

SJM Commentary

Medical Students and Mental Health

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The quality of mental health among medical students worldwide is an issue that has existed for decades, but one that has not, as of yet, received sufficient resources, time, and practical consideration. A recently published meta-analysis of 195 studies in JAMA calculated the overall pooled prevalence, globally, of depression or similar indications of medical students was 27.2% (1). This clearly illustrates a concern among the mental health status of medical students. In conjunction with this meta-analysis, JAMA also published a systemic review by Wasson et al. who focused their research on reviewing 28 different implementations thought to improve the mental health of medical students (2). Such implementation included a pass/fail system and mental health and wellness programs, all of which revealed an improvement in the medical students' mental health status.

Given the growing need to solve issues involving mental health in the medical school setting, why has this subject not received the attention it clearly deserves and warrants? The accompanying editorial by Stuart J. Slavin, MD, MEd lists 5 reasons why this is the case (3). He first states that there is a belief that if a student cannot handle the stress and pressure and workload of medical school, then they should "seek another profession." Dr. Slavin states that this leads to a flawed logic, which indicates that more hours and rigorous education must lead to better "educational outcomes" and that anything less than this is considered a lowering of the standards. Interestingly, curriculum changes at one medical school that implemented pass/fail grading system, less detail oriented study and more student involvement in volunteering and extracurricular showed less stress and anxiety and better overall quality of life among their students.

The second issue in medical school culture is the concern for physical illness over mental health. This is revealed in the lack of prevention of mental health related issues in a medical school setting. Thirdly, most of the resources, money, and medical research have been directed towards the curriculum and how



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No Comment

to make the actual medical material better rather than towards the Student Affairs offices. While this might result in better teaching methods and more efficient presentation of material, the quality of the mental health of the student can be overlooked. A fourth aspect of the atmosphere in medical schools that leads to decreased concern for mental health among students is that the medical school administration remains indifferent. Stuart states that the reason for this indifference could lie in the fear that addressing these issues could reflect badly on the particular medical school.

The fifth and final cultural finding in the medical school setting is the attempt by medical schools to implement mindfulness programs, self-care courses, and resilience programs without addressing the issue of the learning environment of the student and how this affects their mental health. Simply providing students with these generalized programs, while well-intended, takes the responsibility away from the medical school administration, as they are not necessarily addressing the true mental health needs of their students.

Dr. Slavin states that "student wellness must be everyone's concern" and should not be limited to just the Dean of Students office. It is crucial that such mental health concerns are valued just as much

as board scores and residency matches and that the entire administration work together to create a culture in which the mental well-being of the student is the utmost priority.

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Medical Students and Back Pain

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Musculoskeletal (MSK) disorders are injuries that affect the body's muscles, bones, and joints. Lower back pain is one of the most predominant MSK disorders in working class Americans, especially in service workers, craftsmen, operatives, and laborers (1). This pain is defined as a non-traumatic MSK disorder affecting the low back, including lumbar disk problems and sciatica, and not caused by injuries, other diseases, or cervical spine problems (e.g., neck pain) (2). While the prevalence of lower back pain in working Americans is well known, little data has been collected on the prevalence of MSK disorders in medical students.

In a study quantifying the musculoskeletal ailments that 4th year medical students suffer in a medical school in Mainland China, information was obtained from 207 students using an updated Standardized Nordic Questionnaire, a questionnaire that allows for comparison of neck, shoulder, lower back and general complaints amongst a sample (3). Approximately one-third of subjects reported that they suffered from an ongoing MSK disorder, the most common region affected being the lower back (40.1%), followed by neck pain (33.8%) and shoulder pain (21.7%). The study concluded that time spent doing deskwork or on the computer is likely a contributing factor to the high prevalence of MSK disorders in this medical student population (3). With the high prevalence of back, neck,

and shoulder pain in medical students, it is important for this population to be informed regarding exercises that may mitigate such disorders. A systematic review concluded that there is a positive therapeutic effect of yoga in individuals who suffer from chronic spinal pain (4). The authors of this review highlight how certain yoga positions correct vertebral curvatures and strengthen the thoracic, abdominal, and respiratory muscles needed to maintain a proper posture. Yoga, therefore, can be an effective preventative measure and treatment for medical students who may be predisposed to back and neck pain (4). In fact, one of the authors of this review teaches UK medical students about the benefits of yoga. In light of these findings, it is important for medical students to be aware of their bodies while studying and engage in physical activities that deter the onset of MSK disorders.

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Mental Health and the 21st Century Cures Act

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The awareness and treatment of mental health in the United States has made great strides recently, as evident by the approval of the 21st Century Cures Act by the House of Representatives and by the Senate and approval by President Obama. According to Dr. T. Scott Stroup, a psychiatry professor at Columbia University College of Physicians and Surgeons in New York, there is finally in place a bill that is based on evidence and research rather than opinion or ideology. The bill provides access to treatment for individuals with psychosis, requiring 10% of states' mental health

budget be directed toward this issue. In addition, the bill states that a \$5 million grant will be dedicated to community-based mental health, enabling individuals access to a 24-hour on-call professional service team. Another section of the bill requires the United States Attorney General to make mental health programs accessible to patients with severe mental illness or drug addiction. Many of these patients receive large jail sentences for minor crimes, and this program would give these people the support they need rather than keeping them behind bars with no access to mental health care. The bill also aims to clarify when physicians can share information with family members of a patient who cannot provide proper information because of his/her disability.

In the past, the United States has lacked severely in funding and programming for pertinent mental health issues. According to Dr. Maria Oquendo, the president of the American Psychiatric Association, this bill “marks the passage of the first mental health reform bill in more than 50 years and is long overdue.” From how mental illness is handled in the criminal justice system to the improvement of mental health services for children, the treatment and services provided for mental illness will continue to grow and improve from the approval of this legislation. Additionally, the strong support for this bill strengthens the need for physicians to learn more about and, if needed, utilize the resources that are currently and will become available for their patients. Lastly, the mental health programs outlined by the bill are crucial to the health and wellbeing of the citizens of the U.S.

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The Death of Animals in Medical School

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The authors take note of the rapid decline in the use of live animals in medical schools. In 1987 over 90% of schools used live animals as part of their curricula. This number plummeted to 32% of U.S. medical schools in 2001. Today, there are no U.S.-based medical programs that make use of live animals. Many older medical graduates that employed this practice during

their studies are strong proponents for the invaluable experience that comes with handling a live subject. They argue that no simulation can replicate the atmosphere or elicit the same requirements for swift decision-making and teamwork that are used when handling a live animal. On the other hand, animal rights groups, who have fought for such changes in the curricula for several decades, are rejoicing in the results. The authors note that all physicians will eventually have to hold a life in their hands, and with the abolishment of live animal experiments, many trainees' first experience will be with a human. Additionally, given the fact that most patients demand the most experienced physicians, trainees are left to practice their skills on less fortunate individuals, including uninsured, undocumented, and other marginalized groups. Thus, the question remains as to whose body will be the first to be practiced on by newly-trained physicians, and whether simulation technologies are adequate in refining these doctors' skills.

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Genetic Testing and Alzheimer's Disease

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A new study published by the Dementia Research Centre at University College London's Institute of Neurology has concluded that the age of onset and clinical features of autosomal dominant familial Alzheimer's disease (ADAD) may be influenced by the position of the mutation that causes the disorder and the specific causative gene responsible. This conclusion reinforces the importance of considering genetic testing in younger patients who present with dementia and additional neurological features to ensure proper diagnosis and treatment.

Familial Alzheimer's disease is clinically similar to the sporadic form of the disease in that both are associated with progressive impairment of episodic memory, though the heritable form of the disease typically presents with a younger age of onset. Despite ADAD affecting less than 1% of all Alzheimer's patients, the disease has long been considered a useful model to study to shed light on the disorder in general.

To further explore the relationship between the genotype and phenotype of ADAD patients, the Dementia Research Centre reviewed medical histories of approximately 213 patients in the UK and Ireland who were shown to be carriers of two mutations that led to the disease over a 28-year period. The two specific genetic mutations examined were mutations in the gene presenilin 1 (PSEN1) and mutations in a gene responsible for producing amyloid precursor protein (APP).

The results indicate that age of onset is significantly later for individuals who are carriers of APP mutations (50.4 years) than for those with PSEN1 mutations (43.6 years). Moreover, researchers learned that the age of onset in patients with PSEN1 mutations was influenced by the position of the mutation in the gene. The study also shows that the type of symptoms that presented were different between the two mutation carriers. Carriers of mutations in PSEN1 tend to present with atypical cognitive symptoms and other neurological features such as spastic paraparesis, rigidity, and ataxia in addition to the typical Alzheimer symptoms.

The study's findings suggest that it is important to consider ADAD as an option in differential diagnoses of patients with early onset dementia and other neurological features. Moreover, the authors suggest that these findings serve to highlight the importance of investigating atypical genotypes of non-familial Alzheimer's to better understand the complex mechanisms that lead to the disease.

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Gamma Oscillations: Possible Treatment for Alzheimer's Disease?

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In a recent research paper published by the Massachusetts Institute of Technology, and featured on the popular NPR podcast "RadioLab," neuroscientists have shown that subjecting mice suffering from pathology similar to Alzheimer's disease to oscillating light may reduce the buildup of amyloid plaques that lead to neurodegeneration. The study focuses on gamma oscillations, a pattern of electrical

activity between excitatory and inhibitory neurons observed in a healthy brain, and how inducing these oscillations can actually reduce the levels of amyloid plaque buildup in diseased mice engineered to mimic Alzheimer's disease in humans.

The study confirmed that mice that showed an increase in the concentration of amyloid in the brain also showed deficits in the gamma oscillation patterns observed. This conclusion strengthens previous research, which has shown that gamma oscillations are abnormal in humans suffering from Alzheimer's disease. When the MIT team induced the gamma oscillations in mice where the pattern was deficient, they found that the exposure decreased the amount of two different isoforms of amyloid plaques (A β 1–40 and A β 1–42) by 53.22% and 44.62% respectively. In other words, by simply shining a light at the right frequency on specific brain cells, these scientists were able to remove approximately half of the amyloid plaque in these mice.

Furthermore, by performing genome-wide sequencing on the brain tissue of the mice after 1 hour of exposure to 40 Hz oscillations, the MIT researchers found that 35% of the upregulated genes in the tissue were related to the function of the brain's microglia cells. The genes affected tended to be related to macrophage-stimulating factors and other elements involved in the phagocytosis activities of these neuron-assisting cells. The scientists concluded that the amyloid plaque was reduced due to the enhancement of activity of the brain's microglia, which become more effective at ridding the brain of the harmful plaques as a result of the "restoration" of gamma oscillations.

These results could mean that a similar method could be engineered to treat humans suffering from Alzheimer's disease. With that in mind, the scientists showed that they could replicate the results attained in amyloid plaque removal by simply placing diseased mice in an environment with a light flickering at 40Hz, instead of the much more invasive procedure of shining a light at specific neurons in the brain. However, the researchers remain cautious about replicating the results in humans and emphasize that further study is required to determine whether a similar treatment will be therapeutic for humans.

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