Medical student depression, anxiety and distress outside North America: a systematic review

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CONTEXT North American medical students are more depressed and anxious than their peers. In the UK, the regulator now has responsibility for medical students, which may potentially increase scrutiny of their health. This may either help or hinder medical students in accessing appropriate care. The prevalences of anxiety, depression and psychological distress in medical students outside North America are not clear. A better understanding of the prevalence of, risk factors for and results of psychological distress will guide the configuration of support services, increasingly available for doctors, for medical students too.

OBJECTIVES The aim of this study was to examine the prevalences of depression, anxiety and psychological distress in students in medical schools in the UK, Europe and elsewhere in the English-speaking world outside North America.

METHODS A systematic review was conducted using search terms encompassing psychological distress amongst medical students. OvidSP was used to search the following databases: Ovid MEDLINE (R) from 1948 to October 2013; PsycINFO from 1806 to October 2013, and EMBASE from 1980 to October 2013. Results were restricted to medical schools in Europe and the English-speaking world outside North America, and were evaluated against a set of inclusion criteria including the use of validated assessment tools.

RESULTS The searches identified 29 eligible studies. Prevalences of 7.7–65.5% for anxiety, 6.0–66.5% for depression and 12.2–96.7% for psychological distress were recorded. The wide range of results reflects the variable quality of the studies. Almost all were cross-sectional and many did not mention ethical approval. Better-quality studies found lower prevalences. There was little information on the causes or consequences of depression or anxiety.

CONCLUSIONS Prevalences of psychological distress amongst medical students outside North America are substantial. Future research should move on from simple cross-sectional studies to better-quality longitudinal work which can identify both predictors for and outcomes of poor mental health in medical students.
INTRODUCTION

Doctors report high levels of stress, common mental health disorders and alcohol misuse, sometimes with catastrophic consequences. A number of recent reports have focused attention on the area, with calls for better services for doctors with health problems, emphasising that patients need healthy doctors. The Practitioner Health Programme is one model of such care and its early results are very positive.

Time as a medical student, although enjoyable and rewarding, is associated with significant pressures such as those imposed by long hours of study, a high workload and considerable financial pressures. Suicides are not unknown and the death of Daksha Emson in 2000 has been a major driver for change within the National Health Service (NHS). A recent study of doctors on long-term sick leave suggested that interventions should be delivered in medical school to make doctors aware of their own health needs and of how to access appropriate support.

In the UK the General Medical Council (GMC) now has a regulatory responsibility for medical students and medical education. It is not yet clear what impact this will have on either the health or the behaviour of medical students. It seems likely that ill health which might impact on professional performance will be better identified and managed. The substantially increased scrutiny of students who are going through significant life changes may be less helpful.

A recent systematic literature review described high levels of anxiety, depression and psychological distress amongst medical students in North America. This distress was shown to be higher than in the general population, including in age-matched peers. Perhaps even more concerning is the finding that results from this review also revealed an association between psychological distress and a decline in academic performance, and impairments of professionalism and empathy towards patients. However, the extent to which these results can be extrapolated to other educational settings is not clear. In the USA, medicine is taught to graduate students who are, accordingly, older and perhaps more committed. They may, however, have higher levels of debt and different social stressors, such as parental status.

The aim of this study was to systematically review the literature on depression, anxiety and psychological distress in medical students outside North America. In order to obtain a sufficiently detailed picture of the issues, whilst maintaining a degree of homogeneity with regard to the educational systems studied, we included studies from Europe and the Anglophone world outside Europe. We aimed to identify not only prevalence data, but also risk factors that might be associated with such common mental disorders.

METHODS

Using OvidSP, the following databases were selected: (i) Ovid MEDLINE (R) from 1948 to October 2013; (ii) PsycINFO from 1806 to October 2013, and (iii) EMBASE from 1980 to October 2013.

Databases were searched for primary research data pertaining to medical student distress using a combination of free-text and medical subject heading (MeSH) search terms (Appendix S1, online). No date limits were applied.

Searches were evaluated against strict inclusion criteria: (i) the study population must comprise undergraduate medical students; (ii) the study must be located in a European or English-speaking country outside North America; (iii) the study exposure must include depression (and its subtypes), anxiety, adjustment disorder, or emotional distress, and (iv) the study must use a validated assessment tool. There are many assessment tools. Those validated to identify cases of depression or anxiety were included as such. Tools not validated to assess ‘caseness’ but nonetheless including an assessment of sadness, anxiety and other negative mood states were included under the heading ‘psychological distress’. This categorisation, which provides an inclusive concept of distress, has been used elsewhere.

Studies that examined student mental health difficulties arising solely from psychosis, schizophrenia or a significant life event were excluded.

An additional hand search of the reference lists of the final selection of papers was conducted.

A set of search terms was agreed between the authors. After the initial search, each subsequent stage was carried out independently by each author. Areas of disagreement were resolved by discussion. Data were extracted into identical spreadsheets by each author. These spreadsheets were then merged and discrepant findings were again resolved by discussion with reference back to the text of the paper.
There is no single set of quality measures that can be used for all systematic reviews. Our focus in assessing quality was to highlight where bias may have been an issue. Bias can be introduced to prevalence studies in the way that participants are selected, by low study numbers and by low response rates. We extracted data from each paper on each of these measures. To further assess the quality of the research process, we checked whether it was made clear that ethical approval had been sought. As a final measure of overall quality, we noted whether the study appeared in a peer-reviewed publication on the basis that in general peer review supports better-quality studies. We made no attempt to combine our measures of quality. Figure 1 shows a full flow diagram illustrating the systematic review process.

RESULTS

A total of 29 papers met the inclusion criteria (Appendix S2, online) and were included for review. These papers included 9784 medical students. Sample sizes ranged from 60\textsuperscript{19} to 1743\textsuperscript{20} The median sample size was 273 medical students. Almost all studies were cross-sectional.

Assessment tools used

The tools most frequently used to identify depression, anxiety and psychological distress were the Beck Depression Inventory (BDI)\textsuperscript{21} and the 12-item General Health Questionnaire (GHQ-12).\textsuperscript{22} Other less frequently used tools were the Hospital Anxiety and Depression Scale (HADS)\textsuperscript{23} and the Beck Anxiety Inventory (BAI).\textsuperscript{24} Many other tools, some developed by the researchers themselves, were also used to assess the prevalence of psychological distress (Table 1).

Prevalence of depression

We identified 14 studies that measured the prevalence of depression (Table 2). These studies used seven validated depression assessment tools. Even

![Figure 1](image-url)  
**Figure 1** Selection of studies for this systematic review
studies using the same tool used different cut-offs. For example, with reference to the BDI, Alvi et al.\textsuperscript{25} classed a score of >14 out of 63 as representing a case, whereas Mancevska et al.\textsuperscript{26} used a score of >17 out of 63. Five studies did not state their cut-off score for depression.\textsuperscript{27–31} The majority identified a high prevalence of depression, although prevalences ranged from 6.0\%\textsuperscript{30} to 66.5\%.\textsuperscript{31} One study\textsuperscript{32} identified a lower rate of depression amongst 255 medical students than amongst a control group of health science, nursing and architecture students, although the actual prevalence was still high at 17.0\% (p < 0.045).

Prevalence of anxiety

We found 11 studies that measured the prevalence of a number of aspects of anxiety (Table 3), using

| Assessment tool | Assessment tool (abbreviated) | Studies, n |
|-----------------|-------------------------------|------------|
| Depression      |                               |            |
| Beck Depression Inventory | BDI | 4 |
| Hospital Anxiety and Depression Scale | HADS | 3 |
| Major Depression Inventory (modified) | MDI | 2 |
| Depression Anxiety Stress Scales | DASS | 1 |
| Center for Epidemiologic Studies–Depression Scale | CES-D | 1 |
| Mini International Neuropsychiatric Interview | MINI | 1 |
| Perceived Medical School Stress | PMSS | 1 |
| Brief Symptom Inventory Depression Subscale | BSI-DEP | 1 |
| Diagnostic Depression Rating Scale | DDRS | 1 |
| Hamilton Rating Scale for Depression | HAM-D | 1 |
| Patient Health Questionnaire | PHQ | 1 |
| Self-Rating Depression Scale | SDS | 1 |
| Self-Reporting Questionnaire-20 | SRQ-20 | 1 |
| Anxiety          |                               |            |
| Hospital Anxiety and Depression Scale | HADS | 3 |
| Beck Anxiety Inventory | BAI | 1 |
| Depression Anxiety Stress Scales | DASS | 1 |
| Stress Scales    |                               |            |
| Emotional State Questionnaire | EST-Q | 1 |
| Brief Symptom Inventory Anxiety Scale | BSI-ANX | 1 |
| Social Interaction Anxiety Scale | SIAS | 1 |
| Taylor Manifest Anxiety Scale | TMAS | 1 |
| Anxiety Scale    |                               |            |
| Satisfaction with Life Scale | SWLS | 1 |
| Generalised Anxiety Disorder Questionnaire | GAD | 1 |
| Institute for Personality and Ability | IPAT | 1 |

Table 1 Tools used to assess medical student mental health

| Assessment tool | Assessment tool (abbreviated) | Studies, n |
|-----------------|-------------------------------|------------|
| Depression      |                               |            |
| Beck Depression Inventory | BDI | 4 |
| Hospital Anxiety and Depression Scale | HADS | 3 |
| Major Depression Inventory (modified) | MDI | 2 |
| Depression Anxiety Stress Scales | DASS | 1 |
| Center for Epidemiologic Studies–Depression Scale | CES-D | 1 |
| Mini International Neuropsychiatric Interview | MINI | 1 |
| Perceived Medical School Stress | PMSS | 1 |
| Brief Symptom Inventory Depression Subscale | BSI-DEP | 1 |
| Diagnostic Depression Rating Scale | DDRS | 1 |
| Hamilton Rating Scale for Depression | HAM-D | 1 |
| Patient Health Questionnaire | PHQ | 1 |
| Self-Rating Depression Scale | SDS | 1 |
| Self-Reporting Questionnaire-20 | SRQ-20 | 1 |
| Anxiety          |                               |            |
| Hospital Anxiety and Depression Scale | HADS | 3 |
| Beck Anxiety Inventory | BAI | 1 |
| Depression Anxiety Stress Scales | DASS | 1 |
| Stress Scales    |                               |            |
| Emotional State Questionnaire | EST-Q | 1 |
| Brief Symptom Inventory Anxiety Scale | BSI-ANX | 1 |
| Social Interaction Anxiety Scale | SIAS | 1 |
| Taylor Manifest Anxiety Scale | TMAS | 1 |
| Anxiety Scale    |                               |            |
| Satisfaction with Life Scale | SWLS | 1 |
| Generalised Anxiety Disorder Questionnaire | GAD | 1 |
| Institute for Personality and Ability | IPAT | 1 |
seven validated anxiety assessment tools. Three studies did not state the scores used as cut-offs for anxiety. Prevalences ranged from 7.7% to 65.5%. With the notable exception of that by Samaranayake and Fernando, few studies examined specific anxiety disorders such as generalised anxiety disorder in any formal way and thus these studies described results that were not always directly comparable. Some studies examined the prevalence of social anxiety or trait anxiety as opposed to state anxiety or an anxiety disorder. Several studies did not clearly differentiate between anxiety symptoms and a clinical diagnosis of an anxiety disorder.

Prevalence of psychological distress

We identified 16 studies that measured the prevalence of psychological distress using eight validated assessment tools (Table 4). All except one study identified high levels of psychological distress. Recorded prevalences ranged between 12.2% and 96.7%. The weighted mean prevalence was 29.6%. There is likely to be significant publication bias in the reporting of symptoms of psychological distress.

Associated factors

A number of papers included data on risk factors associated with reports of psychological distress, depression and anxiety.

Change during time as a medical student

In the UK and Europe, by contrast with the USA, most medical students are in their first degree course; typically they will start in their late teens. This is a time of significant change, growth and development. A number of the papers included in our study found that levels of common mental disorders and psychological distress differed depending on how far students had progressed through their studies.

We found evidence that depression, anxiety and psychological distress may be more common as the student progresses through the course. Intriguingly, we found that more studies demonstrated that these difficulties became less prevalent towards qualification. This was the case for depression, anxiety and psychological distress.

Gender

In all three areas, we identified studies that reported higher levels of difficulty in female students. However, a number of other studies reported either no difference between the sexes or higher levels in male students.

Social and economic factors

Karaoglu and Seker identified low family income as a risk factor for medical student depression and anxiety.

Quality of studies

Prevalences of depression in the full sample ranged from 6.0% to 66.5%. Studies reporting a response rate of > 80% reported prevalences of 12.9–32.0%. Among only those studies that clearly reported the provision of ethical approval, prevalences ranged from 6.0% to 32.0%. Only one study randomly sampled a population of medical students, reporting a mean prevalence of depression of 14.0%.

Prevalences of anxiety across the studies ranged from 7.7% to 65.5%. Amongst studies with response rates of > 80%, prevalences ranged from 8.0% to 50.5%. Amongst only those studies reporting ethical approval, prevalences ranged from 8.0% to 50.5%. Only one study randomly sampled a population of medical students, reporting a mean prevalence of anxiety of 43.0%.

Prevalences of psychological distress across the studies ranged from 12.2% to 96.7%. In those studies with response rates of > 80%, prevalences ranged from 13.7% to 68.6%. Amongst those studies that reported the provision of ethical approval, prevalences ranged from 13.7% to 68.6%.

DISCUSSION

We carried out a systematic review of the literature describing prevalences of depression, anxiety and psychological distress in medical students in the UK, Europe and the wider Anglophone world excluding North America. We found 14 studies describing depression, 11 describing some form of anxiety and a further 16 describing what we have called ‘psychological distress’. We found prevalences of depression to range from 6.0% to 66.0%, those of anxiety from 7.7% to 65.5% and those of some form of psychological distress to range from 12.2% to 87.3% of students.

In the prevalence studies included in this review, we also examined which factors if any might be
### Table 2 Prevalences of depression in medical students

| Study                        | Medical student population | Location | Sample size, n | Period of study | Assessment tool* | Covariates measured                                                                 | Response rate % |
|------------------------------|-----------------------------|----------|----------------|-----------------|------------------|---------------------------------------------------------------------------------------|-----------------|
| Aki et al. (2010)²⁵           | Pre-clinical and clinical   | English-speaking³ | 279            | < 1 year        | BDI              | Gender, Birth order, Being over-burdened                                            | 71              |
| Baykai et al. (2012)²⁶        | Clinical                    | Europe   | 193            | < 1 year        | DASS             | Personality inventory                                                               | 86.9            |
| Bunevicius et al. (2008)²⁷    | Pre-clinical                | Europe   | 338            | < 1 year        | HADS             | Coping strategies                                                                    | 94              |
| Chan (1992)²⁸                 | Pre-clinical                | English-speaking³ | 95             | < 1 year        | BDI              | Not stated                                                                            |                 |
| Chan (1991)²¹                 | Pre-clinical and clinical   | English-speaking³ | 335            | < 1 year        | BDI, CES-D       | Obsessional compulsiveness                                                            | Not stated      |
| Dahlin & Runeson (2007)²⁰     | Clinical                    | Europe   | 127            | > 1 year        | MDI, MHI         | Burnout, Effects of personality, Study environment                                   | 77.2            |
| Dahlin et al. (2005)²²        | Pre-clinical and clinical   | Europe   | 342            | < 1 year        | MDI, POMSS       | Study stress, Suicidality                                                             | 86.3 at T3      |
| Gaspersz et al. (2012)²²      | Pre-clinical and clinical   | Europe   | 1180           | < 1 year        | BSI-DEP          | Use of mental health services                                                        | 52              |
| Karaoğlu & Seker (2010)²⁸     | Pre-clinical                | Europe   | 350            | > 1 year        | HADS             | Desire and expectations from medicine                                                 | 82.85           |
| Statistically significant results | Peer-reviewed journal | Ethical approval | Sampling method |
|----------------------------------|-----------------------|-----------------|-----------------|
| Depression prevalence 35.1%     | Yes                   | Not stated      | Non-probability sampling |
| Depression associated with:      |                       |                 |                 |
| age > 20 years (p = 0.013)       |                       |                 |                 |
| Female gender (p = 0.016)        |                       |                 |                 |
| Examination and test dissatisfaction (p = 0.002) |                       |                 |                 |
| Prevalence of depression 29.5%  | Yes                   | Yes             | Non-probability sampling |
| Depression prevalence 14%       | Yes                   | Yes             | Probability sampling |
| Lower prevalence of depression compared with control group (p = 0.02) | Yes                   | Yes             | Probability sampling |
| 15/9% (16%) were ‘cases’ on BDI (18/19 cut-off) | Yes                   | Not stated      | Not stated      |
| Depressed medical students more likely to use emotional containment, avoidance and denial to cope with depression (p < 0.05) |                       |                 |                 |
| No significant difference in coping strategies between males and females (p > 0.05) |                       |                 |                 |
| 12% ‘cases’ on BDI (18/19 cut-off)! | Yes                   | Not stated      | Not stated      |
| Females more crying spells than males (p < 0.001) |                       |                 |                 |
| Female students demonstrated tendency for affective symptoms |                       |                 |                 |
| Male students demonstrated tendency for somatic symptoms |                       |                 |                 |
| 5/98 (6%) had ‘major depression’ | Yes                   | Yes             | Probability sampling |
| Increased risk of psychiatric diagnosis during first year with: |                       |                 |                 |
| High performance-based self-esteem (p = 0.045) |                       |                 |                 |
| High depressive symptom load (p = 0.008) |                       |                 |                 |
| Depression (12.9%)              | Yes                   | Yes             | Non-probability sampling |
| More prevalent than control sample (7.8%, p < 0.05) |                       |                 |                 |
| Higher prevalence in female students (16.1%) versus male students (8.1%) and female control group (9.9%) (p < 0.05) |                       |                 |                 |
| Female students at increased risk of depression (p < 0.05) |                       |                 |                 |
| 2.7% of medical student group had made a suicide attempt |                       |                 |                 |
| Depression prevalence in pre-clinical students: 41%; depression prevalence in clinical students: 35% | Yes                   | Yes             | Non-probability sampling |
| 29.4% reported symptoms of depression (females 8.6%, males 20.7%) |                       | Not stated      | Probability sampling |
| Depression more prevalent in:    |                       |                 |                 |
| Year 2 students                 |                       |                 |                 |
| Males Low income/natural family |                       |                 |                 |
| External pressure to study medicine, desire for better economic position (p < 0.05) |                       |                 |                 |
associated with common mental disorders. We found a very mixed picture, which to some degree represented the range of study quality we observed. More studies showed that depression and anxiety reduced in prevalence during the course of a medical degree, although there were few truly longitudinal studies. Whereas in the general population common mental disorders are more often seen in women, our studies described a more mixed picture in which only psychological distress was clearly distributed in this way. A small number of papers described an association between depression and anxiety and academic stressors such as examinations, although no causal inferences could be drawn. The few studies that examined wider social and economic risk factors showed a positive association with depression and psychological distress.

The results of our review suggest that depression and anxiety are more prevalent amongst medical students than among peers of a similar age. However, this finding should be interpreted with care. Firstly, the better-quality studies tended to report lower prevalences and the extent to which the higher-than-background results are related to methodological shortcomings is not clear. Secondly, all of the studies we included were specifically described as studies of students’ mental health. Goodwin et al.44 have shown that such a strategy can lead to an overestimation of the prevalence of common mental disorders. However, our findings are in keeping with Dyrbye et al.14’s review of students in North American medical schools, which found a higher prevalence of depression, anxiety and distress than in the background population.

Given the low number of studies, and the methodological limitations of the studies we did find, results regarding factors associated with common mental disorders are hard to interpret. There is a suggestion that common mental disorders may decrease in prevalence over time, by contrast with Dyrbye et al.14’s finding. This may relate to chance or methodological weaknesses, especially the lack of longitudinal studies outside North America. It may also relate to the differences in the student body as medicine in North America is a graduate degree course. Hence, by the end of the course, American students are...
older, likely to be more indebted, and more likely to be exposed to additional psychosocial stressors such as parenthood.\textsuperscript{15,16}

Our study has a number of strengths. We examined a large number of databases and included studies from a range of countries and educational systems outside North America. We included only those studies in which a validated tool was used to assess the psychological health of medical students. Regrettably, the studies we included are far too heterogeneous to merit any form of meta-analysis.

Most of the studies we found had methodological limitations. With a few notable exceptions, sample sizes were small, many studies gave little or no information on methods of recruitment, and, to our great surprise, a number of studies did not give a clear statement on whether or not they had been given ethical approval. It should be noted that prevalences of common mental disorders were lower in the better-quality studies. All except one study showed a prevalence of depression or psychological distress higher than that in the background population where applicable, and there is likely to have been significant publication bias. Only three of the studies included in our final analysis had any longitudinal component, which greatly limits any conclusions on the impacts of time, progression and increasing maturity on the prevalence of psychological disorders in this population.

To maximise the data available for our study, we included research from the UK, Europe and Anglophone countries across the world. The students included held a number of things in common, but came from and studied in a range of different cultural settings. It is well recognised that prevalences of and risk factors for depression vary among different countries. A recent review by Kessler and Bromet\textsuperscript{45} highlights evidence showing that depression is more common in high-income countries, and that the female preponderance is found across different countries. An adverse impact on education is another cross-national outcome. We were not able to incorporate data on individual countries or cultures in our review and we cannot be certain that assessment tools developed in the UK or the USA are capturing the same issue when they are used in Africa. Nevertheless, we feel that our inclusive

\begin{table}[h]
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\begin{tabular}{|l|c|c|c|}
\hline
Statistically significant results & Peer-reviewed journal & Ethical approval & Sampling method \\
\hline
10.4% had moderate depression BDI score (≥ 21) & Yes & Not stated & Probability sampling \\
Year 1 depressive score (BDI ≥ 17): 11.6%, Year 2: 8.6% & & & \\
Mean depressive BDI score 8.3 ± 7.4 & & & \\
Prevalence of suicidal ideation 2.2-9.1% & Yes & No & Probability sampling \\
Depression prevalence: Mild 47%, moderate 19.5% & & & \\
Depression prevalence 19.5% (cut-off not stated) & Yes & Not stated & Not stated \\
Higher depression in students with life event within 6 months (p = 0.05) & & & \\
Depression prevalence (PHQ-9 > 10) 16.9% & Yes & Yes & Probability sampling \\
Medical students had lower rate of depression than other students (p = 0.045) & & & \\
67% of students had some depressive symptoms on the SDS scale (32% ‘moderate or severe’) & Yes & Not stated & Probability sampling \\
62% of students exhibited stress/depression on the SRQ-20 scale & & & \\
\hline
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### Table 3  Prevalence of anxiety in medical students

| Study                        | Medical student population | Location                  | Sample size, n | Period of study | Assessment tool | Covariates measured                                                      | Response rate % |
|------------------------------|-----------------------------|---------------------------|----------------|-----------------|----------------|--------------------------------------------------------------------------|-----------------|
| Alvi et al. (2010)²⁵         | Pre-clinical and clinical   | English-speaking†         | 279            | < 1 year        | BAI            | Gender, Birth order, Being overburdened                                  | 71              |
| Baykan et al. (2012)²⁰       | Clinical                    | Europe                    | 193            | < 1 year        | DASS           |                                                                           | 86.9            |
| Bunevicius et al. (2008)⁸³   | Pre-clinical                | Europe                    | 338            | < 1 year        | HADS           | Personality inventory                                                   | 94              |
| Eller et al. (2006)⁷⁷        | Pre-clinical and clinical   | Europe                    | 413            | < 1 year        | EST-Q          | Relationship between sleep and emotional symptoms                       | 80.2            |
| Gaspersz et al. (2012)³²     | Pre-clinical and clinical   | Europe                    | 1180           | < 1 year        | BSI-ANX        | Use of mental health services                                           | 52              |
| Karaoglu & Seker (2010)²⁸    | Pre-clinical                | Europe                    | 350            | > 1 year        | HADS           | Desire and expectations from medicine                                   | 82.85           |
| Laidlaw (2009)¹⁴             | Pre-clinical                | UK                        | 247            | < 1 year        | SIAS           | Communication skills                                                     | 82              |
| Mancevska et al. (2008)²⁶    | Pre-clinical                | Europe                    | 354            | < 1 year        | BDI            | Prevalence of substance use                                              | 75 in 2007      |
| Rab et al. (2008)³⁶          | Pre-clinical and clinical   | English-speaking†         | 87             | < 1 year        | HADS           | Effects of social factors, physical illness, life events, History of mental illness | 100             |
| Samaranayake & Fernando (2011)³² | Pre-clinical and clinical   | English-speaking†         | 255            | > 1 year        | SWLS GAD       | Age, sex, ethnicity                                                       | Medical student response rate 80.7 |
| Srivastava et al. (2007)³³   | Pre-clinical                | English-speaking†         | 105            | > 1 year        | IPAT anxiety scale | Locus of control, personality                                            | 87.5            |

* See Table 1 for a full description of the abbreviated terms; †English speaking country outside North America
## Statistically significant results

| Peer-reviewed journal | Ethical approval | Sampling method |
|-----------------------|------------------|-----------------|
| Prevalence of anxiety: 47.7% | Yes | Not stated | Probability sampling |
| Anxiety associated with: | | | |
| Female gender (p = 0.007) | | | |
| Middle birth order (p = 0.049) | | | |
| 2nd year of study (p = 0.001) | | | |
| Examination and test dissatisfaction (p = 0.010 and p = 0.006) | | | |
| Prevalence of anxiety 50.3% | Yes | Yes | Non-probability sampling |
| Prevalence of anxiety 43% | Yes | Yes | Non-probability sampling |
| Lower prevalence of anxiety in medical students compared with control group (p = 0.02) | Yes | Yes | Probability sampling |
| Prevalence of anxiety 21.8% | Yes | Yes | Probability sampling |
| Anxiety more common in female students | | | |
| Anxiety prevalence in pre-clinical students: 32%; Anxiety prevalence in clinical students: 28% | Yes | Yes | Non-probability sampling |
| Prevalence of anxiety 20.3% (female 10.3%, male 10%) | Yes | Not stated | Probability sampling |
| Anxiety associated with: | | | |
| Low family income | | | |
| Desire for guaranteed occupation | | | |
| Expectation of prestige from medical career (p < 0.05) | | | |
| 8% of students (n = 19) had high levels of social anxiety | Yes | Yes | Probability sampling |
| Social anxiety lower than in general population and psychology students (p < 0.001) | | | |
| No difference in social anxiety among Years 1–3 | | | |
| Anxiety prevalence (TMAS) 69.2% females, 55% males | Yes | Not stated | Probability sampling |
| 233 students (65.5%) had a high trait score (≥ 16) | | | |
| 43.7% were anxious; this was highest in Years 4 (55.2%) and 5 (46.7%) students | Yes | Not stated | Not stated |
| Anxiety prevalence (GAD ≥ 8) 13.7% | Yes | Yes | Probability sampling |
| Medical students had lower rate of anxiety than other students (p = 0.001) | | | |
| Anxiety prevalence 13% (Year 1) and 9% (Year 2) | Yes | No | Probability sampling |
Table 4  Prevalence of psychological distress in medical students

| Study                                      | Medical student population | Location | Sample size, n | Period of study | Assessment tool | Covariates measured | Response rate % |
|--------------------------------------------|---------------------------|----------|----------------|----------------|----------------|---------------------|-----------------|
| Alem et al. (2005) [28]                     | Pre-clinical and clinical | English-speaking [7] | 273            | < 1 year        | SRQ-20         | Relationship of mental distress with socio-economic status | 80              |
| Baykan et al. (2012) [20]                   | Clinical                  | Europe   | 193            | < 1 year        | DASS           | 86.9                |                 |
| Biro et al. (2010) [54]                     | Pre-clinical and clinical | Europe   | 100            | < 1 year        | GHQ-12         | Health behaviours, Drug and alcohol use, social support | 81              |
| Das (1999) [57]                             | Pre-clinical and clinical | UK       | 60             | < 1 year        | Stress Vulnerability Scale | Vulnerability to illness, health, Interest in getting help | 92              |
| Gasparsz et al. (2012) [32]                 | Pre-clinical and clinical | Europe   | 1180           | < 1 year        | BS4-DEP        | Use of mental health services | 52              |
| Steen Grommol et al. (2013)                 | Clinical                  | Europe   | 522            | < 1 year        | GHQ-28 (subscale) | Personality traits, Hazardous drinking | 83              |
| Guthrie et al. (1997) [58]                  | Pre-clinical              | UK       | 172            | < 1 year        | GHQ-12 MBI     | Stressful incidents | 84.3            |
| Inam et al. (2003) [57]                     | Pre-clinical and clinical | English-speaking [7] | 189            | < 1 year        | AKUADS         | 75                |
| Jadboon et al. (2010) [59]                  | Pre-clinical and clinical | English-speaking [7] | 482            | < 1 year        | AKUADS         | Effects of socio-demographic factors on depression | 59              |
| Khan et al. (2006) [58]                     | Pre-clinical and clinical | English-speaking [7] | 189            | < 1 year        | AKUADS         | 90%               |
| Leahy et al. (2010) [59]                    | Pre-clinical and clinical | English-speaking [7] | 471            | < 1 year        | K10            | None              | 78              |
| Omokhodion & Gureje (2003) [56]             | Clinical                  | English-speaking [7] | 400            | < 1 year        | GHQ-12         | Perceived causes of depression | 68              |
| Statistically significant results | Peer-reviewed journal | Ethical approval | Sampling method |
|----------------------------------|----------------------|-----------------|----------------|
| Prevalence of mental distress over 1 month: 32.6% | Yes | Yes | Probability sampling |
| Pre-clinical students and students aged < 20 years more likely to report symptoms of mental distress (p = 0.000) | | | |
| Risk of mental distress decreases as year of study advances | | | |
| Prevalence of distress 39.9% | Yes | Yes | Non-probability sampling |
| Prevalence of distress 18.5% (GHQ > 4) | Yes | Yes | Non-probability sampling |
| Association between high GHQ and low SOC (p < 0.001) | | | |
| Prevalence of moderate/severe stress 96.7% (Year 1) 88.2% (Year 2) 75.9% (final year) | Yes | No | Probability sampling |
| Males > females psychosomatic symptoms caused by stress (p < 0.05) | | | |
| Distress prevalence in pre-clinical students: 20%; distress prevalence in clinical students: 18% | Yes | Yes | Non-probability sampling |
| Distress prevalence 13.7% | Yes | Yes | Non-probability sampling |
| Prevalence of distress (GHQ > 4) 36.8% in Manchester, 32.9% St Andrews | Yes | Not stated | Probability sampling |
| Prevalence of ‘anxiety and depression’: 60% overall | Yes | Not stated | Probability sampling |
| Prevalence of anxiety and depression: | | | |
| Year 4: 49%, Year 3: 47%, Year 2: 73%, Year 1: 66% | &nbsp; | &nbsp; | &nbsp; |
| Prevalence of ‘anxiety and depression’: 43.9% | Yes | Yes | Probability sampling |
| Prevalence highest in Year 1 students (p = 0.028), female students (p = 0.001) | | | |
| ‘Approximately 70%’ had ‘anxiety and depression’ | Yes | Not stated | Non-probability sampling |
| Prevalence of distress 44% | Yes | Yes | Probability sampling |
| No significant difference in psychological distress levels between medical school years although Year 5 students (penultimate year) had highest levels of psychological distress 56% | | | |
| Females in Years 1–3 had higher levels of distress than males | | | |
| Prevalence of distress 12.2% (GHQ cut-off 2/3) | Yes | Not stated | Probability sampling |
| Depression more common in those living off campus | | | |
approach has merit inasmuch as no particular pattern emerged among high- and middle/low-income countries, yet high prevalences of depression were found in medical schools across the world.

We think on balance that there is evidence to suggest that medical students suffer higher levels of depression, anxiety and psychological distress than their non-medical student peers. We are unable to say conclusively whether this is more of a problem at the beginning or the end of medical training and methodologically sound longitudinal studies are required to clarify this. We suggest that the associations, albeit limited, with the socio-economic status of the medical student merit a greater level of interest. Medicine needs to draw upon all sections of society and must not be the preserve of the most affluent students. If the occurrence of common mental disorders represents one reason why those from less advantaged backgrounds find it harder to become doctors, then we must establish structures to identify those at risk and provide them with appropriate support. One key area missing from our study refers to what happens to those who do have psychological difficulties as medical students, in terms of both their academic results and the provision of care. In an era in which, in the UK, medical students now come under the auspices of the GMC, issues of stigma and the fear of jeopardising a promising career may lead a medical student to not seek appropriate care, lest he or she is negatively labelled. Overwork, social isolation and alcohol misuse are commonly used coping strategies in qualified doctors. These are not especially helpful in the short term and, more worryingly, may become more firmly established later. Medical students need guidance on the development of more appropriate ways of managing distress.

The time has now come for a high-quality, multi-centre longitudinal study of medical students. Such a study should be able to tease apart individual risk factors for poor mental health that derive from the stress imposed by the study of medicine. This will require the collection of detailed personal information about students, not just the handing out of a tool to assess psychological distress. Therefore, trust in the investigators and assurances regarding confidentiality will be key. Researchers will need to consider carefully how to maximise not only sample size, but also response rate. Validated assessment tools for depression and anxiety will be required. We would suggest that assessments are carried out in line with at least three time-points over the course of a medical student’s career in order to assess the impact of the course on the student’s mental health.
Ideally, consent to follow the cohort into their professional careers would be sought at the start so that the follow-up phase could then examine the longer-term impact of poor mental health as a student on future mental health, professional attainment and involvement with the regulator.

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REFERENCES

1. Murray RM. Characteristics and prognosis of alcoholic doctors. Br Med J 1976;2 (6051):1537–9.
2. Murray RM. Psychiatric illness in male doctors and controls: an analysis of Scottish hospitals in-patient data. Br J Psychiatry 1977;131:1–10.
3. Bryant M. Junior doctor drowned herself over stresses of work. London Evening Standard; 28 November 2011.
4. Department of Health. Mental Health and Ill Health in Doctors. London: DoH 2008.
5. Practitioner Health Programme. National Health Service Practitioner Health Programme 2011 Annual Report. London: PHP 2012.
6. Adams J. Straining to describe and tackle stress in medical students. Med Educ 2004;38:463–4.
7. British Medical Association. BMA Medical Students’ Finance Survey Academic Year 2010/2011. London: BMA 2011.
8. Daily Mail. Cambridge medical student killed himself after university wouldn’t let him resit exam for a third time. Daily Mail; 10 December 2010.
9. Emson D. Daksha Emson: formerly specialist registrar community and rehabilitation psychiatrist Oxleas NHS Trust, died tragically 27 October 2000. Psychiatr Bull 2004;28:152.
10. BMJ. Daksha Emson. BMJ 2004;328 (7434):291.
11. North East London Strategic Health Authority. Report of An Independent Inquiry into the Care and Treatment of Daksha Emson MBBS, MRCPsych, MSc and her Daughter Freya. London: NELSHA 2003.
12. Henderson M, Brooks SK, Del Busso L, Chalder T, Harvey SB, Hotopf M, Madan I, Hatch S. Shame! Self-
stigmatisation as an obstacle to sick doctors returning to work: a qualitative study. BMJ Open 2012;2 (5):e001776.

13 General Medical Council. Information for medical students. 2014. http://www.gmc-uk.org/information_for_you/13920.asp. [Accessed 7 April 2014.]

14 Dyrbye LN, Thomas MR, Shanafelt TD. Systematic review of depression, anxiety, and other indicators of psychological distress among US and Canadian medical students. Acad Med 2006;81 (4):354–73.

15 Dyrbye LN, Thomas MR, Power DV et al. Burnout and serious thoughts of dropping out of medical school: a multi-institutional study. Acad Med 2010;85 (1):94–102.

16 Dyrbye LN, Thomas MR, Massie FS et al. Burnout and suicidal ideation among US medical students. Ann Intern Med 2008;149 (5):334–41.

17 Carney RM, Freedland KE. Psychological distress as a risk factor for stroke-related mortality. Stroke 2002;33 (1):5–6.

18 Matcham F, Rayner L, Hutton J, Monk A, Steel C, Hotopf M. Self-help interventions for symptoms of depression, anxiety and psychological distress in patients with physical illnesses: a systematic review and meta-analysis. Clin Psychol Rev 2014;34 (2):141–57.

19 Yoong CK, Hung ECS, Pin HY et al. Stress among medical students in a medical college of South India. Educ Health 1999;12 (1):63–9.

20 Virtanen P, Koivisto AM. Wellbeing of professionals at entry into the labour market: a follow-up survey of medicine and architecture students. J Epidemiol Community Health 2001;55 (11):831–5.

21 Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. Arch Gen Psychiatry 1961;4:561–71.

22 Goldberg D, Williams P. A User’s Guide to the General Health Questionnaire. Basingstoke: NFER-Nelson. 1988.

23 Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand 1983;67 (6):361–70.

24 Beck AT, Epstein N, Brown G, Steer RA. An inventory for measuring clinical anxiety: psychometric properties. J Consult Clin Psychol 1988;56 (6):893–7.

25 Alvi T, Assad F, Ramzan M, Khan FA. Depression, anxiety and their associated factors among medical students. J Coll Physicians Surg Pak 2010;20 (2):122–6.

26 Mancevska S, Bozinovska L, Tecce J, Pluncev-Gligoroska J, Sivevska-Smilevska E. Depression, anxiety and substance use in medical students in the Republic of Macedonia. Bratisl Lek Listy 2008;109 (12):568–72.

27 Chan DW. Coping with depressed mood among Chinese medical students in Hong Kong. J Affect Disord 1992;24 (2):109–16.

28 Karaoglu N, Seker M. Anxiety and depression in medical students related to desire for and expectations from a medical career. West Indian Med J 2010;59 (2):196–202.

29 Jadoon NA, Yaqoob R, Raza A, Shehzad MA, Zeshan SC. Anxiety and depression among medical students: a cross-sectional study. J Pak Med Assoc 2010;60 (8):699–702.

30 Dahlin ME, Runeson B. Burnout and psychiatric morbidity among medical students entering clinical training: a three-year prospective questionnaire and interview-based study. BMC Med Educ 2007;7:6.

31 Martinac M, Sakic M, Skobic H, Jakovljevic M. Suicidal ideation and medical profession: from medical students to hospital physicians. Psychiatr Danub 2005;15 (3–4):185–8.

32 Samaranayake CB, Fernando AT. Satisfaction with life and depression among medical students in Auckland, New Zealand. N Z Med J 2011;124 (1411):12–7.

33 Sivastava K, Raju M, Saldanha D et al. Psychological well-being of medical students. Med J Armed Forces India 2007;63 (2):137–40.

34 Laidlaw AH. Social anxiety in medical students: implications for communication skills teaching. Med Teach 2009;31 (7):649–54.

35 Omokhodion FO, Gureje O. Psychosocial problems of clinical students in the University of Ibadan Medical School. Afr J Med Sci 2003;32 (1):55–8.

36 Rab F, Mamdou R, Nasir S. Rates of depression and anxiety among female medical students in Pakistan. East Mediterr Health J 2008;14 (1):126–33.

37 Eller T, Aluoja A, Vasar V, Yeldi M. Symptoms of anxiety and depression in Estonian medical students with sleep problems. Depress Anxiety 2006;23 (4):250–6.

38 Leahy CM, Peterson RF, Wilson IG, Newbury JW, Tonkin AL, Turnbull D. Distress levels and self-reported treatment rates for medicine, law, psychology and mechanical engineering tertiary students: cross-sectional study. Aust N Z J Psychiatry 2010;44 (7):608–15.

39 Alem A, Araya M, Melaku Z, Wendimagegn D, Abdullahi A. Mental distress in medical students of Addis Ababa University. Ethiop Med J 2005;43 (3):159–66.

40 Miller PM, Surtees PG. Psychological symptoms and their course in first-year medical students as assessed by the Interval General Health Questionnaire (I-GHQ). Br J Psychiatry 1991;159:199–207.

41 Das A. Stress among medical students in a medical college of south India. Educ Health 1999;12 (1):63–9.

42 Dahlin M, Janeborg N, Runeson B. Stress and depression among medical students: a cross-sectional study. Med Educ 2005;39:594–604.

43 Bunevicius A, Katkute A, Bunevicius R. Symptoms of anxiety and depression in medical students and in humanities students: relationship with big-five personality dimensions and vulnerability to stress. Int J Soci Psychiatry 2008;54 (6):494–501.

44 Goodwin L, Ben-Zion I, Fear NT, Hotopf M, Stansfeld SA, Wessely S. Are reports of psychological stress
higher in occupational studies? A systematic review across occupational and population-based studies. *PLoS One* 2013;8 (11):e78695.

45 Kessler RC, Bromet EJ. The epidemiology of depression across cultures. *Annu Rev Public Health* 2013;34:119–38.

46 Viviers S, Lachance L, Maranda MF, Menard C. Burnout, psychological distress, and overwork: the case of Quebec’s ophthalmologists. *Can J Ophthalmol* 2008;43 (5):535–46.

47 McCranie EW, Brandsma JM. Personality antecedents of burnout among middle-aged physicians. *Behav Med* 1988;14 (1):30–6.

48 Gossop M, Stephens S, Stewart D, Marshall J, Bearn J, Strang J. Health care professionals referred for treatment of alcohol and drug problems. *Alcohol Alcohol* 2001;36 (2):160–4.

49 Gross SR, Wolff K, Strang J, Marshall EJ. Follow-up of provision of inpatient treatment for UK healthcare professionals with alcohol dependence: snapshot of a pilot specialist National Health Service. *Subst Use Misuse* 2009;44 (13):1916–25.

50 Baykan Z, Nacar M, Cetinkaya F. Depression, anxiety, and stress among last-year students at Erciyes University Medical School. *Acad Psychiatry* 2012;36 (1):64–5.

51 Chan DW. Depressive symptoms and depressed mood among Chinese medical students in Hong Kong. *Compr Psychiatry* 1991;32 (2):170–80.

52 Gaspersz R, Frings-Dresen MH, Shuitter JK. Prevalence of common mental disorders among Dutch medical students and related use and need of mental health care: a cross-sectional study. *Int J Adolesc Med Health* 2012;24 (2):169–72.

53 Vaz RF, Mbajorgu EF, Acuda SW. A preliminary study of stress levels among first-year medical students at the University of Zimbabwe. *Centr Afr J Med* 1998;44 (9):214–9.

54 Biro E, Balajti I, Adany R, Kosa K. Determinants of mental well-being in medical students. *Soc Psychiatry Psychiatr Epidemiol* 2010;45 (2):253–8.

55 Søren Grotmol K, Gude T, Moun T, Vaglum P, Tysen R. Risk factors at medical school for later severe depression: a 15-year longitudinal, nationwide study (NORDOC). *J Affect Disord* 2013;146 (1):106–11.

56 Guthrie EA, Black D, Shaw CM, Hamilton J, Creed FH, Tomenson B. Psychological stress in medical students: a comparison of two very different courses. *Stress Med* 1997;13:179–84.

57 Inam SN, Saqib A, Alam E. Prevalence of anxiety and depression among medical students of private university. *J Pak Med Assoc* 2003;53 (2):44–7.

58 Khan MS, Mahmood S, Badshah A, Ali SU, Jamal Y. Prevalence of depression, anxiety and their associated factors among medical students in Karachi, Pakistan. *J Pak Med Assoc* 2006;56 (12):583–6.

59 Radovanovic Z, Eric L, Simic S, Jevremovic I. Smoking, mental health and selected variables among medical students in Belgrade. *Soc Psychiatry* 1985;13 (4):255–60.

60 Sherina MS, Rampal L, Kaneson N. Psychological stress among undergraduate medical students. *Med J Malaysia* 2004;59 (2):207–11.

61 Verger P, Combes JB, Kovess-Masfety V, Choquet M, Guagliardo V, Rouillon F, Peretti-Watel P. Psychological distress in first year university students: socioeconomic and academic stressors, mastery and social support in young men and women. *Soc Psychiatry Psychiatr Epidemiol* 2009;44 (8):643–50.

62 Yousafzai AW, Ahmer S, Syed E, Bhutto N, Iqbal S, Siddiqi MN, Zaman M. Well-being of medical students and their awareness on substance misuse: a cross-sectional survey in Pakistan. *Ann Gen Psychiatry* 2009;8:8.

SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Appendix S1. MeSH terms used in the study search strategy.

Appendix S2. Papers (n = 29) that met the study inclusion criteria and were included for review.

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