Full-Length Article

Burnout: *Why Doctors Need Music*

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Abstract

There are many factors that contribute to the rise of physician burnout, including but not limited to: excessive work hours, little control over work schedule, the stress of balancing work and personal life, the never-ending expansion of medical knowledge that one needs to stay attuned to, and the difficulties that come from reporting to healthcare administrators. Physician burnout is a serious psychological affliction that can lead to, or be comorbid with, other psychological illnesses such as depression.

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Introduction

"I have been planning the perfect suicide." These are the words that James Lynch, M.D. spoke to his friends and family one night after months of battling the dark pull of depression. He was in his early 40's, married, with children, and had endured a successful career when his crippling feelings of stress and hopelessness began. He soon became overwhelmed with the stressors of his life, feeling as if he was constantly disappointing everybody around him—whether that was his spouse, his superiors, and/or even his patients. Ending his life seemed soon to be the only option for him to escape his constant pain [1].

Burnout in Physicians – Incidence

What happened to Lynch was a consequence of the same illness that almost half of United States physicians struggle through every day: burnout [2]. Occupational burnout is defined by the Annual Reviews of Psychology as "a prolonged response to the chronic emotional and interpersonal stressors on the job, (comprised of) three dimensions: exhaustion, cynicism, and inefficacy" [3]. It has become a significant phenomenon of the modern age and has been an important focus of research over the past 25 years [3]. While burnout is a widespread problem that affects people in almost every profession, physicians experience it at the highest rate [2]. As of 2012, it is reported that 45.4% of physicians in the U.S. are experiencing burnout [2].

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Burnout in Physicians – Etiologies and Comorbid Conditions

There are many obvious factors that contribute to the rise of physician burnout, including but not limited to: excessive hours, little control over work schedule, the stress of balancing work and personal life, the never-ending expansion of medical knowledge one needs to stay attuned to, and the difficulties that come from answering to the healthcare administration [4]. Physician burnout is a serious psychological affliction that can lead to, or be comorbid with, other psychological illnesses such as depression (40.4% of physicians screened positive for depression as of 2012 [4]). Thomas Murphy, M.D. published a story about his personal experience with burnout, comparing being at work to being in psychological prison. "I was the type of physician that I never wanted to be," he notes, "impatient, sarcastic, and occasionally dismissive of my patients" [5]. In certain cases, the ultimate consequence of burnout may be suicide. Physicians have the highest rate of suicide among of any profession, at approximately 400 physicians per year. This rate is 1.4-2.3 times higher than the general public [6]. Unfortunately, these statistics are not well known to people due to the stigma that comes with a physician being mentally unwell or committing suicide. Along with the negative effects on one's mental health, burnout has significant physical health risks as well. These include substance abuse, cardiovascular disease, sleep disturbances, immune function compromise, and poor health maintenance [7].

The Acoustic Space in Healthcare – A Modifiable Risk Factor

There are also not-so-obvious causes of stress that can contribute to burnout, such excessive hospital noise. The World Health Organization recommends that hospital noise levels should not exceed 30 dBA [8] (the sound of a whisper in a quiet library) and the Environmental Protection Agency recommends that they should not exceed 45 dBA [9] (the

sound of a quiet urban night). Almost all hospitals have noise levels that exceed both of these recommendations—a typical intensive care unit may experience levels up to 70 dBA [10] (about that of a vacuum cleaner). Excessive alarms are the main cause of such noise levels. The positive predictive value of alarms was found to be only 27% [11], indicating that the majority of alarms heard are either false or clinically insignificant. These alarms constantly raise noise levels in the hospital and may lead to the desensitization of caretakers to the urgency of real alarms [11].

Deleterious Effects of the Alarmscape to Patients and Clinicians

There can be adverse consequences on the health and performance of medical personnel and patients alike from all of this excess noise. Even if a noise is ignored, the ear will not stop hearing it and the stress response (activation of the sympathetic nervous system) will still be triggered. Prolonged activation of the stress response can lead to increased risk of hypertension and ischemic heart disease, and promote sleep disturbances [10]. Shilo et al [12] found that patients in the intensive care unit experience a severe lack of sleep as compared to controls, contributing to ICU syndrome (a form of delirium in which patients experience a cluster of serious psychiatric symptoms after a stay in the ICU) and delirium [12]. Clearly, this is detrimental to patients in recovery. The process of healing may depend on sleep due to the heightened rate of cellular division and protein synthesis that occur [13]. Additionally, noise is especially dangerous to caretakers because it increases occupational stress, which puts effective treatment of patients as well as the caretaker's own well-being at risk (by contributing to symptoms of burnout). Noise has been shown to reduce work performance by delaying responses to alarms as well as increasing communication errors, directly impacting patient safety [14].

Academic Medical Centers – Novel Programs to Address Patient Monitoring

Even though excess hospital noise is a significant issue, only a minority of establishments are issuing calls-to-action to improve alarm management. Beth Israel Deaconess Medical Center in Boston formed a management team that analyzed the failure modes and effects of the problematic alarms, leading to a long-term strategy to improve cardiac monitoring systems. Kaiser Permanente identified four goals to improve alarm management: a new adult telemetry standard, alarm customization, alarm hygiene, and reduction of repeated pager notifications [14]. Besides the concerns previously presented with the cacophony of alarms, another contributor to the acoustic environment in the operating room is the pulse oximeter (the machine used to measure blood oxygen saturation). Utilizing the pulse oximeter is standard of care for patient monitoring during anesthesia care in the United States. However, the continuous auditory information from the pulse oximeter is not standardized by volume, pitch correlation to oxygenation, or degree of change of pitch to signify acuity of change in the patient's oxygenation. To tackle this issue, Brown et al [15] set out to understand the most advantageous approach to patient monitoring with pulse oximetry and different pitch schemata. Most pulse oximeters currently use linear mappings between saturation change and frequency change (i.e. the frequency of the sound from the oximeter changes by 10 hertz per degree of saturation); even though the human ear hears differences in pitch on a logarithmic scale, common in Western music. They found that the ability of anesthesiologists to judge change in oxygen level was significantly better when the logarithmic scale was used [15]. At Vanderbilt University Medical Center, Schlesinger et al [16] devised a multisensory perceptual training regimen to improve anesthesiologists' ability to efficiently monitor the pulse oximeter and perceive subtle pitch differences while in the operating room, a cognitively demanding environment [16].

Work Hours – Comparison of High-Consequence Industries

Though physicians are constantly working to improve the environment of the hospitals in which they work and the care that their patients receive, there is a striking lack of policy in place that would ensure a physician's own well-being is looked after. The hours of most occupations that involve working with the public are regulated to protect people from fatigue-related errors. Doctors in training also have these regulations, but there are no such policies to limit a practicing physician's hours [17]. A pilot has a maximum flight time of nine hours, while a physician may have a 24-hour shift [18]. A truck driver can drive a maximum of 70 hours per week [19], while some doctors may work 80 hours or more [20]. Lack of regulation allows physicians to be overworked and over exhausted to no end, causing or worsening burnout symptoms.

Music – Direct Benefits for Patients and Clinicians

For relief of burnout and other struggles that physicians and patients alike face every day, attention must be called to the often overlooked and under-studied benefits of music. In general, the benefits of music on the well-being of doctors are manifold. For one, music playing in the operating room has been shown to improve surgical efficiency. Siu et al [21] performed a study on the effect of music on robot-assisted laparoscopic surgical performance at the University of Nebraska, Omaha. 10 medical students with no prior experience in robotic surgery participated in the study, were tasked with performing two inanimate surgical tasks using the da Vinci Surgical System: suture tying and mesh alignment. The experiment began with each participant completing the tasks in the baseline (no music) condition, followed four music conditions (jazz, classical, hip-hop, and Jamaican) in random order. Two kinematic variables were measured and

results showed that significant music effects were found for both time of task completion and total distance traveled, indicating that the surgical task was performed more efficiently for all participants [21]. Allen and Blascovich [22] studied the effects of music on the autonomic reactivity (via heart rate, systolic blood pressure and skin conductance) of surgeons by having them perform serial arithmetic tasks under three different conditions: silence, investigator-selected music, and self-selected music. The results indicated that there was a significant reduction in reactivity in the surgeon-selected music condition as compared to the investigator-selected music condition, while both of these had significantly higher reductions when compared to the no-music control condition [22]. Secondly, music has been shown to reduce anxiety and pain. In 2011, Kim et al [23] conducted a study on the effects of musical intervention on intraoperative anxiety levels of patients undergoing impacted mandibular third molar (IMTM) extraction. 219 patients were randomly assigned into a music-treated group or a control (no music) group. Patients in the music-treated group selected their favorite songs, and these songs were played from the patients' arrival to the operating room through the end of surgery. Perioperative anxiety and perceptions of pain were assessed using the Dental Anxiety Scale and the Visual Analog Scale, respectively. Patients' vital signs (blood pressure, heart rate, and respiratory rate) were monitored throughout the surgery. The results indicated that the music-treated group showed a significantly smaller change in heart rate than the control group and reported significantly less intraoperative anxiety than the nonmusic-treated control group when controlling for preoperative anxiety levels [23].

Music and the Neurobiology of Depression

Aside from improving doctors' efficiency and their patients' pain, music may also be able to offer relief to the deteriorating mental health that so many doctors these days suffer from. Though it is still an emerging discipline, music therapy has been found to have successful results in mitigating depressive symptoms and stress levels. The American Music Therapy Association (AMTA) has described music therapy as "the clinical and evidence-based use of music interventions to accomplish individualized goals within a therapeutic relationship by a credentialed professional who has completed an approved music therapy program" [24]. A qualified music therapist assesses the needs of the patient and provides a specialized treatment that may include creating, singing, moving to, and/or listening to music [24]. Music therapy is *not* to be confused with music medicine, which is used by medical personnel who are not qualified music therapists as an "adjunct to various medical treatments or situations" [25]. Some evidence for the validity of music as a potentially therapeutic medium has come from the use of functional magnetic resonance imaging (fMRI) and positron emission tomography (PET) scans to show that music can influence the activity in the emotional centers of the brain (amygdala, the hippocampus, the anterior cingulate cortex, etc.) [26]. There are many challenges that come with research in music therapy, including creating an effective music placebo and creating procedures that are replicable (most music therapies need to be individualized to be most effective). Furthermore, many studies lack the distinction between music therapy and music medicine, and are not run by qualified music therapists [25]. Because of these challenges, legitimizing music therapy as a standard medical treatment option is an ongoing endeavor.

Role of Music in Neuropsychological Outcomes and Improving Patient Metrics

Music therapy has benefit from qualifiable to quantifiable to basic science outcomes. Researchers paving the way in the field of music therapy have shown that music therapy can help improve depressive symptoms. In Finland, Erkkila et al [27] compared standard care to standard care plus music therapy in working-aged depressed adults. The music treated group participated in 20 bi-weekly hour-long music therapy sessions, where the patient and therapist participated in musical improvisation with identical instrumentation. The music treated group showed significantly greater rates of improvement of levels of depression and anxiety [27]. In a pilot study, Canga et al [28] tested the effect of environmental music therapy (EMT) on physical, psychological, and cultural needs of patients, caregivers, and staff in chemotherapy infusion suites and waiting rooms. Live music was played in the suites, tailored to the dynamics of the physical environment and the requests of patients, caregivers, and staff. Questionnaires were given to the patients and staff asking about the effect of the music on the environment, the volume of the music, type of preferred music, and open-ended opinion questions. The results indicated a "strong tendency to consider the EMT intervention as beneficial" [28]. A finding of special importance here is that the caretakers reported the beneficial effect of witnessing and engaging in EMT sessions, noting that the presence of music therapy helped improve the care they were able to give to their patients due to changes in mood and degree of self-awareness. Also of importance was the finding that the therapy sessions reduced the perception of hospital noise in patients and caregivers. Bittman et al [29] conducted a study on the impact of recreational music-making (RMM) on burnout and mood dimensions, as well as on Total Mood Disturbance (TMD) in an interdisciplinary group of long-term retirement center caretakers. RMM interventions include group drumming and keyboard sessions, uniting people of all backgrounds and age groups. It was found that controlled RMM intervention promoted significant improvements for multiple parameters associated with burnout, mood states, and TMD [29]. Benefits of music therapy transcend from qualitative assessments to quantitative vital sign improvement, especially in non-communicative

patients. Loewy et al [30] showed that 3 live music interventions showed changes in heart rate interactive with time – lower heart rates occurred during the lullaby and rhythm intervention in premature infants in the NICU. Caloric intake, sucking behavior, and parental stress perception were all improved with music interventions. These outcome measures not only improve outcomes in the NICU, but may decrease ICU delirium, a difficult to assess neuropsychological outcome in premature infants [30]. Since recorded music can risk overstimulation, the observation and feedback mechanism of music therapy in the ICU setting can allow for a dynamic therapeutic approach, just as the intensivist constantly reevaluates the pharmacologic approach. That is, music therapists have the ability to prescribe the ideal "dose" to treat the whole patient. Moving from qualifiable results to quantifiable results, the neurobiology of music perception and cognition and the rehabilitative effects are best described by Särkämö. Aspects of music perception and cognition include spectral processing, temporal processing, musical memory, and an emotional response to music. Critical brain areas where neurologic damage may occur and affect these aspects of music cognition and perception are: the inferior front gyrus, anterior superior temporal gyrus, middle/inferior temporal gyrus, insula, auditory cortex, planum temporale, and the parietal lobe. Understanding the functional imaging of these brain areas helps in the rehabilitative process of neurologic recovery. Through Särkämö's work on the role of music therapy in depression and stroke, music can and should be used in the rehabilitative process. Utilizing these processes improve care from the neurobiologic presentation to the phenotypic presentation [31].

Pharmacology of Music Therapy – Individualizing the Intervention

Taking care of the aforementioned NICU patients and stroke patients is extremely taxing to the healthcare team, and burnout is a serious concern, as previously presented. Though her studies have received criticism due to conflicts of interest in the fact that she owns shares and acts in a supervisory role for SANOSON, the producer of the receptive music therapy, Brandes et al [26] completed a study that used music therapy to attempt to conquer burnout. 150 participants suffering from burnout were split into four groups: two treatment groups, each having their own specifically designed music intervention programs, one placebo group that listened to benign nature sounds, and one wait-list control group that did not receive any listening program. Each treatment group listened to their program twice a day for 30 minutes, five days per week, for five weeks. The programs rendered significant results in the positive reduction of burnout symptoms [26].

Music, Mind, and Society – Emerging Leaders in the Field

Even though use of music in medicine is an emerging discipline, it has clearly already been shown to have important applications. Many institutions have created novel programs dedicated to research in music therapy. Paving the way in this is the Music Therapy Department at Mount Sinai Beth Israel in NYC, which houses The Louis Armstrong Center for Music and Medicine and Louis and Lucille Armstrong Music Therapy Program. The program was created in 1994 with help from a generous grant from the Louis Armstrong Foundation. They have acquired additional grants and support. Their team provides daily music therapy sessions for patients in a large range of areas of their hospital systems, including the neonatal ICU, Pediatrics, Family Medicine, Oncology, ICU, Orthopedics, Maternity, and Pain Medicine & Palliative Care, and in the community, along with many research projects [32]. They also have implemented 'Caring for the Caregiver' programs that provide music options for staff. Much of this work was an incentive which started after their work with 9-11 personal and professional caregivers [33]. Their team devoted weekly sessions for doctors, nurses and allied staff to partake in live music experientials such as drumming, music meditation and singing. These groups are currently funded by the hospital and are meant to increase acuity and staff satisfaction (personal communication, March 2, Loewy). Vanderbilt University has expanded their research across multiple disciplines, recently launching the novel Program for Music, Mind, and Society led by Dr. Reyna Gordon. A team of over 3 dozen researchers across the disciplines of medicine, psychology, neuroscience, education, and music performance are working together with the goal of exploring the science behind music's effects on the brain and behavior, as well as developing and integrating music therapies into more patients' treatments [34].

Conclusion

Burnout is a serious problem affecting too many of our nation's caretakers, endangering their lives as well as the lives of their patients. From excess hospital noise to endless work hours, physicians are constantly battling stressors that can lead to feelings of exhaustion, cynicism, and inefficacy. Burnout is not a condition that is easily mitigated because it has a plethora of complex causes. Instead, novel treatments such as music therapy integrated with concepts from music and medicine must be created. Even though many institutions have already begun research to unlock the potential benefits that music therapy has to offer, there is still a long way to go, but thankfully, the International Association of Music and Medicine is leading the charge.

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Biographical Statements

Dr. Schlesinger is an Assistant Professor in the Department of Anesthesiology and Division of Critical Care Medicine at Vanderbilt University School of Medicine. After earning his Bachelor of Arts in Music with a concentration in Jazz Piano Performance from Loyola University in New Orleans, Dr. Schlesinger earned his Doctor of Medicine degree from the University of Texas Health Science Center at Houston. He completed residency training in Anesthesiology followed by a fellowship in Critical Care Medicine at Vanderbilt University. While in training, Dr. Schlesinger became a B.H. Robbins scholar. His mentor, Dr. Mark Wallace, is the director of the Vanderbilt Brain Institute. Dr. Schlesinger's research interests include multisensory integration, human factors, aural perception, temporal precision, alarm development, patient monitoring, and medical education. This work led to the prestigious 2014 Education Specialty Award from the Society of Critical Care Medicine. His personal interests include medical mission work, playing the piano, and travel.

Madeleine is an undergraduate student at Vanderbilt University. She has an interest in music and medicine, but especially how this field applies to anthropology research and the clinical translation of how music can not only help patients, but the clinicians that care for them.