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HISTORY OF MEDICINE

Music and Medicine: Harnessing Discipline and Creativity

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It is one of the superficialities of our time to see in science and in art two opposites. Imagination is the mother of both [1].

Theodor Billroth (1829-1894), musician and surgeon

Music and healing have been inextricably linked throughout history. The Greek god Apollo was not only god of the sun, but god of both healing and music. The highly refined skills developed in musical training—listening, collaboration, empathy, attention to detail, and aspiration to excellence—are skills that are equally highly valued in the practice of medicine. Several innovative physicians in the last 300 years were also highly accomplished musicians:

- In France, Dr. Rene Laennec (1781-1826) was a flutist who was known to build his own wooden flutes. He later went on to invent the first stethoscope—a long hollow tube made of wood [2].
- In Russia, Dr. Alexander Borodin (1833-1887) played several instruments and composed two symphonies, three operas, and two string quartets, among other works. He was an organic chemist and physician who also helped establish the first medical school for women in St. Petersburg [3].
- In the US, Dr. Thomas Sudhof, winner of the 2013 Nobel Prize in Medicine for his work in cell transport, credited his bassoon teacher Herbert Tauscher as his source of inspiration [4].

There have been and are thousands of physician-musicians we will never hear about—these are just a few. Is there a connection between the training one undergoes and the skills one needs to become an accomplished musician and the training and skills it takes to be an excellent physician?

Let us consider the life and practice of the exemplary physician-musician Dr. Theodor Billroth (1829-1894), who is widely recognized as one of the most influential and innovative surgeons of his day. Although he first wanted to pursue a career as a pianist, his family persuaded him to study medicine, and he ultimately embraced the field and established himself as a disciplined scientist, superlative teacher, and surgical pioneer [5].

In Vienna, Billroth had the opportunity to push the boundaries of surgery: he was among the first to develop surgical procedures for cancers of the larynx and thyroid, along with the gastrojejunostomy techniques that still bear his name. He was as methodical as he was innovative; when he developed a surgical procedure, Billroth

considered its pathophysiologic basis and practiced on cadaveric specimens and animal models prior to operating on patients.

Billroth was also a pioneer in surgical ethics: many of his then-innovative ideas are now standard practice. He advocated transparency in surgical care, insisting on postsurgery audits and open discussion about unsuccessful as well as successful procedures to improve patient outcomes—a precursor to today's morbidity and mortality rounds. As an educator, he invited students to observe his operations, organized meetings for article reviews, and developed a journal.

What is less known in medical circles is that Billroth's creativity was fueled by his deep engagement in music. An accomplished pianist at an early age, he later learned the viola and violin and became a close friend of composer Johannes Brahms. At the age of 38, Billroth became chief of surgery at the University of Vienna, the youngest physician to hold that position. Billroth initially found it difficult to socialize with his older medical colleagues and was happy for the companionship and musical collaboration he had with Brahms and other musical luminaries his age residing in Vienna.

Billroth hosted frequent evening musical gatherings for friends and fellow musicians, which often featured premieres of the works of Brahms [6]. The composer, in turn, relished holding discussions with people in other fields. He was fascinated by the logic of scientific reasoning and greatly admired Billroth's understanding of medicine and music [7].

In gratitude for their friendship, Brahms dedicated the first two of his string quartets to Billroth in 1873. Two years later, Brahms dedicated his third quartet to another musician-physician, T.W. Engelmann (a cellist and physician interested in cardiac physiology) [8]. Billroth, humbled, wrote to his colleague Engelmann about this honor from Brahms: "I am afraid these dedications will keep our names in memory longer than the best work we have done; for *us*, not very complimentary, but beautiful for humanity which, with the right instinct, considers art more immortal than science" [9].

So what is it that musicianship can bring to doctoring? In his 2011 article "What Musicians Can Teach Doctors," Frank Davidoff compares the training of highly skilled musicians with that of highly skilled physicians and considers the flexibility necessary for creativity to flourish in the arts of music and medicine. While recognizing that not all fine physicians are musicians, Davidoff suggests that a number of elements important to musicians (and other artists) also bear upon good doctoring. These include the fact that the practice of medicine is, like music, essentially "performance"; that learning and teaching in both fields are best accomplished through coaching; that practice is as important as talent, or more so; that continual integration of practice into daily work and performance is essential; and that expertise in both disciplines results from innovation by individual

practitioners that is built on a foundation of fluency with standard procedures [10]. Practice in the arts can help inculcate these values and hone these skills.

Dr. Daniel Roses, distinguished professor of surgery at New York University and musician, describes what made Brahms and Billroth so unique and successful:

They examined everything they did with relentless self-discipline: nothing left their hands that was indifferent.

They accepted no truth second hand. They retested, reapplied, reassessed...and ultimately *reformed* the heritage in surgery and music which they had inherited [11].

Creativity, in each case, was balanced by a clear dedication to excellence. Creativity coupled with dedication to excellence and lifelong commitment to practice is a formula for success in many vocations. The centrality of these skills and attributes to both medicine and music, nonetheless, can only enhance the masterful performance, life, and enjoyment of the physician-musician.

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