Choosing TOMORROW'S DOCTORS

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From Selection to Qualification: How and Why Medical Students Change

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Although I would like to start by showing a different portrait of Jenner from those already shown by the other speakers, I admit to having found the same marvellous quotation as that already used by John Collins, from Jenner's strangely eccentric piece in *The Artist*. As far as I can tell, it is Jenner's only piece of non-immunological writing. That is a great relief to me since, due to a quirk of my medical education in Cambridge and Birmingham, I managed to go through medical school without ever studying immunology, and therefore I was glad I did not have to struggle through the immunological papers. Jenner's paper in *The Artist* of Saturday July 18th 1807 cannot be claimed to have a snappy title. Let me quote it in full:

> *Classes of the Human Powers of Intellect – Hints for a Classification of the Powers of the Mind as they appear in various Descriptions of Men – Examples of Excellence rare – General Division into seven Classes – Difficulty of analysing all the Varieties of Intellect.*

I doubt if any journal editor would accept that nowadays, never mind that the paper contains no empirical data at all. And as John Collins has already said, the classification is not quite as sophisticated as that of modern psychology (although I guess that neither was Jenner's immunology as sophisticated as that of modern immunology). Jenner firstly classifies human intellect into seven groups:

1 *The Idiot*
2 *The Dolt*
3 *Mediocrity*
4 *Mental Perfection*
5 *Eccentricity*
6 *Insanity*
7 *The Maniac*

I am not particularly interested in the first two, the idiot and the dolt, or the last two, the insane and the maniac, but the three in the middle are of more relevance to our present purpose. By Mental Perfection, Jenner is, as we shall see, referring to some sort of Renaissance person, although it is implicitly recognised that most individuals will fall short of this paragon in one way or another:

> *If we subdivided mental perfection into six modifications, three of them might partake more or less of the quality attributed to No. 3 in the scale [Mediocrity]; and the other three, of the quality attributed to No. 5 [Eccentricity]....*

That is, if in selection we search for perfection then we will mostly err one way or the other. How does Jenner define Mental Perfection, Mediocrity and Eccentricity? Let us look at his pen sketches, which show also his fine way with the English language, and probably also reveal so much about Jenner the man. Let us start with Mediocrity:

> Mediocrity – *the large mass of mankind. These crowd our streets, these line our files, these cover our seas. It is with this class that the world is peopled. These are they who move constantly in the beaten path; these support the general order which they do not direct; these uphold the tumult which they do not stir; these echo the censure or praise of what they are neither capable of criticising or admiring.*

I presume that this is the class of individuals whom selection is trying to exclude from our medical schools as far as possible. Presumably what we want instead is Mental Perfection, described here by Jenner, trailing clouds of glories:

> Mental Perfection – *the happy union of all the faculties of the mind, which conduce to promote present and future good; all the energies of genius, valour, judgement. In this class are found the*

> *men who surveying truth in all her loveliness, defend her from assault, and unveil her charms to the world; who rule mankind by their wisdom, and contemplate glory, as the Eagle fixes his view on the sun, undazzled by the rays that surround it.*

Who could turn down such a person when their application form arrived? The danger of course, as Jenner has already suggested, is that Mental Perfection readily slides either into Mediocrity or, perhaps even worse, into the next category, of Eccentricity:

> Eccentricity – *with all its pleasant and unpleasant concomitants: comprehending all such men as are distinguished for great peculiarities – high flights of fancy – unsteadiness of character; – ungovernable either by the advice or admonition of friends; strangers to discretion; for the most part highly irritable; always in extremes of conduct, extravagantly generous and benevolent, or miserably penurious: – who excite the wonder, the laughter or the contempt of the world.*

And recognising the numerical size of the problem, Jenner adds, in a lovely little one-liner, 'I have in this class a very numerous acquaintance'.

Jenner's categories clearly define the problem of medical selection in general: to find as many individuals as possible with Mental Perfection, while weeding out the Mediocre and the Eccentric. How do we do it? Indeed, can we do it?

Differences between medical schools in selection

In the main part of this paper I want to describe some studies we have carried out over the past fifteen or so years, and to look at three separate sorts of question. I will start with the question of whether there are differences between entrants to medical schools which interview candidates and those which do not. In the UK we have a natural experiment which ought to allow us to answer this question because some medical schools interview and some do not. On the basis of such a comparison I would like to develop a simple but, I think, very informative theoretical model of the practical limits of selection, which will, I hope, make us realise that we are seriously constrained in what we have any realistic hope of achieving by selection. And then in the third part of my paper I want to look at some outcome measures, in the fairly traditional form of basic science and final examinations, as well as in terms of clinical experience, which is an outcome measure that has not previously been studied very much.

The results I will be describing are based on three studies which have been carried out at St Mary's Medical School since 1980 in collaboration with Peter Richards, who was fundamental in initiating this research and in supporting it in so many ways over the years. Table 1 summarises our three separate cohort studies which examined applicants who entered medical schools in 1981, 1986 and 1991. In the first two studies we looked only at people who had applied to St Mary's, although, of course, since most applicants applied to four or five other medical schools, the majority actually entered other UK medical schools. So I must emphasise very strongly that we are not looking only at people who entered St Mary's, but at people who entered any UK medical school. For our 1991 cohort we had the cooperation of four other medical schools in England (University College London, the United Medical and Dental Schools, the University of Sheffield and the University of Newcastle-upon-Tyne). We are very grateful for their assistance, not least because of the large increase in sample size that resulted. The applicants applied in 1980, 1985 or 1990, were admitted in 1981, 1986 and 1991 and qualified in 1986, 1991 and 1996 (or 1987, 1992 and 1997 if they took an intercalated degree). The 1991 cohort is still being studied in its final year at the present. To give you some idea of the numbers involved, there were about 1,400 applicants in the first study, and nearly 7,000 in the last one, with about 500, 800 and almost 3,000 entrants to medical school. So we do have quite decent sample sizes.

Let us start by looking at the question of medical schools which interview candidates. In 1991 when we carried out our survey there were 28 medical schools in Britain of which twenty were interviewing and eight were non-interviewing, by which I mean that they did not interview the majority of their entrants. The non-interviewing schools were Leeds, *Manchester, Southampton, Aberdeen, Dundee, Edinburgh, St. Andrews, and Belfast. The asterisk against Manchester indicates that it has since become an interviewing school, which is an important and interesting change. You will notice that no London school is non-interviewing but that lots of Scottish schools do not interview, with Glasgow as the only interviewing school in Scotland. Belfast is like other schools in Ireland in that it does not interview. This means that medical schools who choose not to interview represent a very non-random set of schools in general.

Our primary interest was in whether entrants to interviewing schools differ systematically from those at non-interviewing schools. Although it may seem that is a very straightforward question to ask, in statistical terms it actually becomes exceedingly subtle methodologically, and it has vexed my mind for a long while. The principal

Table 1: Shows brief details of the three cohort studies of medical student selection and training, and emphasises the time scale over which such studies must necessarily work if they are to follow individuals throughout their working life.

	1981 cohort[2,6-8]	*1986 cohort*[2,9]	*1991 cohort*[10]
Applicants to:	St Mary's	St Mary's	St Mary's, UMDS, UCL, Sheffield, Newcastle-upon-Tyne
Entrants to:	Any UK school	Any UK school	Any UK school
Applied:	1980	1985	1990
Entered:	1981	1986	1991
Qualified:	1986/87	1991/92	1996/97
5 years post-qualification	1991/92	1996/97	2001/02
10 years post-qualification	1996/97	2001/02	2006/07
20 years post-qualification	2006/07	2011/12	2016/17
30 years post-qualification	2016/17	2021/22	2026/27
Applicants in study	1,478	2,399	6,901
% UK applicants	12.6%	24.7%	~71%
Entrants	517	871	2,962
% UK entrants	12.9%	22.7%	69.7%

problem is that applicants apply both to interviewing and non-interviewing schools and they receive offers from a combination of them, and that makes it quite difficult to tease apart what is going on. In what follows I will be referring only to our 1991 study since it is much the largest and therefore the most suitable for this analysis; and in addition it also has the widest range of measures.

Analysis

In our analysis we did two separate things. First we compared entrants to interviewing and non-interviewing schools; and secondly we looked at those applicants who received offers from interviewing and non-interviewing schools (although, of course, just because an applicant

receives an offer does not mean that he or she will enter medical school). So it is quite possible to find differences at one stage and not at the other stage. What sort of measures were we using? We had extensive data on these students. We sent them all a detailed 16 page questionnaire to complete and managed to achieve a 93 per cent response rate, which is a tribute both to the commitment of the applicants and the tenacity of my research assistants. As a result we had a wide range of information on these applicants (see Table 2).

First we looked at our demographic measures, many of which are not of particular interest for our present purposes but which we knew were probably predictors of success, and hence we wanted them to be in the analysis. We also looked at educational qualifications, including mean A-level grades and the number of A-levels taken, as well as the pattern of A-levels taken, in particular whether applicants had taken A-levels in a language, an arts subject and so on; and we did similar analyses for GCSE results. 18 separate sub-measures went into the analysis at this point.

We also wanted to look at the broader aspect of people's attitudes, their personal characteristics and so on, because I presume that it is such attributes that interviewing schools would like to think they are assessing. We looked at two separate sets of measures. One set related to what we can call attitudes to medicine and included such items as the age at which the decision was made to study medicine; attitudes to things like AIDS, to disability, to professional help; and to problems in themselves; to encouragements to study medicine; and to interests in the medical course, in particular medical careers; on motivations for studying medicine; and on a doctor-centred or patient-centred approach. In other words, we looked at a wide range of the sorts of things that one may feel could potentially be picked up by an interview. We also had a second set of measurements which were more psychological than medical, and were mainly to do with personality and individual differences; they included a set of timed IQ tests on many applicants who came for interview, measures of attitudes, social, ethical, and political, a decision-making questionnaire, a self-completion questionnaire on empathy, locus of control and so on. Table 2 summarises the breadth of our measures. I would particularly point out that we had a timed test called the Profile of Non-verbal Sensitivity (PONS) where subjects had to watch a video and then say what emotion or situations the person in the video was portraying. Overall, as Table 2 shows, we used a lot of measures.

The important results from this analysis are very simple. The crucial result is that there is no evidence that interviewing medical schools in Britain are admitting candidates who differ systematically

Table 2 The various measures included in the comparison of applicants and entrants to interviewing and non-interviewing schools. Figures in parentheses indicate the number of sub-scales on each measure.

Demographic measures:	***Personality and individual differences***
Date of application (1)	AH5 verbal & spatial ability (2)
Ethnic minority (1)	Attitudes [Social, ethical, political] (8)
Mature (1)	Decision making (7)
Medical family (1)	Empathy (4)
North of England (1)	Locus of control (3)
Post A-level (1)	Masculinity-Femininity (1)
Previous application (1)	Personality type (6)
Private sector education (1)	Profile of Non-verbal Sensitivity [PONS] (3)
Social Class (1)	Reading breadth (1)
Educational qualifications:	Sensation seeking (1)
A-level grades & subjects (9)	Sex-role attitudes (1)
GCSE/O-level grades & subjects (18)	Social behaviour (4)
Attitudes to Medicine	State anxiety (1)
Age decided to be a doctor (2)	Study habits/Learning style (4)
Attitudes to AIDS (1)	Tolerance of ambiguity (1)
Attitudes to disability (3)	Type A behaviour (1)
Attitudes to professional help (5)	
Encouragements for medicine (13)	
Interests in medical course (6)	
Medical career interests (7)	
Motivation for studying medicine (3)	
Patient-centredness (1)	

on these non-academic measures. They differ on A-level grades, but that is all, and I cannot convince myself that there is any other systematic difference between the groups.

That negative result does not mean that we must entirely abandon the idea that interviews do anything. I still believe they do something, although I know I might be seen to be flying in the face of many years of evidence in the psychological literature which says that they do very little or perhaps nothing. In part they do a number of things which we have not considered, one of which we have data on but which I can only mention very briefly. We carried out an analysis on what happens when an applicant holds two offers, one at an interviewing school and one at a non-interviewing school. All other things being equal one would expect a 50/50 chance of the applicant choosing the interviewing school, whereas in fact on 70 per cent of occasions they actually chose the interviewing school. So I think interviewing does something in encouraging candidates actually to come to a school, even if it does

not necessarily bring different candidates. There is also the possibility, which we have not looked at yet, that entrants to interviewing schools may behave differently at medical school or they may become different types of doctors; those are questions still to be studied. We have not got the outcome measures for that at the moment and it is quite possible that the differences will appear later. And it is also possible, although I have not measured it yet, that interviewing may be important because it alters the attitudes of staff. They feel an ownership and involvement in the process of selection so that when the students come they do not say, 'Good heavens, what have they sent to us this year?' but instead staff have to say, 'We chose these people; therefore let us help them and support them'.

In order to understand what may or may not be going on in interviewing I need, at this point, to become more theoretical and ask how we can model the process of student selection, and I will describe a model first developed with Dr Charles Vincent[1]. First, consider what happens if we have a single selection criterion and that criterion is distributed in the population in a normal distribution. And to keep it simple, imagine that we want to select exactly half of the people applying. In fact such a selection ratio, of 2:1, is pretty well what actually happens if we look at the British system overall: half of those applying are eventually accepted.

Figure 1 shows that the simplest, and statistically the optimal, method is to choose those at the top half of the distribution. In other words, those above the mean are accepted, and those below the mean are rejected. Now such a method is fine if you only have *one* selection criterion, and we do at least have that in the sense that most people believe that academic ability in the form of A-levels must be of some importance in student selection.

Now, the situation gets more interesting if, instead of selecting on just one criterion, we select on two or more. If we select on two criteria then we have a graph that looks like Figure 2, in other words a bivariate normal distribution, which we are, as it were, looking down on from above. Ability 1 goes from bad to good and ability 2 also goes from less good through to better. Assume that the selection ratio still remains the same as before, so that we are looking for 50 per cent of the applicants. If we wish to select them so that each selected candidate is above a certain minimum on each of the two distributions, then those selected will lie in a 'square' in the top right hand corner of the distribution, indicated by the two solid lines. In identifying the position of this square, something important happens in comparison with the situation when we selected on just one criterion so that we cut the distribution at the mean, exactly at its mid-point, with *half* lying

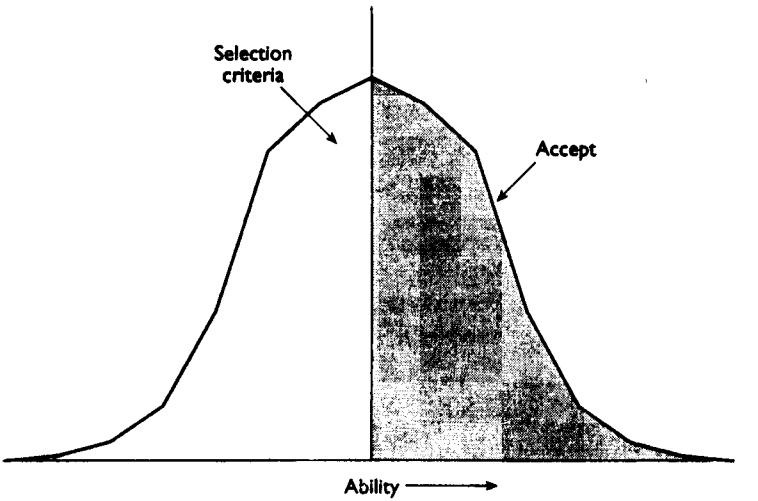

Figure 1 Selection based on a single ability, with the criterion set so that the top 50% are selected.

above the mean. With two uncorrelated criteria, however, if we cut each criterion at its mean then, of necessity, we would only have selected *a quarter* of the candidates. In other words, to select half of the candidates then we must select those in the top 70 per cent or so of each distribution, meaning that the cutting point on each selection criterion will be *substantially below the mean.*

The situation becomes more extreme as more possible selection criteria are invoked (and at today's meeting many people have called for perhaps dozens of factors to be taken into account in selecting those Leonardos who will eventually be able to call themselves Doctor – indeed, John Collins referred to perhaps 80 or 90 separate selection criteria). What happens to selection on each criterion as the number of selection criteria increases? Table 3 shows the proportion of people rejected on each single criterion as the number of criteria increases. By the time you are selecting on ten criteria you are only rejecting the bottom 6 or 7 per cent on each criterion, and if you try and select on 50 criteria then you are only actually rejecting the bottom 1.5 per cent on any of those criteria.

There are two strong implications to come from such an analysis. Firstly, and I cannot emphasise it enough, *if you select on everything you are actually selecting on nothing.* In effect, you are only weeding out a very small number of the weirdos at the very bottom of each distribution,

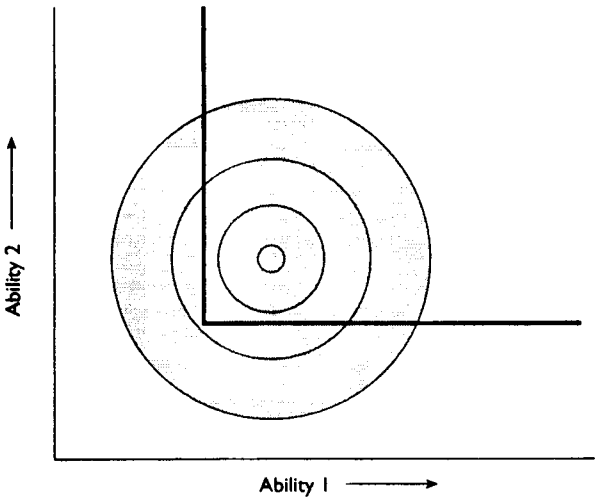

Figure 2 Selection based on two abilities which are assumed to be uncorrelated and distributed as a bivariate normal (viewed from above). In order to select 50% of candidates with all of them above a particular threshold on each ability the candidates must be in the top right hand corner indicated by the two solid lines. Note that both of these lines are below the mean on each ability.

and you are having little impact on the distributions as a whole, and the mean of those selected will be almost the same as for those in the population as a whole. So one is on the horns of a vicious dilemma, one which is fundamentally mathematical, and one which I suspect has barely been taken into account at this meeting, and must be considered by any calls for a massive increase in the range of selection criteria. There is also an important corollary to this principle of selection, and that is that if one over-emphasises the importance of selection on one factor, let us say it is A-level grades, then no room at all is left for selection on any other factors. Thus in Figure 2, if you insist on taking only those who are above average on criterion 1 then there can be no selection at all on criterion 2 if you are to take only half of the subjects. At this point I hope that the relevance of this theoretical model to the role of interviewing in British medical schools is becoming apparent. If indeed A-levels are overly dominant in student selection then there is almost no variance left to be accounted for by other selection methods such as interviewing. So the next empirical question we must look at is the extent to which A-levels are indeed a useful and satisfac-

Table 3 Shows the proportion of candidates who would be rejected on the basis of a particular criterion (criterion 1) according to the number of other independent criteria on which selection is also being carried out.

Number of selection criteria	*Candidates rejected on criterion 1*
1	Bottom 50%
2	Bottom 29%
3	Bottom 21%
4	Bottom 16%
5	Bottom 13%
6	Bottom 11%
10	Bottom 6.7%
20	Bottom 3.4%
50	Bottom 1.4%

tory predictor of appropriate outcomes during medical training. In other words, to ask whether their dominance in selection is justified.

A-levels as predictors of performance

How good actually are A-levels at predicting performance during undergraduate medical training? I will start by looking at examination results in medical school. Although examination results are far from being everything, there is some logic in starting with exams since ultimately there is no point in selecting people who are not going to qualify. It is a waste of our time and their time, and even if they are the nicest people in the world they do need to be able to attain the necessary standards of competence. I will begin by looking at the 1991 cohort, which is our largest study, and for which we have recently put together some preliminary results on the performance of the students on their basic medical science courses. At this point I must thank the Registrars of the various medical schools who have been invaluable in helping us to follow up the students in our cohort studies. We could not have done the work without them. We are here describing the follow-up of about 2,800 entrants to UK medical schools for whom at present we have adequate follow-up information. Our classification of outcome is necessary fairly crude since the students are in all the different medical schools in the UK, with their host of different examining methods, and hence we could not do anything terribly subtle. Nevertheless we feel our classification is effective and useful.

We divided the students into those who had left medical school either of their own accord or as a result of exam failure, those who had

been required to repeat a year at some point, those who had passed in their basic medical science exams but only after taking one or more resits, those who had got through without any resits and those who achieved distinction, had been awarded a prize, or something similar. The students are also divided according to their average A-level grade (irrespective of the number of A-levels taken), ranging from those with an average of three As, through those with an average of three Bs, to those with an average of three Cs and those with less than three Cs (and you will see in Figure 3 that the number in the latter category is very small, as one would expect amongst current medical students).

The category across the top of the graph is those with a distinction or prize, and there is little doubt that they are more common amongst those with the highest A-level grades. There also seems a clear trend for those who are failing, across the bottom category of the graph, to be rather more common amongst those with the lowest A-level grades. And parallel trends are found for those in the intermediate groups. So we can certainly conclude that A-levels are successful in predicting something useful. At that point it might be tempting to say that A-levels *are* a good selection criterion and to carry on using them as our principal, or perhaps only, form of selection. The problem with that position is that A-levels are not quite such a

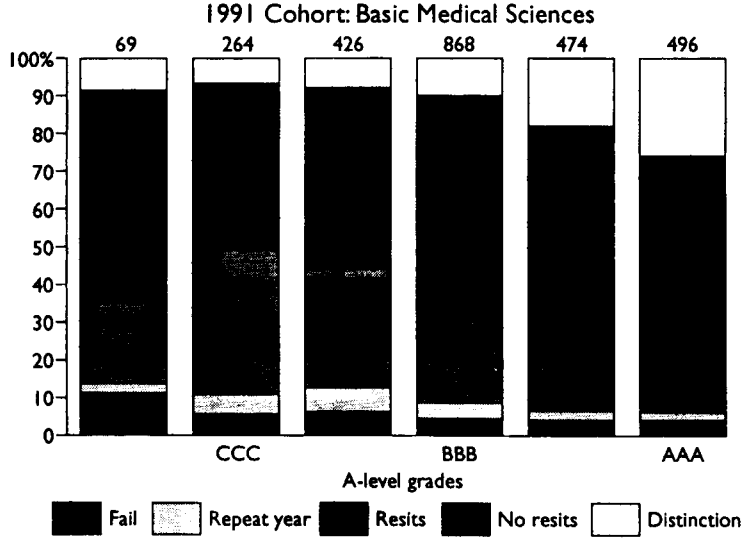

Figure 3 Performance of candidates in the 1991 cohort on their basic medical sciences examinations, in relation to A-level grades.

such a strong criterion as they look at first sight. Although you have to be careful because the number of individuals in each of the groups differs, notice that the vast majority of the students are in the top four A-level groups, and therefore despite people in the bottom two groups failing proportionately more often, most of the students who fail actually have good grades. Although there is a higher proportion of those who are failing in the lowest grades, the majority of people who are leaving are actually entering medical school with high A-level grades. So A-levels are not terribly good at predicting actual losses, although there is undoubtedly a correlation present: as the epidemiologists would say, there is a low attributable risk from having lower A-level grades.

What about final examinations? In the 1981 and 1986 cohort we were very lucky because at that time in the University of London there was a standard set of examinations which almost all medical students took. Those at the Royal Free and St George's had a different system, and I have excluded them from the present analysis. We sorted through the archives to find out how the students in our study had performed in their final examinations, either in 1986 or 1987 for the 1981 entrants, or 1991 or 1992 for the 1986 entrants. We calculated examination performance as a single score, which was approximately normally distributed, calculated from the marks in all the different finals exams, be they multiple choice questions, essays, clinical examinations or vivas, and we set this score so that, like an IQ score, it would have a mean of 100 and a standard deviation of 15.

Figure 4a shows the data for the 1981 entrants. As in Figure 3, the abscissa shows A-level grades, along with the number of individuals, which is of course much smaller in this study. The ordinate shows the average performance in the final exams, expressed as the standard score. It is quite clear that as A-level grades increase so performance in the final examinations improves; and remember that the A-levels were taken five, six or seven years previously. The replicability of these results is shown in Figure 4b, which is a similar analysis for the 1986 cohort, and the pattern is almost identical. So this is a pretty solid result: A-levels are clearly predictive of finals examinations over half a decade later. Perhaps that is not entirely surprising. If you are good at passing one set of exams you will probably be good at passing another set of exams, and finals are exactly that, another set of exams.

It was that which made us wonder whether finals were also picking up other aspects of what is going on in medicine, beyond the mere book work, and so we started to look at what I think is a much neglected area of the experience of medical students, their clinical experience. What do they actually do? How many patients do they

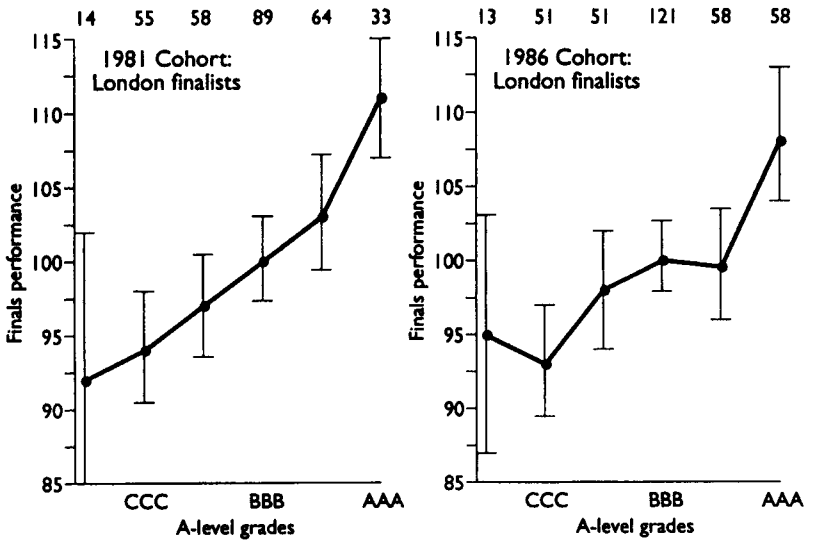

Figure 4 Performance in London final examinations of students in a) the 1981 cohort and b) the 1986 cohort, in relation to A-level grades.

see, how much do they do things to them, watch things being done to them, and so on? And so instead of just looking at performance on final exams we tried to measure the clinical experience of the students. We used a questionnaire given to the students about three months before their final exams, which asked them about their experience of twenty medical conditions, eighteen surgical operations, and twenty-nine practical procedures. We asked them to indicate how often they had seen the medical conditions, how often they had seen surgical operations, and for practical procedures whether they had seen them, performed them with supervision, or performed them alone. We found a wide overall range in the clinical experience, and we combined the three different types of experience into a total score which is what we will consider here, although it must be said that the results are similar for all three measures. The wide range of clinical experience means that some people are seeing a lot of patients, and therefore getting a lot of experience, whereas others are seeing few patients and thus gaining little experience. We take it as given that it is desirable that students should see a lot of patients and experience a wide range of procedures.

The first question we need to consider is whether A-levels can

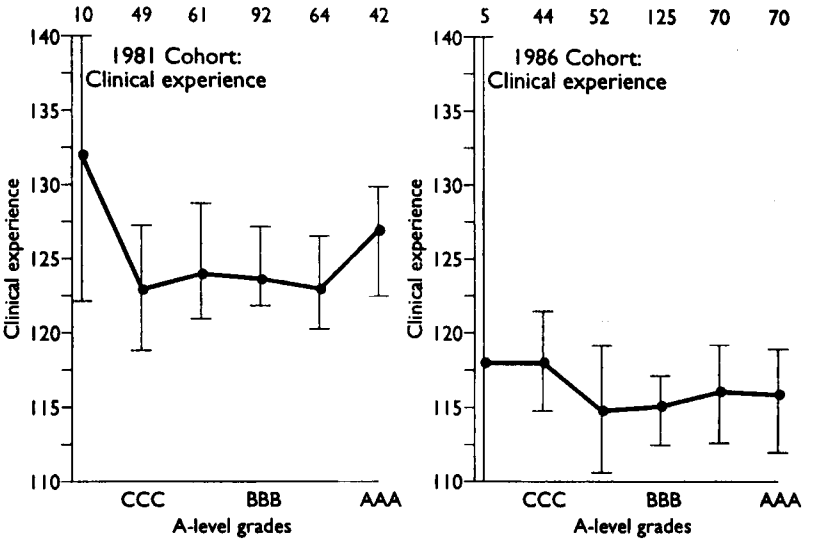

Figure 5 Clinical experience in the final clinical years of students in a) the 1981 cohort and b) the 1986 cohort, in relation to A-level grades.

predict the extent of that clinical experience. Figure 5a shows, for the 1981 cohort, the overall clinical experience on the ordinate in relation to A-level grades on the abscissae and, as in Figures 4a and 4b, I have plotted the ordinate so that its range consists of one standard deviation above and below the mean so that the figures are comparable. Whatever else A-levels are doing, it is clear that they are not predicting which students are gaining a lot of experience, and which are only gaining a little. Figure 5b shows exactly the same pattern, with the only difference that the 1986 line is significantly below the 1981 line, which reflects a genuine fall in the amount of clinical experience that students are reporting over that five year period[2]. But that is another issue altogether.

We also asked whether performance in final examinations related to clinical experience, because one would like to think that good examinations would be assessing clinical behaviour, and hence that those with a greater amount of clinical experience should do better in their finals. That resulted in an important finding, which is potentially problematic. In both the 1981 and the 1986 cohorts, the correlation between the amount of clinical experience and performance in finals was pretty well zero. And more distressing still was

that experience of surgical operations did not correlate with performance in the surgical exam, nor experience of medical conditions with performance in the medicine exam. That forced us to ask some broader questions about clinical experience, and in particular, to ask whether any other measures correlated with it or could predict it. We had long been interested in an area which educational psychologists refer to as study habits or learning styles, and which we suspected might well relate to clinical experience.

Study habits

Study habits can be divided into three broad types, which are called surface, deep and strategic, which differ according to the motivations of the students for studying and the process by which they carry out their study. Surface learners are motivated in order to complete the course, which is all they really care about and they are particularly concerned with avoiding failure. They process information principally by rote learning of facts, and they focus on specific tasks in isolation, not really caring about content itself, but seeing factual material merely as the way to pass exams. They are typical of students who learn, regurgitate and then forget. By contrast, deep learners are motivated by an interest in the subject itself and often by the vocational relevance of material, and by a need for personal understanding. They study by relating ideas to evidence, they integrate material across courses and they identify general principles. Finally, strategic learners are a combination of surface and deep, being driven by a need for success. They love to compete with others and their real motivation is to get high grades, and they use whatever study techniques achieve the highest grades, which might mean surface learning for some topics and deep learning for others, resulting in an understanding which is often extremely patchy and variable.

Do study habits correlate with clinical experience? We might expect they do, particularly given the importance of vocational relevance in deep learners. Table 4 shows for our two cohorts the correlation of study habits in the final year with clinical experience. Greater clinical experience correlates positively with strategic and deep learning, and negatively with surface learning. In other words, those with the right motivations for learning (and I use the word 'right' in a strict sense since I think the surface learners are wrong in objective terms), were the ones seeing the most patients. So clinical experience does correlate with something, but it is not final examination performance or A-levels. Much more interesting though is that we had also measured surface, deep and strategic learning at the time

Table 4 Correlation of clinical experience measured in the final year with study habits/learning style measured in the final year and at application to medical school.

Final year	*1981 (n=333)*	*1986 (n=375)*
Surface	−0.073	−0.054
Deep	0.212 p<0.001	0.136 p<0.001
Strategic	0.206 p<0.001	0.213 p<0.001
Applicants	*1981 (n=311)*	*1986 (n=363)*
Surface	−0.134 p<0.05	−0.140 p<0.01
Deep	na	0.262 p<0.001
Strategic	na	0.220 p<0.001

of selection, five and six years earlier, and Table 4 shows that the correlations are pretty well indistinguishable from the measures we took in the final year. In other words, by a questionnaire measure taken at selection we can predict who is going to be seeing a lot of patients, will be going to theatre a lot and will be doing a lot of practical procedures five or six years later.

At this point you may be concerned that perhaps if nothing else, study habits are predicted by A-level grades, so let me disabuse you of that notion very quickly. There is simply no correlation between study habits and A-level grades. So by selecting on A-levels we are not selecting people with deep and strategic study habits. That is probably because there are two very different ways of getting good grades at A-level, either by learning a lot of facts or by understanding, and the method of examining necessarily cannot distinguish easily between them.

Conclusions

I have now reached the end of a complex chain of argument, so let me try and put it together and summarise the conclusions. I started by saying that interviewing and non-interviewing schools do not seem to select different students and my suspicion is that this is probably due to an undue emphasis in the system on A-level grades which leaves little room for selection on the basis of other characteristics. A-level grades are not entirely unimportant. They do predict performance on basic medical science and clinical examinations but they are far from perfect in doing that. Nevertheless we obviously

cannot throw them out completely, and it might well be that in part their relatively poor performance as predictors is due to restriction of range, there being few people in medical school with three E grades.

More worrying is that clinical experience, which I would regard as fundamental to being a good doctor, since it is only by seeing a lot of patients that you can learn from them, is not related to A-levels, and also worryingly, clinical experience is not related to performance in finals. Clinical experience is however related to study habits, both in the final year and at selection, but as far as I can tell at present, appropriate study habits are not being selected for in our selection systems at present. The result is that by mainly selecting on A-levels alone, we are not selecting those students who are going to gain most clinical experience. The end result is that if we really want to try and select on the basis of other desirable characteristics that have been identified, and I think learning style is certainly one of them, we have to bite the bullet and say we are going to accept somewhat lower A-level grades so that we have the room to manoeuvre in order actually to be able to select on the other important characteristics.

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Discussion from the floor

A speaker from the floor reflected that perhaps the most important factor was not so much the selection of medical students but what happened to them during the medical school course. She stressed the importance of support for medical students, particularly those who might feel that they had made the wrong decision in studying medicine but had valuable qualities such as maturity and sensitivity which were not necessarily easily measurable in straightforward academic terms. Chris McManus agreed that many of the attributes which were desirable in doctors, such as communication, empathy and sensitivity, were trainable skills, and that concentrating on selection as a way of avoiding problems was wrong.

Concern was expressed about drop-out from medical school and how this might be cut. Chris McManus commented that the drop-out rate was difficult to assess accurately and that, in any case, there were no objective national examination criteria for medical students. He noted the analysis by Parkhouse in the *British Medical Journal*[3] claiming a drop-out rate of 13 per cent. Chris McManus thought this was almost certainly too high since the proportion in his cohort studies was about 6–7 per cent[4], which was confirmed by independent General Medical Council data. This proportion was made up of about 3 per cent who failed their examinations and 3 per cent who chose not to carry on. He thought that these were reasonable proportions, and that the cost of medical education would not be fundamentally changed by reducing a 6 or 7 per cent drop-out rate to 2 or 3 per cent.

In response to another question, Chris McManus emphasised the point that the one characteristic that doctors needed, whichever specialty they were in, was the characteristic being picked up by the 'surface-deep-strategic' measures in his studies. He noted that if doctors were vocationally motivated, had an interest in understanding mechanisms and processes for their own sake, enjoyed what they did and were not merely motivated by fear of failure, then they were probably going to be the life-long learners, the reflective practitioners that everybody had said were needed in medicine.

It was possible to identify these characteristics before entry to

medical school through using an 18 item questionnaire derived from the Biggs Study Process Questionnaire[5] with each item completed on a 5-point scale. However, Chris McManus pointed out that, although this was a reliable research measure, it was not necessarily a good selection instrument since the applicants could learn how to respond appropriately unless the instrument were disguised. He thought that this was not an insuperable problem but would need research and development – and resources. His suspicion was that the sort of group task described by John Collins might implicitly have been picking up components of deep and strategic learning without the students being aware of what was being assessed.

CHOOSING TOMORROW'S DOCTORS

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CONTENTS

PREFACE

This book brings together the papers from a conference held in May 1996 at Senate House, University of London, entitled *Choosing Tomorrow's Doctors*. The conference was part of the Edward Jenner bicentenary celebrations organised by St George's Hospital Medical School.

In 1993 the General Medical Council produced a document called *Tomorrow's Doctors* which has far-reaching implications for doctors and for medical education. In a fast-changing society we must confront the fact that the future role of doctors is no longer entirely predictable. The aim of the conference was to stimulate doctors and others to reflect both on their own experience of medicine today and on the issues we must consider as we select the doctors of tomorrow.

The conference was therefore presented in two parts. The first half of the programme addressed the question of what we select doctors for: to fill a role in society, to be effective with their patients, and to enjoy a satisfying job. The second half focused on the selection of medical students and specifically looked at problems of prediction and related ethical issues.

The conference generated a great deal of interest, and over 200 people attended. These were from both within and outside the medical profession, and included secondary school tutors, many medical school deans, teachers, students, and representatives of professional bodies. They were rewarded with a lively range of presentations from a highly distinguished panel of speakers.

We are grateful to the St George's staff who so ably chaired the conference sessions: Professor Sir William Asscher, Dr Gillian Farnsworth, Dr Patricia Hughes and Professor Sean Hilton. We should also like to acknowledge the willing help which the following people gave in organising the conference: Sir Colin Dollery, Pro-Vice Chancellor for Medicine; Mr David Eames, Secretary/Registrar of the Faculty of Medicine; Mrs Susan Gove, Chief Librarian, SGHMS; Professor Kenneth Hobbs, Dean of Faculty of Medicine.

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