The Importance of Exercise in the Well-Rounded Physician: Dialogue for the Inclusion of a Physical Fitness Program in Neurosurgery Resident Training

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Exercise, diet, and personal fitness programs are essentially lacking in modern graduate medical education. In the context of long hours and alternating shift and sleep cycles, the lack of exercise and poor dietary choices may have negative consequences on physician physical and mental health. This opinion piece aims to generate important dialogue regarding the scope of the problem, the literature supporting the health benefits of exercise, potential solutions to enhancing diet and exercise among resident trainees, and possible pitfalls to the adoption of exercise programs within graduate medical education.

INTRODUCTION

The Accreditation Council for Graduate Medical Education mandates the mastery of 7 core competencies among physicians in training. The goal of modern graduate medical education is to instill its trainees not only with medical knowledge and procedural competency that allows individuals to function as independent physicians but also with an awareness of the importance of lifelong learning, interpersonal skills, and personal well-being that will ensure career success, longevity, and satisfaction.

The importance of personal health in both mind and body has long been known. Medical school curricula have become increasingly tailored to promote an ideal learning environment for students in a field in which medical knowledge continues to grow exponentially. Course work now includes education on patient differences and belief systems that allows physicians to be more sensitive to patient-specific needs as well as introspective teaching that promotes understanding of personal biases that may affect medical decision making. The importance of psychological health in terms of learner depression and burnout have led to support programs in schools and residency programs. Now more than ever, residency training attempts to promote a strong and healthy mind, in which individual knowledge, confidence, satisfaction, self-respect, tolerance, and compassion are encouraged. However, the expansion of the mind during resident training may come at the expense of the body.

Exercise, diet, and personal fitness programs are essentially lacking in modern graduate medical education. In the context of long hours and alternating shift and sleep cycles, the lack of exercise and poor dietary choices may have negative consequences on physician physical and mental health. This opinion piece aims to generate important dialogue regarding the scope of the problem, the literature supporting health benefits of exercise, potential solutions to enhancing diet and exercise among resident trainees, and possible pitfalls to the adoption of exercise programs within graduate medical education.

THE DETERIORATION OF PERSONAL HEALTH DURING RESIDENCY TRAINING

Medical students are, in general, active individuals and exercise more frequently than the general population. Most exercise routinely with moderate-intensity activity of at least 2.5–4 hours per week.[1,2] However, most studies evaluating the exercise habits of resident physicians have reported a significant reduction in exercise during graduate medical education.[1,3-5] Reasons for the reduction in physical fitness include fatigue from long working hours and lack of time to participate in exercise.[5]

In addition, dietary habits may deteriorate during the long hours of residency training. In association with changes in sleep patterns, this may predispose resident physicians to weight gain.[6] A Brazilian study of resident physicians[7] showed that many were overweight or obese and many self-reported weight gain during residency, particularly in males. However both male and female residents reported poor diets, with high intake of sweets and saturated fats and low intake of vegetables and fruits.

Key words
- Fitness
- Resident education
- Wellness

Abbreviations and Acronyms
RED: Resident exercise and dietary

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Sleep deprivation and poor sleep quality from long work hours, rotating shifts, and interrupted sleep are commonplace.[8] With changes in resident duty hour regulations to help limit fatigue and reduce medical errors, there has been an unclear effect on resident sleep quality.[9]

BURNOUT AND RESIDENT ATTRITION

The percentage of resident physicians reporting burnout during training is unacceptably high. Burnout, a term used to describe feelings of emotional exhaustion, low self-accomplishment, and depersonalization associated with the work environment, is gaining ground as an important marker for resident well-being. Burnout is reported in most resident physicians on surveys, regardless of the specialty. From 47% to 70% of residents report burnout during training.[10-15] Residents who report burnout and personal distress are probably more likely to make medical errors[16,17] and report suboptimal care for their patients.[18] Residents with burnout may be more likely to display unprofessional behaviors.[19] In addition, burnout and personal distress are associated with resident attrition (quitting or changing residency programs or specialties).

Attrition among surgical residents is not uncommon. In the specialty of general surgery, it has been suggested that about 1 in 5 residents fail to complete residency training.[20,21] One study of attrition rates across clinical specialties reported rates approximating 2%–7%.[22] In neurosurgeons, attrition rates approximate 15%.[23] In 1 survey of general surgery residents, nearly 60% of residents had strongly considered leaving their program. Sleep deprivation was the most cited reason for considering leaving, and support from other residents was one of the most common reasons for deciding to stay.[20] These studies suggest that programs that help to improve team-building support structures and mitigate poor quality sleep may reduce resident distress and attrition.

EXERCISE EFFECTS ON SLEEP, DISTRESS, AND FATIGUE

Exercise is important for physical health. Exercise is an effective means of losing weight, maintaining a healthy body weight, and preventing disease.[24] Lack of exercise has clearly been linked to the development of chronic diseases.[25] The beneficial effects of exercise on health-related quality of life are well documented.[26-30]

Exercise is an effective therapy for depression in young adults.[31] Exercise interventions may be beneficial in reducing the symptoms of depression.[32] Patients who engage in regular exercise often report improved sleep quality, higher sleep efficiency, and shorter sleep latencies.[33-36] Further, exercise is beneficial in reducing the symptoms of fatigue in certain patient populations, such as those with cancer-related fatigue.[37,38] In addition, physical activity may improve self-esteem and feelings of self-worth in young adults.[39] These studies suggest that individuals engaging in routine physical activity may benefit from improved self-esteem, decreased depressive symptoms, reduced fatigue, and better quality sleep.

Evidence supports the benefit of interventions designed specifically for increasing physical activity and healthy behaviors. Systematic reviews of interventions that promote physical activity have a positive effect on self-reported activity[40] and may result in persistent improvements in physical and mental quality of life in healthy individuals.[41] Similar to exercise, dietary interventions may also improve quality of life.[42]

BENEFITS OF EXERCISE IN PHYSICIANS AND TRAINEES

Although there are limited published data on the health and well-being benefits of physical activity on physicians, there are some data supporting a positive effect of exercise. Physicians with healthy behaviors are more likely to be satisfied with their occupation.[43] A study[44] has suggested that restful sleep and exercise have a positive effect on personal well-being in residents. Further, physicians who are engaged in regular exercise are more likely to counsel their patients regarding the benefits of physical fitness.[45]

A PROPOSAL FOR A RESIDENT EXERCISE AND DIETARY PROGRAM

We have designed a resident exercise and dietary (RED) program to be implemented as a pilot study for our neurosurgery residents at the Medical University of South Carolina. This program was designed with direct input and oversight from the residents within the program, who have provided voluntary consent to proceed.

Baseline psychological, health, and general fitness metrics will be obtained before the start of the program. These include resting vital signs, weight, physical fitness tests (eg, time to run a mile, number of push-ups in 2 minutes), serum blood work (lipid panel), InBody body composition testing (fat and lean mass), and psychological screening tests including the 8-item Personal Health Questionnaire Depression Scale (PHQ-8), Generalized Anxiety Disorder 7-item Scale, and Quality of Life Scale. All residents will track their activity with a daily log. The program will be implemented in 5 2-month phases, with each phase adding to the previous requirement. Exit testing will be performed.

Moderate physical activity may consist of circuit weight lifting, running, or cross-fit, volleyball, basketball, soccer, and dodgeball. Sessions will last 45 minutes with a 15-minute cool-down period. Attendance will be encouraged but will not be mandatory.

The dietary intervention will be the offering of free breakfast during didactic sessions to all staff and residents within the department. Breakfast items will include only healthy options, such as fruit, vegetables, and yogurt. This will help to promote healthy eating habits for 1 meal a day for trainees, free of charge. Nutrition and fitness lectures will be incorporated into the resident lecture series.

Residents will be provided with a wrist actigraphy device that they will be asked to wear to help monitor their personal activity levels. This will allow residents to track their distance traveled, calories burned, and vital signs in response to activity. Further, this device allows for determination of total time asleep, number of times restless, and number of awakenings such that residents can track their sleep behavior. The goal of this device will be to provide constant feedback to the trainees regarding their health and behavior.

Qualitative and quantitative evaluations will be performed both before the intervention and after the program has been under way for 3 months to assess the benefits of the program in terms of quality of life, well-being, and physical health. Any interested

faculty will also be encouraged to participate in the program and participate alongside the residents.

BENEFITS OF THE RED PROGRAM

The goal of the RED program is to provide residents with approximately 90 minutes of moderate physical activity per week that is protected time away from clinical responsibilities. Further, it will provide residents with a daily breakfast meal with only healthy options, to help improve dietary habits. The goal is to promote improved mental and physical health, reduce burnout, and improve self-worth among our resident population, supporting healthy activity and dietary habits so that they may persist beyond residency.

The team-based exercise program, in contrast to individual exercise programs, may increase resident exercise adherence. Engaging in physical fitness habits with other individuals, particularly those with similar goals and habits, may improve adherence to fitness regimens.[46] Further, exercise is 1 area of lifestyle that may be transformed through social norms within the community.[47,48] This fact has added importance given that stressful conditions usually have a negative effect on efforts to increase physical activity[49]: conditions not unlike those among residents in training. Therefore, a group effort by which residents can provide support to others may be an effective means of promoting physical fitness.

Implementation of a departmental RED program may serve as a means for faculty members to become involved as well to improve physical fitness and diet. A department that prioritizes personal health and well-being in its residents may also improve lifestyle habits of faculty, office staff, and physician extenders within the department.

CHALLENGES AND PITFALLS

Implementation of an exercise and dietary program into residency training generates several important ethical concerns. First, the program must be voluntary and trainees must not be coerced into participating because of concern for disparate treatment or negative evaluations. Individuals with disabilities, those with health concerns precluding physical activity, those with special dietary restrictions, or those not interested in participating must be able to opt out without concern for differential treatment. Therefore, all individuals who choose not to participate should be allowed to do so freely without fear of reprisal. Second, the additional time spent away from clinical responsibilities or didactic sessions must be included within the 80-hour work week and must not have negative consequences on mastering of the 7 Accreditation Council for Graduate Medical Education core competencies during their training. Third, delivery of neurosurgical care is fraught with emergencies and creates an unpredictable schedule, which makes adherence to a weekly schedule challenging. The burden of neurosurgery clinical care is not insignificant.[50] Additional exercise added onto already fatiguing work days may have consequences on patient care that must be monitored and prevented. These factors will require continuous monitoring while the program is in place (**Table 1**). Regular resident–director meetings can help to identify resident concerns regarding its effect on patient care, learning, or operative opportunities. Further, anonymous resident surveys can be administered on a regular basis to allow for monitoring of negative consequences anonymously. Should some of the residents express concerns, the program can be temporarily halted for review and revision of policies. We emphasize with our residents that participation is entirely voluntary and any educational or patient care responsibilities are the priority and supersede all wellness activities.

Table 1. Potential Obstacles and Solutions for Program Implementation

Obstacles	Solutions
Funding: there will be costs associated with fitness center memberships, activity tracking meters, data collection, and group activities	Educational grants
	Graduate medical education support
	Objective metrics can be obtained with economical devices such as Fitbit, which track steps taken, distance traveled, calories, and continuous heart rate
Compliance: patient care needs will continue to be the primary concern and dictate resident availability	Striving for 100% compliance at every activity is unrealistic. The goal will be to have the best participation possible and track progress
	Trial and error of different activities will be beneficial
	The night float resident may need to have a uniquely tailored regimen or be excused altogether
Resident and faculty attitudes: ingrained mentality of toughness in neurosurgery passed down from the pre–duty hour work limits creates resistance, which may limit widespread acceptance of some programs	Rather than perceiving incorporation of a physical activity program into residency training as a weakness (akin to resident nap time or cookies and milk), it should be viewed as strengthening the resident physician and increasing their physical reserve by promoting a balanced and healthy lifestyle, which will improve their ability to perform neurosurgery at the highest level in the long run
Liability: injuries may occur	Participants will sign a waiver of liability at the onset of the program
Participation: residents may feel coerced to participate even if they do not want to, or may feel attention away from clinical responsibilities is damaging patient care	Serial anonymous online surveys are performed, and if more than a quarter of residents report that they do not want to continue, or they believe the program is harming patient care, the program will be temporarily halted to allow for internal review and modification/termination

We have estimated the annual cost of our wellness program to approximate $500 per resident participant. This total includes the cost of wrist actigraphy devices, healthy food options, and matching workout uniforms. However, most of these interventions are not mandatory for the success of the program. We believe that the most important part of the program is changing the culture among the residents and faculty, where it is now encouraged for our team members to focus on personal health and well-being. For those centers in which cost may be prohibit healthy food choices or wrist actigraphy devices, a wellness

initiative that changes the culture of a program may still be successful. For instance, simply incorporating dietary lectures or physical fitness sessions into the work week may help to improve the culture of wellness.

CONCLUSIONS

Exercise and healthy dietary choices have undeniable, positive effects on physical and mental health. Studies have suggested that resident physicians engage in low levels of physical activity, have poor dietary habits, and have poor quality sleep. Burnout and depression are common among residents in training and may be related to these factors. We believe that the implementation of the RED program may help to improve resident mental and physical health and reduce burnout and attrition. We plan to implement a simple program to improve resident physical activity and diet.

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