Research Report

Identifying best practice in the selection of medical students (literature review and interview survey)

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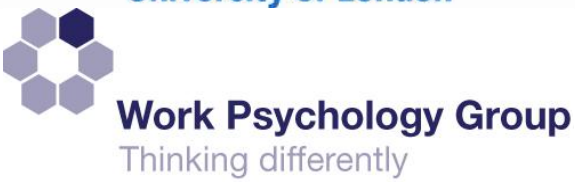

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Executive summary

This work was commissioned to examine the available evidence on a) the effectiveness of different methods used by medical schools to select students, and b) the effectiveness of widening access initiatives used by medical schools to promote fair access. These aims were addressed via a modified systematic review process (Selection), a realist review (Widening Access) and a telephone survey of UK Admissions Deans. The last used a semi-structured interview format.

We focused on assessing effectiveness, process/fairness, acceptability, cost effectiveness and stakeholder satisfaction in relation to selection and widening access.

Eight core topic areas were identified under selection. These were: aptitude tests; academic records; personal statements, essays and autobiographical submissions; references; Situational Judgement Tests (SJTs); Personality Assessment and Emotional intelligence; interviews and Mini-multiple interviews (MMIs); and Selection Centres. Each has strengths and weaknesses in terms of our assessment criteria and "evidential weight" and the outcome measures used currently to evaluate selection methods focus mostly on medical school attainment rather than being a good doctor. However, it is clear from the data summarised in this report that the evidence for MMIs, aptitude testing, SJTs and selection centres is "better" overall than that for traditional interviews, references and autobiographic reports.

Widening access (WA) activities in the UK focus on addressed the disadvantages faced by applicants to medicine from lower socio-economic groups. We reviewed the literature in terms of WA activities directed at preparing potential applicants, the application process, support once at medical school, and what happens to WA medical students when they become doctors. Data reporting is generally poor although there is some evidence of effectiveness of pre-entry activities. The use of contextual data in the admissions process is variable and medical schools wish for guidance on this matter. Data is lacking in terms of support for successful applicants and the career pathways of students from WA background. More research is required into WA to medicine, including exploration of the effect of institutional policy differences.

The concepts and processes of selection and WA access, while different, are inter-linked. Selection processes can support, or not support, WA. The data reviewed indicates that aptitude tests are "better" in terms of WA than academic records, personal statements and references.

The evidence reviewed in this report supports immediate, medium-term and long-term recommendations for further work, presented in Final recommendations (Section 8).

1. Team Biographies

Professor Jennifer Cleland is Lead for Medical Education Research in the Division of Medical and Dental Education at the University of Aberdeen. Professor Cleland was the project lead with overall responsibility for the original research proposal, management of the review and telephone survey, reviewing published evidence, direction and writing of the final report.

Miss Emma Dunlop, Medical Admissions, University of Aberdeen, was involved in reviewing grey literature for the widening access component of the project and provided administrative support.

Dr Jon Dowell is Reader of Medical Education at the University of Dundee, School of Medicine. Dr Dowell was a co-applicant and contributor to the original research proposal, and was involved in the design of the review protocol, reviewing published evidence, and writing of the final report.

Dr Shirley Jia is Academic Foundation Year Doctor in the Division of Medical and Dental Education at the University of Aberdeen. Dr Jai was involved in the review process for the widening access component of the project and reviewing published evidence.

Dr Alec Knight is Consultant Psychologist at Work Psychology Group. Dr Knight was involved in the design of the review protocol, management of review processes, reviewing published evidence, and writing of the final report.

Professor John McLachlan is Professor of Medical Education and Associate Dean for Undergraduate Medicine at Durham University, School of Medicine, Pharmacy and Health. Professor McLachlan was a co-applicant and contributor to the original research proposal, and was involved in the design of the review protocol, reviewing published evidence, and writing of the final report.

Dr Mandy Moffat is Lecturer in Medical Education, Division of Medical and Dental Education, University of Aberdeen. Dr Moffat was involved in the design of the telephone survey, management of this process, and the writing of the final report.

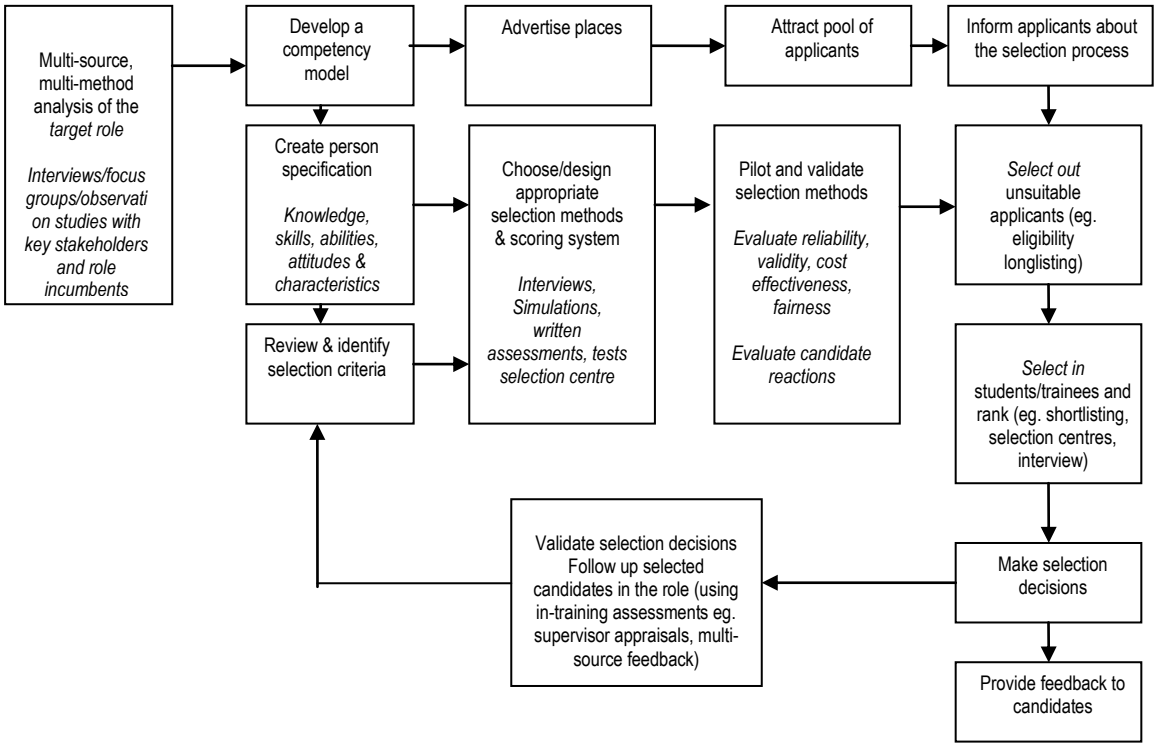
Dr Sandra Nicholson is lead for the Academic Unit for Community-Based Medical Education at Barts and the London School of Medicine and Dentistry, at Queen Mary, University of London. Dr Nicholson was a co-applicant and contributor to the original research proposal, and was involved in the design of the review protocol, reviewing published evidence, and writing of the final report.

Professor Fiona Patterson is Principal Researcher at the University of Cambridge, Department of Psychology, Visiting Professor at City University London, Department of Psychology, and Founding Director of Work Psychology Group, a research-led occupational psychology consultancy. Professor Patterson was a co-applicant and contributor to the original research proposal, and was involved in the design of the review protocol, reviewing published evidence, and writing of the final report.

2. Introduction

Selection is the first assessment in the medical education and training pathway. The ultimate intention of selection is to predict who will be the best doctors. This is a somewhat indeterminate and distal criterion, in the sense that performance as a doctor is not a discrete construct and is temporally distant from selection. A clearer and proximal criterion of selection is performance at medical school (e.g. to identify those individuals who will successfully complete training, before training commences). However, the relation between performance at medical school and which individuals go on to become the best doctors has been poorly defined and researched. We refer to this issue as the "criterion problem" of selection, meaning that it is currently unclear as to whether the criterion for selection should be medical school performance or subsequent performance as a doctor. We return to discuss the criterion problem throughout the report. Figure 1 provides an outline of the main elements involved in an ideal selection process (adapted from Patterson & Ferguson, (1)).

Figure 1: The selection process



Admission to medical school in the UK has traditionally been based primarily on educational attainment (2,3). The typical admission process is that candidates with (or anticipated to gain) the required grades are interviewed, and personal statements and letters from professional referees are scored to assess non-academic abilities (attributes such as maturity and motivation). For most UK medical schools, attainment on an aptitude test is now also used in the admissions process. These admission processes have been criticised heavily as a result of concerns that they lack incremental validity, are unreliable, create potential bias effects and waste resources (4–8). It is also clear that they are not infallible: weak students enter and progress in medicine, and there is evidence from the US that weak students become weak doctors (9–11). Moreover, "grade inflation" and perhaps a greater awareness of importance of non-academic factors have influenced perceptions of the reliability and validity of some selection processes that are currently used widely in medicine. More robust selection processes for medicine are therefore essential for a number of reasons.

Related to selection is widening access. Widening Access (WA) refers to the policy that people such as students from disadvantaged backgrounds, mature students, those from ethnic and cultural groups and disabled students should be encouraged into higher education. WA to medicine is part of the bigger picture of fair access to the professions, which in turn relates to improving social mobility. When a society is mobile, individuals have an equal chance of progressing in terms of income or occupation. This contrasts with societies where birth dictates social and economic outcomes. Education is a strong determinant of later-life income and opportunities, and hence a major contributing factor to patterns of poverty, social immobility and inequality. Governments have asked for medical selection systems to be reviewed, as current systems persistently fail to widen participation for lower socio-economic groups independent of gender and ethnicity. This review specifically evaluates the contribution of various initiatives and policies engaged by medical schools to broaden their admission of disadvantaged groups, and review medical school selection processes through the lens of widening access.

The data from this review provides an opportunity for the GMC to lead evidence based discussion that takes into account the practical, financial and academic merit of the available selection tools, and how these tools contribute to the selection of the best medical students and where possible demonstrate the attributes required of doctors. It also highlights many areas where additional research can and should be conducted to plug gaps in our knowledge

and understanding in key areas. For instance, by seeking evidence that selection can indeed influence the quality of doctors, not simply medical school academic progress.

This project defines, analyses, and critiques existing approaches to selection and widening access into medicine, and synthesises these into recommendations for policy and actions. At heart, work in this report is conceptually underpinned by the GMC's *Tomorrow's Doctors* and *Good Medical Practice*, and the Schwartz report principles: transparency, selecting students by their achievements and potential, assessment methods that are reliable and valid and minimising barriers to applicants.

3. Aims and objectives

Aims

- To examine the available evidence on the effectiveness of different methods used by medical schools to select students, both in the UK and worldwide.
- To examine the available evidence on the effectiveness of widening access initiatives used by medical schools to promote fair access, both in the UK and worldwide.

Objectives

- To identify the evidence on the effectiveness of student selection methods, and different combinations of methods, currently used.
- To identify if there is evidence to suggest that different selection methods have varying impacts in terms of who is selected.
- To identify the evidence in terms of how practical considerations influence medical schools in their design of student selection methods.
- To make recommendations for future practice on the part of the GMC with regard to selection and widening access initiatives.

4. Key concepts

Patterson and Ferguson (1) described fourteen evaluative standards for judging the quality of selection procedures and to understand the framework used for determining best practice (see Table 1). When choosing the selection method(s) it is important that it is consistent/stable (*reliable*), relevant/precise/accurate (*valid*), *objective*, *standardised*, administered by trained professional(s), and monitored. Evaluation of the system is essential to ensure that selection tools are also *fair, defensible, cost-effective and feasible.* Feedback is used to continually improve the selection system to enhance accuracy and fairness.

Table 1: Evaluative standards for selection procedures

1. Establishing reliability and validity of the tool	9. Expertise required for analysis & interpretation of information generated by the tool
2. Positive employee/student reactions	10. Utility
3. Ensuring ease of interpretation	11. Fairness
4. Ensuring generality of use	12. Educational impact/value
5. Minimising costs and maximising value	13. Generates appropriate feedback
6. Practicality and administrative convenience	14. Procedures are in place for ongoing validation, evaluation and renewal of assessment tools
7. Legality	
8. Stakeholder acceptance	

The concept of fairness (see Table 1) is relevant to both selection and widening access. Fair selection and recruitment is based on three principles:

- Having objective and valid criteria (developed through an appropriate job analysis)
- Accurate and standardised assessment by appropriately trained staff
- Monitored outcomes. However, as will become clear in this report, widening access is not just about fairness at the point of selection.

The issue of validity - (i.e. how well scores on a selection measure predict some future outcome) is multi-faceted and problematic (see Table 2). One major problem is in accessing the appropriate outcome data to validate the selection process. Typically the outcome data used in validating

medical selection is academic outcomes such as performance on degree examinations. However, this is only one part of the picture: it is essential to validate selection against professional and behavioural outcomes, rather than solely academic data. Similarly, often the criteria used to measure performance in the job role do not match the criteria used for selection. Ideally, predictor scores should not be used to make selection decisions until after a predictive validation study has been conducted. Practically, this is difficult to achieve. Moreover, executing validation studies is complex in practical terms since researchers would rarely use one single predictor to make selection decisions. Given the multifaceted nature of the role of a doctor, selectors are likely to design multiple selection tools to assess selection criteria. Therefore, recruiters must decide whether a job applicant must score highly on all selection criteria (non-compensatory) or whether high scores on some criteria can make up for low scores on another (compensatory). In practice, recruiters might assign different weightings to various selection criteria.

Table 2: Evaluating validity in selection

Faith validity	*This is a 'blind' faith that a selection method works because someone plausible said so.*
Face validity	*The selection tool content appears relevant to the target role.*
Content validity	*The content of the selection tool is judged to be directly relevant to the target role by subject matter experts.*
Criterion validity: Concurrent	*A form of criterion-related validity in which data on the predictor and criterion are obtained at the same time. High correlations between predictor and criterion scores indicate concurrent validity.*
Criterion validity: Predictive	*This is the extent to which a predictor measure (e.g. a selection test score) is correlated to A criterion measure (e.g. work performance). High predictive validity indicates that a selection measure gives an accurate indication of candidates' future performance on the criterion.*
Incremental validity	*This is an empirical issue to determine how much additional value using another test/assessment provides.*
Construct validity	*An indication of the extent to which the test or procedure measures the construct that it is intended to measure (such as empathy, clinical expertise).*
Political Validity	*An indication of the extent to which various stakeholders and stakeholder groups (such as, employers, parents, government departments, society, the regulator) consider the tool(s) to be appropriate and acceptable for use in selection.*

This review considers many validity studies. Although we have endeavoured to minimise technical language, it is helpful for the reader to have a framework for interpreting the validity data which we present. The most commonly used measure of predictive validity is a correlation (or **validity**) **coefficient**. The validity coefficient is a statistical index used to report evidence of validity for intended interpretations of test scores and defined as the magnitude of the correlation between test scores and a criterion variable (i.e., a measure representing a theoretical component of the intended

meaning of the test). Validity coefficients range in absolute value from 0 to 1.00. Validity coefficients below *r*=0.1 are defined as being weak, below *r*=0.3 as being moderate, and above *r*=0.5 as being strong (12). Of note is the fact that research consistently shows that validity coefficients of considerably less than +1.0 can provide a basis for improved selection practices (13). This means that relatively low correlations between selection and criterion data may still provide useful information and offer improvements in selection procedures.

Another core concept is that of reliability. *Reliability* refers to the extent to which assessments are consistent – for example, it should not make any difference whether a student takes the assessment in the morning or afternoon; one day or the next. The values for reliability coefficients range from 0 to 1.0. A coefficient of 0 means no reliability and 1.0 means perfect reliability. Since all tests have some error, reliability coefficients never reach 1.0. Generally, if the reliability of a standardized test is above .80, it is said to have very good reliability; if it is below .50, it would not be considered a very reliable test. Note that reliability data is not the same as predictive correlations.

We also refer to "G", meaning Generalizability theory, or G Theory: a statistical framework which is used to determine reliability of measurements under specific conditions. It is particularly useful for assessing the reliability of performance assessments.

5. Approach

The aims and objectives of this study were addressed using a number of focused approaches.

First, a modified systematic review process, Systematic Rapid Evidence Assessment, or Rapid Review - umbrella terms for a variety of methods that incorporate the principles of systematic review technology but modify the methods used in order to complete work with in specified time and resource envelopes – was used to review the selection literature. Selection into medicine has attracted much attention over time. Selection is also a very mainstream topic in the organizational psychology and management literature (as evidenced, for example, by journals which focus on this topic e.g., *International Journal of Selection and Assessment*), and much relevant literature exists to warrant a systematic review of this size to answer the questions outlined. The systematic searching focused particularly on recent literature since selection is an area where good practice is developmental and incremental, the most recent studies generally update and expand on previous historical practice. Because of the variety of research questions being addressed in the review and the variety of research designs and methods, a synthesis approach such as meta-analysis could not be adopted. Rather the review is narrative.

The widening access literature is very different. There are, relatively speaking, a very small number of research studies published on this topic. Thus, to examine in depth the activities undertaken by UK medical schools to widen access, identify remaining issues, and make recommendations, we used a realist review (14) to assess the research and grey literature on three WA topics:

a. The wider political and social context
b. Review and synthesis of widening access interventions
c. Support for students from widening access backgrounds.

The data from this realist literature review was supplemented by data gathered via an initial website survey to examine each medical school's selection and WA polices followed up by direct contact with Admissions Deans by telephone, using a semi-structured interview format[1].

[1] Ethics permission was granted for the survey by the College of Life Sciences and Medicine Ethical Research Board (CERB), University of Aberdeen.

The purpose of this telephone survey was to elicit descriptive data on a) how availability of resources such as staff availability and costs influence medical schools in their design of student selection methods and b) the nature and impact of local and national widening access initiatives (e.g. are pre-medicine courses provided, if so, how many people take these courses and of these, how many apply for and enter medicine), as this data is likely to be mostly unpublished. Thus, in addition to a rapid review and a realist review, this report presents data from a telephone interview survey with UK medical Admissions Deans/teams from a number of medical schools and data gathered from the admissions pages of medical schools' websites. Data from the survey is interwoven throughout the report, as relevant, to illustrate particular points.

As mentioned above, because of the variety of research questions being addressed in the review and the variety of research designs and methods, a synthesis approach such as meta-analysis could not be adopted. Given this, in order to provide some sort of assessment of "evidential weight" and relevance, and to incorporate findings with other existing information, we have used the following typology, adapted from Petticrew and Roberts (15):

- Effectiveness (essentially validity and reliability)
- Process/fairness (in respect of widening access & susceptibility to coaching)
- Acceptability
- Cost effectiveness (school and candidate)
- Stakeholder satisfaction

This typology reflects that presented in Table 1, but is more straightforward and appropriate for the task in the time available. The use of a typology to assess evidence is useful in conceptualising the strengths and weaknesses of different methodological approaches. A table summarising the findings of this review in reference to the typology is presented in the conclusion of the report.

It is likely that the literature – both selection and widening access – are subject to publication bias issues as authors are unlikely to publish studies investigating, for example, traditional interview reliability and predictive validity if the findings are negative. This should be kept in mind when considering the overall picture of the data reported.

6. Selection

Our search focused on research papers published in the last 15 year due to the progressive nature of this field. We identified 1372 results, which were screened down to approximately 150 papers for full review. Eight core topic areas were identified:

- Aptitude Tests
- Academic Records
- Personal statements, essays and autobiographical submissions
- References
- Situational Judgement Tests (SJTs)
- Personality Assessment and Emotional intelligence
- Interviews and Mini-multiple interviews (MMIs)
- Selection Centres.

The findings are presented under these headings.

6.1 Aptitude Tests[2]

In the following two sections, fine comparisons must be made between different selection methods, and therefore some numerical values must be used, rather than purely descriptive terms. A general description of the verbal equivalents of these terms has already been provided, but here we need to bear in mind that the predictive value of a measure can range from 0 to 1, where 1 would be the strongest possible relationship.

Tests of *general mental ability* (GMA) and tests of specific cognitive abilities (e.g. numerical, verbal or spatial ability) are increasingly popular in selection procedures (16,17). GMA and cognitive ability tests are robust predictors of job performance and training success across a wide range of occupations (17,18). However, there are concerns regarding fairness, since GMA tests can result in marked racial differences in test performance, which are not matched in job performance, for reasons which are unclear but are probably related to wider societal issues. (19).

Aptitude tests are standardised tests designed to measure the ability of a person to develop skills or acquire knowledge. They are used to predict future performance in a given activity (20). Like tests of GMA, aptitude tests measure an individual's overall performance across a broad range of mental abilities. Aptitude tests often include items measuring more specialised abilities such as verbal and numerical skills. These can predict academic, training, or job performance. Aptitude tests, which include specific ability tests and a knowledge component, are increasingly popular in medicine (21).

In a selection context - especially with respect to widening access - it is important to distinguish between general mental abilities (GMA) in terms of c*rystallised* intelligence (i.e. knowledge-based intelligence acquired via schooling) and *fluid* intelligence (i.e. biologically-based cognitive skills such as processing speed or inductive reasoning) (22,23). Aptitude tests are tests of fluid intelligence in this terminology, and it has been argued that tests of fluid intelligence should be used for medical school admissions to widen access, so as to identify raw talent independent of education (24).

[2] Lead author: John McLaughlin

In the UK, concerns over the discriminatory power of A levels led to the introduction of additional selection methods such as specific medical knowledge tests (21) and intellectual aptitude tests (e.g. the Oxford Medicine Admission test). The use of aptitude tests for medical school selection is increasing across several countries (25). UKCAT is perhaps the best developed aptitude test, with some evidence that it has predictive validity in the years 1 and 2 of medical school (26). Since this particular study was conducted using a stepwise regression model, the statistics cannot be directly compared with effect sizes or correlation from other studies, but a high performing student on UKCAT would score at least 15 examination points higher than a student with a score close to the entry minimum. An unpublished study by McManus and colleagues (personal communication), using performance in year 1 of medical school as the outcome measure, indicates that the validity of UKCAT for all students is 0.142, while for mature students it is 0.252. In the same study, the corresponding validity for A levels was 0.391. The incremental value of UKCAT with A levels was described as 0.048 when a composite measure of educational attainment was used, but was 0.118 when only the best three A levels or best five Scottish Highers were included. The model contains suggestions that UKCAT may be less biased with "*students performing significantly better who are mature, who are female, who are White, and who have not been to selective schools*". This is borne out by Tiffin et al. (24), who show that UKCAT has a positive effect on widening participation when used as a selection filter, such that use of UKCAT as a threshold raises the odds of admission of a candidate from a non professional background to 1.27. In short, while prior academic performance is the strongest single indicator of medical school performance, this data shows that UKCAT has incremental validity over three A levels.

Internationally, the Medical Colleges Aptitude Test (MCAT) is widely employed in the U.S. as a selection tool. This is a mixed test, with fluid intelligence sections on problem-solving, verbal reasoning, and writing skills, and crystallised intelligence sections on biological and physical sciences knowledge. The performance of MCAT has been extensively studied (27,28). Results are variable from institution to institution, but suggest there is what is described as 'small to medium' predictive validity of the test overall. Julian (27) reports correlations between MCAT scores and medical school grades of between 0.2 and 0.7, while Donnon et al. (28) report correlations of 0.39 with preclinical years performance, and 0.60 with Step 1 of the national U.S. Medical Licencing Exam. The biological sciences knowledge sub-test was the strongest predictor. Callahan et al (29) undertook a longitudinal study of MCAT within one particular institution and found reasonably consistent predictive ability, of about 0.45 for Years 1 and 2 of medical school, earlier years, but declining to 0.30 in years 3 and 4 (the final years in the U.S. 4 year degree system).

The BioMedical Admissions Test (BMAT) is used by Oxford, Cambridge, UCL and Imperial College Medical Schools in a conscious desire to recruit candidates with particularly high abilities. It has an aptitude component and a knowledge component, allowing these different components to be compared directly. A study by Emery and Bell (30) concluded that the aptitude component was a positive but weak predictor of degree outcomes and final scores on a cohort by cohort basis, but that this effect disappeared when cohorts were combined. The knowledge component was more strongly predictive of both outcomes. It is not entirely clear from this paper whether or not the aptitude component has incremental predictive validity over the knowledge component alone, but in an extensive critique and re-examination of this data, McManus et al. (31) identify what they describe as significant methodological issues in the paper, and indicate that the incremental predictive validity of the aptitude component of BMAT is slight. These authors also comment on the paucity of good reliability data in this field.

The McManus et al (3) study also compared medical career performance with a fluid intelligence test, and found no association with performance and a range of outcome measures.

Overall, the outcomes from a number of comparative studies exploring combined (knowledge and aptitude) tests indicate that the knowledge component is generally significantly stronger as a predictor of performance, but there is the possibility of small but real incremental validity of aptitude tests in addition to knowledge tests.

Currently, there is a cost associated with aptitude tests for selection into medicine, although UKCAT has a bursary scheme for disadvantaged candidates. However, applicants for medicine really have no choice but to undertake an aptitude test if this forms part of the selection process for their preferred medical schools. However, these tests are not wholly popular: the student BMA has recorded opposition to the UKCAT and Cleland et al. (32) found that first year medical students had negative views of the UKCAT due to concern regarding how this data was used in the selection process (see later in this report), its fairness and the cost, particularly given lack of predictive validity data. One study has looked at the effect of coaching and preparation on UKCAT performance (33), and found that coaching appeared to have no impact, but candidates who had used more than one method of preparation (e.g. practice tests and guidance books) scored slightly higher than those

who had not, but the effect (a gain of about 50 points) was less than the Standard Error of Measurement (about 100 points) on a test where the score range is 1200 to 3200 points. On the other hand, those involved with admissions appear to appreciate the additional data provided by an aptitude test, as illustrated by this quote from our survey: *"And the UKCAT's likely to then be giving you more of a feel of who has... who's, ah, ah, not just academically able but would have an aptitude at medicine as well."*

In conclusion, the use of General Mental Ability and Aptitude tests is currently insufficiently supported by evidence to be used as a sole alternative, though evidence suggests that UKCAT has a small but real incremental advantage when used alongside A levels, and when used as a threshold (see page 65), promotes a broader applicant base.

Only longitudinal studies, where quantified measures of doctor achievement are compared with the independent predictor variables, can truly provide the evidence needed to examine the role of aptitude tests in selection for medical schools in the UK.

Conclusions: Aptitude tests

Evidence for validity is mixed, but is consistent with a small but real increment in predictive validity.

However, reliability is not always fully described in studies of aptitude tests, and more research is required.

Candidates are prepared to undertake this approach, but are not wholly positive about aptitude tests for a variety of reasons.

Widening access is an aim of aptitude tests, and there is preliminary evidence (24, 26) that it has a positive effect.

There appears to be a small impact of preparation on performance in UKCAT, but is less than the standard error of measurement.

Aptitude tests remain of potential value in widening access and improving selection, and merit further study.

6.2 Academic Records[3]

Academic criteria are a major component of selection to medical school in several countries. Traditionally, selection for admission to medical school is based on predicted or actual school-end examination results, such as A-levels in the UK. A-level results might reflect type of schooling and social class (34) (and see later in this report for further discussion), which has lead to debates about social exclusivity of the selection processes into medicine because of the weight given to school examination results. In comparison, in the USA and Canada, students can only apply to medical school at postgraduate level (graduate entry), however, academic grades such as Grade Point Average (GPA) remain the main criterion for selection although they are usually considered in combination with other predictors, such as the Medical College Admission Test (MCAT).

Some authors have shown that academic criteria such as A-level grades correlate with dropout rates, career progression and success at postgraduate membership and fellowship exams (5,25,35–37). However, this effect typically shows correlations of about 0.3 to 0.37, where correlations above 0.5 are usually described as strong (see page 7), and generally seems stronger with performance as a medical student, decreasing across the years of the programme, and being much less in the clinical context (5,38,39).

McManus et al (3) carried out a longitudinal study comparing entry qualifications with subsequent medical career performance, and found that A levels were significant predictors for a range of outcomes, with an overall effect size of about 0.3. It is worth noting, however, that the average A level score in these candidates was BBB, indicating that a much wider range of abilities were represented in this cohort than is the case in current cohorts into medicine given grade inflation.

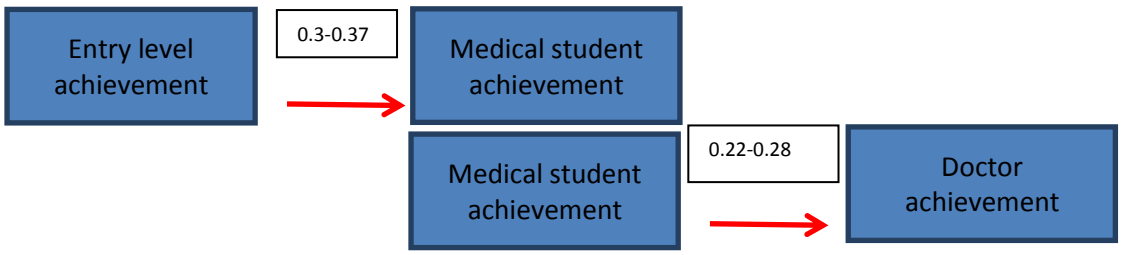
The maximum effect size that can be recorded in a study cannot exceed the square root of the reliability of that study (40), and it is a good assessment whose reliability markedly exceeds 0.7, for instance. This sets an upper bound on the correlation co-efficient that can be observed. In addition, those admitted to medical school generally represent a range-restricted group, and this can weaken the effect sizes observed. Therefore, it is possible (but not inevitable) that the figures observed for these correlations could in reality be higher than those quoted.

[3] [3] Lead author: John McLaughlin

Equally, since the outcome variable is generally a measure of test performance, then it is possible that a testing artefact resulting from *earlier test performance* being associated with *later test performance*, rather than with achievement as a doctor, is being observed. The true effect may therefore equally well be less than the quoted correlations.

It is true that there is reasonable evidence that performance in tests at medical school and at graduation correlates with performance as a doctor as measured by complex outcome measures (41–45). However, since in general entry level attainment is a weak predictor of performance as a doctor, it cannot be assumed that there is a linear or curvilinear relationship between entry-level attainment and performance as a doctor. 'Medical student achievement' is initially an outcome variable but subsequently an independent variable. See Figure 2 for an illustration of this.

Figure 2: Correlations between performance in tests and performance as a student and doctor.



A correlation of 0.37 would normally be taken to mean that the input variable 'predicted' 13.7 % of the variance. It is not clear whether the large amount of remaining residual variance is explained by one or more large unknown factors, or by many smaller factors. Education is a complex intervention, and is mediated by many factors, including local policies and resource availability.

We have used the term 'co-distributes' above rather than 'correlates', to emphasise that academic performance may be a surrogate for a whole range of other factors, and a correlation says nothing about causality. McManus et al (25) identify three factors which may influence this relationship. One is that academic performance may be a measure of specific cognitive knowledge (crystallised intelligence) or it may be a measure of generalised cognitive ability (fluid intelligence). The third is personal qualities which lead to success in these areas independently: there is good evidence that some personality traits such as conscientiousness are significant predictors of work place performance, including medicine (46).

McManus has commented sceptically on the additional value of general tests of cognitive ability, such as aptitude tests (25), but non-cognitive personal qualities assessments have not yet been fully explored.

There is some evidence that the relationship between entry level attainment and medical school attainment may not be linear at high levels. At very high levels of performance, it is possible that applicants may be less motivated to study medicine. Powis and Rolfe (47) indicate that candidates from the very highest academic performance group are more likely to be rated negatively by interviewers as unsuitable for medicine, and O'Neill et al (48) provide clear evidence that candidates selected on the basis of high academic performance alone are much more likely to drop out than candidates selected through a complex admissions process which includes scoring of personal statements and interview, aimed at exploring commitment to studying medicine.

Additionally, most studies of the relationship between entry level attainment and medical school attainment are retrospective and rely on the grades actually achieved by candidates. In the UK setting, students are admitted on their predicted grades. Where offers for interview are made on the basis of predicted grades and not actual grades, there is a further level of uncertainty in this process. Predicted grades may show even worse socioeconomic class bias than achieved grades. Hayward et al (49), in a study of 36,287 subject grades, found that predicted grades were inaccurate in more than 50% of cases. Of relevance to this report is that prediction errors were more likely for those from lower socio-economic groups.

A number of studies of the predictive validity of entry-level attainments rely for their statistical power on the existence of a continuous graded scale (such as Grade Point Average). This is not the case with A levels in the UK, which are currently designed as a criterion referenced attainment test, rather than as a discriminator test (which UKCAT is designed to be). Unfortunately, whilst in past studies, A level grades could also fulfil a discriminator role because of the range of grades which were considered suitable for admission, they have now lost this role since virtually all applicants are required to have three As at A level. As McManus points out (50), introduction of A* grades is "too little, too late" to restore the discriminator role of A levels in the UK. A higher level of resolution is required by some other means.

In conclusion, academic records represent the best studied area of admissions selection. The quantity of evidence is therefore extensive. Since objective measures of performance, both as predictor variables in selection and outcome variables of performance are generally employed, the quality of studies and data analyses are high. From this work, it is clear that A levels are losing their discriminating power and are biased in favour of those from higher socio-economic classes and susceptible to coaching, and there is a considerable degree of uncertainty around the nature and strength of the relationship between predicted or actual A level grades at the current level, and attainment as a doctor in the UK setting.

Conclusions: Academic records

Overall, Academic Records represent the best studied area of admissions selection, with extensive, generally-high quality evidence available for review.

There is a moderate correlation between academic performance and subsequent performance at medical school. These are the strongest relationships observed to date for any selection method in the UK system. Evidence for validity in later medical practice is less common, but indicates that there is a weak association between the two.

In general, reliability values calculated for academic records are high, both because candidates perform consistently and because assessment methods generally rely on objective testing, avoiding assessor bias.

Use of academic record predictors is almost universally employed as a selection tool for medical school and therefore has high acceptability through familiarity.

In many incidences academic records used for selection for medical school are administered by other bodies such as school or other exam boards. The cost to medical schools is therefore zero and costs to candidates are bundled with their general education.

However, there is clear evidence (in a UK context) that use of academic records introduces a significant socio-economic class bias.

6.3 Personal statements, essays, and autobiographical submissions[4]

Selection methods such as personal statements, essays, and other forms of autobiographical submission (henceforth "autobiographical submissions") are widely used to assess the suitability of medical school applicants. As a proportion of the overall body of research identified by this review, a median number of papers exist relating to autobiographical submissions.

Overall, the quality of research evidence on autobiographical submissions is limited. Five cross-sectional studies were identified assessing the effectiveness of autobiographical submissions in predicting subsequent performance in medical school (6,51–54). Two of these studies (51,52) reported that autobiographical submissions were predictive of subsequent performance. However, the third study (53) reported that autobiographical submissions have low reliability compared to other common selection instruments. The fourth study (54) also reported that personal statements were predictive of clinical aspects of training. However, the fifth study (6) reported that scores on personal statements were not predictive of subsequent success at a medical school overall. The reliability and validity of autobiographical submissions that are not completed under invigilated examination conditions may be contaminated by factors such as length of time spent completing the submission, as well as the potential influence and assistance of third parties. Oosterveld and ten Cate (53) concluded, therefore, that the contents of written testimonies including autobiographical submissions are not likely to reflect the genuine nature of medical school candidates as well as selection methods like interviews or observations.

Seven studies were identified assessing procedural issues relating to the use of autobiographical submissions in medical student selection. Of these studies, two were methodologically rigorous and investigated credible samples (55,56) and five had limited generalizability (21,57–60). The rigorous studies both suggested that medical school candidates attempted to present themselves in autobiographical submissions in ways that they perceived to be most desirable and that were not necessarily accurate. As such, the information captured by autobiographical submissions is likely to be both partial and subjective in nature. This finding is in contrast to the intended function of autobiographical submissions, which is to select candidates based on objective criteria (55). Two studies of limited generalizability reported the impact of external influences on autobiographical submissions, such as the earliness of submission in relation to deadlines (60) and differences when

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submissions are completed on-site versus off-site (59). Two studies reported a significant association between autobiographical submission scores and performance on multiple mini interviews (58,59) but autobiographical submission scores were significantly affected by factors such as marking method (candidates marked serially versus questions marked serially) and location of completion (on-site versus off-site). Finally, one study (21) reported inconsistency between UK medical schools in terms of how data from autobiographical submissions were used. Some medical schools formally used the information in making selection decisions, while others ignore this information due to concerns that it may unfairly bias selection decisions. Data from our survey indicated that, even in medical schools scoring the personal statement as a component of the selection process, there are concerns as to its use: "all the problems associated with personal statements, such as who wrote it, plagiarism and so on …."

No quality studies were identified assessing the acceptability (i.e. face validity) or cost effectiveness of autobiographical submissions in medical student selection. One study of limited generalizability (53) and one study of intermediate generalizability (56) reflected on the appropriateness of autobiographical submissions in medical student selection. Both of these studies commented on potential sources of data contamination in autobiographical submissions, including candidates' prior expectations, length of time spent completing submissions, and input in submissions from third parties. Finally, two studies of intermediate generalizability (56,61) commented on the political validity and stakeholder satisfaction of autobiographical submissions in medical student selection. White et al. (56) suggested that medical school applicants are influenced by their understanding of what the medical school admissions committees are looking for in candidates and they as applicants should behave in order to gain admission. Elam et al. (61) reported that the contents of medical school candidates' application forms are very unlikely to exert any significant influence on decisions made by admissions committees.

Despite the widespread use of autobiographical submissions in medical student selection, the research presented in this review suggests that evidence supporting the utility of such methods is limited. There is a dearth of high-quality, generalizable evidence on the predictive validity of autobiographical submissions, and researchers have highlighted numerous limitations and sources of inconsistency with the use of these selection instruments.

Conclusions: Personal statements, essays, and autobiographical submissions

Despite the widespread use of autobiographical submissions such as personal statements in medical student selection, the research presented in this review suggests that evidence supporting the utility of such methods is limited.

Overall, research evidence suggests that autobiographical submissions have limited validity in relation to medical student selection.

Although the term *autobiographical submissions* refers to range of different selection methods, which have varying levels of structure and control, research evidence suggests that the selection method overall tends to lack reliability.

No studies were identified that reported on the candidate acceptability of autobiographical submissions.

No research evidence was found on the relative cost of autobiographical submissions for candidates and medical schools. However, scoring of autobiographical submissions requires on-going input from subject-matter experts for setting and marking the submissions. This makes autobiographical submissions more costly for medical schools than other selection methods that do not have on-going costs.

Research evidence suggests that autobiographical submissions are more susceptible to contamination and input from third parties than many other common selection methods, which disadvantages applicants from lower socio-economic groups who are less likely to have the appropriate networks and resources to provide this.

6.4 References and letters of recommendation[5]

Parry and colleagues (21) conducted a review of admissions processes for medical courses within English universities, and found that the vast majority of schools include referees' reports as part of their selection process. As a proportion of the overall body of research evidence, this review identified relatively few studies examining the utility of referees' reports in medical student selection. A total of six studies were identified that remarked on the predictive validity of referees' reports in medical student selection (21,51,52,54,62,63). Generally, these studies did not include a direct empirical test of predictive validity, although Ferguson et al. (54) provided direct evidence that teachers' references did not consistently predict performance at medical school. Overall, there was good consensus among researchers that referees' reports were of limited use in predicting performance at medical school. This hypothesis is consistent with empirical findings from the wider research literature on selection and assessment (e.g. Hunter & Schmitt (64)). Stedman et al. (65) examined the content of referees' reports, and found that the writers of these reports typically apply positive and negative attributions homogeneously across applicants, thus making it impossible for admissions committees to differentiate between applicants on the this basis of these data. Steadman and colleagues concluded, therefore, that the utility of referees' reports in medical student selection is questionable at best. No studies were identified examining the face validity or cost effectiveness of referees' reports as a method of medical student selection.

Five studies were identified that commented on the appropriateness of referees' reports as a method of medical student selection (21,51,63,66)(Steadman et al., 2009). Four of these studies were critical of the inclusion of referees' reports in medical student selection, and remarked that the information they contain may unduly bias admissions committees. The fifth study, which was based in the context of veterinary medicine, stated explicitly that referees' reports have been shown to be biased, too flattering to their subjects, and not good predictors of performance (63). Nevertheless, two studies commented that referees' reports remain widespread in medical student selection (21,66). Moreover, Bates (66) reported that osteopathic program directors in the US rated references as the twelfth most important out of 23 criteria used in the selection of postgraduate trainees. This may suggest a discrepancy between evidence and practice in medical student selection with respect to referees' reports.

[5] [5] Lead authors: Alec Knight and Fiona Patterson

Perhaps more than any other method currently used in medical student selection, the research cited in this review is critical of the utility of referees' reports. Parry and colleagues (21) commented that some medical schools actually ignore information contained in referees' reports for fear of unfairly biasing selection decisions. However, other schools use this information in determining selection outcomes. The dearth of research on the utility of referees' reports in medical student selection may reflect researchers' scepticism that referees' reports are of practical use in medical student selection. Nevertheless, as referees' reports are still widely used, more research on their cost effectiveness, appropriateness and stakeholder satisfaction/political validity would help to guide best practice in medical student selection.

Conclusions: References and letters of recommendation

There is good consensus among researchers that referees' reports have very low utility in predicting subsequent academic or professional performance.

This review did not uncover any direct tests of the reliability of referees' reports. However, there seems to be good consensus among researchers that this selection method has poor reliability. Nevertheless, the use of referees' reports remains widespread, and they may be viewed positively by admissions tutors in medical schools.

We did not find any direct analyses of the acceptability of referees' reports to medical school candidates. However, in the UK referees' reports are a ubiquitous element of medical school applications and candidates would probably expect them to be a part of the application process.

The scoring of referees' reports requires on-going input from admissions professionals, making this selection method relatively costly.

There are no studies exploring the relationships between references and widening access and/or coaching.

6.5 Situational Judgement Tests[6]

Situational judgement tests (SJTs) are assessments designed to measure candidates' judgement in role-relevant settings. The tests present candidates with a scenario and a list of possible responses. The candidate is asked to consider the situation and make judgements about the possible responses. The candidates response is scored against expert responses (see Box 1 for an example).

Box 1: Example of a Situational Judgement Test (SJT).

Example SJT item

You are reviewing a routine drug chart for a patient with rheumatoid arthritis during an overnight shift. You notice that your consultant has inappropriately prescribed methotrexate 7.5mg daily instead of weekly.

Rank in order the following actions in response to this situation (1= Most appropriate; 5= Least appropriate)

A Ask the nurses if the consultant has made any other drug errors recently
B Correct the prescription to 7.5mg weekly
C Leave the prescription unchanged until the consultant ward round the following morning
D Phone the consultant at home to ask about changing the prescription
E Inform the patient of the error

In the UK in recent years, the use of SJTs in medical selection and assessment has become widespread but, compared with other selection methods identified in this review, only a median amount of research evidence exists on their utility. The quality and generalizability of this research is generally very high compared to other selection methods identified in this review. Moreover, the scope of research on SJTs in medical selection and assessment – the variety of research questions that have been addressed – is also broad compared to other selection methods identified in this review.

Seventeen studies were identified assessing the effectiveness of SJTs in relation to medical selection (67–79). Of these studies, two were high quality, cross-sectional studies with large participant samples, and four were very high quality reviews, meta-analyses or systematic reviews, which summarised findings across multiple studies. In a wide-ranging review study, Lievens et al. (70)

[6] [6] Lead authors: Alec Knight and Fiona Patterson

reported that SJTs show criterion-related validity and incremental validity above academic ability tests and personality assessments. Moreover, the authors reported that SJTs have relatively low adverse impact against minority groups, and are generally perceived favourably by candidates. Similarly, Christian et al. (79) conducted a meta-analytic study that concluded SJTs have relatively high predictive validities for job performance measures across numerous industries, including medicine. McDaniel et al. (39) and McDaniel and Nguyen (73) also conducted meta-analyses that concluded SJTs have significant predictive and criterion-related validity for job performance measures across numerous industries including medicine. Notable among the numerous cross-sectional studies on the effectiveness of SJTs were two high-quality studies. Patterson et al. (80) examined the use of SJTs in selecting GP trainees, and concluded that SJTs were better predictors of selection centre performance than both a knowledge test and application form questions. Lievens et al. (72) also presented findings from a high quality, cross-sectional study, which concluded that a video-based SJT was differentially valid for predicting medical school performance across different curricula. Moreover, Lievens and colleagues concluded that SJTs become more valid as predictors of performance over the years of medical education and training. The remaining studies presented cross-sectional evidence from medical and non-medical contexts on the relatively high levels of validity and reliability of SJTs when used in selection contexts. No studies reporting evidence contrary to the above were identified in the research literature by this review.

A total of seven studies were identified assessing procedural issues relating to SJTs in selection contexts (70,79,81–85). Three of these studies were very high quality review studies, with a further two being high quality cross-sectional research papers. Issues raised by these research papers included the impact of mode of administration, with video-based SJTs reported to have higher validities than equivalent paper-and-pencil SJTs (79). Similarly, Ployhart & Ehrhart (81) and McDaniel et al. (82) described how different response instructions may affect the validity of SJTs, while Lievens and Sackett (84) commented on how the method of construction of alternate forms of an SJT may influence test validity. Lievens et al. (70) concluded that SJTs may be susceptible to faking, practice, and coaching effects, but this conclusion is tempered by the finding of Cullen et al. (85), who noted that SJTs were less susceptible to coaching than knowledge-based tests used for similar selection purposes. Four studies were identified relating to the face validity of SJTs (70,77,83,86). Of these studies, one was a very high quality review study, and two were high quality cross-sectional studies. In each case, SJTs were rated favourably as selection tools by candidates, while tentative evidence was presented by Chan and Schmitt (83) that mode of administration may affect candidate

evaluations of SJTs. One very high quality review study was identified that related to the cost-effectiveness of SJTs (70). This study concluded that there was tentative evidence of the relative cost-effectiveness of SJTs compared with other methods of assessment, although direct evidence in this area was not presented. Seven studies were identified examining the appropriateness of SJTs as a component of a wider selection process (69,70,76,80,87,88), including one very high quality review study, and a high quality cross sectional study. Several of these studies concluded that SJTs could usefully be incorporated into selection procedures across industries, while others argued for the inclusion of SJTs in selection and assessment specifically within the medical arena.

No studies were identified that examined the political validity or stakeholder acceptance of SJTs in medical student selection.

In conclusion, the adoption of SJTs in medical student selection is supported by the weight of published empirical evidence on this selection method. Although the number of published studies in this area is low relative to some other selection methods (such as interviews), the research evidence is marked by a relatively high number of high quality and generalizable studies, and by a good consensus among researchers on the utility of SJTs as a selection method. Direct evidence on the predictive validity of SJTs in medical student performance has been provided by Filip Lievens and colleagues in Belgium (see the following case study), although evidence of replication of these findings within the UK has yet to be published. Further research is necessary to explore further the finding that predictive validity of SJTs increases throughout medical school. Similarly, evidence is lacking on the predictive validity of medical school entrance SJTs on subsequent professional performance.

Case study: Medical school selection in Belgium (Adapted from Buyse, (89)**).**

In the mid-1990s, Belgium had a surplus of qualified doctors and dentists compared to number of medical and dental employment positions. To deal with this situation, the Belgian government implemented a law to limit the maximum number of medical and dental student graduations each year. In the Dutch-speaking region of Belgium (Flanders), it was decided that the flow of students into medical and dental education would be restricted by implementing an admissions exam. The dual aims of this exam were to differentiate applicants on their likely chances of succeeding at medical or dental education, and to give indications as to later performance as a doctor or dentist. Today, the admission exam remains the sole criterion to determine whether a student can start medical or dental education.

The first part of the admission exam assesses candidates' scientific knowledge and insight in relation to Biology, Chemistry, Physics and Mathematics. The second part of the exam assesses information gathering and processing abilities through academic ability and situational judgement tests. Selection methods including an interview, a manual dexterity test, a nursing internship, and a personality assessment were considered by the Technical Commission tasked with developing the admission exam. However, the interview, manual dexterity test and nursing internship were considered unfeasible for the likely number of applicants and so were not included in the test. Similarly, the Commission could not reach consensus on the usefulness of a personality assessment, and so decided not to include this type of assessment within the admission test.

Research has confirmed the ability of the admission exam to predict students' performance in the first years of medical education (72). Moreover, the ultimate goal of selection procedures is to select candidates who will do well as professionals. Further evidence reports that the admissions exam has predictive validity for performance in the later years of medical education, which are more clinically-based. The situational judgement test element of the admission exam was found to be a valid predictor of academic performance and subsequent job performance ratings, and offers incremental validity above and beyond the level offered by academic measures alone.

Conclusions: Situational Judgement Tests

The research literature provides consistent, direct evidence of the utility of SJTs in medical school selection. SJTs are among the best and most valid methods in medical school selection when they are underpinned by a thorough role analysis, and are constructed in accordance with the principles of psychometric best practice.

Provided that SJTs are constructed in accordance with the principles of best practice in psychometrics, they offer a reliable and robust medical school selection method.

Provisional evidence is present in the research literature that candidates view SJTs favourably as a medical school selection method.

A properly maintained SJT has on-going costs in relation to psychometric analysis of the constituent items, and development of new items.

Preliminary research evidence suggests that written SJTs have a lower level of adverse impact for minority groups than do written tests of cognitive ability.

Research evidence has recently suggested that SJTs may be susceptible to coaching to a degree. However, certain SJT response instructions and methods of delivery are likely to be less susceptible than others to coaching than other tests that are delivered in similar ways (such as knowledge-based tests).

6.6 Personality assessment and emotional intelligence [7]

Personality assessment generally makes use of self-report inventories that require candidates to respond to questions or statements by rating the extent to which they agree, or by indicating how accurate an item is as a description of their personality. Personality assessment is very common in selection and assessment across numerous industries, and compared to other selection methods identified in this review a median amount of research evidence exists in relation to medical student selection. The majority of this evidence relates to the effectiveness of personality assessments in predicting subsequent performance, with little or no evidence relating to other research questions.

The generalizability of research evidence in relation to personality assessment is generally quite low, with the exception of studies of effectiveness, where research evidence is moderately generalizable. One moderate-to-high quality (non-systematic) review study was identified relating to personality assessment in medical selection (52). This review summarises 11 studies examining the relation between personality measures and performance in medical school. The overall finding was that a moderate correlation exists between personality measures and performance at medical school. Fifteen cross-sectional studies were also identified relating personality and performance (6,46,47,54,90–100). Several of these papers reported significant associations between measures of personality and performance at medical school. For example, two papers (90,91) reported that personality traits defined as "dysfunctional" were significantly negatively associated with negative outcomes for medical students such as lower academic performance. Another two studies provided tentative evidence that the *Personal Qualities Assessment* (PQA) test was a useful addition in a medical school selection process. Lumsden et al. (92) also reported that the empathy and motivation aspects of the PQA test were related to success at medical school. Haight et al. (46) also reported significant associations between *NEO-Personality Inventory (Revised Version)* personality domains and performance across various aspects of medical school. Ferguson et al. (6) reported that the conscientiousness personality trait was predictive of medical school performance, and offered incremental validity over academic performance. Ferguson et al. (54)replicated this finding, and added that conscientiousness was positively related to preclinical performance, but was negatively related to clinical grades. Finally, Chan-Ob and Boonyanaruthee (97) reported that the *California Personality Inventory* was a useful predictor of variation among performance of medical students in a Thailand medical school.

[7] [7] Lead authors: Alec Knight and Fiona Patterson

Conversely, numerous papers have reported that personality measures were not useful predictors of medical student performance. For example, Sefcik and colleagues (93) reported no significant association between the *Myers-Briggs Type Indicator* test and performance on the Medical College Admission Test. Dowell and colleagues (94) also reported that overall the PQA was not correlated with success as a medical student. Kogan and McConnell (98) conducted a non-systematic review of the literature on selection into veterinary medicine, and concluded that the evidence for validity of personality measures as selection instruments was mixed. However, more recently, Lievens and colleagues (99) suggested that the validity of personality measures in predicting medical school grades increases over the course of medical education and training. For example, while there may not be any advantages to being open and extraverted for early academic performance, these traits may gain importance for later academic performance. Similarly, Lievens and colleagues reported that conscientiousness appeared to be an increasing asset for medical students. Therefore, in assessing the usefulness of personality assessment, it is possible that previous studies relying on early outcome criteria might have underestimated the predictive value of personality variables. The finding that conscientiousness is an increasing asset for medical students as their course becomes more clinical is in direct contrast to the findings reported by Ferguson and colleagues (54), who concluded that conscientiousness was only an valid predictor of preclinical performance at medical school.

With the exception of the Lievens et al. (99) study described above, no studies were identified relating to procedural or face validity research questions with respect to personality assessment. Moreover, no studies were identified that provided evidence on the political validity and stakeholder satisfaction of the use of personality assessment in medical student selection. Two cross-sectional studies contained elements relating to both cost effectiveness (47,91) and appropriateness research questions (99,100). Knights and Kennedy (91) concluded that measures of dysfunctional personality types could usefully and cost-effectively be incorporated into medical student selection, although they did not provide any direct evidence for this assertion. Similarly, Powis and Rolfe (1998) gave consideration to the costs and benefits of the selection procedure at a single medical school, but did not provide any direct evidence on the cost-effectiveness of personality measures in medical student selection. Lievens et al. (99) presented evidence suggesting that medical student performance may be differentially predicted by personality assessment across the course of medical education, and this finding lends weight to the notion that personality assessment is an appropriate selection method in the context of medical student selection. However, Jerant and colleagues (100) cautioned

against the adoption of personality measures into selection systems without consideration of potential future impacts on diversity in medical student personalities, with potential implications for students' professional growth, specialty distribution, and ultimately patient care.

Overall, research on personality assessment in medical student selection is heavily focused on effectiveness research questions. Other research questions relating to process, face validity, cost effectiveness, appropriateness, and political validity and stakeholder satisfaction have received little or no empirical exploration. The research evidence identified by this review presents mixed supportive and contradictory evidence on the use of personality assessment in medical student selection. High-quality studies and research syntheses are lacking, and conflicting evidence exist on the predictive validity of various personality assessments. The best evidence suggests that personality assessment may provide moderate utility in predicting future performance at medical school but, as Lievens et al. (99) discussed, the relation between personality characteristics and medical school performance may not be as simple linear relationship between specific traits and later performance. Rather, it may be the case that certain traits are associated with different levels of performance at different stages in medical education.

Emotional intelligence (EI) has been defined as "the ability to perceive accurately, appraise, and express emotion; the ability to access and/or generate feelings when they facilitate thought; the ability to understand emotion and emotional knowledge; and the ability to regulate emotions to promote emotional and intellectual growth" (68, p.479). This ability is considered by some as an important ability for clinicians in relation to clinical interactions with patients, their families, and other healthcare providers (102). Thus, the use of EI tests has attracted some attention within the research literature as a tool for medical student selection. This review identified four studies examining the utility of EI in medical student selection (102–105). Three of these studies provide tentative evidence that while EI may be an important ability for medical students, it is often not assessed by typical medical school selection methods (102–104). The fourth study indicates that an EI measure can meaningfully assess attributes that indicate desirable personal and interpersonal skills in medical school applicants (105).

The research identified by this review on the use of EI testing in medical student selection was sparse and at a very early stage of development. The studies and reports were typically pilot studies or opinion pieces citing evidence as to why EI may represent a valuable tool in future medical

student selection processes. However, no current evidence was identified on the predictive validity of EI tests in medical student selection. Similarly, no reports were identified as to the face validity or wider acceptability of using EI tests in medical student selection, or the cost effectiveness of so doing. Future research may prove EI to be a useful component of medical school selection processes. However, the evidence presented in the research identified by this review was not sufficient to support the use of EI as a valid instrument in medical student selection.

Conclusions: Personality and emotional intelligence (EI) assessment

Personality assessment may provide a moderate level of predictive validity in medical selection.

The predictive power of personality some personality traits (e.g. conscientiousness) may increase as the content of courses becomes more clinical in nature, although contradictory evidence also exists. Further empirical evidence is required to establish the validity of EI tests in medical school selection.

Most commercial personality inventories and emotional intelligence tests have established high levels of reliability.

No studies were identified that directly tested the candidate acceptability of personality assessment or emotional intelligence testing in medical school selection.

Commercial personality and EI assessments often have clear unit costs, making the calculation of the total cost of implementing them fairly simple. However, as these are commercial products, their cost may be high relative to some other selection methods.

There are some concerns that restricting admissions to medical schools on the basis of personality traits may be contrary to the ethos behind widening access initiatives.

As commercial personality and EI assessments rely on stock questions, data security and susceptibility to coaching are key concerns. They may also be susceptible to socially-desirable responding compared to other selection methods.

6.7 Interviews & MMIs[8]

It cannot be assumed that those with high academic ability alone can be turned into good doctors via medical training - other skills and qualities relevant to the required competencies need to be present from the start (1). This follows a deeper analysis of the so-called (and somewhat artificial) divide in criteria between the *cognitive or academic* (e.g. knowledge) and the *non-cognitive or non-academic* skills needed in a doctor as set out in Good Medical Practice (GMC (106) see also Albanese (107)). The medical school admissions interview has historically been used to probe the following, essentially non-academic, attributes (108):

- Experience and knowledge of the profession
- Source of motivation
- Interpersonal skills (including communication and empathy)
- Responsibility, integrity and commitment
- Educational, economic and social background.

In 1991 eight of the then 21 UK medical schools interviewed, now all but two do so (8,21) including most of the "new" medical schools (109), perhaps reflecting an increased focus on the non-academic attributes of doctors. However, the value of medical admissions interviews has proved hard to establish.

This section will review the available evidence for 'traditional' style interviews as well as emerging studies regarding the Multiple Mini Interview (MMI) approach (110). The MMI is a technique for conducting interviews for medical school built on the multiple station format of the objective structured clinical examination (OSCE). These typically involve a mixture of 1:1 interview, role-play and interactive tasks, each lasting between 5 and 10 minutes and focused on a range of domains. The evidence is reviewed in reference to the key concepts of reliability, validity, bias and utility as required of any high stakes assessment.

[8] Lead author: Jon Dowell

6.7.1 Reliability

Historically the research on the reliability of interviews for medical school admissions is very variable reflecting the range of approaches used and possibly a bias against publishing negative findings. Meta-analyses have shown that inter-rater reliability in structured approaches (i.e. interviewers giving similar scores to similar interview performances) was modest (0.27 to 0.38) (111). A high degree of variability has been identified between interview formats and the characteristics they purport to measure, meaning different types of interviews may assess different interviewee characteristics and suggesting content validity is variable (107). In addition they have been shown to be susceptible to interviewer bias, whereby candidates are awarded preferential ratings if their personality inventory scores are similar to those of the interviewers (112). It is clear that the way interviews are conducted is important and that unreliable approaches cannot have useful predictive validity or utility as selection tools.

Other authors and meta-analytic studies have shown that very carefully-structured interviews which ask relevant and standardised questions, use panels of trained interviewers and validated scoring criteria can achieve acceptable inter-rater reliability (113–117). However, Axelson and colleagues exploited the mixed nature of their interview process (around half tightly structured, half unstructured discussion) to compare the two processes in over 3000 events (118). Both components appeared to measure distinct attributes and an optimal assessment was achieved with 50/50 weighting. However, they concluded that an unrealistic six 25 minute interviews with two assessors were required achieve the most desirable reliability of 0.8 or above. While their results offer some encouragement, these developments appear to have been eclipsed by the recent advent of the MMI process.

The MMI system seems comparably reliable to the OSCE clinical assessment format and in addition to Eva et al. (110) many others have now reported similar results. For instance, Roberts (119) presented an analysis of 485 graduate MMI applicants demonstrating satisfactory reliability (G 0.7) with 8 stations, utilising 1 hour interviewer training. In a small UK study O'Brien et al. (120) reported a comparable figure both for graduate (0.69) and school-aged applicants (0.73). Dowell et al. (121) report on 929 MMI scores with the same levels of reliability (G 0.7) but also reported that graduate interviewees scored higher than school leavers and females better than males illustrating how the data MMIs generate enables a range of additional analysis to be conducted. For instance it is feasible to assess how stringent or lenient assessors are and Harasym et al. (122) advocate statistical

corrections to adjust for this and enhance reliability further; Till et al. (123) report on this process being used within the UK. It is also possible to scrutinise the performance of individual questions, for instance to assess for gender or ethnic bias. MMIs have been successfully implemented in several schools worldwide (119,124,125) and have also been shown to be reliable and valid in selecting suitable candidates for postgraduate positions (126). Gafni et al. (127) compared scores on over 2000 medical school applicants at two assessment centres in Israel and reported high reliability, and test/retest correlations of 0.59 and 0.43 within MMI components respectively (and 0.72 / 0.65 for the full assessment which included written aspects). Correlations for those who sat both tests concurrently were 0.56 (MMI only) and 0.75 overall. Attention has now progressed to assessing where sources of variation arise in the MMI process and how these may be reduced. For instance, Griffin and Wilson's (128) multivariate analysis of 506 candidates and 292 staff found variation in examiner scores (stringency/leniency) could be reduced from 20% to 7% with an hour of 'skills' based training.

However, it is important to be realistic regarding the background 'noise' when considering reliability as other factors will be involved. For instance, Redelmeier and Baxter (129) conducted an analysis of nearly 3000 interview scores and weather on the day. They found significantly reduced scores on wet days, equivalent to a significant 10% lower MCAT score with the system at Toronto.

In conclusion, high stakes assessment instruments must be reliable and there has been concern that traditional interviews rarely achieve this. It is clear there are a number of interview approaches which can produce satisfactory (0.7) and even ideal (0.8) level of reliability. The MMI format holds most promise as it appears readily transferable with satisfactory results and has the best predictive validity data. A number of enhancements can be achieved beyond the typical 8 -10 station MMI approaches already in use in a number of schools and experience in Israel suggests they can potentially be enhanced in other ways, including through use of selection centres.

6.7.2 Validity

Interviews, beyond being reliable, must also measure something meaningful and here we shall focus on the key areas of face, construct and predictive validity.

Interviews have high 'face' validity. There is a strong belief in interviews and some evidence they attract applicants to choose the medical school (8). Face validity can be enhanced by including

'vignettes' (130) or 'professionalism scenarios' (131), or by greater standardisation (132). Moreover, candidate and interviewer reactions have been positive with a number of studies reporting high levels satisfaction with an MMI type selection process at undergraduate (110,120,121,125,133,134) and postgraduate levels (135,136). See Box 2 for an overview of the type of constructs assessed by MMI. Adding structure may even increase the chances of an organisation successfully defending a lawsuit (137). However, given the resource involved in interviewing thousands of medical school applicants, we surely require a stronger rationale than this.

Box 2: Constructs assessed by MMI

McMaster Eva et al. (110)	**Canberra** Harris and Owen (124)	**Calgary** Lemay et al. (138)	**Israel** Gafni et al. (127)	**Dundee** Dowell et al. (121)
Communication Critical thinking Ethical decision making Knowledge of health care system	Interpersonal skills Giving Instructions Taking instructions Problem solving Ethics Resilience/maturity Enthusiasm Awareness of issues in medicine	Empathy Advocacy Ambiguity Collegiality Cultural sensitivity Ethics Integrity Responsibility Self - assessment	Communication Handling stress Initiative and responsibility Self-awareness / maturity	Communication Critical thinking Integrity Moral reasoning Preparation + motivation Teamwork

The constructs being measured in an interview are important but the specific skills and attributes deemed appropriate for medical students, or doctors, remain much debated (139). Typically, a job analysis (a systematic assessment of the role and attributes required) would be used to determine the desirable non-academic characteristics but medicine includes such widely diverse careers that creating a specific core set of attributes is challenging. Historically a blueprinting process with local clinical and teaching faculty prioritising those attributes they value has been used but it is not clear if this is adequate, as we lack key evidence to assess this (140). However resolving this would require both sound measures of the individual skills and assessment of their value in different area of practice. So, whilst there is certainly scope to improve construct validity the fundamental challenge of determining the weight to be put on potentially contradictory attributes such as empathy, integrity and motivation remains. It may be helpful to consider these in terms of extremes to 'select out' as much as attributes for ranking applicants and some authors have even suggested that excessive empathy as well as other personal traits might be targeted (95). The desirable attributes

may also vary with medical school depending on their focus (for instance those training rural and remote practitioners may prioritise particular motivations).

The impact of interview based selection processes on the nature of the students selected may be important but little relevant evidence was encountered. One study found interviews selected a slightly more 'agreeable' cohort (100), which could be considered as beneficial in terms of teamwork and communication, or, as concluded, undesirable if it reduced recruitment to surgical specialities. We found no studies reporting specifically on the relationship between interview or MMI performance and professional outcomes despite most interviews and MMIs broadly focusing on aspects of professionalism. In addition, no studies were reviewed which fundamentally explored (let alone evidenced) the potential role of the selection process to avoid those who will perform poorly or not progress, reliably rank the strongest appropriately or fit selection to workforce needs. As interview tools evolve this becomes increasingly relevant as we are developing the ability, for instance, to select only those who can (under test conditions) communicate on an interpersonal level both effectively and supportively. This may be an obvious step forward (as a prime area of patient complaint) but some may fear could exclude some with other skills and abilities (academic or surgical brilliance perhaps). We simply do not yet know if this is the case, nor have the means to weigh up the pros and cons if so.

Given our current state of knowledge, however, it cannot be assumed that even basic interviews have no value, for example, in screening out unsuitable individuals (141) or selecting for desirable characteristics not measured by exams. The appropriate outcome markers are not currently unavailable.

On an entirely pragmatic basis interviews can also be seen to introduce other factors, checks and balances within selection systems as medical schools seek to match the numbers invited for interview with capacity (see Box 2). Given the limitations of the other data available to selectors they focus attention on, and moderate the impact of entirely academic measures. As noted previously, they also require applicants to visit the school, which may have many benefits as well as possibly help 'recruit' (8), both factors likely to mitigate against selection centres (see later in this report). Moreover, interviews focus medical schools' use of other selection processes in order to limit the numbers invited for interview that they feel they can practically manage.

Box 3: The need to manage numbers for interview, data from the Admissions Dean's survey

"....But there's also an element of… It's an arbitrary cut off. It's the 600 [invited to interview], it's just what we feel we can cope with, you know, and selectors, and demands on selectors....."

"....with 2,300 applicants, there's got to be some way of, you know, cutting down the numbers that seem to be… that is fair, and hopefully gives us the best candidates."

However, whatever format is used, interviews appear to assess something unrelated (142), or perhaps even negatively correlated with academic performance at school or college (143). Some research also suggests that structured interviews have incremental validity over academic ability tests (64,144).

In summary, the evidence base underpinning the constructs assessed at interview is poor. They seek to assess something beyond simple academic abilities or achievements but exactly what they actually assess or why remains ill-defined.

The ultimate test for an assessment is its relationship to a relevant outcome, so-called predictive validity. Do students with high interview scores outperform those with low scores? This can only ever be demonstrated when both the selection and assessment tools are adequately reliable but it seems that traditional style interviews, even long or carefully structured ones, do not achieve even small (<0.2) levels of predictive validity when compared with outcome markers based on written or clinical medical school exams (7,145,146).

In contrast, Donnon (114) reported that three semi-structured 'Medical Judgment Vignettes' given to first year students scored according to a tight theoretical framework correlated moderately with clerkship grades in a number of domains (around 0.45), and the MMI (110) utilising 10 eight-minute stations focused on ethical and moral reasoning achieved promising predictive validity. Following up their original cohort Eva, Reiter and colleagues have demonstrated the MMI was the best predictor of OSCE performance, clerkship ratings, and clinical aspects of the Canadian licensure exams (147). The correlations they found were consistently moderate (+/- 0.4) for the MMI and absent or even negative for other aspects of their admissions system. They have also demonstrated that MMI at medical school selection correlated moderately with stations passed in the part II MCCQE licensure (r = 0.43) some 6 years later: much of this appears mediated via ethical aspects of these assessments (148). A number of other studies of MMIs are confirming similar levels of predictive validity beyond

the specific approach developed by Eva and colleagues at McMaster (e.g., Oostervald et al. (53); Parry et al. (21) ; Dore et al. (149); Dowell et al. (121); Prideaux et al. (150)).

In short, there is a consistent and growing literature supporting the reliability, validity and acceptability of MMIs as an undergraduate and postgraduate medical selection tool so we now briefly consider issues of bias and cost.

6.7.3 Bias

A range of studies have sought to explore potential sources of bias within interviews but differentiating bias from other factors (such as true ability) is complex. Reassuringly, there appears relatively little differences between ethnic groups (151). Griffin (128) found no apparent effect connecting gender of candidate and staff member. Hofmeister et al. (126) tested an MMI for selecting international medical graduates for a family medicine training program and found no differences due to gender although, in a younger UK sample, Dowell (121) found females performed better than males. In the UK context preferential access to formal preparation is a concern but Griffin (152) found training for an MMI appeared not to improve scores.
The concern that any individual could have an undue effect on the outcome of an interview is greatly reduced by involving multiple assessors and makes the MMI approach preferable as well as more defensible.

6.7.4 Utility

The costs of traditional interviews appears to have received little attention but a number of comparisons have shown that an MMI can be delivered with the same level of resources afforded to typical traditional interviews (e.g., Eva at al. (110)). A detailed estimation of comparable total costs concluded that the greater preparatory costs can be offset by less face to face interview time but this is highly contingent upon a school's existing system and any changes to interviewer composition, such as inclusion of students and community members (153).

There is emerging confidence that MMI station length can be reduced to as little as five minutes, which could reduce costs or be used to increase reliability (153,154), and that student and lay assessors perform just as well as faculty or clinicians (123).

Case report

In 2006 Dundee medical school decided to review its admissions process and reviewed the available literature. Amongst other changes it was decided to investigate the Multiple Mini Interview and a visit to McMaster was arranged to observe one. Impressed by the process and reliability data Dundee decided to create an MMI. In 2007 the 'traditional' 20 minute with two staff interviewers was changed to four 10 minute stations, one an interactive task manned and scored by student volunteers. Deemed a success a ten station (7 minutes each, 5 being interactive and student run) MMI was introduced in 2008. Over 2000 applicants have now been assessed, reliability is consistently satisfactory (0.7) and predictive validity matches the correlations reported by Eva et al (between 0.29 and 0.57 for OSCE assessments).

In summary, the non-academic assessment of medical school applicants is evolving rapidly. Our review of the literature determined that an unstructured approach is typically so unreliable it could be considered an expensive lottery. In contrast, the advent of a combined structured and interactive approach in the form of an MMI is amassing consistent evidence regarding reliability and promising predicative validity for clinical performance in the context of medical school and perhaps beyond. This new sense of progress has prompted a rapid increase in publications exploring what and how to evaluate applicants. However, there remains little understanding of exactly what non-academic domains are or should be measured and no method has demonstrated an ability to move beyond summary global scores (considering communication and moral reasoning separately for instance. The MMI may effectively be a combination of a structured interview and simulated communications skills assessment which, by virtue of its OSCE like format, predicts performance in similar on course assessment. It is clear there is the potential to improve reliability further through increased numbers of stations, advanced statistical techniques and exploring the potential of selection centre approaches. In addition, all attention has been on evaluating interview processes against existing outcome markers, primarily clinical exams in the form of OSCEs. Whilst important, this omits to assess the role interviews may play in identifying unsuitable applicants or improving professionalism which are important but challenging to measure.

It is now apparent that worthwhile non-academic assessments can be made and that further research should investigate how to optimise the format and content. New methods should be trialled through shadowing studies before they are implemented. It must be recognised that existing

markers are inadequate for assessing the full range of important outcomes, which should include professional behaviours, and will require extended follow-up.

Conclusions: Interviews and MMIs

Non-academic assessment of medical school applicants necessitates a reliable (typically highly structured) approach to this 'high stakes' process.

There is emerging consensus on the reliability, validity and acceptability of Multiple Mini Interviews.

Whatever approach is used clarity is required regarding the attributes being measured which should be coherent with the intended purpose.

The construct validity of selection interviews requires further evaluation and connecting to analysis of the job role.

There is emerging evidence that reliable assessments (especially MMI) show worthwhile correlations with clinical outcome markers (e.g., undergraduate and postgraduate OSCE scores).

No studies were found reporting relating non-academic selection measures with professionally orientated outcomes (such as fitness to practice).

6.8 Selection centres[9]

Selection centres, also known as assessment centres, are a selection method used widely in non-medical selection contexts. The International Taskforce on Assessment Centre Operations (155) defines selection centres as "a standardized evaluation of behaviour based on multiple inputs. Multiple trained observers and techniques are used. Judgments about behaviours are made, in major part, from specifically developed assessment simulations. These judgments are pooled in a meeting among the assessors or by a statistical integration process" (153, p.2). Recently, the selection centre approach has been applied in medical student selection. This review identified six studies that examined the use of selection centres in medical student selection (127,156–160). Three of these studies reported pilot selection centres for medical student selection as being a reliable and internally valid method for assessing applicants' aptitude for medical study (127,156,157). Another three studies reported pilot selection centres for selection into specialty training for anaesthesia, paediatrics, and obstetrics and gynaecology (158–160). These selection centres were reported as being reliable, cost-effective, suitable for high-volume assessment, and favourably rated by candidates and assessors. Provisional evidence was presented for predictive validity in performance in specialty training (160) but further evidence is required to build a stronger case for predictive validity in medical and medical school selection. Ziv and colleagues (156) also considered the cost effectiveness of the selection centre method. Their conclusion was that the selection centre method as developed was an expensive option (approximately 300 USD per candidate) and was logistically complex. Implementing the selection centre required the recruitment and training of faculty raters, and on-going collaboration among academic and professional institutions and experts in different operational aspects of the process (including simulation, evaluation and measurement).

Overall, the research identified on the utility of selection centres in medical student selection was relatively sparse and lacked strong evidence on the predictive validity of the selection centre method in relation to subsequent academic or professional performance. Moreover, selection centres may comprise a large number of elements in different combinations and orders, meaning that the processes by which a selection centre is designed and administered may affect the utility of the method. Further research should also focus on the face validity of the selection centre method, in addition to its perceived cost-effectiveness, appropriateness, and political validity.

[9] Lead authors: Alec Knight and Fiona Patterson

Conclusions: Selection centres

Provisional evidence has been presented that selection centres offer good predictive validity in medical school selection. Further replication of these findings is required to make firm conclusions on the validity of selection centres in medical selection.

Although relatively few studies were identified assessing the reliability of selection centres, the evidence provided by these studies was quite strong and consistent; the selection centre method is likely to have a good level of reliability in medical school selection.

The review identified a few studies in a comparable field (specialty training selection) that suggest the selection centre method is viewed favourably by candidates.

Selection centres involve multiple assessments and assessors and, therefore, have relatively high running costs for medical schools. Nevertheless, several studies stated explicitly that they represent an appropriate selection method in high-volume medical selection contexts.

By definition selection centres comprise numerous elements, and so will be more difficult targets for coaching than discrete, monolithic selection methods

7. The effectiveness of widening access initiatives used by medical schools to promote fair access[10]

7.1. Aim

To examine the available evidence on the effectiveness of widening access initiatives used by medical schools to promote fair access.

7.2. Background

Increasing the demographic variability of medical students remains a major policy issue in the UK. In this section of the report, we explore the rationale behind widening access (WA); the strengths and weaknesses of WA interventions and initiatives; the complexity of issues pertinent to widening access and widening access to medicine in particular, and ways forward in terms of policy, practice and research. This discussion focuses on how medicine seeks to minimise barriers to applicants. It is positioned in the UK political and social context and draws on literature from across Higher Education (HE), including international literature where relevant.

WA refers to the policy that people such as students from disadvantaged backgrounds, mature students, students from ethnic and cultural groups and disabled students should be encouraged into higher education, which in turn relates to improving social mobility. Social mobility can be defined as breaking the transmission of disadvantage from one generation to the next (161). When a society is mobile, individuals have more opportunities of progressing in terms of income or occupation.

One way to achieve social justice is equality of opportunity by removing barriers and compensating for disadvantage in terms of individual participation in higher education (HE) (162). Strategies to do so include the (now-discontinued) Education Maintenance Allowance (EMA), to encourage pupils who may have otherwise left school to stay on to sit A levels or Highers, and the establishment of the Office for Fair Access (OFFA) to monitor student funding after the 2004 Higher Education Act changes. OFFA's role includes ensuring that HE institutions are engaged in activities to encourage and support potential applicants from "non-traditional" backgrounds.

[10] Lead authors: Jennifer Cleland and Sandra Nicholson

A second rationale for widening access to medicine is to improve healthcare provision by ensuring "doctors should be as representative as possible of the society they serve in order to provide the best possible care to the UK population" (163). This assumes that increasing the diversity of the medical workforce will improve healthcare, based on the assumption that "like would treat like" (164). The data supporting this assumption comes in the main from the US, where the approach to WA is race-conscious affirmative action (e.g., see Lakhan (165) for an overview) rather than the class-focused meritocratic activities favoured in the UK.

Additionally, it may be that students who train in more diverse medical schools gain a greater understanding of other people from different socio-cultural backgrounds, and this increases their ability to provide healthcare to people with backgrounds different from their own (e.g., Cohen and Steinecke (166); Saha et al. (167); Whitla et al. (168)).

While the rationales for WA to medicine – social equality and improving healthcare provision – are laudable, data suggests that the efforts to date to minimise the barriers into medicine have had mixed success. Since the 1970s, the UK medical student body has become increasingly diverse when it comes to gender, ethnicity and age. That progress, however, has not been mirrored by a similar change in the socio-economic background of medical students.

"*Medicine … has a long way to go when it comes to making access fairer, diversifying its workforce and raising social mobility... Its success in recruiting more female doctors and doctors from black and minority ethnic backgrounds indicates that with the right level of intentionality the medical profession can also throw open its doors to a far broader social intake than it does at present. ... Overall, medicine has made far too little progress and shown far too little interest in the issue of fair access. It needs a step change in approach*" Fair Access to Professional Careers (126, p.3).

This damning summary is supported by data. For example, in 2010/11, only 7% of successful medical school applicants were from the bottom socio-economic groups compared to about 45% of the working population. This demonstrates no improvement from 2002/3 (126, p.44). Indeed, if anything, the proportion of medical students from working-class backgrounds is shrinking: only 11 percent of respondents in the BMA Medical Students' Finance Survey Academic Year 2010/11 report

a father or other main family breadwinner from a semi-skilled or unskilled occupational class, compared to 14 percent in 2009/10. This reflects the broader picture (169) of student admissions.

It seems that the resources invested in widening access activities have not addressed the disadvantages faced by applicants to medicine from lower socio-economic groups to any measurable extent. To explore why this might be the case, we examine the activities undertaken by UK medical schools to widen access, identify the remaining issues, and make recommendations. First, we used a realist review (14) to provide a synthesis of widening access interventions. We interpreted this with reference to the wider political and social context, which is presented first to frame this section of the report. Our search identified 222 results, screened down to approximately 40 papers in the review.

We also carried out a telephone interview survey with UK medical Admissions Deans and/or a member of the Admissions team. We approached all 32 schools to take part in this survey, of which 28 agreed to take part. We did not hear back from four schools. We were not able to arrange a mutually convenient interview with four of these 28 schools. We interviewed 29 people from 24 medical schools. The schools in the survey represented all four UK countries, graduate entry and undergraduate courses, and varied in terms of number of students, age and location.

With reference to "University Challenge: How Higher Education Can Advance Social Mobility" (170), our findings are presented under the topic headings of:

- Getting ready – reaching out to potential applicants
- Getting in - admissions
- Staying in - retention
- Getting on – student outcomes

Before we present these findings, we consider WA to medicine in context, as this helps elucidate some of the difficulties for potential applicants.

7.3. The social and political context to widening access

It is helpful to consider WA to medicine in context, as this helps elucidate some of the difficulties for potential applicants. The wider literature identifies the main contextual factors as costs/debt, cultural norms and attainment and aspiration, all of which are known to be implicated in decisions whether or not to progress to HE.

7.3.1. Debt

Financial concerns are an obvious issue in making the choice to go to university or not. Government policy assumes that the decision to go into higher education is solely an investment decision where students make upfront financial sacrifices to receive benefits in the long run (better job, higher social status). While this might be the case for "traditional" students, UK students from lower socio-economic class question the pay-off from HE (171); HE costs are seen as a debt not an investment; poorer students are more debt-averse in the first place than students from higher SEC (172); and the fear of this debt is more likely to deter applicants from lower SEC than those from higher socio-economic classes (173). Indeed, Callender and Kemp (139, p.91) state that "*debt aversion is greatest amongst the very students most in need of student loans, namely those from the poorest backgrounds … Ultimately, these groups may be deterred from entry into HE because of debt*". Finally, students from lower SEC tend to prefer universities nearer to home to keep costs down (175,176), which means a double disadvantage for those potential applicants to medicine who live in, for example, remote and rural areas of Scotland where the nearest medical school is hundreds of miles away.

The evidence to date suggests that the new fee level of £9000 has adversely impacted on the HE application rate: in Scotland, Wales and Northern Ireland, the application rates of 18 year olds for study in their own country (ie where home students do not need to pay fees) have broadly continued their recent trends in 2012, but there is a significant drop in applications in England (http://www.ucas.ac.uk/about_us/media_enquiries/media_releases/2012/20120823). At the time of writing this report, the breakdown of UCAS data by subject and applicant socio-economic class was not available so whether there has been any disproportionate drop-off in applications from poorer or less advantaged communities is not known. However, it is unlikely that this change in fees will help the WA agenda.

The upfront costs of medical school look an even worse investment when one brings in the predictions of job shortages in some specialties, oversupply of doctors and insufficient Foundation Programme training places for UK graduates (*The State of Medical Education and Practice in the UK* http://www.gmc-uk.org/publications/13887.asp).

However the Milburn report clearly outlines that whilst upfront fees present a clear obstacle to entry much can be done to better communicate how these financial changes affect students and how the financial burden can be best managed and minimized (159, 168). For example, the decision to link repayment to minimum earnings of £21,000 and over 40% of applicants overestimating the repayment requirements for those earning £25,000, documented within the Milburn report, highlights how such information needs to be better communicated to those that need it most.

In conclusion, the current financial burden of HE is not to be underestimated and applicants to medicine face a longer course and incur greater financial hardship than most students. We need to be realistic about the financial situations of students who may not be able to manage a medical degree due not to lack of ability or aptitude but because of lack of money (177).

Conclusion: Supporting people from WA backgrounds to apply is not enough: providing information about grants and bursaries, minimizing debt and providing financial support is critical to WA.

7.3.2. Cultural norms and aspirations

For students from working class backgrounds, the decision to go to university is not just financial it involves more social and emotional risk than for middle class students (178). The choice is counter-cultural – the progression to higher education is not a tradition in the school or family - and so entails a conscious process of decision making rather than the "non-decisions" typical of middle-class students (179). University is an unfamiliar environment with an alien ethos of "institutional habitus" (broadly meaning the values and ethos of the institution) (179) and, medical school in particular, is seen as "not for the likes of me" (180). Addressing these perceptions and the lack of aspiration which accompanies them is one of the main aims of WA outreach. Indeed, the need to support school pupils to have a more positive view of their academic abilities – in other words,

aspiration - is required to encourage students to continue to HE, even controlling for ability and other student characteristics (181).

Research highlights parent and peer influences and expectations, school climate and teachers, and own capability beliefs are important in considering university, especially in early to mid adolescence (168,182–184). The influences can be subtle: Douglas (1964, cited in DfES (185)) suggests that children are not educationally disadvantaged directly by social class but by lack of parent interest. They may also be negative as illustrated by a quote from our survey about state schools (see Box 4).

Box 4: Influences on career decision making

"[there is] almost complete absence of, of career guidance for people who are, um, who, who are looking at those sorts of aspirational careers. It's just awful. Just rubbish. So, I can see why, um, they [pupils] would feel very unsupported, and, and perhaps not brave enough to, to go for it."

These social influences have been explored in 16 year olds with aspirations to study medicine (186). This paper describes an empirical study based on biographical life narrative interviews with 45 16-year olds from inner London who were considering applying to medical school, drawn mainly from the most socio-economically deprived 25% of the population. Influences on the development of academic identity and medical ambition were identified including: family drive to secure a better future and of education as the vehicle to regaining a high social position; the school, especially the support of teachers; and shared aspirations with friends and peers. The authors also identified that, despite their talents and ambitions, many students had important gaps in their knowledge of the application process and lacked sophistication in the "admissions game", emphasizing that even very able and motivated students require support to apply for medicine (see Kamali et al. (187)). This work is particularly interesting because of the contrasts found between this group and underachieving students who give up on education (e.g., Cote and Levine (188)), where, for example, the peer group can destroy any academic aspirations (189). Indeed, we often fail to take into account the fact that young people from lower-SEC may have priorities other than education (190,191).

These studies raise the question: to whom should WA activities be directed? If social influences are dominant to individual agency in determining life chances, then should WA interventions be directed

to groups (e.g., peers, school year groups, teachers) rather than individuals? We cannot provide answers to this question other than to call for more research into the influences on aspiration to study medicine as knowing more about this may identify where to target specific interventions.

Conclusion Choosing to study medicine entails a conscious process of decision making and the confidence to take social and personal risks by entering into an alien environment.

7.3.3. Aspiration versus attainment

Following on from the above, widening access is not just about inspiring youngsters with the appropriate qualifications to apply for medical school. It is also crucial to address the gap in attainment between lower and higher socio-economic groups of students. The literature is unequivocal: pupils at fee-paying or independent schools achieve better grades than those at state schools, and factors such as family, culture and environment are the most important factors in attaining the qualifications for entry into HE (e.g., Gorard et al. (192)). Young people from lower socio-economic groups achieve fewer A-levels, have lower rates of staying on at school post-16, achieve fewer GCSEs and have lower attainment at Key Stage 3 (193). Chowdry et al.'s (194) analysis of administrative data for approximately a million English school leavers found the difference in university participation between pupils from lower and higher socioeconomic class (SEC) backgrounds does not emerge at the point of entry to HE. Instead, it comes about largely because lower SEC pupils do not achieve as highly in secondary school as their more advantaged counterparts, confirming the general trend in the literature that SEC differences emerge early in life, and indeed increase during the primary schooling years (195). Their work also highlights the potentially important role schools (an environmental variable, see Gorard et al. (192); Howard (196) play in encouraging – or not encouraging - pupils to apply to high status universities.

Not achieving the required grades may be as much, if not more of, a limiting factor in WA to medicine as social (aspiration, cultural norms) and structural (e.g, admissions processes) constraints. However, the picture is even more complex. First, if disadvantaged pupils feel that HE is not for people like them (e.g., Maras (197)) then their achievement at school may simply reflect anticipated barriers (why bother?) rather than the other way around. Second, prior attainment does appear to influence performance at medical school (see earlier and McManus et al. (3)) although the

relationship between prior attainment and performance as a doctor is less certain. For example, the Schwartz report (198) cites evidence that all things being equal, students from state schools perform better at undergraduate level than students from public schools.

Conclusion: Inequality of access is due to broad societal and economic issues of inequality which start early.

7.4 Getting ready

Pre-entry interventions tend to focus on providing more information on the recruitment and selection process, and to inspire pupils to aspire, particularly to medicine and the other professions (e.g., Unleashing Aspiration: The Final Report of the Panel on Fair Access to the Professions (199); Gateway to the Professions Report (193)). This approach is based on a "deficit model" (192,200), the premise that young people from disadvantaged backgrounds lack the necessary knowledge, skills and/or qualifications to successfully apply for university. Other approaches to WA include affirmative action (quotas and percentage plans, and targeted recruitment) as pursued in the USA and upheld by Grutter v. Bollinger (539, U.S. 306; 2003) as constitutional (see Lakhan (165) for discussion), but not pursued to date in the UK due to the UK emphasis on meritocracy (but see later).

Pre-entry interventions are typically outreach or inreach activities of low- or high-intensity. Inreach initiatives, such as university open days and residential courses, provide student participants the opportunities to experience some aspects of undergraduate life and curriculum, meet staff and explore the university campus. These interventions aim to provide students with information, guidance and samples of university experiences to raise aspirations and develop appropriate expectations of university life. Outreach activities are where HE institutions, sometimes in collaboration with specific WA organisations, deliver talks, planned activities and conferences aimed to provide information, advice and guidance (IAG) upon HE choices, university degree content, and matters pertaining to students such as finance.

High intensity interventions also take various forms. There are: student mentoring schemes involving undergraduate students, preferably originating from local schools, who return to support school pupils in their HE applications; and Foundation/extended degree programmes or feeder courses that allow students who meet specified WA criteria to develop the necessary knowledge, skills and requirements to enter the medical course. Those who fulfil pre-determined criteria while on these programmes are often guaranteed an interview or place at the linked medical school.

It is clear from our survey and the grey literature reporting WA activities in medicine, and across HE, that most medical schools are engaged in a number of WA activities. These range from "stand-alone" activities, such as sending medical students out to local schools and Taster Days, as well as

engagement with university-wide, national or multi-university activities, such as “Aimhigher” a collaborative programme which aimed to widen participation in HE in England by raising awareness, aspirations and attainment among young people from under-represented groups, particularly lower socio-economic groups and the disabled. A further example is Reach Scotland, a national project that aims to raise awareness of and to encourage, support and prepare secondary school pupils from s4-s6 wishing to pursue a professional degree. Some medical schools also run quite specific WA activities, targeted at particular local groups, such as the University of Glasgow Medical School’s work to engage young Muslim women (see Langlands (193), for details of this and a number of other initiatives).

As well as being engaged with a multitude of WA activities, the activities are often themselves multi-faceted, involving a number of inreach or outreach, low- or high-intensity components (e.g., school visits; organising an Open Day, which may include a number of didactic and interactive events; mentoring usually by early year medical students themselves who provide advice and assistance concerning work experience opportunities and completing application forms; and practical insight into what it means to be a medical student and experience of their educational activities. Responses to our telephone survey indicated that some medical schools’ WA activities tended to identify potential future students and then follow them up over the next three or four years prior to commencement of degree. More intense support was organised at strategic points e.g. workshop to helping with completion of UCAS forms/personal statements and workshops on interview preparation, as per the following quote from our survey *“telling them about what they need to do, helping them, ah, get interview practice and all this kind of stuff...”*

In terms of literature reporting outcomes from pre-entry or “getting ready” interventions, Miller and Smith (201) carried out a qualitative evaluation of low and high intensity interventions such as campus visits and the Associate Scheme of Aimhigher respectively. The low intensity interventions were very positively received, and did result in a large proportion of pupils making careers appointments. On the other hand, the Associate scheme, with 50 pupils involved at a total cost of £40,000, had mixed reviews. There were difficulties recruiting mentors and some schools reported that the scheme was disruptive for school life, but mentors made the greatest impact in helping pupils apply for places on Summer Schools. Whilst in principle mentoring was highly valued, low and medium intensity activities were favoured by schools and young people, and were obviously more cost-effective.

Another study provides useful information concerning the socio-demographics of the students studied and their preferences in types of IAG interventions. Maras (197) reported on the second stage of a three year longitudinal study involving 3,570 students aged 13-18 in a London Borough, looking at the type and impact of widening participation activities on the attitudes of students towards HE. Using a qualitative questionnaire survey, she found that young men participated in more IAG activities whilst young women preferred mentoring activities.

As illustrated by the above two papers, our review of academic and practitioner literature revealed mostly descriptive papers outlining a variety of initiatives, most limited by their small scale and restriction to an individual institution. Published research that evaluates any effects of pre-entry interventions other than qualitative attitudinal studies (e.g., how participants felt about the experience and their view of its impact[11]) is limited. Several years on, the conclusions of a HEFCE-funded review led by Gorard *et al*. (192) which laments the paucity of evidence that such outreach interventions make any difference to widening participation in the short term mainly because any evaluation methods used are small scale, pertaining only to one institution, mostly qualitative in nature and designed to assess participants' attitudes and views rather than any increase in application or admission rates to HE, are still pertinent (see also Thomas (202)). Moreover, our survey confirmed that published research is not the norm: most of the medical schools engaging in WA activities are not carrying out robust evaluations of their WA activities.

Fortunately, there are a few better quality studies. Kamali et al. (187) reported a higher success rate of receiving offers of a medical or dental school place for students who had been mentored (a high intensity intervention) by undergraduate students over a 10 month period and received assistance with completing their UCAS applications (as opposed to being simply advised about the importance of describing work experience and voluntary activities within their personal statements). This retrospective study provides some evidence that mentoring may be more effective than simply the information, advice and guidance (IAG) approach. However, Kamali et al. (187) found a rising

[11] For example, the taster days designed and delivered by Leeds medical students reported feedback that the high school students had enjoyed the practical nature of the day and more than 85% stated they were more likely to study medicine as a result (263).

trend in offers with both the high (mentoring) and low intensity (IAG) interventions they reviewed, suggesting that the impact of low intensity interventions is not to be dismissed.

Chilosi et al. (203) measured the effect of an Aimhigher partnership (http://www.aimhigher.ac.uk) on compulsory schooling attainment, HE applications and HE entries using robust statistical analysis. Their results suggest that Aimhigher had a positive impact on GCSE results and, especially, HE applications and entries, and that being targeted by Aimhigher was associated with an increase in the probability of entering into HE in general by about four percentage points.

Another approach to pre-entry WA activity is the Foundation Year. Foundation Year programmes address the issue that not achieving the required grades may be as much, if not more of, a limiting factor in WA to medicine as social factors such as aspiration and cultural norms (e.g., "*But no one in my family has been to University*" (197)). Garlick and Brown (204) report on the extended medical degree programme (EMDP) at King's College London. This programme takes six years rather than five because the content of the first two years of the conventional course is spread over three years to produce gradually increasing workloads. Eligible candidates must have attended state school in an educationally deprived borough of inner London. Students are accepted with lower grades than those required for entry into the conventional course, and assessed for their potential to study medicine by aptitude test and interview. EMDP students are integrated with the conventional students from the beginning, but in their extra available time they receive a package of additional support (discussed in more detail later in this report). The three predominantly clinical years are completed in the standard time. This scheme has run since 2001 and graduation rates are similar to those of the conventional course students. The King's College EMDP is an example of a WA activity which addresses socio-economic disparities in attainment rather than solely targeting issues of awareness and aspiration.

Providing a pre-entry year was described by schools as a means to reduce entry grades but also to provide support ……For example, one medical school in our survey reported: "*We also have up to six places on a pre-medical year … designed for local school kids. .. we dropped the academic requirements for that … the interview score requirements, um, so they have another year to, to prove themselves, and raise their game.*"

The King's EMDP is also an example of best practice in its implementation and reporting of formalised, ongoing support once the students join the main programme (see later).

Foundation or extended degree courses are provided at a number of other medical schools. Mathers et al. (205) analysed anonymised data from the Universities and Colleges Admissions Service (UCAS) pertaining to 34,407 UK medical students admitted to university in 2002-6. The study concluded that Foundation Programmes are effective and have increased the proportion of medical students from under-represented groups but numbers are small and the costs are high. Moreover, our telephone survey indicated that Foundation programmes and other WA activities appear to be less well established at the more selective universities. This is in line with Harrison (206) who reported on data published annually by the Higher Education Statistics Agency that seeks to evaluate the effects of the 2004 Higher Education Act (that introduced variable tuition fees, expanded student grants, discretionary bursaries and OFFA, the Office for Fair Access). He concluded that, while there is some evidence for modest improvements with increased participation from young people from state schools and colleges and from lower socio-economic groups, these progressions have been concentrated outside the 'top universities' and, by implication, also outside Medicine. He comments that: "*The Russell Group institutions' reputation for excellence, however, does not extend to their performance in social inclusivity*" (171, p.450). The paper, and others (e.g., Gallacher (207), highlights that these institutions have seen slippage relative to the rest of the sector in terms of widening participation.

Overall, the data indicates that pre-entry WA activities do affect the applications and admission of WA students. Difficulties remain however in terms of identifying what works and what does not work due to unscientific approach taken in developing and evaluating WA activities. There are a number of issues related to the difficulty of standardising design and delivery, sensitivity to local context, the organisational and logistical difficulty of applying experimental methods to service or policy change, and the length and complexity of linking intervention with outcome. For example, much attention has been devoted to the importance of applicants attaining medically related work experience prior to medical school. Reasons for this are that such experiences facilitate students understanding of what a career in medicine may entail, moderate their expectations and help guide their choices of HE bearing in mind their own strengths and weaknesses. However, only one of our papers (187) specifically details how pre-entry advice and assistance was given to school students concerning medical work experience. If this information is not directly reported, there is no way of

measuring the impact of this activity (advice) on outcome. This finding opens a broader discussion on "who you know" and social capital. Students from non-traditional backgrounds frequently do not have the sophisticated knowledge and networks required to arrange work experience themselves and may also struggle to access more formalised schemes, thus potentially missing out on this aspect of preparation for medical school application and selection. If the gains from work experience are unclear, the use of work experience as a criterion in the selection process (see later) seems doubly unfair in terms of disadvantaging some students.

The case study presented below provides a useful illustration of a typical and seemingly successful WA activity for medicine which could be defined as a complex evaluation where the respective value of different parts of the initiative cannot be identified due to the design of the intervention.

Case study: Universities of Bradford and Leeds

In 2001, the Universities of Bradford and Leeds bid successfully for additional medical student numbers, with 40 new places being reserved for students transferring to the MB/ChB course at Leeds from a new Clinical Sciences course at Bradford. One of the key aims of the partnership was to widen participation and support different kinds of students entering medical training.

To this end, typical outreach interventions such as conferences, taster sessions, focus days and lessons with local schools involving medical students and Widening Participation Co-ordinators from both campuses were used to raise awareness and encourage applications to Medicine. Data regarding the socio-economic and ethnic backgrounds of both Clinical Science students and traditional entrants to the Leeds MB/ChB course were examined and the students attending the Clinical Science course were found to have socio-demographic characteristics compatible with coming from non-traditional backgrounds associated with Medicine. 40% of first-batch graduates from the 1- 4 year course took up places on medical courses in the UK.

Whilst the Leeds/Bradford partnership appears to be indeed successful it is difficult to disentangle which aspects of the initiative are responsible for widening participation and one might argue that all three approaches are required. Moreover, the outcome of transferring students from the Clinical Sciences degree programme onto the MB/ChB was unreported (208). The authors also comment that Bradford is one of the most socially inclusive universities in the UK providing strong student support, personal mentoring and an institutional habitus that welcomes non-traditional students.

This study is therefore evaluating efforts to widen participation to medicine on several different levels; successful outreach, what could be called an additional foundation year and supportive initiatives in retaining students.

These difficulties in developing and evaluating widening access interventions can be addressed. Pre-entry WA interventions are fundamentally complex interventions – that is, interventions with several interacting components – in health and social care. A standard approach to developing and evaluating complex interventions has been in place since 2000 (Medical Research Council, 2000; updated 2008 (209). This guidance is applicable to educational evaluation and research and its use for these purposes has been proposed by several authors (e.g., Cleland et al. (210); Ringsted et al. (211)).

Our review also highlighted that most WA activities target secondary school pupils, most often those aged 14-16 years. This is too late. Outreach activities are needed to raise aspirations and provide knowledge and understanding of the admissions process and medicine but addressing class barriers to attainment must be targeted pre-school and in the early years of school not at secondary school level when social class inequalities have increased even further (195). Data from the survey indicated that participants were aware of the importance of early outreach: *"And we, we realised that actually ***** [outreach programme] is all well and good working in year nine but we, we, we need to get in there sooner and plant little seeds."*

7.4.1. Getting ready – mature students

At the other end of the spectrum, a specific issue pertinent to medicine is widening access for mature students. Graduate entry only degree programmes were introduced to widen participation and diversify the medical workforce.

Whilst there is some evidence that initial entry to some programmes served this function (164) larger scale population based cross sectional analysis conclude that these initiatives have not led to significant changes to the socioeconomic profile of the UK medical student population (205). This conclusion reflects international patterns: a recent review of Australian data suggests that graduate

entry to medicine programmes may end up drawing from the same pool of students only following graduation from usually a science degree (212). Searle (212) comments: "*it is important not to conflate graduate medical education with diversity*". Moreover, it is difficult to reliably measure socio-economic class in graduate/mature students. The studies quoted (164,205) use forms of residence (e.g., postcode) which probably do not accurately reflect the socio-economic class of a graduate applicant (e.g., as the postcode may be that of the applicant's parents, or of a temporary residence). Good quality longitudinal research needs an alternative robust method of identifying how best to measure socio-economic class in mature applicants to medicine.

Evidence suggests that mature learners are disadvantaged due to over-reliance on school qualifications in admissions procedures and by being "missed" by WA initiatives which tend to be targeted at those already in education (213) (but see case study below).

In short, the studies reviewed indicate that, whilst graduate programmes and targeted Foundation Programmes may contribute to some degree to the diversity of the medical school population (e.g., the average age of applicants will obviously be older), the need for other strategies to widen participation remains (214). Of interest, however, is the finding from Mathers et al. (205) that traditional courses run at newer schools seem to attract a different type of student: older and more likely to be white and from a less affluent family background than students on traditional courses at established schools. The authors reflect that this may be as a result of institutional policy differences and our own research indicates that this is reflective of wider national patterns of HE (215). More research is required in ascertaining the effect of an institutional habitus on the application numbers and admission of non-traditional students to medical schools.

Eight years' experience of widening access to medical education

Holmes (216) reported on a one-year, full-time widening access to medicine course that prepares mature adults for entry to selected UK medical schools. The course was developed in co-operation with the University of Leicester Medical School. Not only was this course successful in supporting an increased proportion of mature students progressing into medical school over a four year period, there was also a higher than expected proportion of students from socioeconomic groups IV and V. Progression to medical school has increased steadily from an average of 64% to an average of 85% over three years. However, the numbers are small, the data reported is now over 10 years old and pre-dates the changes in medical training introduced in 2007.

Conclusions: Getting ready

The evaluation of pre-entry interventions on applications and admissions is hampered by a lack of robust qualitative and quantitative data with stated reliability and validity descriptors.

However, there is probably sufficient evidence that these interventions do affect the applications and admission of WA students, but, in medicine, numbers are small and have not impacted on the socio-demographic profiles of medical school populations in any measurable way.

One of the strengths of pre-entry initiatives is in terms of social accountability – activities are usually designed to encourage local populations to apply for medicine via links with schools and colleges.

Pre-entry activities tend to focus more on aspiration/information, advice and guidance, less on addressing socio-economic disparities in attainment (but this is not always the case), and neglect mature entrants.

When considering designing pre-entry widening access interventions, one size does not fit all and different types of intervention are probably required for maximal effect.

No scientific approach is taken to planning or evaluating WA interventions – what works best, for whom and when is unknown.

Recommendations:

WA pre-entry activities can be viewed as complex interventions and as such should consider guidance from other research contexts as a basis for planning and evaluation. Following this guidance would address the issue of poor data reporting.

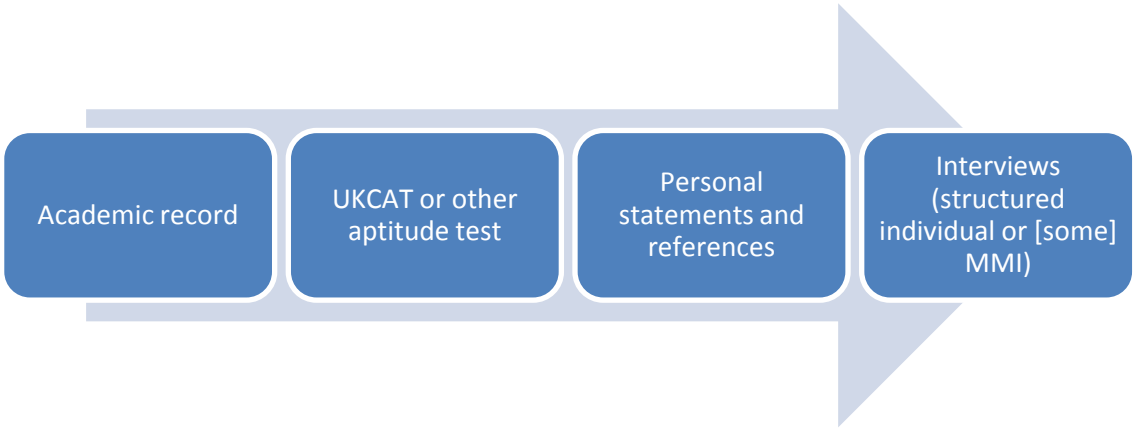
Interventions should be designed for, and targeted at, primary school pupils, their families and schools, as well as older pupils and mature applicants.

The impact of different types of intervention, including systems for facilitating work experience, on different groups must be evaluated. Until this information is available, both low and high intensity interventions are recommended.

7.5 Getting in

Widening access remains an issue at point of entry. It is not just that the higher socio-economic classes dominate medical applications, but this dominance is even more pronounced when it comes to acceptances. Indeed, the proportion of acceptances to medical school coming from socio-economic class I was almost twice that of acceptances to all other degrees from class I (217). There are clearly barriers to getting in to medical school for those WA students who are potential applicants. The barriers at this stage are discussed below.

Our Admissions Deans survey and the earlier GMC mapping exercise identified that most UK medical schools use a combination of the following for selection:



A description of the processes used at each medical school is openly available on the institutional web pages. However, transparency is not just about what order in which processes are used, but how they are used. Our survey and previous research identified that medical schools weigh selection processes differently, sometimes with unclear rationale and are hampered by a limited evidence-base to their approaches. For example, most UK medical schools use the UKCAT, a test of aptitude, as part of their selection process and alongside Adam et al. (218) we found a considerable variability in the use of the UKCAT which has evolved initially on the basis of practice rather than evidence.

This variation in practice is not unique to the UKCAT: schools also vary in their use of, and the weighing they give to, other parts of the selection process such as personal statements and references. The latter is important as while many medical schools do provide an overview of their

process on the Admissions website, they do not always state how much weight is given to each component. Applicants may not know, for example, how much their performance at interview will contribute to their chances of success. We reviewed the UK Medical School websites during the timelines of this project. All schools provided information on the steps involved in their process, but it was rare for a website to present concrete guidance on the weight given to each method. However, see the University of Aberdeen (219) for an example of good practice in terms of transparency. This variation in how similar admissions processes are used may explain, at least to some extent, why different medical schools select different student populations. For example, Cleland et al. (220) identified that students at the five Scottish medical schools differ by country of birth, age group and ethnicity. For example, Aberdeen had the highest proportion of mature students; Dundee the most home students, Edinburgh the most students from the rest of the UK, St Andrews the most overseas students. There was, however, no significant difference across the Scottish medical schools in terms of the socio-economic backgrounds of their student populations (see later for further discussion of the differences between medical school student populations).

It is argued therefore that varying selection practices may influence which applicants get into different medical schools. For example, Tiffin et al. (24) concluded that how medical schools may use the results of candidates' UKCAT scores may lead to more equitable provision of offers to those applying to medical school from under-represented socio-demographic groups. Their prospective cohort study examined data available on advanced qualifications and socioeconomic background of 8459 applicants (24 844 applications) to 22 UK medical schools in 2009. The main outcome measure was the increased probability of an application resulting in an offer of a place on a medicine course according to seven educational and socio-demographic variables and depending on how the UKCAT was used by the medical school (in borderline offer cases, as a factor in admissions, or as a threshold for usually interview). Candidates from several under-represented groups applying to medical schools that used a threshold approach to the UKCAT were less disadvantaged than those applying to the other institutions in the consortium. Importantly these effects were also partially reflected in significant differences in the absolute proportion of such candidates finally taking up places in the different types of medical schools. For example "stronger" use of the test score (as a factor or threshold) was associated with a significantly increased odds of entrants coming from a low socioeconomic background, additionally there was also a non-significant trend towards entrants being from a state (non-grammar) school where a stronger use of the test was employed. They concluded that the UKCAT seems to be a tool that has the potential to produce a more level playing

field for many of those seeking access to the medical profession. This emphasises the importance of monitoring not just what selection processes are used but how they are used.

The above discussion has focused on use of the UKCAT because this is a new method of selection into medicine in the UK and hence has been subject to much academic scrutiny. UKCAT also has as one of its aims widening participation. The strengths and weaknesses of each of the common admissions processes is discussed in detail earlier in this report and will not be reiterated here. However, the Tiffin et al. (24) paper clearly shows that the way in which selection processes are used is relevant to WA.

While the precise implications of these different approaches to selection are unknown in terms of their impact on who is selected, the wider literature offers some insight into potential pitfalls. First, given that pupils at fee-paying or independent schools achieve better grades than those at state schools (e.g., Gorard et al. (192)), admissions processes which focus heavily on academic records (A levels, Highers), as is the case in medicine, run counter to the principles of widening access. However, the picture is complex: prior attainment influences performance at medical school (3,221)(see earlier) but, all things being equal, students from state schools perform better at undergraduate level than students from public schools (e.g., Universities UK (222)). Moreover, the system does not enable the teasing out of subtleties such as the interplay between class and school for able pupils who obtain scholarships to attend a fee-paying school or academy.

Foundation programmes (see "*Getting ready*") are one solution to addressing inequalities in attainment. Another approach is the use of contextual data in the admissions process. Contextual data means setting an application in its educational or socio-economic context, such as acknowledging the type of school attended. Supporting Professionalism in Admissions (SPA) has produced an extensive report that outlines the rationale, possible methods and outcomes where available of the use of contextual data in the university admissions process (223). For example, the Admissions to Higher Education Steering Group (163, p.7), the Panel on Fair Access to the Professions (199) and, most recently, University Challenge: How Higher Education Can Advance Social Mobility (170) call for all UK Universities to take into account the educational and social context of pupils' prior achievements when making their admissions decisions. The British Government has encouraged universities to make greater use of "appropriate contextual criteria" in

their admissions procedures (190, p.10), to level the playing field and to recognise the link between potential and prior achievement requires more than just looking at A levels/Higher.

While this is laudable, the use of contextual data in practice has been contentious and there is a paucity of published academic literature concerning its use or evaluation of any outcomes. Universities which have used contextual data in Admissions have faced negative media pressure due to the perception that the use of contextual data is perceived as "affirmative action" where applicants with lower grades are selected over those with the required grades. Indeed, Adnett et al. (225) found that making lower offers to some applicants than to others to achieve a mixed student body is seen as more unfair now than in 2004. Few Medical Schools refer to the use of contextual data in admissions decision making on their websites or other prospectuses, possibly for fear of being seen to be dropping standards, risky in these days of universities being judged on the basis of league tables which may be brought down by admitting students with lower academic achievement. That the use of contextual data is controversial is illustrated by one quote from our survey: "*there's maybe two reasons for not gaining that level of competence. Either they (the applicants) have not had the opportunity or they are not that competent".*

However, our survey identified that contextual data (typically parental profession and school) is frequently used in decision making – but there is no standard approach to how it is used. Different medical schools weigh contextual data, and different types of contextual data, idiosyncratically, and have different attitudes towards its use (see Box 5).

Box 5: Quotes from the Admissions Dean's survey: the use of contextual data

"We have what are called contextual data flags for our candidates … they're the ones who are not formally in the [Access Programme] but who are given preferential treatment in the sense that the UKCAT score threshold is reduced."

"I think the issue of whether we should use contextualised data or not … it's something that I personally have a dilemma with. Because it's very difficult to make places available when it means that someone else who, perhaps, has the grades … doesn't get a place based on the school they go to."

In short, there is no standardised or universal approach to the use of contextual data. Our impression from the survey is that many – but not all - schools believe the use of contextual data is appropriate but are struggling to know *how to* do so as there is no available guidance on best practice. They do not know if postcode or school or parental income or individual circumstances, or all of the aforementioned, should be used in their Admissions process, and how this should be used in an objective and defensible manner. Similarly, the survey highlighted that the selection processes were used by medical schools as much to manage an overwhelming number of applications as to identify the best candidates for medicine. Participants stated that traditional selection processes are challenged by A level inflation and academic record is potentially no longer a means of identifying the best applicants, but they were struggling to know how to do so. Part of the issue seemed to be a lack of clarity over the purpose of selection to medical school. Is this to let in the best medical student, or the best doctor, or to exclude undesirables? Our impression from the data was of Admissions Teams trying to do their best in terms of fairness and due process but who wished for more guidance and support in how best to manage the selection process.

Conclusions: Getting in

Widening access is not just about inspiring youngsters with the appropriate qualifications to apply for medical school. It is also crucial to address the gap in attainment between lower and higher socio-economic class students at the point of selection.

The methods used for selection may conflict with the principles of widening access and incentives to WA are few.

Complex weighting systems used in selection lacking transparency may disadvantage particular groups of candidates further.

The use of contextual data is one mechanism to correct for socio-economic disparities in educational attainment, but there is no current guidance on best practice.

Recommendations:

Statistical modelling studies are needed to explore impact of different weighing of different admissions processes on widening access. This requires data on unsuccessful applicants as well as those given offers to identify patterns.

Qualitative and longitudinal studies evaluating the use of contextual data are essential to provide guidance on its use.

Medical schools need guidance such as a common statement of support for the use of contextual data which will be legally defensible.

Quotas (ring-fenced additional places) for non-traditional medical students, as per the USA and Australian systems for specific ethnic and indigenous populations, may be worthy of consideration.

More research is required in ascertaining the effect of institutional policy differences, or institutional habitus, on the application numbers and admission of non-traditional students to medical schools.

7.6. Staying in: the experiences of students from widening access backgrounds

Our review has identified that research has concentrated on the views and attitudes of potential applicants to medicine (226–228) or investigating whether widening access interventions increase application and admission rates whilst almost ignoring the experiences of WA students once they have reached university or medical school (e.g., Greenbank (229); Thomas (202)). While it is important to have some insight into how successful a university is at attracting applications from WA participants and supporting these applications, it is also necessary to know how successful applicants fare to fully assess WA. For example, if a high proportion of WA students leave within the first year, WA has failed.

Across HE the "drop out" rates are higher for students from non-traditional backgrounds and thus the Universities with the most success at widening participation also have the highest drop-out rates (215). Progression and retention are linked to a multitude of factors including debt, poor performance and "not fitting in". We shall discuss each of these in turn.

Many of those from lower SEC worry about entering HE because of uncertainty about their ability and commitment to complete a degree (230) and more students from WA backgrounds drop out of HE (e.g., Higher Education Statistics Agency, 2009-10 data). High retention and graduation rates in medicine, relative to other programmes, provide positive signals. However, the information WA students require is not average rates but retention and non-completion for entrants similar to themselves (231). The evidence also suggests that poorer medical students leave university with more debt, possibly because of less financial assistance from family towards the costs of university and/or restricted ability to earn during term-time and vacations compared to students undertaking other courses due to the nature of medical degree programmes (longer terms, placements) (BMA Medical Students' Finance Survey Academic Year 2010/11). Conversely, students who get money from their parents are much more likely to gain good university examination results (232). There are messages here in terms of role modelling and peer mentoring (180) and for ensuring medical degree programmes are structured so students who cannot progress, particularly for non-academic reasons such as financial ones, can leave gracefully with clear gains.

The literature on grants/bursaries and loans is of relevance here. The award of a bursary has a positive psychological impact by way of reducing students' fear of debt; students who receive bursaries are more likely to complete their first year successfully than non-bursary students from low-income backgrounds; grants have a positive impact on the enrolment of low-income groups; bursaries ease the transition into HE (233–236) and financial incentives for students to undertake HE study in the country in which they are domiciled seem to disproportionately benefit non-traditional students (237). In contrast, student loans have a negative impact on the enrolment of low-income groups because they constitute debt (e.g.,Heller (236)). In short, the abandonment of grants for loans perpetuated the differences between rich and poor and reduced social mobility.

Bursaries are available for students from WA backgrounds but OFFA (238) data shows that much of the available bursary funds are unclaimed. Why is this? Decentralised bursaries are complex, differ dramatically by institution, and place a complex decision making burden on those who are least likely to have the knowledge and/or support to work through the complexity (233). In short, bursaries are a lottery in the current format.

If loans are a disincentive, and bursaries a lottery, the challenge to find a model of student funding that acts as an incentive to widening access remains (172,239). Evidence, again from the US, suggests that properly designed grants – not loans – are effective in increasing access for low-income students (240), while, in the UK, Adnett and Tlupova (241) argue for a centralised system of bursaries to make the bursary process manageable for potential applicants. Evidence from the US suggests that merit-aid (on the basis of prior academic performance) has more of an impact on widening participation than needs-aid (on the basis of low income) (242) but this has not been explored in the UK context. To do so, however, requires careful methodological consideration given prior academic performance is influenced by socio-economic class/schooling in the UK (243)(see earlier).

"Drop out" rates, while very low in medicine, may also be due to academic performance (failing summative examinations) or "not fitting in" (see later). Arulampalam et al. (244) analysed routine administrative data from over 50 000 students in 21 UK medical schools. They found the overall average dropout rate to be 3.8%. They found no relationship between social class and previous schooling on dropout probability in the first year of medical school. It is difficult to extrapolate any current messages from this data, however, as the data analysed was from 1980-1992 and A level

grades have inflated and financial constraints increased since this time. Moreover, data from our survey indicates that WA medical students are perceived as more likely to fail than traditional students, and schools perceive that they take a risk in terms of taking on WA students given "drop outs" mean financial penalty. A quote from our survey illustrates this point: "*the access students have got an increased risk or not completing … that's fine as long as you can sort of factor it in. But the current system doesn't really encourage that... if a student drops out, the university loses out financially… you're put in the position to recruit the people that are most likely to succeed*". Thus, the system of tightly controlled medical student numbers linked to reimbursement – and penalties for going over or under numbers - may be considered as not supporting WA.

Other evidence indirectly indicates that students from WA backgrounds require ongoing support to perform to the best of their ability. Garlick and Brown's (204) review of students on the extended medical degree programme (EMDP) at King's College London indicated that the success of this programme was at least partially due to the ongoing support EMDP students received. This included extra teaching, mentoring, personalised learning programmes and formative assessments over a two year period. Their data indicates no difference in examination results between EMDP students and those on the conventional course, although the retention rate of EMDP students is slightly lower than compared to students on the conventional programme (90% versus 97%). The programme is extremely expensive (estimated at £190, 000 per year). While this picture is very encouraging it does not provide insight into the experiences of WA students who enter a conventional degree programme where they are treated like any other medical student. The mature students on the WA foundation course reported by Holmes (216) did appear to perform successfully once studying medicine but little data was provided. However, anecdotal evidence from medical schools suggests that WA students may underperform without ongoing support. This aligns with the broader HE literature: Pugh et al. (231) report that WA students may need more teaching and learning support once at university, traditional students are less costly to recruit, teach and retain (245) and those universities with the most success at widening participation also have the highest drop-out rates (215). However, it is of note that the monitoring of course performance to evaluate the reliability and validity of admissions decision making is questionable as there are inherent sample selection problems associated with this approach (225). It is also important, therefore, to look at the experiences of students from WA backgrounds who are successful in their application to university and medical school.

What is clear from various studies (226–228) is that non-traditional students who apply for university diverge from their familial and institutional (school) norms and may struggle financially and identify issues with medical student socialisation,, the latter particularly in terms of re-constructing their class and other social identities, and not feeling good enough for university (e.g., Leathwood and O'Connell (246)). It is not unreasonable to assume, therefore, that for some medical students from a WA background, the incongruence between their perceptions of medicine and developing a professional identity remains on entering medical school.

Case study

Data provided for this report from the University of Glasgow highlighted that staff perceive that mature students, who are not direct from school, have more complex lives due to additional responsibilities and more developed family and personal relationships and roles. These can have practical implications in terms of the long hours and often long distances to placements inherent in the medical programme. There are also issues of debt and the impact of debt on personal and family life. The transition into medicine, in terms of socialisation, seems different for this cohort of students.

Unpublished evidence from a London university by Nicholson suggests that medical students from lower socio-economic groups initially struggle more in developing the appropriate attitudes and behaviours associated with an effective medical habitus (247,248) that are commonly accepted within the medical culture and facilitate students' progress. This study indicates that students from lower socio-economic groups tend to have financial constraints (see earlier) and fewer if any medical contacts before entering medical school which reduces their accessible resources both before and whilst at medical school. They tend to initially network less effectively with other students and faculty and this in turn reduces their capacity to increase their resources. These students are not familiar with, and so have to learn how to engage with, medical staff in ways which foster academic advantage and facilitate their understanding of how to fit in and maximise their learning in clinical settings. Conclusions from this small London study are that non-traditional medical students do learn these habits and graduate successfully but find initial participation in clinical settings more challenging.

The broader literature also provides relevant messages. Kettlewell et al. (249) report on a small longitudinal study that features two successive cohorts of successful university applicants who felt they benefited from the Reach for Excellence (RfE) programmes (which provided a typical combination of low level interventions). Participants valued the encouragement they received to apply to university and importantly what to expect when there. Retention was reported as high and performance good. Participants valued aspects of the interventions that facilitated meeting other people, subject-specific sessions and financial advice. This study had high stakeholder acceptance and while the methodology employed no control, it presents valid data concerning what students value and, importantly for this section of the report, continue to value after admission to HE.

A study of six English HE institutions which performed above their benchmarks with regard to WA and also student retention and completion found that the key institutional factors in achieving this success were a strong policy commitment to access and retention, backed up by practical action (250). The practical actions which seemed to be important were: a friendly institutional climate, support in the first year of study, emphasis on formative assessment early on, recognition that learning has a social dimension, and a student-centred attitude. While these data are not drawn from universities with medical schools, the data has intuitive appeal and the factors identified as important merit further investigation in medicine, particularly when considered together with other data which indicates that different medical schools may attract different types of student (205,220).

Taken as a whole, this data suggests that WA students are qualitatively different from traditional medical students and may have greater support needs, in terms of individual support and a supportive institutional ethos, and in terms of financial needs, which may all contribute to a picture of additional costs to support WA students. Moreover, providing support for these students is not likely to be straightforward. A useful comparison is that of free school meals. More than a quarter of children entitled to free school meals do not take them up because of not knowing they are eligible and/or fear of being stigmatised, but changes in the system which made school meals the norm encouraged take-up by the original target groups (251). These issues may also be pertinent in the context of support provision for particular groups of students at medical school. Further research is required to explore how best to provide support to WA students.

Conclusions: Staying in

There is some evidence that WA medical students benefit from ongoing support but this requires further exploration.

Supporting people from WA backgrounds to apply to medicine is not enough: minimizing debt, providing financial support and appropriate targeted financial information is critical to widening access and reducing the deterrent effect of financial burden.

There is little research describing how WA students engage with the sociocultural aspects of becoming a doctor, or comparing the similarities and differences between WA and traditional students in this process.

There is insufficient available data to make any conclusions about retention, performance and the student experience in medical students from WA backgrounds.

Recommendations:

WA initiatives must be evaluated not only in terms of application and selection processes but also in terms of the student experience. This requires qualitative and longitudinal studies, and data reporting on student experience, performance and support needs.

Widening access to medicine requires making available a transparent and straightforward system of financial support.

The impact of financial aid on WA student numbers and progression should be monitored via routine data (admissions, assessment, and performance) and exploratory methods (e.g., student views and attitudes).

Further study into the experiences and help required by medical students from non-traditional backgrounds once enrolled is imperative to better inform us of what may be required pre-entry.

Medical degree programmes should be structured so students who cannot progress, particularly for non-academic reasons such as financial ones, can leave gracefully with recognition of their achievements to date.

7.7 Getting on

This section refers to what happens to students when they leave university. In terms of WA to medicine, it is useful to consider gains for the profession as well as individual gains in terms of social mobility.

There is the assumption that increasing the diversity of the medical workforce will improve healthcare, as "like would treat like" (164). The data supporting this assumption comes in the main from the US, where the approach to WA is race-conscious affirmative action (e.g., see Lakhan (165) for an overview) rather than the class-focused meritocratic activities favoured in the UK. The wider literature indicates that graduate career paths in the UK differ by medical school (252). This may be due to different groups of students applying for different medical schools or different medical schools selecting different groups of student (see Cleland et al. (220)). However, there have been no published UK studies following up medical students into training posts or fully trained positions which have adjusted for WA-linked variables in their analysis. The only UK work we could identify on this topic is Dowell's (unpublished) 2011 study of nearly 700 general practitioners in Scotland. Dowell found that those few participants from socio-economic classes (SEC) 4 and 5 (n=34) were four times more likely to end up working in one of the 100 most deprived practices than those from SEC 1-3. Studies from the US confirm that medical students from lower SEC and with financial constraints favour family practice and psychiatry but these finding have not been replicated in the UK. Social background, personality, attitudes and aptitude are important in career choices following graduation. Eagle & Marcos (253) found that psychiatry attracted students from a lower social class, from cities, more often single and politically liberal. Demographic factors positively influencing choice of family medicine as a career include non-medical parents, older students, lower socioeconomic class, parental income less than $100,000/year, Hispanic background, rural background, and marriage (254).

Alternatively, or additionally, it may be that students who train in more diverse medical schools gain a greater understanding of other people from different socio-cultural backgrounds, and this increases their ability to provide healthcare to people with backgrounds different from their own (166–168). However, there have been no empirical studies exploring if this is indeed the case in UK medical students and doctors and studies from elsewhere in medical education bring this assumption under question (e.g., Woolf et al. (255)). Patient satisfaction with their doctor may be

increased in cases where they share the same ethnicity (256) or sex (257) and, although research is lacking, this finding could potentially extend to similarities in social background or class (24).

However, at this point in time there is no UK data linking medical student outcomes with socio-economic class, age at entry, ethnicity and other potential WA variables. We do not know if medical students from WA backgrounds are more likely to attend particular medical schools, follow particular career paths, or "treat like", or influence the cohort they train with in a positive way. It is not appropriate to extrapolate from international data given the unique UK focus on socio-economic class issues.

Taking the available evidence into account, particularly the evidence related to debt and debt aversion (see earlier) coupled with Nicholson's work indicating that students from WA background have relatively less "social capital", it may be that WA medical students have a different experience of medical school compared to traditional students. WA medical students may be less able to take advantage of opportunities such as intercalating and overseas electives which are part of the overall experience of medical school for many students, and provide advantages in terms of application for training posts (258), but which are associated with additional financial costs.

Medicine is a vocational course and, until very recently, there were more training places and jobs than graduates. It is predicted that this will not be the case in the future given current fears of job shortages in some specialties, oversupply of doctors and insufficient Foundation Programme training places for UK graduates (*The State of Medical Education and Practice in the UK* http://www.gmc-uk.org/publications/13887.asp). The process of application for Foundation Programme, core and specialist training, is competitive, and postgraduate data indicates that some programmes are over-subscribed, others under-subscribed. There are many reasons for this variation in popularity but we are not aware of any data which looks at applications in relation to applicant demographic factors. We do not know if students from WA backgrounds do not have the self-confidence to apply for more competitive posts and/or are not equipped with the range of extra-curricular activities necessary to "stand out from the crowd". However, careers advice in medicine is traditionally poorly designed (259) and those without "social capital" may struggle more with the processes of circumscription (sense of personal fit) and compromise (what is feasible once practical considerations such as availability of posts are taken into account) in career choice (260,261).

However, without even routine data exploring differences between WA and traditional students, we cannot identify the interactions between background, debt/cost and quantitatively measurable aspects of the continuum of the training experience and working as a doctor.

Conclusions: Getting on

There is no direct indication of the value-added to the medical profession or patient care as a result of WA activities.

Recommendations

Longitudinal studies are required to examine if the educational outcomes and career pathways of WA students differ from those of traditional students, and to examine the influences on any differences between groups.

7.8 Widening Access: Questions remaining

The UK medical student body has become increasingly diverse when it comes to gender, ethnicity and age. That progress, however, has not been mirrored by a similar change in the socio-economic background of medical students. Our realist review of the literature on this topic and survey of Admissions Deans identified a lack of robust qualitative and quantitative data. The following questions remain unanswered:

- What WA pre-entry activities are effective, with whom – pupils, parents, teachers?
- Focus should perhaps be made on low to medium interventions which are more cost effective and desirable for students and teachers given the data suggests that IAG initiatives are effective at raising aspiration and probably admission (but longitudinal follow-up is required).
- What is the effect of institutional policy differences, or institutional habitus, on the application numbers and admission of non-traditional students to medical schools?
- What is the impact of different weighing of different admissions processes on WA?
- Do different medical schools look for different qualities in their students and graduates? If so, what are the implications for WA and selection?
- How do WA students engage with the sociocultural aspects of becoming a doctor?
- Do WA students differ from traditional students in terms of retention, performance, the student experience and career choices and destinations?
- Can lessons from other areas of healthcare be applied successfully to planning and evaluating WA activities, particularly in terms of quantitative data?
- What is the impact of financial constraints on the student experience particularly given the recent increase in student fees? How can grants and bursaries be better structured and communicated to reach those in most need?
- What support is required by WA students once in medical school? Are the support needs of WA students different from the general student population, and how best can support be provided to avoid stigmatisation?
- How can contextual data be used to increase diversity at medical school, in such a way as to avoid litigation and adverse publicity?

We suggest that there seem to be no financial or reputation incentives for medical schools to widen participation at the current time. There are however several risks, the possibility of taking students who may struggle and bring down the institutional tariff if admitted with lower academic achievement. We argue therefore that poor progress with WA in medicine is not necessarily a purposeful negative intention of medical schools. Medical school initiatives and admission of students from lower socio-economic backgrounds could be rewarded both financially and reputationally by markers that contribute points to national league tables.

Finally, inequality of access is due to wider societal and economic issues, issues which are beyond the power of individual universities and medical schools to address (262). Addressing class barriers to attainment is a political mandate, one which must be targeted pre-school and in the early years of school not left to secondary school level when social class inequalities have increased even further (195).

8. Summary

In keeping with the original aims and objectives of this work, we have presented the selection and widening access (WA) reviews separately, while interweaving data from the Admissions Dean's survey throughout the report, to illustrate particular points. In Table 3, we have provided some sort of assessment of "evidential weight" and relevance for each of the selection topics, in terms of:

- Effectiveness (essentially validity, which is currently largely measured as success at medical school, and reliability)
- Process/fairness (in respect of widening access and susceptibility to coaching)
- Acceptability
- Cost effectiveness (school and candidate)
- Stakeholder satisfaction

Table 3 presents an overall rating by respective section heads and based upon very variable levels of data. However, it is a useful overview as it illustrates that no one selection approach is ideal. Furthermore, it is important to highlight that outcome measures used currently to evaluate selection methods focus mostly on medical school attainment rather than being a good doctor. On the other hand, it is clear from this summary and from the section conclusions presented throughout this report, that the evidence for MMIs, aptitude testing, SJTs and selection centres is "better" overall than that for traditional interviews, references and autobiographic reports.

Table 3 also illustrates that the concepts and processes of selection and WA access, while different, are inter-linked. Selection processes can support, or not support, WA. On the other hand, much of the focus of WA activities is to prepare potential candidates for the processes of selection to medicine (such as support with completing application forms).

Table 3: An assessment of the relationship between selection processes and effectiveness, process, acceptability, cost and stakeholder satisfaction (typology modified from Petticrew and Roberts (15)).

	Reliability	**Validity**	**Candidate acceptability**	**Cost (school)**	**Cost (student/ applicant)**	**"Promotes" Widening access/SES**	**Susceptible to coaching**
1a. Traditional Interviews	Low	Low	High	Moderate	Moderate	?	High
1b. MMIs	Moderate to high	Moderate	High	Moderate	Moderate	Low	Moderate
2. Aptitude testing	High	Various	Moderate	?	Moderate to high	Moderate /Various	Low to moderate
3. Academic record	High	High	High	None/low	None	Low	N/A
4. Autobio-graphical submissions	Low	Low	High	Moderate	Low	Low	High
5. References	Low	Low	High	Moderate	None	Low	N/A
6. Situational Judgement Tests (SJTs)	High	Moderate to high	Moderate to high	Moderate	Low	Moderate	Low to moderate
7. Personality/EI	High	Moderate	Low to moderate	Low to moderate	Moderate to high	?	Moderate to high
8. Selection centres	Moderate to high	Moderate to high	High	High	Low	Moderate	Moderate

9. Final recommendations for further work

The evidence reviewed in this report supports the following immediate, medium-term and long-term recommendations for further work.

Immediate

The GMC should work with the MSC and medical schools to further explore and define good practice on selection into medical school. This should include consideration of the following ideas which have emerged from the evidence reviewed in this report.

- That an aptitude test (see 6.1) and academic record (6.2) are used conjointly in selection, as this may positively impact on socio-economic class biases in selection.
- That the use of personal statements (6.3) and references (6.4) in selection for medicine is reviewed, as these lack validity and reliability, and impact on socio-economic class bias.
- That where personal statements (6.3) and references (6.4) are used, they are not used for ranking purposes in the selection process, as these lack validity and reliability, and impact on socio-economic class bias.
- That the use of SJTs (6.5) be considered as a selection tool for non-academic attributes of medical selection as these are among the best and most valid methods in medical school selection.
- That structured interviews (6.7) are used as part of the selection process
- That an agreed, national framework for the use and transfer of contextual data (7.5), such as applicant school or social circumstances, is created and validated.
- To explore the utility of a (supplementary) league table which includes selected other indices pertinent to medicine, such as effective WA schemes (7.4) or student support (7.65), which medical schools could use to compare and rate activities and performance in selection and WA (Section 7).

Medium term

That medical schools provide the following to the GMC.

- A declaration of what selection tools are used and their respective weightings
- Mapping of selection procedures against socio-economic markers (e.g., interview ratings and postcode of applicant), using an agreed common format so selection system performance can be assessed [12].
- Evidence of support systems which acknowledge the needs of widening access students.

That the GMC, the departments of health, and relevant key interests consider the desirability and feasibility of pursuing the following areas of further work which have emerged from the evidence reviewed in this report.

- The development, piloting and evaluation of a common framework for reporting selection processes, how they are used and weighted in each medical school.
- The development, piloting and evaluation of a common framework for the use of contextual data in selection.
- Commissioning a role analysis to determine selection criteria, which will include mapping to existing policy documentation such as GMP as well as the variation between medical schools and different branches of the profession, to clarify the issue of what selection should actually be measuring.
- Commissioning a project testing out methodologies for long-term follow-up of applicants to medicine through to career posts.
- Commissioning modelling studies to explore the impact of different weightings of admissions procedures on widening access.

[12] *Note that the emphasis on common formats and frameworks is purposeful, to enable pooling of data at a national level. This will facilitate robust and useful data analysis.*

Long-term

The GMC discuss highlight and promote the importance of further longitudinal work to:

- Follow up medical students through to trained post to enable the comparison of prior educational attainment and demographic markers against performance as a clinician and career choices.
- Develop and evaluating widening access interventions using robust methodologies suited to interventions with multiple components and complexities such as those well-established in health services research.
- Explore the predictive validity of aptitude tests and SJTs in undergraduate selection in relation to performance as a clinician.
- Examine the use of contextual data based on an agreed, national framework which is legally defensible.

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