university to read a non-medical subject, 114 reading paramedical or biological sciences; 45 reading physical sciences, mathematics, or engineering; eight reading social sciences, five law, and one English. Seven hundred and seventy two applicants (52·2%) did not enter university in October 1981.

Successful interviewees were made either unconditional offers (28) or conditional offers (175), or were put on our "waiting list" (31), the last being used for students whom we wanted to reconsider in August 1981 if they had not gained a place elsewhere. One hundred and four candidates were rejected outright at the time of interview. Of 180 candidates made conditional offers, only 66 (36·7%) eventually arrived at St Mary's.

Fig 1 summarises the process of applicants and also indicates the numbers of UK applicants, respondents to Q1, the average position of St Mary's on the UCCA form, and the average O and A level grades for applicants in the various groups, calculated on the basis of 5 points for an A grade, 4 for a B, etc.

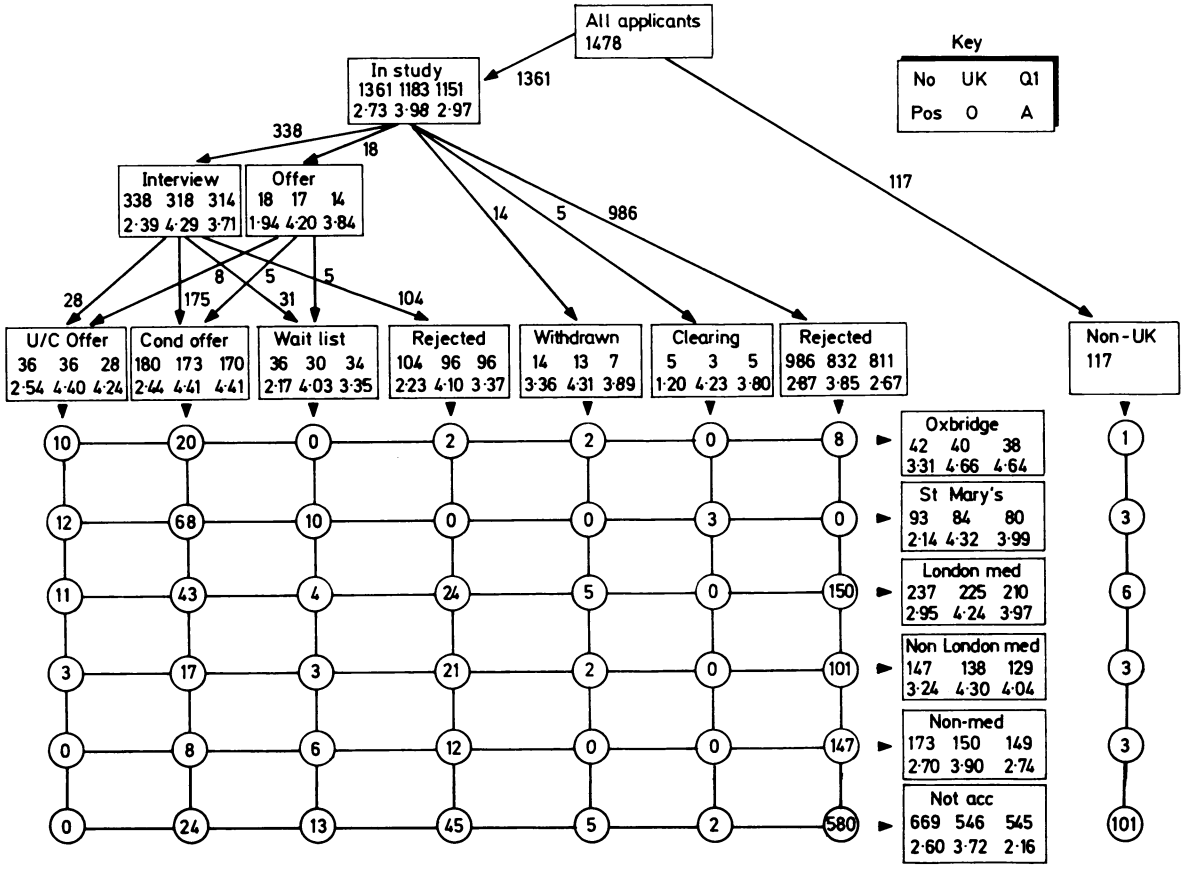

FIG 1—Progress of applicants through selection, and their eventual destinations. Figures in the boxes show the total number of individuals (No), of UK nationals (UK), and of individuals who returned questionnaire 1 (Q1); the mean position of St Mary's on the UCCA form (Pos); the mean O level grade (O); and the mean A level grade (A) of those in the particular box (see key for location of items). Figures in circles represent numbers of individuals in particular combinations of intermediate and final destinations. Numbers alongside arrows are the numbers of individuals involved. Abbreviations: U/C Offer, unconditional offer; Cond offer, conditional offer; Wait list, waiting list; Non-UK, non-UK postal address; London med, other London medical schools; Non-London med, non-London, non-Oxbridge medical school; Non-med, non-medical university course; Not acc, not accepted for a university course.

TIMING OF APPLICATIONS

Fig 2*a* shows the destination of candidates in relation to the date of receipt of their application at UCCA. Figure 2*b* shows that earlier applicants fared better than later applicants ($p \ll 0{\cdot}0001$), had a higher interview rate ($p \ll 0{\cdot}001$), had higher O level grades ($p \ll 0{\cdot}001$) and higher A level grades ($p \ll 0{\cdot}001$), and were perhaps better motivated, a higher proportion returning Q1 ($p < 0{\cdot}001$).

ACADEMIC QUALIFICATIONS

Examination scores were scored as 5, 4, 3, 2, 1, 0 and 0 for grades A, B, C, D, E, O, and F respectively. Some 13·8% of applicants took four A levels, 2·1% took more than four A levels, and 2·3% offered only two. Academic qualifications have been summarised as the number and the mean grade of O and A levels.

Fig 3 shows the cumulative distributions of A level achievement in UK applicants according to destination. Oxbridge entrants scored higher mean A level grades than other acceptances ($p < 0{\cdot}001$). There were no differences between St Mary's, other London, and non-London schools. Those accepted for non-medical courses had significantly higher grades than those rejected

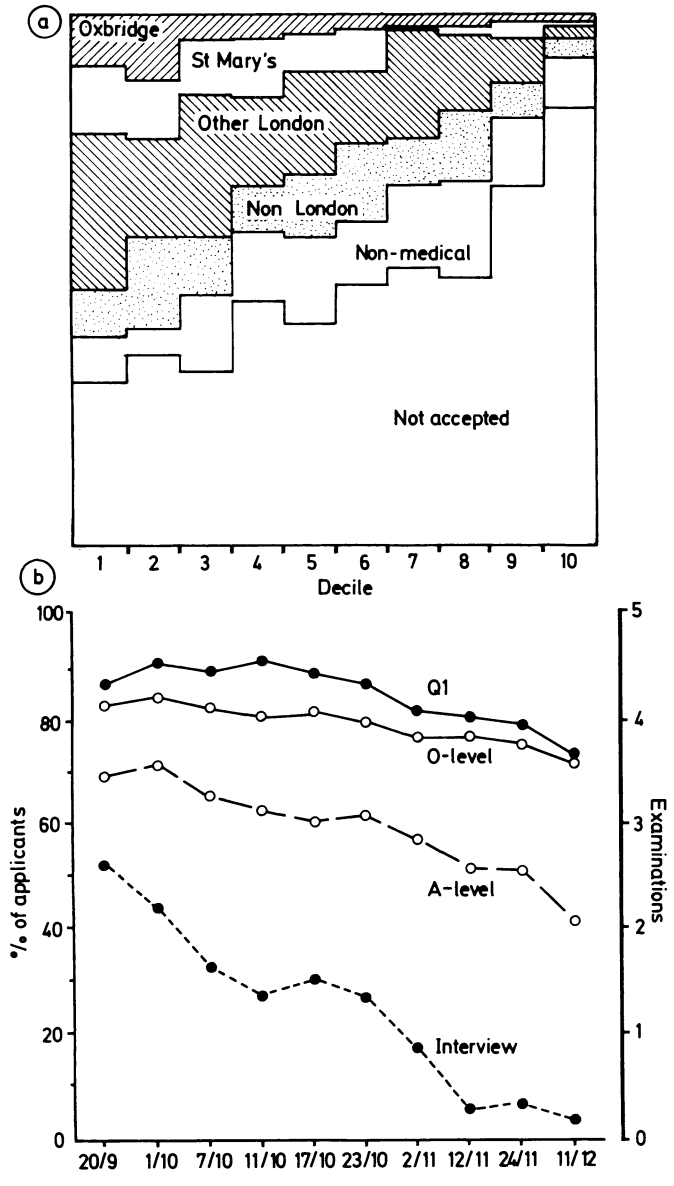

FIG 2—Proportion of candidates going to each destination (*a*: top) and average O and A level grades, and the likelihood of a candidate being interviewed or of returning questionnaire 1 (*b*: bottom) in relation to the decile of date of application to UCCA, the median date for each decile being shown on the lower abscissa.

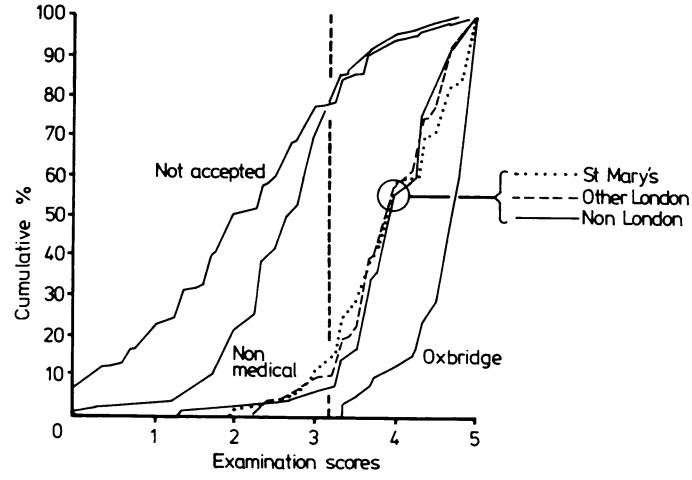

FIG 3—Cumulative distribution of mean A level grade, according to the eventual destination of applicants.

overall ($p<0·001$). An A level mean grade of 3·1—that is, an average grade between a B and a C or the equivalent of between 9 and 10 points based on three subjects—correctly grouped 83·9% of applicants into acceptances and rejections, only 8·4% of acceptances gaining less and 22·1% of rejections surpassing this threshold.

BIAS IN SELECTION

Twenty four demographic, educational, and applicational variables were examined in relation to selection (table I). One hundred and seventy eight (13·1%) of the applicants to St Mary's and 5·8% of those accepted were not British, and, in view of possible educational and other differences from UK applicants, were excluded from the analysis.

Demographic factors

The social class structure was similar to that reported by the Royal Commission on Medical Education[3]: 48·1%, 35·2%, 12·9%, 2·0%, and 1·7% of applicants were from the Registrar General's social classes I to V respectively. Some 54·3%, 32·6%, and 11·1% of overall acceptances were from classes I, II, and III respectively. A family was considered as medical if either parent was medically qualified. Mature applicants were those aged 21 or over on 30 September 1981. The "north" was arbitrarily defined by a line drawn between the Mersey and the Humber, along the northern boundaries of Lincolnshire, Nottinghamshire, Derbyshire, Staffordshire, Shropshire, and Clwyd, and including Scotland and Northern Ireland.

Significance of each of the 24 variables in predicting success at application to any medical school

	Variable	Relative likelihood of acceptance	Multiple logistic regression		Mean (SD) or percentage in		Univariate Significance
			Significance	95% limits	Acceptances	Rejects	
1	Mean A level grade obtained	8·166x per mean grade	<0·001	6·13–11·55	4·04 (0·65)	2·32 (1·13)	<0·001
2	Mean O level grade obtained	2·229x per mean grade	<0·005	1·30– 3·82	4·30 (0·46)	3·77 (0·56)	<0·001
3	Date of UCCA application	1·442x per 28 days earlier	<0·01	1·11– 1·88	45·28 (21·6)	60·68 (25·3)	<0·001
4	Number of A levels taken	1·774x per A level	<0·05	1·05– 2·99	3·21 (0·49)	3·13 (0·52)	<0·05
5	Number of O levels taken	1·168x per O level	<0·05	1·01– 1·35	9·3 (2·2)	8·2 (3·2)	<0·001
6	From a medical family	1·724x	<0·05	1·01– 2·96	19·9%	15·1%	<0·05
7	Overall size of school	1·552x per 100 pupils less	NS		834·1 (461·3)	822·6 (357·6)	NS
8	Private sector education	1·405x if public sector	NS		51·1%	44·9%	<0·05
9	Mature applicant	2·382x if not mature applicant	NS		8·3%	19·3%	<0·001
10	Oxbridge on UCCA form	1·586x	NS		20·3%	3·3%	<0·001
11	From north of Britain	1·304x	NS		15·6%	13·9%	NS
12	Maths A level taken	1·292x if not taken	NS		43·7%	36·0%	<0·01
13	Percentage of 6th form to university	1·039x per 10% increase	NS		26·5 (11·8)	25·6 (12·6)	NS
14	Previous UCCA application	1·325x if no previous application	NS		22·6%	20·4%	NS
15	No of medical schools on UCCA form	1·303x per medical school	NS		4·97 (0·20)	4·94 (0·35)	<0·05
16	Post A level application	1·235x	NS		39·0%	34·9%	NS
17	No in 6th form	1·087x per 100 pupils less	NS		228·1 (154·4)	221·7 (142·2)	NS
18	No from 6th form to university each year	1·039x per 10 pupils more	NS		57·1 (36·5)	53·9 (34·9)	NS
19	Use of brackets on UCCA form	1·021x for no bracketing versus all equal first	NS		4·20 (1·09)	3·97 (1·30)	<0·005
20	Biology A level taken	1·178x	NS		74·4%	81·0%	<0·01
21	Female applicant	1·108x	NS		40·2%	35·7%	NS
22	No of London medical schools on UCCA form	1·034x per school	NS		3·48 (1·34)	3·78 (1·31)	<0·001
23	Total number of choices on UCCA form	1·073x per choice	NS		4·96 (0·35)	4·98 (0·13)	NS
24	Registrar General's social class	1·016x per class lower	NS		1·66 (0·79)	1·80 (0·81)	<0·005

The 24 variables are ordered in terms of their significance in the multiple logistic regression; only the first six variables are significant.

Education

Any education in independent public schools, direct grant schools, private schools, or tutorial colleges was defined as private sector education.

The UCCA application

Candidates may use one or two brackets to indicate equal preference of choice. Bracketing was scored as the preference of the school that was actually in last position. If no brackets were used then the last choice was truly fifth in preference and scored 5; if all five choices were bracketed together the last choice was actually first equal and scored 1. If the applicant had already taken two or more A levels at the time of application the application was classed as "post A level." The date of UCCA application was measured in days after 1 September 1980.

Table I shows the mean and standard deviation (SD) for all variables (or percentage for binary variables) in UK applicants and rejects, and the result of a univariate significance test (unpaired t test or χ^2 squared test) for differences between the two groups.

MULTIVARIATE ANALYSIS

A multiple logistic regression was used to assess the effects of background variables on the likelihood of acceptance at *any* medical school.[9 10] For the 946 UK applicants with complete data the prediction equation based on all 24 variables was highly significant ($\chi^2=601{\cdot}5$, 24df, $p\ll0{\cdot}001$). Table I shows the effect of each variable on the relative likelihood of acceptance, variables being ranked from most significant to least significant, significance being assessed after taking effects of all prior variables into account. Only the first six variables reach the conventional 5% level. Taken together the last 18 variables do not significantly improve the fit of the regression equation ($\chi^2=12{\cdot}4$, 18df, NS).

OTHER FACTORS

Extensive data were collected on personality, career preferences, cultural interests, and attitudes, only a brief resume of which may be given.

Personality—Those accepted and rejected did not differ on the Eysenck personality questionnaire, the state-trait anxiety inventory, or in syllabus boundness. Applicants were more extravert, less neurotic, and less psychotic, and had slightly higher lie (social acquiescence) scores than age-sex norms.

Career preferences and interests in medicine—Those accepted were less interested in learning about physical aspects of disease ($p<0{\cdot}001$), and were more certain about the nature of an eventual career, were more interested in hospital work ($p<0{\cdot}05$) and less interested in non-clinical work ($p<0{\cdot}05$). Those accepted and rejected did not differ in their interest in 24 medical specialties.

Cultural and leisure interests—Those accepted had fewer cultural interests ($p<0{\cdot}025$).

Attitudes—One hundred and twelve attitudes were analysed in terms of eight principal components. Those accepted were less in favour of the control of medical practice ($p<0{\cdot}001$).

Discussion

A level grades are the most important factor determining selection, and may well have become more so in recent years.[11] The widespread opinion that academic qualifications should only be a partial factor in selection[12–17] may to some extent be justified by the poor predictive value of A levels for university[18] and medical school[19] performance. The greatest advantage of selection based primarily on A level grades is its lack of bias by irrelevant social factors.

Other factors predicting selection—in particular, a medical parent—are important in that they undermine public confidence in the fairness of the system, but their numerical effect is small. The role of O level achievement is worrying in that it probably has little predictive value for subsequent medical practice. We make recommendations concerning the date of application in a subsequent paper.

Background factors such as schooling, sex, and social class have no direct effects on selection, but may be shown to confer indirect advantage through educational qualifications and early application.

In interpreting our findings it must be remembered that there are many factors which this study does not consider, since it examines only biases arising after application. Nevertheless, many factors originating in school, home, or peer group affect application and may persuade some potential applicants that application is not worth while or that studying appropriate O and A level subjects may be pointless.[20] Such bias may be inferred from the social class distribution of applicants, which is more exclusive than intellectual ability alone would predict.[21]

The mainly negative findings on personality, attitudes, and career preferences are none the less important, since we may conclude that the attitudes and career preferences found in doctors and medical students cannot be ascribed to the selection system.

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A patient suffers from night cramps, which are not so frequent as to justify regularly taking quinine. They are, however, severe after working hard in the garden. Could these be related to heavy sodium loss from sweating and, if so, would a drink of normal saline at bedtime be beneficial?

I think it is extremely unlikely that working hard in the garden in the United Kingdom could produce sufficient sodium loss to cause cramp. Painful muscle cramps after exercise are a feature of salt depletion heat exhaustion occurring in people working in hot environments, but the salt depletion usually develops insidiously.[1] Cramp also occurs in some people after unaccustomed exercise in the absence of salt depletion. I would be surprised if a drink of normal saline at bedtime helped, and I suggest trying a dose of quinine on occasions when cramp is expected. There is no need to take it regularly to obtain a beneficial effect.—LINDA BEELEY, consultant clinical pharmacologist, Birmingham.

1 Keatinge WR. Environmental extremes. In: Weatherall DJ, Ledingham JGG, Warrell DA, eds. *Oxford textbook of medicine*. Oxford: Oxford University Press, 1983:6.53.

Corrections

"The Incomplete Houseman"

The price of *The Incomplete Houseman: a Guide for Medical Students and First-year Doctors* is £3, not £5 as stated in the review (8 September, p 621).

Dangers of adding insulin to intravenous infusion bags with fixed needle syringes

In the paper by Dr E Mark Talbot (15 September, p 678) the legend to fig 3 should have read: Distribution of variables of needle length (range 12·5-13·2 mm). . . .