Selecting Medical Students: an unresolved challenge

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Disclosure of Interest

I have a financial interest in **PQA**, the Personal Qualities Assessment, that I co-developed
“The recent reports…have drawn attention to some of the problems connected with the selection of medical students…

[and] point out the problems, without discussing ways and means of solving them.”

Medical Student Selection in the UK

“Why aren’t they choosing the right candidates for medicine?”

LB Lockhart

_The Lancet_ 1 (1981) 546-548

“For some time there has been dissatisfaction over the way medical students are believed to be selected, and much inconclusive discussion continues.”

Editorial

_The Lancet, 24 September 1984_
“Although mounting criticism and concern are expressed for the manner in which our medical students are selected, the status quo continues.”

EF Campbell et al.
Medical Journal of Australia
1 (1974) 785-788
What was the *status quo*?

- high academic marks
- sometimes tempered by ‘other qualities’ assessed by interview
Medical Student Selection in Australia

“nobody has any other solution which is strong enough to combat…..the ‘high enough mark method’.”

J Best

Medical Journal of Australia
150 (1989) 158-161
Achievement in relation to A level score

n = 3333

Basic Medical Sciences examinations

1991 cohort study

Source: Prof Chris McManus
Achievement in relation to A level score

Mean A level grade

AAA
BBB
CCC
DDD
EEE

1991 cohort study

Source: Prof Chris McManus
Achievement in relation to A level score

The Academic Backbone, medical school and beyond
Academic scores account for

- 23% of the variance of progress measures at medical school,
- ...and 6% beyond medical school

Achievement in relation to A level score

Source: Prof Chris McManus

n = 3333

1991 cohort study

Basic Medical Sciences examinations
Achievement in relation to A level score

Mean A level grade

AAA
BBB
CCC
DDD
EEE

resit finals; qualification delayed

passed finals at one sitting

1991 cohort study

Source: Prof Chris McManus
Selecting medical students

- Why are we having this debate…..again?

- What are the problems?
  - unsatisfactory doctors?
  - unsatisfactory medical students?

- Are we admitting the wrong students?
Many doctors are excellent…
and most are adequate
but some are not …
A few attract notoriety...

- Harold Shipman, UK:
  convicted murderer of 250+ his patients

- Howard Martin, UK:
  struck off medical register for hastening the deaths of 18 patients

- Jayant Patel, Australia:
  gross incompetence, manslaughter of 3 patients, grievous bodily harm

- Graeme Reeves, Australia:
  guilty of female genital mutilation
Some doctors are deficient in communication skills

- Don’t communicate adequately or appropriately with peers, mentors, patients, patients’ families
Some doctors are deficient in communication skills

- Don’t communicate adequately or appropriately with peers, mentors, patients, patients’ families

NSW Health Care Complaints commission
Number of complaints about doctors has been increasing annually

1616 complaints in 2012-13, concerning

- 3155 issues … of which
- 695 focused on communication
- 407 related to attitude & manner
Chart 6.2 – Complaints received about health practitioners 2008-2009 to 2012-2013
Some doctors are unprofessional

Unethical and unprofessional behaviour

- A significant percentage attract complaints and litigation
  (53 per ‘000 insured doctors; Australia 2000 – 2004)

- 2010 UK General Medical Council (GMC)
  - highest ever number of complaints against doctors (7,153)
  - held record number of Fitness-to-Practise hearings (326)
Some doctors are seriously compromised

**Depression, anxiety**

- 36.7% of sample of primary care physicians (Spain) displayed high levels of ‘psychological discomfort’ associated with practice.

- 1 in 5 hospital doctors (a single centre UK survey) had symptoms of ‘such severe depression and anxiety that they warranted psychiatric care, had it been sought’

- “Depression and anxiety are common among doctors and their suicide rate is higher than in the general population”

  (Systematic literature review, Elliot *et al.*, 2010)
Some doctors are seriously compromised

High suicide rate

relative to general population

- Male doctors - 1.41:1
- Female doctors - 2.27:1

Some doctors are seriously compromised

**Substance abuse**

- 1 in 15 doctors in the UK dependent on alcohol or drugs in their professional lifetime (GMC, 2005)
- 1400 doctors across USA disciplined for substance abuse between 1999 – 2004
Hypotheses

High incidence of burnout / distress
attributed *inter alia* to:

- stressful work environment
- long working hours
- conflict between work and personal life tasks
- individual psychological vulnerability

Poland: 10 year longitudinal study (n=365)

- significant psychological qualities predict job and life performance of medical graduates
- coping styles are the indicators of satisfaction with medicine as a career

Tartas et al., Medical Teacher, 33, 2011, e163-e172
A study of 2999 Australian Doctors……

- factors associated with psychiatric morbidity...having personality traits of neuroticism and introversion

- and with potentially hazardous alcohol use...having personality traits of neuroticism and extraversion

The relationship between resilience and personality traits in doctors: implications for enhancing well being.

Eley et al.,

*PeerJ* 1:e216, 2013; DOI 10.7717/peerj.2
Selecting medical students

Why are we having this debate…..again?

What are the problems?

- unsatisfactory doctors?
- unsatisfactory medical students?
As Medical Educators….

We all have had experience of students who cause concern

- they are a small proportion of any cohort
  - and may be progressing academically through medical school, but…. 
A survey of professionals

Clinical staff (n = 190 respondents; Australia) asked to list undesirable personal characteristics they had observed in medical students

Lowe et al., J Medical Ethics 27 (2001) 404-408
Inappropriate behaviours and attitudes observed in medical student

- arrogant
- power-seeking
- inflexible
- defensive
- dishonest
- patronising
- brash
- egocentric
- isolated
- insensitive
- self-centred
- uncaring

- indifferent
- selfish
- antisocial
- amoral
- devious
- prejudiced
- flippant
- rude
- aggressive
- condescending
- rigid attitudes
- judgemental

Lowe et al., J Medical Ethics 27 (2001) 404-408
Academic failure?

In one UK medical school study over 5 years, **10 – 15%** of each intake identified as ‘strugglers’

- attendance at academic progress committee
- termination of enrolment for academic reasons
- voluntary withdrawal for academic or personal reasons
- course suspended for academic or personal reasons

Yates & James, *BMJ* 332, 2006, 1009-1013
Problems observed in medical students

**USA**: 53% of 2682 medical students in 7 schools (Dyrbye et al., 2010) met criteria for professional burnout (emotional exhaustion, depersonalisation, low sense of personal achievement)

**USA**: >2000 medical students in 6 schools (Goebert et al., 2009) 12% major depression, 9% mild/moderate, 6% suicidal ideation

**USA**: 505 medical students in a single school (Schwenk et al., 2010) 14% with moderate to severe depression; ¾ year > ½ year; Female>Male

**Norway**: One third of 421 students reported mental health problems during their first 3 years at medical school (Midtgård et al., 2008)
Mental illness rife among med students

Amanda Davey

Australian medical students are crying out for help with one in five admitting to suicidal thoughts in the last year, a problem exacerbated by inadequate psychological support on campus, say student representatives.

The Australian Medical Students’ Association is so concerned with the deteriorating mental health of its members that it is now calling on the Federal Government to intervene.

“We are not after special treatment per se but we are asking the government to consider the life of a medical student when making judgements about the average tertiary students’ needs,” AMSA president, Jessica Dean, said.

“If that means additional income support then we would welcome that. The government needs to take into account that we are not normal, our needs are often higher.”

Ms Dean said medical students’ unrelenting workload meant it was difficult for them to support themselves financially.

“Most tertiary students can supplement their government support with part-time employment but medical students have high and unpredictable contact hours as well as interstate placements so finding and maintaining part-time employment is nearly impossible,” she said.

While tangible causes for the high rates of mental illness are at this stage only speculative, Ms Dean said anecdotally the causes of student psychological distress were not just around financial strain but also due to an uncertain job market and the “intern crisis”.

“Not all medical graduates are guaranteed an internship so there is more pressure to perform and compete for the limited places which exacerbates the stress.”

Concerned about a lack of mental health support services on campus, the Ms Dean said the AMSA will initially focus its efforts on this area of need.

Private discussions have been held with Health Minister Peter Dutton, she added.

The AMSA’s call to action comes on the back of a report released last year by Beyond Blue which showed doctors suffer from higher rates of psychological distress and attempted suicide compared to the rest of the professional population.

What do you think?

calendar@6minutes.com.au
It’s not only medical students....

Australia:
- 48% of 955 students in tertiary education psychologically distressed
- 4.4 x that of age-matched peers
- 11% of the sample had been treated for a mental health problem

Is this the co-incidence of psychological vulnerability and a demanding academic environment?

Leahy et al., Aust NZ J Psych 44, 2010, 608-615
Med school burnout **linked** to unprofessional behaviour

Mayo Clinic study reported in *JAMA* Sep 2010

Disciplinary action by a medical board **strongly associated** with prior unprofessional behaviour at medical school

Papadakis *et al.*, *NE J Medicine* 353, 2005, 2673-2682

- poor reliability and responsibility
- poor initiative and motivation
- severely diminished capacity for self improvement
What do we know about Medical School applicants?

- High academic achievers
- Motivated to apply
- In most countries their numbers greatly exceed the number of places available
  - Therefore selection is highly competitive
In 2012, in the UK

- 24,347 applicants (median age 18) for undergraduate entry to medicine and dentistry
- 9,078 of whom were accepted (2.7 : 1)
In 2012, in the UK

- Prior academic achievement still the predominant selection criterion
  
  ‘the brightest and best’; ‘the cream’

- Mean tariff score of entering medical students = 418
  
  i.e. Better than 3 grade ‘A’ at A-level (= 360)
In the USA and Canada

- overview of medical school admission processes; 120 respondents
- mean importance (1/5) of applicant data in making offers:
  - interview recommendation: 4.5
  - letters of recommendation: 3.7
  - cumulative undergraduate GPA: 3.6
  - MCAT total (exc. writing sample): 3.4

Monroe et al., Academic Medicine 88, 2013, 672-681
Selector’s advantage

- choose the best; “the cream of the cream”
- very high academic thresholds
- academically eligible pool differentiated by:
  - Tests of advanced scientific knowledge
    (MCAT, GAMSAT, BMAT etc.)
  - Cognitive skills tests
    (MCAT, UKCAT, GAMSAT, UMAT, HPAT-Ireland etc.)
  - Personal statements
  - Referees’ reports
  - Interviews
Is this the right way?

Many have asked the question…

- *Medical Education*, 37, 2003
- *BMJ*, 16 February 2010
- *Lancet*, 28 August 2010
- *Medical Teacher*, 33, 2011
What are the indicators we have not got selection right?
“found no scientific evidence that supported the power of performance in undergraduate science courses as a way to predict clinical or professional quality as a physician”

AND

“found…consistent evidence that performance in the premedical sciences is inversely associated with many of the personal, non-cognitive qualities so central to the art of medicine”
<table>
<thead>
<tr>
<th>Science GPA</th>
<th>High achievers</th>
<th>Lower achievers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>painstaking</td>
<td>progressive</td>
</tr>
<tr>
<td></td>
<td>patient</td>
<td>poised</td>
</tr>
<tr>
<td></td>
<td>silent</td>
<td>self-controlled</td>
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<tr>
<td></td>
<td>mild</td>
<td>wide interests</td>
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<tr>
<td>Preference for</td>
<td>conservative</td>
<td>progressive</td>
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<tr>
<td>Science Subjects</td>
<td>forceful</td>
<td>easy going</td>
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<tr>
<td></td>
<td>hasty</td>
<td>relaxed</td>
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<td></td>
<td>irritable</td>
<td>warm</td>
</tr>
<tr>
<td>Composite Index</td>
<td>awkward</td>
<td>progressive</td>
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<tr>
<td>of Scientific</td>
<td>conservative</td>
<td>relaxed</td>
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<tr>
<td>Aptitude</td>
<td>painstaking</td>
<td>stable</td>
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<tr>
<td></td>
<td>cautious</td>
<td>adaptable</td>
</tr>
<tr>
<td></td>
<td>shy</td>
<td>tactful</td>
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</tbody>
</table>

TER = tertiary entrance rank
Interview Rank

TER

Poor scores
Applicant unsuitable

Good scores
Applicant suitable

(University of Newcastle, NSW)
n = 332

Interview Rank

TER

Powis & Bristow *MJA* 166 (1997) 613
Paradigm shift

Most medical students (and doctors) are satisfactory.

Just a small minority are troublesome.

SO

Realign selection effort from differentiating the top academic achievers TO identifying the potentially unsuitable
Can we identify the potentially unsuitable at the outset?

- academic record
- cognitive skills – UMAT, UKCAT, MCAT etc
- personal statement
- referees’ reports
- interview – panel, MMI
- non-cognitive tests (personality measures)
Cognitive skills

- “Intelligence is the best predictor of job performance”
  
  Ree & Earles, *Current Directions in Psychological Science* 1, 1992, 86-89

- Most add little to GPA in predicting outcomes
  
  - AH5 intelligence test
  - GAMSAT
  - UMAT
  - HPAT-Ireland
**Figure 2** U.S. and Canadian medical schools’ use of Medical College Admission Test (MCAT) score and undergraduate grade point average (UGPA) data to predict various outcomes, as endorsed by the 120 admission deans (or their designees) who responded to a 2008 survey. USMLE indicates United States Medical Licensing Examination.
Personal statements

- fakeability!
- plagiarised
- labour intensive to assess
- criticised for “the potential for impression management, and their limited ability to predict future performance”

Editorial: Wilson et al., MJA 196, 2012
Referees’ reports

- have low validity even when structured to increase reliability
- strongly skewed
- can identify the poorly regarded candidates

N=585
Interviews

- frequently a ‘story telling’ session
- coaching clinics

Panel Interviews

- low reliability (interviewer biases)
- communication skills
- allows observation of behaviour and attitude
n = 332

TER

Interview Rank

Powis & Bristow MJA 166 (1997) 613
Preponderance of ‘good’ candidates

<table>
<thead>
<tr>
<th>rating and description of candidate</th>
<th>number (%) interviewed (n = 1609)</th>
<th>cumulative percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Outstanding</td>
<td>265 (16.5)</td>
<td>16.5</td>
</tr>
<tr>
<td>2. Good Quality</td>
<td>662 (41.1)</td>
<td>57.6</td>
</tr>
<tr>
<td>3. Adequate</td>
<td>367 (22.8)</td>
<td>80.4</td>
</tr>
<tr>
<td>4. Barely adequate</td>
<td>265 (16.5)</td>
<td>96.9</td>
</tr>
<tr>
<td>5. Unsuitable</td>
<td>50 (3.1)</td>
<td>100</td>
</tr>
</tbody>
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Powis et al., BMJ 296, 1988, 765-768
Withdrawn and Excluded Students
Grouped according to Final Joint Interview Score

Proportion of entering students * (%)

*Intake 1978 - 1986

Powis et al., BMJ 296, 1988, 765-768
Multiple Mini Interview

- better reliability (e.g., .75 vs .42)
- may be a good instrument to assess skills

Eva et al., *Medical Education* 38, 2004, 314-326, and subsequently
Newcastle, Australia

- 8 independent stations
  - each measure a distinct skill or behaviour
  - scored objectively
    - meets criterion / borderline / does not meet criterion

- All stations
  - assess ‘communication skills’
  - scored objectively
    - meets criterion / borderline / does not meet criterion
    
    AND

Bore, Munro & Powis, Med Teacher 31, 2009, 1066-1072
Subjective concerns

- All stations
  - record ‘concerns’
  - scored subjectively
    
    I have concerns about the attitude or behaviour of this applicant
    vs
    I have no concerns

- Three strikes and you’re out!
Frequency graph for concerns

N = 668

85.9%  (549) no concerns
12.9%  (130) 1-2 concerns
1.2%   (8)  3 or more concerns
Non – cognitive tests

- Relevant personal qualities
  - conscientious (vs unreliable)
  - resilient (vs unable to cope with stress)
  - self-controlled (vs disorderly or unrestrained)
  - ethical (vs dishonest, immoral)
  - empathic (vs detached, withdrawn)
  - etc. etc.
A battery of (non-cognitive and cognitive) tests:

- **Moral Orientation**: ethical decision making, social responsibility

- **Personality**
  - Involved (empathic and confident) vs. Detached (narcissistic and aloof)
  - Resilient vs. Emotional (‘neuroticism’)
  - Self-Controlled vs. Disorderly

- **Mental Agility Test** (diverse high level reasoning skills)

[www.pqa.net.au](http://www.pqa.net.au)
Construct validity

PQA personality scores have been correlated with other standard measures, e.g.,

- 16PF modified (Cattell, 1998)
- IPIP Five-Factor Test - ‘Big 5’ (Goldberg, 1999)
- Right Wing Authoritarianism (Altemeyer, 1982)
- Emotional Intelligence (Schutté et al. 1998)
- Eysenck Personality Questionnaire (Eysenck, 1985)
- Depression, Anxiety & Stress Scales (Lovibond, 1995) [modified]
- Horney-Coolidge Type Indicator (Coolidge, 2001)
### ‘Big 5’ correlates of PQA dimensions

<table>
<thead>
<tr>
<th>‘Big 5’ (NEO-PI)</th>
<th>PQA Traits</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Involved</td>
<td>Resilience</td>
<td>Control</td>
</tr>
<tr>
<td>Agreeable</td>
<td>.58***</td>
<td>.24***</td>
<td>.35***</td>
</tr>
<tr>
<td>Neurotic</td>
<td>-.28***</td>
<td>-.86***</td>
<td>-.30***</td>
</tr>
<tr>
<td>Conscientious</td>
<td>.26***</td>
<td>.35***</td>
<td>.82***</td>
</tr>
<tr>
<td>Extraverted</td>
<td>.49***</td>
<td>.42***</td>
<td>.11*</td>
</tr>
<tr>
<td>Open</td>
<td>.44***</td>
<td>.07</td>
<td>-.20***</td>
</tr>
</tbody>
</table>

n = 427 psychology students
Reliability (Cronbach alpha coefficients)

Moral Orientation
(social responsibility): .88
Involved: .87
Resilience .89
Self-Control .85

‘socially desirable answers’ .73

(Running averages over a large number of studies)
UKCAT - 2009

N = 4772

Moral Orientation
libertarian  communitarian

-2 s.d.  +2 s.d.
UKCAT - 2009

N = 4790

-2 s.d.  +2 s.d.

Frequency

detached  Involved vs Detached  involved
UKCAT - 2009

N = 4720

Resilience

-2 s.d.  +2 s.d.
UKCAT - 2009

N = 4720

(Self) Control

-2 s.d.
+2 s.d.
communitarian | self-controlled | resilient | involved
---|---|---|---
favours group at expense of individuals’ needs | over-controlled inflexible rule bound | lacks emotion cold | dependent upon others prone to burnout lacks objectivity
balances group and individuals’ needs | conscientious industrious orderly | cool-headed calm under pressure handles stress manages emotions | empathetic friendly agreeable polite
favours individuals’ needs at expense of group | permissive anti-social impulsive disorderly | anxious moody strange thoughts melancholic emotionally reactive | aggressive difficult manipulative arrogant

extreme high scores: 2.5%
midrange scores: 95%
extreme low scores: 2.5%
The million dollar question.....

- do non-cognitive tests predict a better outcome?
The main stumbling block....

- Absence of relevant & robust outcome measures
  - behavioural
  - on the job performance
  - i.e. more than just academic outcomes
It’s not only a ‘selection’ issue…..

- the curriculum
- ongoing assessment

- robust professionalism barrier
  - inter-personal and communication
  - clinical competence
The million dollar question…..

- do non-cognitive tests predict a better outcome?
- Is it acceptable to use such tests on face validity grounds? For example to…
  - *exclude* those that display extreme qualities deemed unsuitable for medical practice?
  - *exclude* those that display very low resilience?
Where we came in…..

“The methods of selection fail to exclude a number who, though able to pass examinations, have not the necessary aptitude, character, or staying power for a medical career”

British Medical Association, in their evidence to the Goodenough Committee, 1944; reported in DH Smyth, *BMJ* 14 September 1946
A model for Medical Student Selection

- Besides selecting **in** for
  - academic ability and cognitive skills
  - ability to communicate appropriately
  - good interpersonal skills

- Select **out** those who demonstrate traits of
  - psychological vulnerability
    (inability to handle stress appropriately; low resilience)
  - high levels of neuroticism
  - low levels of conscientiousness
  - extreme detachment, extreme emotional involvement
  - high levels of impulsiveness and permissiveness
Problem-solver, Conceptual thinker,

Ability to apply knowledge appropriately

Knowledge

Life-long learner, maintained interest

Technical competence, Psychomotor skills

Team worker

Organisation and administrative skills, conscientious, reliable

Good decision making skills

Calm under pressure, Copes well with stress

Ethical, high integrity

Capacity to empathise

Communication skills (approachable, listens, uses appropriate language)

Good Doctor

PPIK theory:

Process

Personality

Interests

Knowledge
Thank you for your attention