MUSIC AND HEALTH CARE

A Paper Commissioned by the Musical Connections Program of Carnegie Hall's Weill Music Institute

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

In 2009, the Weill Music Institute of Carnegie Hall launched the Musical Connections Program. The program was founded on these premises:

- *Music has the power to transform lives and to bring hope and comfort to people in challenging circumstances.*
- *All people deserve to have great music in their lives.*
- *Carnegie Hall feels a responsibility to provide and develop programs that respond to community need based on the organization's mission and civic position.*

Musical Connections has taken musicians to settings as diverse as adult and juvenile correctional facilities, homeless shelters, senior service organizations, and hospitals. In these settings, Musical Connections has offered programs ranging from large-scale concerts for several hundred people to in-depth workshops extending over many weeks involving as few as five or six participants. Initial evaluation of the program has demonstrated its profound impact on people's lives.

Carnegie Hall recently decided to expand Musical Connections nationally based on the idea that the success of local programming's response to New York City's needs had implications for communities across the country. One of the aims of a national partnership is to try to find an underlying set of common goals and measures that might offer opportunities for cross site documentation and assessment. A first step in this effort is to ground the work in a broader understanding of theory and practice about the way music connects to the fields in which the program is active. This paper is intended to do that for the field of music and health.

MUSIC'S IMPACT

The paper begins by exploring a core premise of the program: that music can have a transformative impact on people's lives. Music is a primary force in the lives of individuals, families, and societies. Across cultures and throughout recorded history, humans make music. Rhythm, song, and improvisation punctuate the progress of individual and collective experience, from the melodies of everyday life to the set incantations of ritual. Music activates and shapes the human brain, sharpening the mind's ability to hear and interpret speech, awakening emotion, and encoding memory. Music has been an element in the survival and development of the human species and musical instinct has its basis in biology.

Music and Health Care

MUSIC AND THE BRAIN

The power of music to control the spirit has always been understood, but within the last decade, new technologies have made visible the interaction between music and the physical brain. The making and processing of music involves structures, networks, and pathways throughout the brain, from the highest order of conscious reaction to the lowest unconscious levels of response.

Music has been shown to stimulate the brain's primary engines of human capacity. Musical engagement exercises attentional networks and executive function, evokes emotional response and stimulates the central nervous system, and appears to activate the human mirror-neuron system, supporting the coupling between perceptual events (visual or auditory) and motor actions (leg, arm/hand, or vocal/articulatory actions).

At one time, theories of human brain development argued that there was little or no growth of brain cells after age 30. But recent studies of music and the brain have shown this view to be erroneous. The brain is a plastic organ and music itself has the power to shape the brain's development into later life. The implications of this finding are huge. Providing opportunities for people to experience music in many settings can have a profound impact on their healthy development. Exposure to music alters the physical structure of the brain. Engaging in musical activities not only shapes the organization of the developing brain but also produces long-lasting changes even after brain maturation is complete. For example, those who frequently play a musical instrument are less likely to develop dementia compared to those who do not, revealing that music works not only to train the brain, but also to protect cognitive functioning.

Music has long been recognized as a powerful force in rehabilitative treatment, used clinically to address impairments in motor function, language, cognition, sensory processing, and emotional disturbances that can result from brain injury. It has been used successfully to induce cognitive repair in patients with stroke, Parkinson's disease, cerebral palsy, or traumatic brain injury. Indeed, music has the potential to "fix" the brain, by providing an alternative entry point into a "broken" brain system to remediate impaired neural processes or neural connections.

MUSIC AND HEALTH CARE

With respect to health care, music can be an effective intervention with patients of every age. Music offers health benefits throughout life, from those born into the neonatal intensive care unit for whom music mediates medically-necessary stress,

through those in hospice care at the end of life who can use music to transcend physical symptoms and declines.

Music is effective with patients with conditions ranging from cancer to schizophrenia to traumatic brain injury, and is used to support patients in staying well by combating the debilitating effects of stress, sleeplessness, and chronic pain. Indeed, today music is integrated into health care at every level. The clinical use of music is now an evidence-based practice that has been proven both to satisfy patients and, very significantly, to lower the cost of care.

Music has also been shown to enhance the experience of patients waiting for well visits – improving individual perception of the hospital, enhancing the speed and efficacy of staff performance in surgery, and even ameliorating the anxiety of patients being weaned from mechanical ventilation. Music has the potential to minimize the procedural and environmental demand that the conditions of the Intensive Care Unit place on patients, and it can engage and help to retain typically elusive patient-groups in areas such as mental health and substance abuse. Additionally, music has the potential to encourage people to commit to routine and necessary preventive care.

STAFF

Each of the arts can be an effective tool for motivating, empowering, and developing staff. Many arts-based programs and encounters can help staff to affect positive change in their working environment and to address personal and professional development aims, yet music appears especially effective in addressing the needs of caregivers. This is particularly true for stress. For example, targeted music experiences have helped nurses relax, rejuvenate, and re-focus, enabling them to do their work with renewed energy.

Staff experience is also improved by those musical interventions that ease patient conditions, making patients more comfortable and rendering them easier to care for. For example, the use of music can contribute to work satisfaction for staff by soothing patient populations whose condition can incline them to agitation or disruptive behaviors.

RESEARCH ON SPECIFIC CONDITIONS

This paper highlights selectively some of the extensive research on ways in which music has been used to promote health in specific areas of illness and/or care. While research is growing, many studies are still limited to a few patients or to mostly qualitative techniques, which is a concern when music advocates try to make their

case to medical professionals or administrators who hold decision-making authority about staffing and treatment. Nevertheless, for each area there is a body of research correlating music with health improvements and specific papers are cited.

Conditions and areas of treatment for adults include:

1. Pain, Stress, and Anxiety
2. Oncology
3. End of Life
4. Gerontology
5. Parkinson's Disease
6. Alzheimer's and Dementia
7. Mental Health
8. Substance Abuse
9. Rehabilitation
10. Veterans

Pediatric conditions and area of treatment include:

1. Labor
2. Neonatal Intensive Care/Premature Infants
3. Learning and Development
4. Autism
5. Adolescents
6. Pediatric Illness

MUSIC THERAPY

Programs that bring professional musicians into hospitals introduce one kind of musical intervention (performances and workshops) into a health care environment where a very different kind of musical activity has long dominated. That activity is called Music Therapy.

Music therapists are *professionally trained and credentialed health professionals*. They come to their work having completed a standardized curriculum that is comprised of an academic program, 1200 hours of clinical training, and a supervised internship. The therapeutic experience they offer can take many forms but it relies on a real-time relationship between a clinician and a client (or clients). There is a concentrated focus on the client's evolving affect and expression and a concomitant adjustment in therapy in a session.

Music and Health Care

According to at least one well-known music therapist, the kinds of musical experiences offered by outside musicians coming into health care settings generally lack several of the critical components of a music therapy encounter:

- Often they are not elective: a patient cannot opt out of hearing the music.
- The experiences are not targeted to individual patients' condition, mood, treatment plan, or essential self as therapy is.
- Most often they are not sustained or repeated over time.
- They are not geared to respond to changes in patients moment-by-moment or to those observed over time.

Yet the evidence from some of these programs is that many of the elements mentioned above can be built into an intervention by a professional musician. It is also true that sometimes musicians offering a performance can reach clients who are not engaging therapeutically, or a performance can elicit an entirely different emotional response from that yielded by therapeutic technique. In any case, the imperative of careful calibration of selected music and performances in real time based on the responses of the patients is a valuable lesson that music therapy can teach the professional musician going into health care settings.

In spite of over half a century of positive outcomes for patients, music therapy has not been fully or routinely integrated into health care. Part of the challenge is the trend in health care towards an evidence-based model, one that has subjected longstanding clinical practice to a new level and vocabulary of scrutiny. Music therapy often suffers from the perception of simply not measuring up when it comes to evidence of outcomes. In addition, music therapy is not always welcomed by medical personnel or institutions: it has the potential to introduce unpredictability and additional people into treatment space and planning.

Further Issues and Opportunities for Music and Health Care

A. The nature of the interaction: No one has identified precise components and range of facilitated musical experiences in health care settings though we know that facilitated music experience exists on a continuum from a single performance without talk by a musician to the full therapeutic experience over time of a highly trained music therapist utilizing his or her interpersonal skills, knowledge base, and in some cases training as a professional musician. But this gross distinction doesn't help very much and it has, in some cases, worked against the most cooperative strategies within health care settings. Perhaps what is needed is a more precise taxonomy of ways that

professionals can interact musically with a range of patients together with opportunities and challenges posed by a variety of scenarios.

B. Access: In hospitals, clinics, or senior centers, musical outreach is often considered as entertainment, environmental enhancement, or recreation, and not a clinical intervention. Accordingly, access can be quite limited. Visiting musicians meet only those patients that the hospital staff deems healthy enough to handle the experience – in those spaces designated by the facility. In many places, gaining access is a challenge. Because the introduction of professional musicians into the health care environment can be perceived as an intrusion by some, advocacy by staff within the institution is critical – often the higher in the authority chain the better.

C. Dose and duration: Two intriguing questions in the area of music and health care are:

- How much music does it take to make a difference?
- How long do results last?

The question of frequency of exposure required to glean benefit is a subject of research. Not surprisingly, many studies correlate superior effects on patients to increased frequency of music intervention. But the long-term measurable benefits of music interventions are difficult to document. Certainly any form of program design or evaluation should take into account the effects of both dose and duration on intended outcome.

D. What music for which people? The delivery of music that is "appropriate" in health care settings is more than an issue of satisfying a generic checklist of do's and don'ts. The brain of each individual patient has picked up musical building blocks from the local sonic environment in infancy and developed preferences based on this experience. To the extent possible, music needs to be tuned to resonate with patients' particular and deep-rooted musical instinct. The evidence for this is overwhelming – patient preferences and prior musical experiences are vital determinants of the ultimate success of any intervention. Ideally music should be relevant to its listeners in terms of culture, genre, mood, and era of origin. Yet because music is an inherently evocative medium, performers also need to be cautious not to evoke too much feeling.

E. Research: What do we know and how reliable is our knowledge?
A growing interest in music and health has created an explosion of research over the last decade. But the research has generally been performed on limited populations (small numbers make statistical validity much more difficult), and analysis rarely factors in the implications of the demographic sample and often does not control for

other factors in the environment. Live musical performances regularly garner enthusiastic reviews from patients and from staff, and have the potential to transform the experience of both patients and their caregivers, but their effects can be difficult to quantify.

Few studies so far document the effects of the kind of programs offered by Musical Connections or by other organizations doing the work of community engagement in the field of music and health, due in part due to the methodological considerations mentioned above. This work is widespread and deserving of consideration by research. The design of effective evaluation and research protocols is a challenging proposition, yet the work requires documentation, assessment, and evaluation in order to persist and evolve. One contribution that the Musical Connections program and others like it can make is to introduce greater rigor into that process of evaluation and documentation, which could help to address the problem.

F. Technology: New possibilities: The use of music in health care is being transformed by technology. Already, technology is used to offer relaxation and entertainment, enabling patients to access individualized pre-recorded content. New, easy-to-use devices allow the recording of sound and lyrics in the moment and this makes possible a new kind of "play," allowing a patient who may not be comfortable producing music in traditional ways to engage in music-making without singing or playing an instrument. Because so many adolescents record and sample music already, technology can also provide an avenue of access to this age group.

With new technologies becoming more prevalent in health care settings, those who care about the quality of musical interactions need to become involved with the planning of content and use. One lesson from the almost universal presence of television in hospitals is that technology often seeks the lowest common denominator of content. High quality content needs advocates who can make a clinical case for its use.

I. BACKGROUND

Music is a transformative technology of the mind." –Aniruddh Patel

In 2009, the Weill Music Institute of Carnegie Hall launched the Musical Connections Program. The program was founded on these premises:

- *Music has the power to transform lives and to bring hope and comfort to people in challenging circumstances.*
- *All people deserve to have great music in their lives.*
- *Carnegie Hall feels a responsibility to provide and develop programs that respond to community need based on the organization's mission and civic position.*

Carnegie Hall has, for more than a century, been associated with the highest forms of musical expression. Carnegie Hall's mission is to bring the transformative power of music to the widest possible audience, to provide visionary education programs, and to foster the future of music through the cultivation of new works, artists, and audiences. This led to the creation of Musical Connections. Musical Connections has taken musicians to settings as diverse as adult and juvenile correctional facilities, homeless shelters, senior service organizations, and hospitals. The programs they have offered have varied from large-scale concerts for several hundred people to in-depth workshops extending over many weeks involving as few as five or six participants.

Carnegie Hall recently decided to expand the Musical Connections nationally based on the idea that the success of local programming's response to New York City's needs had implications for communities across the country. It established partnerships with a small group of organizations across the United States that are either doing similar work or hoping to embark upon it. One of the aims of the partnership is to try to find an underlying set of common goals and measures that might offer opportunities for cross site documentation and assessment. Such work across sites can contribute to a broader understanding of how music can be offered effectively to populations under stress. A first step in this effort is to **ground the work in a broader understanding of theory and practice** about the way music connects to the fields in which the program is active.

One of the fields where Musical Connections is active is health care. In the past two years, programs have taken place in over thirteen health care institutions. **A strong partnership has been established between Carnegie Hall and Jacobi Medical Center in the Bronx (New York),** one of the largest public hospitals in the United States. **The partnership has explored two broad questions** (as well as many smaller ones)**:**

- ***How can music promote a hospital's wellness message?***
- ***What would it mean to have a truly 'musical hospital?'***

The Carnegie Hall-Jacobi partnership has provided performances for the Medical Center's in-house patient population, as well as for the broader community of the Bronx, coupling musical events with health fairs to stimulate participation in wellness activities. It has offered targeted small group

sessions by musicians in various units of the hospital for specific sets of patients (sometimes including the families of patients) as well as events designed for staff. The program has also provided an intensive song writing workshop of twelve weeks duration for teens receiving services through the Pediatric AIDS Clinic, and it has offered professional development for staff with a specific event centered around a Nurses Grand Rounds. The results and impact of all of this activity has been carefully documented and assessed.

Based on the Jacobi work and the national Musical Connections partnership, WolfBrown has prepared this first background paper, which attempts to look at a large body of research and activity on the theory and practice of music and health care. It begins by setting the broadest possible content for the impact of music on people's lives, discusses recent research on music and the brain, and then moves into the specifics of music in health care settings. The paper also describes the field of music therapy, the long-established therapeutic model for the use of music to promote health, and it ends with a discussion of large-scale issues that need to be considered as programs like Musical Connections move forward.

In completing these introductory ideas, special thanks are extended to the many medical professionals who contributed expertise and knowledge to this paper in various ways.

II. Testing the Premise that Music Can Have a Powerful Positive Impact on People's Lives

The Musical Connections program was established on a core premise that music can have a transformative impact on people's lives. A recent Musical Connections presentation at Jacobi Medical Center's Nurses Grand Rounds made the point clearly (Livermore-James, 2011): music is a primary force in the lives of individuals, families, and societies. Across cultures and throughout recorded history, humans make music. Rhythm, song, and improvisation punctuate the progress of individual and collective experience, from the melodies of everyday life to the set incantations of ritual. Every culture makes music to acknowledge the arc of a life, from lullabies to requiems. Music activates and shapes the human brain, sharpening the mind's ability to hear and interpret speech, awakening emotion, and encoding memory.

Music has been essential to the development of the human species over the millennia. Music's profound influence on neurology and the brain poses an evolutionary question for science: why are more than twenty cerebral regions activated by the perceptual attributes of music if music is not strictly required for survival? **Some speculate that music has been an element of survival** because it bonds individuals into social units (Levitin & Tirovolas, 2009). Another theory is that music was most important to early humans because it facilitated the earliest forms of communication (Mithen, 2009). Still others calculate that the creativity evoked by music enabled early peoples to think hypothetically, conferring an evolutionary advantage (Tooby & Cosmides, 2001).

That **the visceral power of music is biological** is intuitively obvious. The rhythmic momentum of a song or symphony takes its power from the simple pulse of blood through the body, from the speed of our gait when we walk or run, or from the tempo at which we swing our arms. **Our bodies influence our music**: hearing sound is a physical and mechanical process, and physical sensation dictates, in part, how we perceive music – as fast or slow, intense or relaxing. **Just as our physical being impacts our music, the opposite is also true**. It is no accident that fitness and other forms of physical activity use music to inspire energy. In addition, we know that music shapes our mood – think of an exhilarating concert or a scary movie with a musical sound track that literally raises the hackles on the back of our necks.

Musical tone may be a critical engine of human development. It is the analog to human utterance, and rhythm and meter mimic the phonemes of speech. Language is a form of music just as music has many elements of spoken language in form, structure, and meaning. Both help us to connect with others and express what we think and feel. We are, both biologically and socially, compendiums of musical cadence.

Finally, **music constitutes us as social animals**. It helps us to know ourselves and others. At a conscious level, we tell our own biography in music – identifying with the music of our families and culture, finding ourselves in the sounds of music we encounter or choose to listen to, remembering epochs in our lives by the music that accompanied them. Subconsciously, at the level of brain function, music helps to encode our experience: the skills of auditory processing are linked to the

manufacture of memory. Music is essential to how we recognize and understand others: we can be wordlessly connected to others who hear the same music that we do, and pitch conveys emotion in speech, allowing us to form an understanding of others (Loewy, 2011).

III. Music and the Brain

A. Some Underlying Science

In pursuing the connection between music and health, new research and methods have revealed critical connections and important relationships. The power of music to control the spirit has always been understood, but within the last decade, **new technologies have made visible the interaction between music and the physical brain**. Increasingly, we apprehend the workings of the body through objective maps of biological function, garnered from newly available images and scans, and from measurements of physiological data such as hormone levels, respiration, heart rate, and blood oxygenation levels. The advent of functional brain imagery has demonstrated that musicians' brains are differently contoured from the brains of non-musicians, and a variety of imaging technologies can now convey real-time images of the neural activity stimulated by the activities of listening, imagining, or composing music (Sacks, 2007).

Half a century ago, science diagrammed the brain in terms of right and left hemispheres, and assigned the processing of musical structures to the right hemisphere (Warren, 2008). New research has complicated that picture, revealing that **making and processing music involves structures, networks, and pathways throughout the brain, from the highest order of conscious reaction to the lowest unconscious levels of response**.

Experiment, measures of physiological response, and imaging together show that creating or listening to music engages "regions throughout the brain, bilaterally, and in the cortex, neo-cortex, paleo-, and neocerebellum" (Levitin & Tirovolas, 2009, p. 214). Pierce (1983) distinguishes eight perceptual dimensions of music: pitch, rhythm, tempo, timbre, meter, contour, loudness, and spatial location, each of which has been tested independently by experiment. Each of these components of music has been shown to activate distinct brain structures and neural circuitry. The current diagram of musical perception is of a sequence, wherein the base components of pitch, rhythm, and loudness are processed individually and separately within the brain (Trainor & Schmidt, 2003), and then synthesized to create the understanding of an entire phrase (Peretz & Zatorre, 2005).

Critically for the discussion of music and health, Oliver Sacks' triad of "making, imagining or composing" **music has been shown to stimulate the brain's primary engines of human capacity**. **Musical engagement exercises attentional networks and executive function** (Levitin & Tirovolas, 2009), **evokes emotional response, and stimulates the central nervous system (**Trainor & Schmidt, 2003**), and, according to Schlaug** (2009), **may activate the human mirror- neuron system, potentially supporting "the coupling between perceptual events (visual or auditory) and motor actions (leg, arm/hand, or vocal/articulatory actions)**" (p. 372).

B. LEARNING FROM THE BRAINS OF MUSICIANS: THE BRAIN AS A PLASTIC ORGAN

The research on music and the brain has yielded important new findings that challenge long-held assumptions. It was once thought that a human brain develops rapidly in the embryo and subsequently in the young child, but that thereafter brain development slows and then stops. This idea dominated medical thinking for generations, as did the idea that new cells simply did not grow in the brain after age 30. Thus, the physician-philosopher William James (1890) described the brain after the age of thirty as "set like plaster," without the ability ever to become plastic again. Others have reflected that view over more than a century.

Recent studies of music and the brain have proven this conception erroneous. **The brain is a plastic organ, and music itself has the power to shape the brain's development throughout the lifespan**. The implications of this finding are huge. If, as the familiar adage recites, we are what we eat, perhaps we are also what we listen to and hear. **Providing opportunities for people to experience music in many settings can have a profound impact on their healthy development.**

Interestingly, much recent scientific study has focused on musicians, seeking to identify differences in brain structure and in the mechanics of auditory processing between this group and non-musicians. While all humans possess a "largely unconscious structural appreciation of music" (Sacks, 2007), differences between musicians and control groups demonstrate the power of music to enhance the brain and to amplify human functioning. Most simply: **exposure to music alters the physical structure of the brain.**

At the level of neuroanatomical differences, a 1995 study, since replicated, reported larger anterior corpus callosum in musicians (Schlaug 2009). The corpus callosum plays an important role in inter-hemispheric communication, which underlies the execution of complex motor sequences. These results in humans reinforce the results of earlier experiments in primates: Michael Merzenich's experiments on monkeys showed that cortical areas responding to sound grow faster and more precise with increased exposure, while the area of the brain that responds expands (Tallal, 2011). Such studies are intriguing partly because music represents a persuasive example of brain plasticity: illustrating both how the brain reacts to outside stimuli, and how different cortical regions are literally shaped by experience.

At the level of processing, musicians (defined as those individuals with greater exposure to music) hear better, perceiving sound with greater speed and accuracy and retrieving information out of noise more reliably. These effects are not finite: **the more music one hears, the more refined one's hearing can become** (Chandrasekaran & Kraus, 2009). **Superior auditory processing is linked to many if not most aspects of human experience: from language acquisition to the ability to decode social cues from tones in speech** (Tallal, 2011).

Study of the interaction between music and the brain has exploded in volume over the last decade, and currently attracts interest from a vast array of disciplines (Wong, 2011). This research changes our understanding of ourselves, by demonstrating beyond doubt that our brains change in response to experience – that the brain is an essentially plastic organ. The idea of brain plasticity is a relatively

new one according to Wan and Schlaug (2010), who define plasticity as a "fundamental organizational feature of human brain function" (p. 566). **The phenomenon of brain plasticity is inherently intriguing, in part because it suggests that human potential is ongoing across the lifespan.** The enhancement of functional capacity evokes a promising array of choices for individuals, but also has implications for collective consideration in terms of policy, health care, and allocation of resources.

C. MUSIC WORKS ACROSS THE LIFESPAN TO *DEVELOP*, TO *PROTECT*, AND TO *REPAIR* THE BRAIN

Nina Kraus, Director of the Auditory Neuroscience Laboratory at Northwestern University, describes music as "a model for plasticity in the brain" (2011). Music has the potential to enrich functioning at every stage of development. **In children, music can be an effective intervention to enhance cognitive abilities, facilitate verbal and nonverbal communication, and influence physiology** (Naylor, Kingsnorth, Lamont, McKeever, & Macarthur, 2011). For infants, the skills of detecting pattern in sound map eventually to the skills of locating meaning in language. Pitch, timing, and timbre are components of music, but are also the ingredients of speech, and micro-tonal acoustic differences are the aural equivalent of distinct consonant letter sounds. **Musicians' faster neural timing allows them to better distinguish sound in noise,** a skill that goes beyond the ability to extract a base line or identify a theme, generalizing to linguistic prosody (Kraus, 2011).

Plasticity is a cognitive potential that has been typically associated with the developing brain. Yet recent research shows that the dynamic interaction between experience and brain structure and functioning continues into adulthood. **Engaging in musical activities not only shapes the organization of the developing brain but also produces long-lasting changes even after brain maturation is complete.** Studies of musicians show that musical experience can induce structural modifications, even in the mature brain (Wan & Schlaug, 2010). Although brain plasticity is known to occur throughout the life span, the degree of plasticity typically declines with age. Yet musicians appear to be less susceptible to age-related degenerations in the brain, presumably as a result of their daily musical activities. One study of adults over the age of 75 demonstrated that **those who frequently played a musical instrument were less likely to have developed dementia compared to those who rarely played a musical instrument, revealing that music works not only to train the brain, but also to protect cognitive functioning** (ibid).

Rehabilitation—or the idea that impairment in human functioning has the potential to be reversed—has its basis in the notion of brain plasticity. The restoration of lost capacity can occur only if the brain can be retrained or reorganized. Beyond its role in developing and protecting cognitive function throughout the human lifespan, **music may have the power to restore "lost" brain capacities. Music has long been recognized as a powerful force in rehabilitative treatment – used clinically to address the impairments in motor function, language, cognition, sensory processing, and emotional disturbances that can result from brain injury**. As recent accounts of Congresswoman Gabrielle Giffords' rehabilitation program attest, music therapy can be used to stimulate brain functions that support the basic components of everyday life – movement, cognition, speech, emotions, and sensory perceptions (Sherwell, 2011). Thaut (2009) suggests that music, which is the rhythmically organized coding of sound over time, simulates the rhythmic neural synchronization required to process information in the brain.

This resemblance renders music a powerful form of cognitive stimulus, one that has the potential to communicate information into the brain when other means, such as language, have been shut off by injury. **Music has been used successfully to induce varying degrees of cognitive repair in patients with stroke, Parkinson's disease, cerebral palsy, or traumatic brain injury** (Thaut, Gardiner, Holmberg, Horwitz, Kent, Andrews, Donelan & McIntosh, 2009). Additionally, ongoing research into treatment of pain focuses on music as a mechanism for retraining perception, essentially re-educating the brain away from its own deleterious pathways of sensation (Latremoliere, 2011). As Schlaug, a prominent neuroscientist whose lab specializes in the study of music and the brain, writes: **music has the potential to "fix" the brain, by providing an "alternative entry point into a "broken" brain system to remediate impaired neural processes or neural connections**" (2009, p. 373).

IV. MUSIC AND HEALTH CARE

A. OVERVIEW

Music has long been used to enhance wellbeing and to reduce suffering (Kemper & Denhauer, 2005). Clinical literature documenting the use of music in health care settings demonstrates that **music is an effective intervention with patients of every age. This ranges from those born into the neonatal intensive care unit, for whom music mediates "medically necessary stress"** (Patel, 2011) **through those in hospice care at the end of life, who can use music to transcend physical symptoms, to facilitate emotional expression and communication, and as a medium to work on a legacy project** (Hilliard, 2007, Long, 2011). Music is understood as a modality for the promotion of the broadest possible definition of health: used both to aid the sick – 0patients with conditions ranging from cancer to schizophrenia to traumatic brain injury – and to support patients in staying well, by **combating the debilitating effects of stress, sleeplessness, and chronic pain** (Hanser & Mandel, 2010).

No longer considered an "alternative therapy," **music is promoted as a technology for healing in prestigious hospitals and health care settings, and the study of music-based health care interventions is funded by the National Institutes of Health (NIH).** NIH sponsors research into music and the brain, (http://grants.nih.gov/grants/oer.htm), and, through the National Center for Complementary and Alternative Medicine, research into areas as diverse as *music* therapy-based stress reduction, the use of *music* engagement for non-pharmacological analgesia, and heart rate variability response to music-based intervention in pediatric patients (http://nccam.nih.gov/).

B. WHOLE ENVIRONMENT

From the quiet song of a nurse working with bedridden patient to the deliberate implementation of sound in the creation of a healing environment, **music is integrated into health care at every level**. Public health departments target campaigns of commissioned songs and lyrics to specific conditions and populations (Willis Newson, 2010). Hospitals carefully calculate and monitor environmental noise in waiting and treatment rooms and live music is used strategically to lower stress for patients and staff (Long, 2011).

As the landscape of health care evolves, industry leaders face an evolving set of imperatives. **New health care facilities and programs face a gauntlet of design requirements: to incorporate "all relevant and proven evidence-based design innovations to optimize patient safety, quality, and satisfaction as well as workforce safety, satisfaction, productivity, and energy efficiency"** (p. 22 Sadler, DuBose, & Zimring, 2008, p. 22). The use of music in hospitals is congruent with current strictures: **the clinical use of music is both an innovative and an evidence-based practice that has been proven both to satisfy patients and to lower the cost of care.** In the United Kingdom, where nationalized health care promotes a public dialogue about the delivery of services, the arts have been identified as a powerful tool to optimize health. A recent government review, *Arts and Health Evidence and Evaluation* (2010), reported that the arts can: "help to

create health care environments that are welcoming, reassuring, stimulating and personal and that are able to reflect the needs and values of the local community" (p. 1).

In the United States, ongoing cuts to funding of social services increasingly transform hospitals into multi-purpose mediators of the effects of poverty and mental illness, yielding environments that are active, noisy, and potentially overtaxed. Music in particular has been identified as a force that may reduce the effects of trauma and facilitate coping strategies for difficult environments **(**Naylor, et al., 2011**).**

Hospitals are increasingly **envisioned and designed as total healing environments, in which every aspect of design promotes health**. This ranges from building architecture (including the incorporation of natural light) to construction materials ("green" materials free of toxins) to the training of staff (Ulrich, Quan, Zimring, Joseph & Choudhary, 2004). Scientific study tends to document specifics. **Music has been introduced into health care delivery at multiple levels, but most published outcomes describe the effect of particular music interventions on specific patient groups and conditions. The idea of a more systemic approach – indeed the idea of a "musical hospital" as explored by Carnegie Hall and Jacobi – in which making and listening to music pervades every aspect of care, is intriguing but largely unstudied**.

One of the few examples of a study following a systemic approach to music in a hospital – a 2007 article describing a year-long residency by the Irish Chamber Orchestra in a university teaching hospital – documents the potential of live resident creators of music. The study reports that, after one year, surveys revealed that "(l)ive music in hospital was found to enhance the quality of the aesthetic environment of the hospital, with both patients and staff stating that listening to live music helped them to relax, feel happier and more positive" (Moss, Nolan & O'Neill, 2007, p. 636).

C. Cost

The strategic use of musical intervention has been shown to address the defining reality of health care cost. **Effectively and appropriately deployed, music is a relatively low-cost intervention. Internationally, art-based interventions are gaining traction beyond their clinical effects, due to the savings they can provide.** In an article on world hospitals and health services, Owen (1999) writes that "evidence suggests that the health care settings that support and reflect the perspectives offered by Dance, Music, Literature, Museums and Galleries lead to health gain and are in the long term cost-effective" (p. 3).

The United Kingdom's *Arts and Health Evidence and Evaluation* (Willis Newson, 2010) additionally found that "arts-based projects are seen as an effective and 'value-for-money' means of creating impact and ensuring appropriateness" (p. 1). **Music specifically has been identified as a cost-effective means of:**

- **Addressing pain and anxiety in perioperative settings** (Nilsson, 2008)
- **Improving quality of life among senior citizens living in supervised group settings** (Lee, Chan & Mok, 2010)
- **Addressing the multiple domains of palliative care in a hospice setting** (Romo & Gifford, 2001).

In an age of cost containment, the prognosis for musical interventions in health care setting would seem rosy. Yet, for some, the evidence of the efficacy of music as an intervention needs to be more fully and scientifically vetted and compared with other therapies. Additional work may be required to satisfy those who make medical and financial decisions in hospitals.

D. PATIENT EXPERIENCE

The advent of "patient-centered care" has highlighted the experience of the individual receiving services in the discussion of health care. Music therapy is entirely congruent with this emphasis, as **a broad array of evidence (including meta-reviews) proves that music alters and improves patient experience** (Engwall & Duppils 2009), which has implications for patient attendance and engagement, preventive care, and attitudes about health providers. Illness is often compounded by fear and anxiety, and **musical interventions can effectively address and reduce patient pain, anxiety, and stress**, although the exact mechanism of these therapies is not entirely understood (Nilsson, 2008).

Music has been shown to enhance the experience of patients waiting for well visits – improving individual perception of the hospital (Moss, Nolan & O'Neill, 2007**), enhancing the speed and efficacy of staff performance in surgery** (Kemper & Denhauer, note 80)**, and even ameliorating the anxiety of patients being weaned from mechanical ventilation** (Hunter, Oliva, Sahler, Gaisser, Salipante, 2010). Though medicine is focused increasingly on the least invasive forms of treatment, some hospital environments, like the Intensive Care Unit (ICU) and the Neonatal Intensive Care Unit (NICU), deliver "medically necessary' intrusive forms of care. **Music has the potential to minimize the procedural and environmental demand that the conditions of the ICU and NICO place on patients** (Patel, 2011).

Music therapy, a musical component of psycho-educational programming (adjunct programs for patients that foster autonomy by offering educational curriculum on how to maintain physical and/or mental well-being) has the potential to engage and to help to retain typically elusive patient-groups in arenas such as mental health and substance abuse. A 2008 study of members of a substance-abuse treatment group found that enjoyment and motivation to participate during music-based sessions was "uniformly high," regardless of age or drug-of-dependence (Dingle, Gleadhill & Baker, 2008). Psychiatric patients in a 2006 study who were offered music-based psycho-education consistently rated music therapy as more effective than other programming in addressing specific psychiatric deficit areas, with more than half of the participants noting that music therapy was their favorite class/therapy (Silverman, 2006).

Additionally, **music has the potential to encourage people to commit to routine and necessary preventive care**: a meta-analysis of eight Randomized Controlled Trials to determine effect of music on patients undergoing colonoscopy found that despite the fact that patients' rating of their own pain/discomfort did not decrease, patient scoring of the overall experience was significantly improved with music. These patients were also significantly more willing to repeat the same procedure in the future (Bechtold, Puli, Othman, Bartalos, Marshall & Roy, 2009).

E. STAFF

At its most basic, health care is a dynamic equation—a live relationship between patient and caregiver. **Music has the potential to support both human sides of the caring equation and to reinforce the relationship between them by addressing the needs of staff.** According to the United Kingdom's 2010 government-sponsored review*, Arts and Health Evidence and Evaluation,* **the arts are an effective tool for "motivating, empowering and developing staff by engaging them in arts projects that empower them to affect positive change in their working environment and address personal and professional development aims**" (p. 1).

Common sense and social science each dictate that caregiving can be stressful: a 2008 study of 130 nurses in a Taiwanese ICU found that half of all participants intended to leave their jobs (Lai, Lin, Chang, Wang, Liu, 2008), and in the United States, the nursing turnover rate across all specialties is 20% (Ulrich, Quan, Zimring, Joseph & Choudhary, 2004). Across a variety of professions, however, programs designed to prevent burnout can be effective, though the positive effects of these restorative programs diminish over time (Awa, Plaumann & Walter, 2010).

The last several decades have seen a focus on preventing burnout in the medical profession. Gray-Toft & Anderson (1981) make the connection between professional fatigue and the quality of service delivery to patients, and later studies identify music-based interventions as potentially effective, with **nursing personnel self-reporting that targeted music experiences "helped them to relax, rejuvenate, and re-focus, enabling them to complete their shifts with renewed energy"** (Brooks, Bradt, Eyre, Hunt, & Dileo, 2010, p. 255).

According to Deforia Lane, Director of Music Therapy at the University Hospitals of Cleveland, when offered to staff, music therapy and live music can work to reverse the dynamic of care—to offer respite to those who are used to providing it for others, which often has a powerful effect. **Music therapy programs offered to hospital staff can be the most direct and convincing demonstration of the power of music-based intervention, and these programs can educate and encourage medical staff to collaborate in the music-based clinical processes of patient assessment, treatment, and evaluation**. According to Lane (2011), offering music therapy experiences to staff can be a first step in the process of providing nurses and doctors the tools and skills to use music independently with their patients.

At Jacobi Medical Center, a survey conducted after a musical Nurses Grand Rounds seems to confirm the findings above. As reported in an evaluation of the session (Wolf 2011), a survey was taken by 78 nurses who found the Musical Connections program to be "good" or "excellent" on several dimensions (with the vast majority selecting "excellent"). Administrative staff reported later that the Carnegie Hall's **musical program had gone a long way toward addressing the "low level of engagement" among nursing staff**, a major concern within the institution in monitoring the quality of patient care.

Given the reciprocal nature of the relationship between professional caregivers and their patients, the **staff experience is improved by those interventions that ease patient condition, making patients more comfortable and rendering them easier to care for.** A survey of staff attitudes towards music therapy across two "high-demand" specialties – a neonatal intensive care unit (NICU) and a pediatric outpatient hematology oncology unit (PEDS ONC) – found that a large majority

agreed that **music enjoyed by patients can reduce staff stress** (86% in the NICU, 100% in PEDS ONC) and improve sleep (79% in the NICU, 95% in PEDS ONC), contributing to favorable staff attitudes toward music for patients (Bouhairie, Kemper, Martin & Woods, 2006).

The use of music can contribute to work satisfaction for staff by soothing patient populations whose condition can incline them to agitation, such as certain elderly patient groups. A Norwegian study of patients and staff in five nursing homes found that the implementation of an individualized music program reduced patient agitation during the performance of typically disruptive routines, such as staff-administered personal hygiene. Ultimately fewer staff were required to complete these tasks when musical intervention was in use (Myskja, & Hapnes, 2010).

Beyond the use of music to prevent staff burnout and to improve the mechanics of patient care, opt-in music programs designed for hospital staff have yielded positive results. **One study found that participation in group music sessions by long-term health workers yielded less burnout and improved mood** (Bittman, Bruhn, Stevens, et al. 2003), **while a staff choir at Peter MacCallum Cancer Centre mediated a "stressful" and "overwhelming" work environment, by providing participants with stress relief, friendship, and feelings of wellbeing**. Staff in the audience at choir performances reported that the concerts left them "uplifted, inspired and moved" (O'Callaghan, Hornby, Pearson, & Ball, 2010, p. 1421).

V. The Research on Specific Conditions

This section of the report **highlights selectively some of the extensive research on ways in which music has been used to promote health in specific areas of illness and/or care. While research is growing, many studies are still limited to a few patients or to mostly qualitative studies, which is a concern when music advocates try to make their case to medical professionals or to administrators who make key decisions about staffing and treatment in health settings.**

For each condition, a capsule paragraph or two summarizes what the research shows. That is followed by a listing of some of the relevant studies on the topic. Music, in the variety of cases offered, can refer to live or recorded sound, and it can be created by a music therapist, a musician/volunteer, a nurse, or the patients themselves. Many of these studies refer to facilitated therapeutic music interventions, though not all document the specific type or method of therapy implemented or its duration.

A. Conditions in Adults

1. Pain, Stress, and Anxiety

Pain, stress, and anxiety are often intermingled, especially for patients in medical situations. The use of music has been shown to have the potential to reduce all three of these sensations, both separately and together. Music can decrease both stress and the perception of pain, and its use effectively reduces anxiety and improves mood for patients in pre- and peri-operative settings.

Music can be used to reduce pain in adults with painful conditions (burn patients), those undergoing uncomfortable procedures (colonoscopy or chemotherapy infusion), and those with chronic illness (such as heart disease).

One study of patients receiving spinal anesthesia prior to surgery demonstrated that those who listened to music required less sedative to achieve a similar degree of relaxation compared with a control group. Music listening may have a beneficial effect on blood pressure, heart rate, respiratory rate, anxiety, and pain in persons with coronary heart disease. Music is a proportionally low-cost intervention to combat stress, anxiety and pain and to improve the patient experience. There are no reported adverse side effects to musical intervention, and it is most often appreciated by patients and their caregivers.

Relevant research includes:

- Lepage C., Drolet P., Girard M., Grenier, Y. & DeGagne, R. (2001). Music decreases sedative requirements during spinal anesthesia. *Anesthesia and Analgesia*, 93, 912–916.
- Bradt, J. & Dileo, C. (2009). Music for stress and anxiety reduction in coronary heart disease patients. *Cochrane Database of Systematic Reviews* (Online), 2(2).

- Engwall, M., & Duppils, G. (2009). Music as a nursing intervention for postoperative pain: A systematic review. *Journal of Perianesthesia Nursing*, 24(6), 370-83.
- Prensner, J.D., Yowler, C.J., Smith L.F., Steele, A.L., Fratianne, R.B. (2001). Music therapy for assistance with pain and anxiety management in burn treatment. *Journal of Burn Care Rehabilitation*, 22, 83–88.
- Nilsson, U. (2008). The anxiety- and pain-reducing effects of music interventions: A systematic review. *Journal of the Association of periOperative Nursing, 87*(4), 780-807.
- Nickel, A.K., Hillecke, T., Argstatter, H., Bolay, H.V. (2006). Outcome Research in Music Therapy: A Step on the Long Road to an Evidence-Based Treatment. *Annals of the New York Academy of Sciences*, 1060, 269–270.
- Khalfa, S., Bella S.D., Roy, M., Peretz, I. & Lupien, S.J. (2003). Effects of relaxing music on salivary cortisol level after psychological stress. *Annals of the New York Academy of Sciences*, 999, 374-6.

2. ONCOLOGY

Oncology encompasses the treatment of a myriad of cancers. In each of these component diseases, patients cycle through different stages. **Depending on an individual patient's interest and ability to participate, music can be relevant in the preventive, treatment, recovery, and palliative stages of cancer**. Empirical studies of the use of music with oncology patients have demonstrated that **music can reduce anxiety and physical symptoms, can help to manage pain and nausea** (see results from the *Musical Connections Survey of October 27, 2010*), can encourage a reflective awareness of emotion, and can enhance communication and quality of life. Burns et al report that patient preference is a vital determinant of whether or not to use music as a therapy, how participatory a music experience can be, and what genre or type of music to use. In a related finding, a study of 126 hospitalized persons with cancer pain in Kaoshiung City in southern Taiwan, found that it was critical to be able to offer a choice of familiar and culturally appropriate music to patients.

Relevant research includes:

- Magill L. (2001).The use of music therapy to address the suffering in advanced cancer pain. *Journal of Palliative Care*, 17, 167–172.
- Burns D.S. (2001). The effect of the bonny method of guided imagery and music on the mood and life quality of cancer patients. *Journal of Music Therapy*, 38, 51– 65.
- Smith M., Casey L, Johnson D, Gwede, C. & Riggen, O.Z. (2001). Music as a therapeutic intervention for anxiety in patients receiving radiation therapy. *Oncology Nursing Forum*, 28, 855– 862.
- Huang, S., Good, M., & Zauszniewski, J. (2010). The effectiveness of music in relieving pain in cancer patients: A randomized controlled trial. *International Journal of Nursing Studies*, *47*(11), 1354-1362.
- Hanser, S. (2006). Music therapy in adult oncology: research issues. *Journal of the Society for Integrated Oncology*. 4(2), 62-6.
- Beck, S.L. (1991). The therapeutic use of music for cancer-related pain. *Oncology Nursing Forum*. 18(8), 1327-37.
- Kwekkeboom, K.., Cherwin, C., Lee, J., & Wanta, B. (2010). Mind-body treatments for the pain-fatigue-sleep disturbance symptom cluster in persons with cancer. *Journal of Pain & Symptom Management*, 39(1), 126-138.
- Burns, D., Sledge, R. B., Fuller, L., Daggy, J. & Monahan, P. (2005) Cancer patients' interest and preferences for music therapy. *Journal of Music Therapy*, 42 (3), 85-99.

3. End of Life

There are few empirical, quantitative studies of the use of music in end-of-life care, and at least one review of the literature, by DiLeo and Bradt, states that the evidence is insufficient to conclude that music therapy confers any benefit except, potentially, in the outcome of enhancement to quality of life. In Hilliard's review of 11 studies about music therapy in end-of-life care, however, six show that **music is effective in addressing at least one of the areas of pain, physical comfort, fatigue and energy, anxiety and relaxation, time and duration of treatment, mood, spirituality, and quality of life in end-of-life care**.

In a study of single-session music interventions for terminally ill patients, significant changes were found pre-to-post-experience for pain control, physical comfort, and feelings of relaxation. **In a study of effects of music therapy on home hospice patients, those randomly assigned to receive music therapy reported higher quality of life than those in a control group**. This study documents a dose-effect correlation: the quality of life of these individuals increased with greater numbers of music therapy sessions. One small study demonstrates that music therapy is cost-effective in hospice care.

Relevant research includes:

- Bradt, J. & C, Dileo. (2010). Music therapy for end-of-life care. *Cochrane Database of Systematic Reviews (Online)*, *1*(1).
- Hilliard, R. (2005). Music Therapy in Hospice and Palliative Care: a Review of the Empirical Data. *Evidence Based Complementary and Alternative Medicine*, 2(2): 173–178.
- Halstead, M.T. & Roscoe S.T. (2002). Restoring the spirit at the end of life: music as an intervention for oncology nurses. *Clinical Journal of Oncology Nursing*, 6, 332–336.
- Hilliard, R.E. (2003). The effects of music therapy on the quality and length of life of people diagnosed with terminal cancer. *Journal of Music Therapy*, 40, 113–137.
- Gallagher, L.M., Huston, M.J. & Nelson K.A, Walsh, D. & Steele, A. (2001). Music therapy in palliative medicine. *Support Care Cancer*, 9, 156 –161.
- Krout, R.E. (2001). The effects of single-session music therapy interventions on the observed and self-reported levels of pain control, physical comfort, and relaxation of hospice patients. *American Journal of Hospice and Palliative Care*, 18, 383–390.
- Romo, R., & Gifford, L. (2001). A cost-benefit analysis of music therapy in a home hospice. *Nursing Economics*, *25*(6), 353-8.

4. Gerontology

Among older individuals, music and music therapy can be a source of meaningful stimulation and enjoyment. Music can be used therapeutically to increase independence, to put off cognitive decline, and to reduce chronic pain. The use of music also confers positive effects to staff and family caregivers. Music can be used to combat depression and offers benefit in areas related to dementia and specific disorders including osteoarthritis pain, post-operative delirium, sleep difficulties, and chronic obstructive pulmonary disease. As Lee, Chan and Mok conclude: "Music is a non-invasive, simple, and inexpensive therapeutic method of improving quality of life in community-dwelling elders."

Relevant research includes:

- Reid, M., Papaleontiou, M., Ong, A., Breckman, R., Wethington, E., et al. (2008). Self-management strategies to reduce pain and improve function among older adults in community settings: A review of the evidence. *Pain Medicine*, 9(4), 409-424.
- Myskja, A., & Hapnes, O. (2010). Music and health in a local community: a coordinated teaching program in five nursing homes in mid-Norway. *Norsk Tidsskrift for Sykepleieforskning*, 12(1), 3-15.
- Lee, Y., Chan, M., & Mok, E. (2010). Effectiveness of music intervention on the quality of life of older people. *Journal of Advanced Nursing*, 66(12), 2677-2687.
- Skingley, A., & Vella-Burrows, T. (2010). Therapeutic effects of music and singing for older people. *Nursing Standard (Royal College of Nursing (Great Britain)*, 24(19), 35-41.
- Hanser, S. B., Thompson, L., W. (1994). Effects of a music therapy strategy on depressed older adults. *Journals of Gerontology*, 49(6), 265-9.

5. Parkinson's Disease

Music is effective in the treatment of Parkinson's in a variety of ways. Modern management of Parkinson's disease aims to control symptoms, to reduce clinical disability, and to improve quality of life. One of the effects of Parkinson's Disease is the slowing of neurotiming mechanisms, which inhibits patients from generating an internal rhythm that drives the motor skills required for ambulation and speech production. Rhythmic entrainment – or the use of external rhythmic auditory stimulation to rehabilitate these skills using the timing inherent in music – has been shown to be highly effective with this population. **The rhythmic patterns of music can help patients with Parkinson disease overcome bradykinesia and episodes of "freezing" of movement. Music therapy has been shown to improve body posture and symmetry, stride length and arm swing, motor initiation, and shuffling gait. Music is also used with this population to improve mood and quality of life.**

Relevant research includes:

- Tamaino, C. (2011). Music therapy and Parkinson's disease: research and therapeutics. Paper presented at Music, Science and Medicine: Frontiers in Biomedical Research and Clinical Applications, New York, NY.
- Pacchetti, C., Mancini, F., Aglierir, R., Fundaro, C., Martignoni, E. & Nappi, G. (2000). Active music therapy in Parkinson's Disease: an integrative method for motor and emotional rehabilitation, *Psychosomatic Medicine,* 62, 386 –393.

6. Alzheimer's and Dementia

Music is a successful intervention for individuals with Alzheimer's who experience deficits in physical, psychological, cognitive, or social functioning – even those who typically resist other treatment approaches. Studies with memory disorders, such as Alzheimer disease, frequently show retention of musical information in patients that is preserved longer and out of proportion with their concurrent state of memory loss. Based on its universally tangible emotional content, music is a useful modality to access and enhance memory function for these individuals.

Music therapy can offer benefits in the domains of memory, mood and emotional state, awareness of self and environment, anxiety and stress reduction, nonpharmacological

management of pain and discomfort, stimulation, and communication with caregivers. Positive effects on anxiety and depression have been reported in patients with mild to moderate Alzheimer's disease who are treated with music therapy. 75% of dementia is caused by Alzheimer's disease, and some studies refer to these linked conditions together. Music can provide engagement in meaningful activity for patients with dementia, and it has the potential to reduce problem behaviors and to avert the need for pharmacological or physical intervention**. Song-singing is a therapeutic intervention that is effective in this population.**

Relevant research includes:

- Sherratt, K., Thornton, A., & Hatton, C. (2004). Music interventions for people with dementia: a review of the literature. *Aging & Mental Health*, 8(1), 3–12.
- Harrison, S., Cooke, M., Moyle, W., Shum, D. & Murfield, J.E. (2010). Development of a music intervention protocol and its effect on participant engagement: experiences from a randomised controlled trial with older people with dementia. In: *Arts & Health*, 2(2), 125-139.
- Thaut, M.H. (2005). The future of music in therapy and medicine. *Annals of the New York Academy of Sciences*, *1060*, 303-308.
- Guetin, S., Portet, F., Picot, M.C., et al. (2009). Effect of music therapy on anxiety and depression in patients with Alzheimer's type dementia: randomised, controlled study. *Dementia and Geriatric Cognitive Disorders*, 28(1), 36-46.
- Ferris, S., Brotons, M. & Kroger, S.M. (2000). The impact of music therapy on language functioning in dementia. *Journal of Music Therapy*, 37(3), 183-95.
- Gregory, D. (2002). Music listening for maintaining attention of older adults with cognitive impairments. *Journal of Music Therapy*, 39(4), 244-264.
- Brotons, M. & Marti, P. (2003). Music therapy with Alzheimer's patients and their family caregivers: a pilot project. *Journal of Music Therapy* 40(2), 138-150.

7. MENTAL HEALTH

Music therapy, as an adjunct to traditional therapies and treatment for those with mental health needs, has been demonstrated to be an effective intervention. It can allow individuals to explore personal feelings, to make positive changes in mood and emotional states, to practice problem solving, and to develop the skills required for family and peer relationships. Music therapy makes use of a non-verbal medium with which people have prior positive associations to encourage participation from people of lower functioning levels. Music therapy is demonstrated to be a beneficial intervention for people who exhibit more enduring symptoms. Results show that group music therapy for adults with mental illness may help to reduce psychiatric symptoms related to anxiety. Also, patients perceive music therapy as helpful, and use of this intervention can improve attitudes toward help seeking.

Two meta-reviews in the area of mental health conclude that **music is an effective intervention – improving global state, mental state, and functioning – for those with the most serious mental disorders, including schizophrenia and psychotic disorders.** Interestingly, both reviews conclude that the therapy must be sustained in order to deliver benefit.

Relevant research includes:

- Gold, C., Heldal, T., Dahle, T., & Wigram, T. (2005). Music therapy for schizophrenia or schizophrenia-like illnesses. *Cochrane Database of Systematic Reviews*.
- Gold, C., Solli, H., Krüger, V., & Lie, S. (2009). Dose-response relationship in music therapy for people with serious mental disorders: Systematic review and meta-analysis. *Clinical Psychology Review*, 29(3), 193-207.
- Maratos, A. S., Gold, C., Wang, X., Crawford, M. J. (2008). Music therapy for depression. *Cochrane Database of Systematic Reviews*, 1.
- Edwards, J. (2006). Music therapy in the treatment and management of mental disorders. *Irish Journal of Psychological Medicine*, 23(1), 33–35.
- Silverman, M. J. (2006). Psychiatric patients' perception of music therapy and other psychoeducational programming. *Journal of Music Therapy*, 43(2), 111–122.
- De l'Etoile, S. (2002). The effectiveness of music therapy in group psychotherapy for adults with mental illness. *The Arts in Psychotherapy*, 29(2), 69-78.

8. Substance Abuse

Few studies evaluate the therapeutic effectiveness of the most commonly practiced music therapy techniques used to treat addicted individuals, and no studies compare music therapy and other group interventions used in the long-term treatment of chemical dependence. **Music therapy has the potential to interest and engage patients in substance abuse treatment (regardless of age), who report music therapy to be highly effective in increasing relaxation and energy level and in decreasing impulsiveness.** Music therapy can allow this population to experience emotions without the need for substance use. Co-occurring mental illness and addiction is very common, and tends to predict worse treatment outcomes for those who are chemically dependent. The single study of this population included here demonstrates that music therapy appears to be a novel motivational tool in a severely impaired inpatient sample of patients with co-occurring disorders.

Relevant research includes:

- M.J, S. (2003). Music therapy and clients who are chemically dependent: A review of literature and pilot study. *Arts in Psychotherapy*, 30(5), 273-281.
- Dingle, G., Gleadhill, L., & Baker, F. (2008). Can music therapy engage patients in group cognitive behaviour therapy for substance abuse treatment? *Drug and Alcohol Review*, 27(2), 190.
- Baker, F. A., Gleadhill, L. M., and Dingle, G. A. (2007). Music therapy and emotional exploration: Exposing substance abuse clients to the experiences of non-drug-induced emotions. *The Arts in Psychotherapy,* 34(4), 321-330.
- Ross, S., Cidambi, I., Dermatis, H., Weinstein, J., Ziedonis, D., Roth, S. & Galanter, M. (2008). Music therapy: A novel motivational approach for dually diagnosed patients. *Journal of Addictive Disorders*, 27(1), 41.
- Silverman, M. J. (2003). Music therapy and clients who are chemically dependent: A review of literature and pilot study. *The Arts in Psychotherapy,* 30, 273-281.
- Rio, R. (2005). Adults in Recovery: A Year with Members of the Choirhouse, *Nordic Journal of Music Therapy*. 14 (2), 107-19.

9. REHABILITATION

Rehabilitation addresses the needs of those with Acquired Brain Injury (ABI) as from a stroke, those with Traumatic Brain Injury (TBI), and those requiring physical rehabilitation following injury. **For those with brain injuries, a large number of clinical studies have shown that auditory rhythm and music can be effectively harnessed for specific therapeutic purposes in recovering motor, cognitive, and linguistic skills**. **Post-stroke, music-supported therapy offers improvement in fine as well as gross motor skills with respect to speed, precision, and smoothness of movements.** Patients with neurological movement disorders can benefit from the effect of music and rhythm to retrain their motor functions. Participants in a study on TBI and the therapeutic use of music showed improvement in executive function and overall emotional adjustment, and lessening of depression, sensation seeking, and anxiety. **In terms of physical rehabilitation, music therapy can exert significant positive change in fine and gross motor functioning**. The utility of music for this population includes increasing motivation, providing an external timekeeper, and providing purposeful and structured rehabilitation interventions, suggesting that music therapy enhances physical, psychological, cognitive and emotional functioning within physical rehabilitation.

Relevant research includes:

- Altenmuller, E., Marco-Pallares, J., Munte, T., & Schneider, S. (2009). Neural reorganization underlies improvement in stroke-induced motor dysfunction by music-supported therapy. *Annals of the New York Academy of Sciences*, 1169, 395-405.
- Thaut, M.H. (2005). The future of music in therapy and medicine. *Annals of the New York Academy of Sciences*, 1060, 303-308.
- Thaut, M.H., Gardiner, J.C., Holmberg, D., Horwitz, J., Kent, L., Andrews, G., Donelan, B. & McIntosh, G.R. (2009). Neurologic music therapy improves executive function and emotional adjustment in traumatic brain injury rehabilitation. *Annals of the New York Academy of Sciences*, 1169, 406-16.
- Bradt J., Magee W.L., Dileo, C., Wheeler B.L. & McGilloway, E. (2010). Music therapy for acquired brain injury. *Cochrane Database of Systematic Reviews (Online)*, 7.
- Weller, C., & Baker, F. (2011). The role of music therapy in physical rehabilitation: A systematic literature review. *Nordic Journal of Music Therapy*, 20(1), 43-61.

10. VETERANS

Music therapy has been used extensively by the military since the mid-20th century. Initially provided to promote morale and to aid in physical rehabilitation, music is still used by the VA hospital system to rehabilitate those injured in combat, as an adjunctive psychotherapy, especially for veterans with post-traumatic stress disorder (PTSD). **Learning, creating, and performing music engages many aspects of brain function, and music can be a valuable recovery tool for those with combat-incurred brain injury**. Music therapy has been shown to be effective in both individual and group settings. The focused work of learning to play a musical instrument yields both physical and psychological health outcomes. In Bensimon et al, a drumming group for veterans with PTSD caused a reduction in PTSD symptoms, increasing emotional openness and a feeling of belonging. **Music, through the act of drumming, allowed participants with PTSD symptoms a non-intimidating access to traumatic memories, and facilitated an outlet for rage and regaining a sense of self-control.**

Relevant research includes:

- Rorke, M. A. (1996). Music and the wounded of World War II. *The Journal of Music Therapy*, 33, 189-207.
- Levesque, W. (3/ 22/2009). VA Uses Music Therapy In Veterans' Recovery. *St. Petersburg Times*: http://www.theledger.com/article/20090322/news/903225028
- Moshe Bensimon, M., Dorit Amir, D. & Wolf, Y. (2008). Drumming through trauma: Music therapy with post-traumatic soldiers. *The Arts in Psychotherapy,* 35 (1), 34-48.
- http://musicorps.net/Home.html
- http://www.makingmusicmag.com/features/06may03.html

B. PEDIATRIC CONDITIONS

OVERVIEW

Music is used in many pediatric applications, for children of every age: from those in the process of being born (music has been used successfully to decrease perception of and response to pain during labor) to adolescents and young adults. As in the case of the studies of the use of music with adults, many of those listed below have small sample sizes, and some are qualitative. Nearly universally these studies conclude that more research is needed.

Relevant pediatric overview research includes:

- Naylor, K. T., Kingsnorth, S., Lamont, A. McKeever, P. & Macarthur, C. (2011). The effectiveness of music in pediatric health care: a systematic review of randomized controlled trials. *Evidence-Based Complementary and Alternative Medicine*, 2011, 18 pages.

1. LABOR

While music in labor is aimed primarily at alleviating stress in the mother, the condition is included here to group it with other birth-related conditions. **Music can effectively reduce patients' perceptions of and responses to pain during labor**. Women who use music during labor perceive it as helpful, and the use of soft (recorded) music can decrease women's self-report of distress.

Relevant research includes:

- Phumdoung, S., Good, M. (2003) Music reduces sensation and distress of labor pain. *Pain Management Nursing*, 4 (2), 54-61.
- Hanser, S. B., Larson, S.C. & O'Connell, A. S. (1983). The effect of music on relaxation of expectant mothers during labor. *Journal of Music Therapy*, 20(2), 50-8.

2. Neonatal Intensive Care/Premature infants

Music has statistically significant and clinically important benefits for premature infants in the NICU. Among premature infants, lullabies and classical music appear to increase weight gain, decrease episodes of oxygen desaturation, decrease distressed behaviors, and increase nonnutritive sucking, all of which may decrease length of hospital stay. Music is an effective intervention during painful procedures for infants, such as circumcision or heel prick. While listening to music, infants become quiet and appear to fall asleep; these decreases in activity may reduce caloric expenditure, enhance weight gain, and hasten hospital discharge.

Relevant research includes:

- Collins S.K. & Kuck, K. (1991) Music therapy in the neonatal intensive care unit. *Neonatal Network*, 9, 23–26.
- Caine J. The effects of music on the selected stress behaviors, weight, caloric and formula intake, and length of hospital stay of premature and low birth weight neonates in a newborn intensive care unit. *Journal of Music Therapy* 28, 180 –192.
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- Hartling, L., Shaik, M., Tjosvold, L., Leicht, R., Liang, Y., et al. (2009). Music for medical indications in the neonatal period: A systematic review of randomised controlled trials. *Archives of Disease in Childhood – Fetal & Neonatal Edition*, 94(5).
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3. Learning and Development

Exposure to music can induce changes in the how the brain processes sound, enhancing language development and cognitive ability, especially among children with learning disabilities. The sustained and targeted use of music can improve verbal communication and improve perception in the classroom environment. **Research indicates that music can be used to enhance language and literacy skills, sharpening both working memory and the perception of speech in noise.** In one study of dyslexic children, classroom music lessons had a positive effect on both phonologic and spelling skills. Music therapy can allow children with emotional, learning, and behavioral disorders to channel and transform negative emotional states.

Relevant research includes:

- Chandrasekarn, B. & Kraus, N. (2009). Children with language-based learning disorders. *Music Perception* 27, 4, 297–306.
- Claussen, D.W. & Thaut M.H. (1997). Music as a mnemonic device for children with learning disabilities. *Canadian Journal of Music Therapy*, 5, 55–66.
- Overy, K. (2003). Dyslexia and music: from timing deficits to musical intervention. *Annals of the New York Academy of Sciences*, 999, 497–505.
- Montello, L. & Coons, E. E. (1998). Effects of active versus passive group music therapy on preadolescents with emotional, learning, and behavioral disorders. Journal of Music Therapy, 35, 49-67.

- Tallal, P. (2011). The role of rapid auditory processing in language development and disorders. Paper presented at Music, Science and Medicine: Frontiers in Biomedical Research and Clinical Applications, New York, NY.

4. AUTISM

Metanalyses of the literature offer conflicting reports of the evidence supporting the use of music interventions to facilitate social, communicative, and behavioral skills in young children with autism. Few of the studies published in this area are empirical ones. However, **music therapy is used often in the treatment of autism, and individual studies report gains in cognitive skill, verbal and nonverbal communication, attention span, and social behavior among autistic children who participate in music-based interventio**n. Music is also identified as a powerful tool for diagnostic and clinical assessment with this population. It has been suggested that music can help autistic children to organize the nervous system and to integrate multiple sensory inputs. Because autistic individuals cannot typically distinguish pitch, they are unable to access the auditory component of speech content, which is often linked to emotion. Work with music has the potential to enhance communication by training focus onto changes in vocal pitch and emphasis.

Relevant research includes:

- Simpson, K. & Keen, D. (2011). Music Interventions for Children with Autism: Narrative Review of the Literature. *Journal of Autism and Developmental Disorders.* 1/4/2011.
- Accordino, R., Comer, R. & Heller, W. (2006) Searching for music's potential: A critical examination of research on music therapy with individuals with autism. *Research in Autism Spectrum Disorders.* 1(1), 101-115.
- Buday, M. (1995). The effects of signed and spoken words taught with music on sign and speech imitation by children with autism. *Journal of Music Therapy*, 32, 189–202.
- Kim, J., Wigram, T. & Gold, C. (2008). The effects of improvisational music therapy on joint attention behaviors in autistic children: a randomized controlled study. *Journal of Autism and Developmental Disorders*, 38, 9, 1758–1766.
- Alberti, M. L. (2011). Clinical music therapy treatment addressing autism characteristics. Paper presented at Music, Science and Medicine: Frontiers in Biomedical Research and Clinical Applications, New York, NY.

5. ADOLESCENTS

The literature on adolescents tends to address interventions for behavioral problems, or to describe adolescents struggling with mental health issues, such as anorexia nervosa or depression. Results are often complicated because individuals are coping with multiple stressors, including psychological diagnosis, health condition, or life situation, and those in therapy are sometimes participating in more than one type of treatment. Music therapy has been found to be effective for children and adolescents with psychopathology when techniques from different music therapy approaches are combined.

Literature on adolescents emphasizes the use of popular music (most often hip hop) and songwriting, typically focused around issues of self-identity**. Music therapy has been shown to improve quality of life scores for adolescents with emotional and behavioral problems, and to enhance coping skills in response to stressful life events such as bereavement. Gains in**

these realms have not been shown to extend to academic achievement.

Relevant research includes:

- Ciardiello, S. (2003). Meet them in the lab: using hip-hop music therapy groups with adolescents in residential settings. In N. E. Sullivan, E. S. Mesbur, N. C. Lang, D. Goodman, & L. Mitchell (Eds.), *Social work with groups: Social justice through personal, community and societal change* (103–117). New York: Haworth Press.
- McFerran, K., Baker, F., Patton, G.C. & Sawyer S.M. (2006). A retrospective lyrical analysis of songs written by adolescents with anorexia nervosa. *European Eating Disorders Review*, 14(6), 397-403.
- Dalton, T.A. & Krout, R.E. (2005) Development of the grief process scale through music therapy songwriting with bereaved adolescents. *Arts in Psychotherapy*, 32(2), 131-143.
- Hilliard, R. (2007). The effects of Orff-based music therapy and social work groups on childhood grief symptoms and behaviors. *Journal of Music Therapy*,44 (2), 123-138.
- Chong, H.J. & Kim, S.J. (2010) Education-oriented music therapy as an after-school program for students with emotional and behavioral problems. *Arts in Psychotherapy,* 37(3), 190-196.
- Baker. F. & Jones, C. (2006). The effect of music therapy services on classroom behaviours of newly arrived refugee students in Australia—a pilot study. *Emotional and Behavioural Difficulties*. 11(4), 249–260.
- Rickson, J. & Watkins, W.G. (2003). Music therapy to promote prosocial behaviors in aggressive adolescent boys—a pilot study, *Journal of Music Therapy*, 40(4), 283–301.
- Rickson, J. (2006). Instructional and improvisational models of music therapy with adolescents who have Attention Deficit Hyperactivity Disorder (ADHD): a comparison of the effects on motor impulsivity. *Journal of Music Therapy*, 43(1), 39–62.
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- Gold, C., Voracek, M. & Wigram, T. (2004). Effects of music therapy for children and adolescents with psychopathology: a meta-analysis. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 45(6), 1054–1063.
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- Bodner, E., Iancu, I., Gilboa, A., Sarel, A., Mazor, A. & Amir, D. (2007). Finding words for emotions: the reactions of patients with major depressive disorder towards various musical excerpts. *Arts in Psychotherapy*, 34(2), 142-150.
- Hendricks, C. B. (2001). A study of the use of music therapy techniques in a group for the treatment of adolescent depression. *Dissertation Abstracts International*, 62(2-A).

6. Pediatric Illness

Two meta-analyses have shown that, as for adults, the **use of music with children can reduce the pain, anxiety, and stress associated with painful or frightening medical procedures, in some cases offering an alternative to pharmacological therapies**. Children suffering from chronic or acute physical illness, such as cancer or cystic fibrosis, also see benefits, measured by physiologic indicators, by self report, and by the report of (variously) parents, physicians, and the participating music therapist.

Music and Health Care

Relevant research includes:

- Standley, J.M. & Whipple, J. (2003). Music therapy with pediatric patients: A meta-analysis. In Sheri Robb (Ed.) *Music Therapy in Pediatric Healthcare: Research and Evidence-Based Practice***.** Silver Spring, MD: American Music Therapy Association, 1-18.
- Klassen, J.A., Liang, Y., Tjosvold, L., Klassen, T.P., Hartling, L. (2008). Music for pain and anxiety in children undergoing medical procedures: a systematic review of randomized controlled trials. *Ambulatory Pediatrics*. 8(2), 117–128.
- Byat, A., Ramaiah, R., & Bhananker, S.M. (2010). Analgesia and sedation for children undergoing burn wound care. *Expert Review of Neurotherapeutics*, 10(11), 1747-1759.
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- Standley, J. & Hanser, S. (1995.) Music therapy research and applications in pediatric oncology treatment. *Journal of Pediatric Oncology Nursing*, 12(1), 3-8.
- Barrera, M.E., Rykov, M.H. & Doyle, S.L. (2002). The effects of interactive music therapy on hospitalized children: a pilot study. *Psycho-Oncology*, 11, 379–388.

VI. MUSIC THERAPY

Music Therapy is the primary modality for the therapeutic use of music to promote health goals. Currently practiced at Jacobi Medical Center and in hundreds of other health care settings, music therapy is a well-established profession going back to the Second World War. Music therapy targets outcomes in mental and physical health, and is a process of interpersonal engagement that uses all of the dimensions of music for therapeutic purposes.

As defined by the American Music Therapy Association (AMTA):

> Music Therapy is 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. (AMTA.org)

In the United States more than 5,000 certified music therapists work in community mental health centers, correctional facilities, drug and alcohol programs, general and state hospitals, geriatric care programs, hospice programs, physical rehabilitation centers, prevention and wellness programs, public and private schools, special education programs, residential facilities, and in private practice. Their numbers are growing as health care consumers, advocates, and administrators take note of the efficacy of music-based interventions.

The importance of clearly distinguishing between the work of musicians working on behalf of programs like Musical Connections and that of music therapists should not be underestimated. Music therapists are *professionally trained and credentialed health professionals*. It is critically important to understand the world of music therapists and credit their professional expertise, as these clinicians may often be the only resident staff with musical training at the hospitals in which programs are to take place.

TRAINING

Music therapists are permanent or contracted members of hospital staffs, available to work with patients as needed or in ongoing sessions for individuals or groups. **They come to their work having completed a standardized curriculum that includes both academic and clinical work**. All hold a bachelor's degree or higher in music therapy from one of over 70 American Music Therapy Association (AMTA) approved college and university programs. Curriculum at the Bachelor's level is organized into three areas of focus: musical foundations, clinical foundations, and music therapy foundations and principles.

The academic course work of a music therapist must be supplemented by 1200 hours of clinical training, which includes a supervised internship. In the early 1970s, an independent organization, The Certification Board for Music Therapists, was established to offer board certification in an effort to promote objective national standards in training, practice, and ethics. The exam-based MT-BC (Music Therapist - Board Certified) credential allows individuals to practice professionally and must be maintained through participation in accredited continuing education

coursework. Graduate degrees in Music Therapy focus on advanced clinical practice and research. Though there are other professional degrees that certify individuals to work or to play music in health care settings (such as a Certified Music Practitioner), those certified as music therapists receive the most complete and ongoing professional training (Lane, 2011).

THE NATURE OF THE THERAPEUTIC EXPERIENCE

The therapeutic experience in music therapy can take many forms: the music can be live or pre-recorded, and the client can take many roles, on a spectrum from passive to active listening (including activities like music visualization or music-assisted relaxation) to making or improvising their own song or score.

Bruscia (1998) offers a precise taxonomy of music therapy interventions distinguishing between "interactive" and "receptive" music experiences.

- "Interactive" music interventions include improvisation, re-creation, and composition that involve the client engaging in some type of musical behavior.
- "Receptive" music experiences are those that involve a client in listening either to live or recorded music and responding with a nonmusical behavior.

There are variations within each type and each intervention can occur within a group or individual setting (ibid). Music therapists embody different roles – performer, individual therapist, group leader, improviser, staff educator, etc. – sometimes within a single therapy session (Hanser, 2011).

Most of the research done on music and health care describes either the effects of music therapy interventions performed by a therapist, or passive listening experiences with recorded music such as the use of music in the operating room or in pre-surgery patient waiting rooms, or the use of recorded music as a distractor during painful or stressful procedures such as bandaging for children with burns or weaning from mechanical ventilation. **Music therapy is defined as a facilitated musical experience, which raises the question of whether efficacy in patient engagement resides in the act of facilitation as much as in the pure experience of music.**

The music therapy experience relies on the real-time relationship between a clinician and a client (or clients). There is a concentrated focus on the client's evolving affect and expression and a concomitant adjustment in therapy in a session. It is very much an interpersonal process that goes beyond the straightforward presentation of music. Bradt and Dileo's (2007) work confirms the vitality of this personal interchange, finding clinically significant results reported more often for trials employing the systematic use of music with a trained music therapist than for those employing no music therapist. Evidence supports the idea that music therapy works best when (depending on their condition) a patient is engaged in the process: electing to participate (Kemper & Danhauer, 2005), choosing their level of participation (Burns, Sledge, Fuller, Daggy & Monahan, 2005), and being informed about how the therapy works (Chan, Chung, Chung & Lee, 2009).

Suzanne Hanser, Chair of the Music Therapy Department at Berklee College of Music, makes a distinction between the clinical use of music by therapists in health care settings and the delivery of

musical experience to patients by professional musicians or volunteers, defining only the first as an "intervention." The experience of music in the unexpected setting of a hospital or clinic may have a "transformative effect" on listeners, Hanser says, but this music is not inherently therapeutic.

According to Hanser, **music therapy interventions are:**

- **Often elective: a patient can opt in**
- **Targeted to individual patients' condition, mood, treatment plan, or essential self**
- **Sustained or repeated over time**
- **Geared to respond to changes in patients moment-by-moment or to those observed over time.**

Extra-clinical musical experiences can be different from these critical components of a music therapy encounter, but evidence from Musical Connections shows that many of these elements can also be present. Patients have opted into or out of many of the Jacobi events. Working with clinical staff at the hospital, many of the interventions have been carefully calibrated to patient needs. In some cases (most especially the 12-week song writing workshop with a population of adolescents infected with HIV), the experience has been sustained over time. And, in the best examples of presentations with small groups of patients, there has been musician response to patient needs (though perhaps not at the moment-by-moment level Hanser describes as critical to music therapy).

It is important to be clear with where there are distinct differences of goals and outcomes, and where services can complement each other for patient benefit. This can only happen through continual dialogue and understanding amongst musicians, music therapists, and health care professionals.

The enumeration of differences between music therapy and the experience of live music delivered by outside musicians leaves open the question of what the effects of non-clinical musical encounters can be. Dr. Phillip Speiser reports that, in his practice, **live music performed by professional musicians can sometimes reach clients who are not engaging therapeutically, or a performance can elicit an entirely different emotional response from that yielded by therapeutic technique** (Speiser, 2011). These effects are best explored with patients and made clinically relevant by the collaboration between a musician and a music therapy professional. For Deforia Lane of University Hospitals in Cleveland, part of the potential of a live performance is the opportunity it provides her to "honor" a patient. She asks if the patient will "allow" a musician who wants to offer live music into their room, conferring power to the person who is ill by offering "a brilliant, important person who wants to play for you." **The framing of a musical event can have extraordinary effects on the self-esteem of patients**, she says, even those suffering from disfiguring conditions. "There can be a resonance" in this kind of encounter, she reports, "that simply elevates the moment" (Lane, 2011).

Studies of brain structure and function clearly indicate that humans respond to music, and that music has the potential to activate and connect neural circuitry in ways that enhance wellbeing, so all musical experience has the potential to reach into the human core. Creating a more detailed taxonomy of ways to interact with patients and specific populations may be a first step toward clarifying this issue (as is further discussed in the final section of the report).

ISSUES IN MUSIC THERAPY

1. LIVE MUSIC AND SENSITIVITY TO THE PATIENT

Many clinicians in music therapy believe that music is most therapeutic when it is live (AMTA). The reason is simple and powerful – live music provided by a therapist allows that individual to adjust to patients' reactions in real time. From the perspective of neural activity, the "acoustic cues" that ignite human cognitive response are not only resident in the structure, but also in the performance characteristics of music (Trainor & Schmidt, p. 311). **Clinical outcome depends on the qualities of performance and expression, and on the listener's experience—all of which can be calibrated by a musician in real time if the music is live.**

Loewy (2011) provides the example of a music therapist improvising with a needle-phobic patient who is the chemotherapy infusion room. Over the course of having blood drawn and a pump hooked up, the music evolves to match the patient's state, remaining always in the key of the beeping pumps all around the treatment room.

For some patient populations, live music is a clinical necessity because their condition requires that the use of music be both personalized and delivered under clinical supervision. In a fact sheet on music therapy interventions for patients suffering from trauma or post-traumatic stress disorder, the AMTA explains that "highly evocative music" should not be used with these individuals unless they are in the room with a clinician because of the possibility that music may act as a trigger for psychological symptoms. Additionally, these patients, according to the AMTA, may be sound sensitive—another condition that suggests the importance of a live musical experience that can be adjusted, live, to the patient's evolving response (AMTA, 2010*).*

It is difficult to quantify the effects of live music, or to tease out whether it is the immediacy of live performance or the presence of a facilitator of the musical experience that renders the experience more therapeutically potent**. The valuable lesson here is the idea of careful calibration of the selected music and the performances in real time based on the responses of the audience, a concept that perhaps should be part of the professional development of all musicians going into health care settings**.

2. GAINING CREDIBILITY IN A RESEARCH-BASED HEALTH CARE ENVIRONMENT

Many music therapists would concede that their profession has not always been held in the highest regard by other health care professionals. Why should this be? Music therapy is practiced internationally. There are professional music therapy associations in the United States, the United Kingdom, Australia, Japan, Scandinavia, Italy, Latin America, and elsewhere throughout the world. The scope of practice continues to grow: music therapy has been used to aid the victims of natural disaster, including the recent floods in Australia (McFerran & Teggelove, 2011), to help people to recover from the impact of the terrorist attacks in the United States on September 11, 2001 (Loewy, 2011), as a part of peace efforts in the West Bank (Coombes, 2011), and to assist veterans suffering from PTSD in the United States and elsewhere (Bensimon, Amir & Wolf, 2008). The powerful relationship between music and healing is, increasingly, integrated into the knowledge base of other

academic and professional disciplines from neuroscience to the training of professional musicians to the emerging practice of pain management (Lopez, 2005).

Despite these developments, and **in spite of over half a century of positive outcomes for patients, music therapy has not been fully or routinely integrated into health care** (Burns, Sledge, Fuller, Daggy & Monahan, 2005). In recent years, research has begun to catch up to the clinical practice of music therapy (Tamaino, 2011), as the effects of music on the brain gain traction in the popular and scientific imaginations, and as music therapy piques the interest both of medical professionals and of individuals searching out new technologies of healing (Hanser, 2011).

Part of the challenge for music therapy is the trend in health care towards an evidence-based model that has subjected longstanding clinical practice to a new level and vocabulary of scrutiny, derived from the scientific model (Sackett, Rosenberg, Gray, Haynes & Richardson, 1996). The mutual integration of accumulated practitioner expertise and scientific protocol is not always smooth, however, and the culture of research and that of therapy occasionally collide (Wong, 2011). **Assessments of the outcome research in music therapy interventions that are informed by the recent emphasis on scientific method and quantitative outcomes often conclude that the evidence simply does not measure up.**

As one example, analysis of existing outcome studies within the field of music therapy finds that many fall short of established scientific standards of evaluation. Lopez (2005) writes that "typical articles on music therapy are characterized by small samples, lack of a proper control group, subjective measurement protocols, and huge inter-experimenter/therapist variability" (p.269) though Silverman notes that, in this respect, music therapy is like "other well-established psychosocial treatments for psychiatric consumers" (2010, p. 7). Results of Silverman's metanalysis indicated a lack of randomized controlled trials and overall low level of evidence in studies of music therapy interventions for psychiatric patients.

Additionally, many studies deploy idiosyncratic methodology and terminology. For example, one 2009 meta-review of 22 studies of pediatric music therapy interventions revealed significant gaps in the description of eight key areas: "music qualities, intervention materials, intervention components, intervention delivery schedule, interventionist, treatment fidelity, setting and music delivery method" (Robb & Carpenter, p. 490). The absence of reporting guidelines limits the replicability and medical utility of existing research, preventing the development of a systematic method, outside of individual clinical expertise, to determine the most appropriate music therapy intervention for patients within specific clinical contexts (Warrick, Irish, Morningstar, Gilbert, Brown, & Gullane, 1999).

Joanne Loewy, Director of the Louis Armstrong Center for Music and Medicine at Beth Israel Hospital in Manhattan, attests that music therapy works best if all members of a patient's health care team believe in its efficacy and are willing to incorporate music therapy and the music therapist into an evolving and collaborative treatment plan. Warrick et al (1999) report that lack of endorsement from medical professionals may influence patients' decisions about participation in music therapy, and Bouhairie, Kemper, Martin & Woods (2006) report that staff attitudes about music therapy vary, depending on prior musical training, profession, and years of experience.

Indeed, within the power hierarchy of health care settings, allied therapies like music therapy often rank low—so a patient's access to musical experience may depend on hospital administrators' or supervising physicians' beliefs about its therapeutic potential. Music therapy is not always welcomed

by medical personnel or institutions: it has the potential to introduce unpredictability and additional people into treatment space and planning, and, though a relatively inexpensive form of treatment, music therapy requires investments of time and of capital (Patel, 2011).

3. Funding, Payment, and Insurance for Music Therapy

The funding of and payment for music therapy is evolving. **Institutions and individual providers must find creative ways to describe music-based interventions that render them either reimbursable by insurance or fundable by other means**. Dr. Phillip Speiser, Director of Arts Therapy at Whittier Street Health Center, a community health care clinic, funds the delivery of art-based therapies at his agency by a combination of means: through grant funding, ongoing contracts with school districts, and by billing third party insurance providers (Speiser, 2011). Reimbursement by insurance for music therapy varies by state, and in Speiser's home state of Massachusetts, music therapy can be reimbursed under mental and behavioral health provisions, though this requires that therapists comply with all of the associated requirements for licensure and documentation (Hanser, 2011).

Because reimbursement by insurance varies so widely, and because a reliance on reimbursement by insurance would limit those patients to whom music therapy could be offered, **some hospital systems, like University Hospitals of Cleveland, simply make an institutional commitment to fund the provision of music therapy to all of their patients** (Lane, 2011).

Like most kinds of therapy, music therapy must be pre-approved for coverage or reimbursement, and claims are paid (on a case-by-case basis) only if therapy is deemed medically necessary to reach the treatment goals of the individual patient. The American Music Therapy Association now estimates that **at least 20% of music therapists receive third party reimbursement for the services they provide** (AMTA). Both Medicare and Medicaid identify music therapy as a reimbursable service. Guidelines for these programs vary by state, but reimbursement universally depends on the demonstration of progress by individuals receiving therapy (ibid). As the use of music therapy spreads, payment structures may standardize, yet at the moment, one of the roles of those who provide or contract for these clinical interventions is to facilitate how they are paid for.

VII. Further Issues and Opportunities for Music and Health Care

A. The Nature of the Interaction

No one has identified the precise components and range of facilitated musical experiences in health care settings. One distinction that can be made is between product and process. Professional musicians are in some sense bringing a product – offering live music, or the opportunity to create a satisfying pairing of melody and lyric. A music therapist is bringing a music-enabled process of self-expression, giving less attention to any defined musical outcome (Hanser, 2011).

Certainly, we know that facilitated music experience exists on a continuum from a single performance without talk by a musician to a full interactive experience over time with a highly trained music therapist utilizing his or her interpersonal skills, knowledge base, and in some cases, training as a professional musician to target individualized goals. But this gross distinction doesn't help very much and it has, in some cases, worked against the most cooperative strategies within health care settings. Perhaps **what is needed is a more precise taxonomy of ways that professionals can interact musically with a range of patients, one that outlines possible opportunities and challenges inherent in a variety of clinical settings**.

Once a taxonomy is developed, appropriate training is the next step. Deforia Lane, in her role as a hospital Director of Music Therapy, coordinates all visits to patients by professional musicians. She offers **practical information to all potential musician volunteers, from general and legal guidelines and limitations on patient interaction, to medical information on relevant medical conditions, to collaborative instruction about appropriate timbre or length of performance for specific patients or groups**. This training extends to practical advice and role plays to prepare musicians for a variety of scenarios: *When am I, the performer, finished? What do I do when I'm done playing? What if a bedridden patient needs to use a bedpan? What if I'm playing for a comatose patient and the monitor starts to react?* Dispensing with these concerns allows a musician to engage with a patient more immediately and directly.

Those musicians who do outreach into health care settings attest that their programs generally work best when they can draw patients in by talking about what they are doing and describe a personal relationship to the music they are playing (Maggi, 2011). But even such a simple rule of thumb depends on the patient population: for some patients it is an intrinsic aspect of the music itself that is most healing. For patients with dementia, music may access memory or emotion that is otherwise obscure (Thaut, 2005), while for those suffering from Parkinson's disease, the rhythm in music has the potential to aid in the relearning of speech and gait (Tomaino, 2011). Over time, documentation of these differences and distinctions would be of great benefit to those wanting to do this sort of work.

B. ACCESS

There are other practical implications of the differences between the clinical use of music by music therapists in health care settings and community engagement projects that deliver live musical experience to those same settings. One is access. **In hospitals, clinics, or senior centers, musical outreach is often considered as entertainment, environmental enhancement, or recreation, and not a clinical intervention, and access can be quite limited** (Hanser, 2011). Music therapists, on the other hand, are employed or contracted by a facility: they are already resident in the ecosystem and considered part of the therapeutic staff. These practitioners have access to patients in a variety of conditions and can move without supervision between physical locations. **Visiting musicians meet only those patients that the hospital staff deems healthy enough to handle the experience – in those spaces designated by the facility.**

Tanya Maggi, Director of Partnerships and Community Engagement at the New England Conservatory of Music, coordinates ensembles of students performing in community settings throughout the Boston area. She reports that she and other colleagues have difficulty getting in to perform in local hospitals. "It seems like since the swine flu epidemic or slightly before, it is much harder to get in to perform in hospitals," she said in an interview. "The rules are just far more strict now, and the best we can do in most places is to perform a concert in the lobby." The trend is widespread: at University Hospitals in Cleveland, anyone wanting to volunteer must complete an application form, submit to a background check and fingerprinting, and then participate in an interview with a member of the hospital staff (Lane, 2011). **Another factor pertaining to ease of access (or lack of it) is the relationship between music therapists and visiting musicians**. The potential cost savings to a hospital – and sometimes the prestige conferred by the visit of an accomplished professional musician – may diminish administrative interest in contracting for music therapy services, meaning that a live performance may impact a music therapist in ways a performer does not imagine (ibid).

Because the introduction of professional musicians into the health care environment can be perceived as an intrusion by some, advocacy by staff within the institution is critical – often the higher in the authority chain the better. Suzanne Hanser, Chair of the Music Therapy Department at Berklee College of Music in Boston, suggests one specific model for effective entry of musicians/volunteers into the health care space: the use of a music therapy consultant. This has the advantage of utilizing an expert who represents the interests of the patients and can work with persons entering hospital or clinic settings to ensure a valuable and appropriate music experience, screening choices of repertoire or program length, for example. The presence of a music therapy consultant in a long-running group or residency can help to maintain musical outcomes while focusing participants on the process of authentic expression. It can also help diminish the potential for tension where a music therapist is not part of the decision-making.

C. DOSE AND DURATION

Two intriguing questions in the area of music and health care are:

- **How much music does it take to make a difference?**
- **How long do results last?**

In the Musical Connections program, for example, some concerts are offered in a large atrium space at Jacobi Medical Center that also serves as a corridor from the main entrance to treatment areas. Another program has adolescents from the HIV Pediatrics Clinic at Jacobi spend 12 weeks in intensive small group work sessions with a composer creating their own songs. Being clear with intention and goals leads to experimenting with dose and duration in different ways. What is the impact of a 45-minute concert in the atrium space? Are the adolescents' lives changed in any way because of the workshops?

The question of frequency of exposure required to glean benefit is a subject of research. Studies on musicians indicate superior neural connectivity related to the effects of regular musical experience over decades, yet music clearly has the potential to affect most people, and evidence shows that even non-musicians intuit basic musical structures, and react emotionally to hearing music (Trainor & Schmidt, 2003). **Not surprisingly, many studies correlate superior effects on patients to increased frequency of music intervention**. (Gold, Solli, Kruger & Lie, 2009). Gold & Solli et al identify "significant dose-effect relationships," reporting that while "slight improvements can be seen with a few therapy sessions, longer courses or more frequent sessions are needed to achieve more substantial benefits" (p. 193). Ross, Cidambi, Dermatis, Weinstein, Ziedonis, Galanter & Roth (2008) link the amount of therapeutic musical experience to the motivation of patients dually diagnosed with substance abuse and mental disorders, reporting that patients who attended six or more music therapy sessions stayed in treatment longer than those who attended fewer, and that "music therapy group attendance during in-patient treatment was predictive of successful follow-up" and aftercare (p. 41).

But the long-term measurable benefits of music interventions are difficult to document. Some research describes the duration of measurable outcomes: for example, one study on the use of music therapy to lower anxiety in patients with Alzheimer's disease, the effect of music therapy was sustained for up to 8 weeks after the discontinuation of regular sessions (Guetin, Portet, Picot & Pommie, 2009). Different patient groups remain in clinical settings for varying amounts of time, affecting the amount of time over which they could experience any form of music. **Any form of program design or evaluation should take into account the effects of both dose and duration on intended outcome**.

D. WHAT'S ON THE PROGRAM? WHAT MUSIC FOR WHICH PEOPLE?

According to Dr. Phillip Speiser, "It is important to remember that music is both cultural and personal. You always have to find the right sounds." (2011) And those "right sounds" may be different for any two patients. Indeed, **the delivery of music that is "appropriate" in health care settings is more than an issue of satisfying a generic checklist of do's and don'ts.**

Because the brain of each individual patient has absorbed musical building blocks of his or her local sonic environment in infancy and developed expectations and preferences based on this experience, choosing appropriate musical selections is an important challenge. Yet there are techniques that can assist.

At a profound neural level, listeners respond to music that is culturally familiar: research shows that at the age of nine months, infants respond to "particular characteristics of the scales of their own musical culture" (Levitin & Tirovolas, 2009, p. 216), a process that continues throughout development, eventually yielding a complete grammar of musical expectation (Trainor & Trehub, 1994). Musical response is, at one level, the experience of tension or release engendered by the violation or fulfillment of musical expectation (Peretz & Zatorre, 2003), which suggests that **musical experience needs to be tuned to resonate with patients' particular and deep-rooted musical instinct**. **The evidence for this is overwhelming – patient preferences and prior musical experiences are vital determinants of the ultimate success of any musical intervention** (Chan, Chung, Chung & Lee, 2009).

Patient physical and mental health is also important according to the same study, which renders the choice of music even more complicated. Physical condition plays a role in patients' choices about whether and how to participate in music in conjunction with other therapies. In a 1999 study of patients receiving chemotherapy, a large majority (85%) were interested in using some type of music therapy during treatment. Yet these patients had specific types of experience in mind, indicating more interest in music listening (44%) than in music making (17%) (Burns, Sledge, Fuller, Daggy & Monahan, 2005). A meta-analytic review of research articles on the use of music to decrease arousal due to stress that included 22 quantitative studies demonstrated that music worked to reduce stress among enrollees, but that **the amount of stress reduction was significantly different when considering age, type of stress, music assisted relaxation technique, musical preference, previous music experience, and type of intervention** (Pelletier, 2004).

Individual patients' confidence in their musical abilities may influence their willingness to be involved, especially if the music is foreign to their experience. Those with formal musical training or previous success in performing may feel relatively more confident singing or playing an instrument during an interactive music intervention. The individual who has not had successful musical experiences in the past may choose to participate in a receptive music intervention, such as music imagery, music relaxation, or music listening, or may choose to refuse music therapy services altogether (Burns, et al., 2005). Failure to take account of a patient's feelings about musical experience or intervention can be damaging: **individuals presented with music experiences with which they do not feel confident may experience increased anxiety** (Montello & Coons, 1998). In sum, the background and feelings of patients are central to how they respond to any music, but especially so in a health care setting.

These findings suggest another area where professional musicians going into health care settings can learn the way in which music therapy takes the self and the state of the patient as a point of origin. Professional musicians – even those who have undergone training relevant to the setting – are generally oriented by repertoire and technique, or by a musical process (such as songwriting) that has its own aesthetic imperatives. **Simply put, repertoire especially, but also technique and musical process, should be oriented to fit the requirements of specific patient populations and individual participants and should be a focus of professional development.**

It will be important to research and develop a protocol for talking about repertoire. Some initial questions to consider might include:

- Who is in the audience?
- Where does the performance take place? (Is it a chemotherapy infusion room? A pediatric floor? A lobby concert?)
- What repertoire would make sense for these listeners?
- What are some of the ways musicians can engage those listening into the musical experience?
- Will audiences in that space be voluntary? (Sometimes the physical space includes patients, caregivers, or hospital staff who cannot choose to listen.)
- Who is the musician and what is their training and performance experience? What are their experiences with health and illness?
- Why does the musician want to be there?

Programming for the health care environment encompasses opposing imperatives. **Ideally music should be relevant to its listeners, in terms of culture, genre, mood, and era of origin** (Maggi, 2011). **Yet because music is an inherently evocative medium, performers need to be cautious not to evoke too much feeling** (AMTA, 2010), or to summon emotions that are potentially overwhelming (Hanser, 2011). It is also important to keep in mind that research into the cognitive processing of music indicates that non-musician listeners process and grasp music at the level of individual phrases (in approximately 30 second intervals), rather than at the level of musicians who hear the structural arc and can grasp entire sections (Tillman & Bigand, 2004). Thus, a professional musician may hear a rondo as a very simple A-B-A-C-A-D-A form, while non-professional may hear a sonic wash of confusing phrases.

Finally, thematic programming presents its own set of issues. Tanya Maggi, Director of Community Performances & Partnerships Program at New England Conservatory, programs multiple holiday concerts in hospitals and senior centers. These programs are extremely popular with patients and residents and with her staff counterparts at partner institutions, and she describes the events as "always very warm and very emotional." Holiday concerts are an important annual event for the students who perform and for those who hear them, yet creating these programs requires a careful calibration between different religious and cultural traditions (something Musical Connections encountered at Jacobi), the inclusion of music that is familiar to a variety of audiences, and the strategic placement of those songs to which most people can sing along.

E. RESEARCH: WHAT DO WE KNOW AND HOW RELIABLE IS OUR KNOWLEDGE?

A growing interest in music and health has created an explosion of research over the last decade. Advances in neuroscience, especially in imaging technology, have yielded new findings that map the brain's musical circuitry. New peer-reviewed journals are being introduced in the music therapy field, and ever-greater numbers of conferences are being convened to share knowledge across disciplines (Wong, 2011).

Music and Health Care

The advance, in the last decade, of the evidence-based paradigm of medicine has mandated the integration of the so-called "randomized trial" (subjects assigned to treatment groups in randomized ways) and meta-analyses of several randomized trials or studies to establish reliable patterns of findings has become standard in medical care (Sackett, Rosenberg, Gray, Haynes & Richardson, 1996). **In the field of music and health, as in many others, professional energy has been directed into research, and research has focused away from the global (is music good for patients feeling of well-being?) and toward the highly particular (can a hypothesized stress reduction outcome be proven in a statistically valid way for oncology patients before chemotherapy?)**.

But there are problems. **Research into music in health care has generally been performed on limited populations (small numbers make statistical validity much more difficult), and analysis rarely factors in the implications of the demographic sample and often does not control for other factors in the environment.** The comparisons of brain anatomy and functioning between musicians and non-musicians that have yielded so much information about the power of music to shape the brain may be skewed by the corollaries of music involvement. This, as already noted, has posed challenges for those advocating for music therapy as the "evidence" often does not hold up to the highest forms of scientific scrutiny.

As Wan and Schlaug (2010) point out about their own research into the effects of musical training on children:

> …it is often difficult to draw strong inferences about the effects of musical training on cognitive performance. This is because factors such as higher socioeconomic status, greater availability of resources at school, superior motivational skills, more supportive home environment, or higher prior IQ could account for some of the cognitive advantages observed in the musically trained children."(p. 567).

At the Auditory Neuroscience Laboratory at Northwestern University, Nina Kraus and colleagues purposefully enroll participants of varying socioeconomic status into their studies of auditory processing, to account for the role of economic privilege in musical exposure and to test hypotheses of learning. In studies where enrollment is typically small, and often homogenous, generalizability is limited. One meta-review of 27 studies of chronic pain in older adults concluded that, overall, results across analyses were restricted by "limited enrollment of ethnic minority elders, as well as non-ethnic elders aged 80 and above" in the research under examination (Reid, Papaleontiou, Ong, Breckman, & Wethington, 2008, p. 409). While all studies that indicate positive outcomes are promising, few so far overtly describe the patient populations under study, and even fewer consider the implications of who can be helped how.

Other lacunae in the research suggest potential opportunities. **Though some of the studies mentioned here describe the effects of music on medical or hospital staff, this area is largely uncharted.** Music has much to offer staff, but what are the measurable effects of a hospital environment characterized by musical experience? How does staff relate to visiting musicians or permanent music therapy teams? Do staff members benefit indirectly from the effects of interventions directed to their patients? Do staff participate in musical ensembles and music-based continuing education?

Music is used in health care in many ways, yet not all musical experiences are equally documented by research. **Live musical performances regularly garner enthusiastic reviews from patients and from staff** (Maggi, 2011) **and have the potential to transform the experience of both patients and their caregivers** (Hanser, 2011), **but their effects can be difficult to quantify** (Wong, 2011). Research protocols are precisely targeted to evaluate specific dosages and interventions, and the unpredictable and generalized nature of events such as concerts offered by volunteers or professional musicians makes their effects difficult to assess, except by global tools such as surveys for program evaluation (Hanser, 2011).

Few studies so far document the effects of the kind of programs offered by Musical Connections, or by other organizations doing the work of community engagement in the field of music and health, due in part due to the methodological considerations mentioned above. This work is widespread and deserving of consideration by research. The design of effective evaluation and research protocols are challenging propositions, yet the work requires documentation, assessment, and evaluation in order to persist and evolve. **One contribution that the Musical Connections program and others like it can make is to introduce greater rigor into that process.**

Students, aspiring professionals, and working musicians are increasingly drawn to perform outside of the concert hall. As the definition of what it means to be a musician evolves to include ideas of service and entrepreneurship, how is the next generation of musical performers shaped by their work in health care settings? **Though program evaluation is often focused on those who receive the music, what are the gains on the other side of the equation, for those who refine their own musical identities in the presence of hospital patients and staff?**

F. TECHNOLOGY: NEW POSSIBILITIES

Like every aspect of human experience, the use of **music in health care is being transformed by technology**. As but one example, the University of Michigan Comprehensive Cancer Center checks out iPod touch devices to patients and families receiving treatment—each preloaded with relaxing music, patient-education podcasts about cancer, guided imagery, and National Public Radio programs. These **new devices offer relaxation and entertainment, and enable people of various reading levels to access the content they prefer.** A group of student volunteers called the "iPod Squad" visits the clinics, infusion areas, and inpatient units, and checks out iPods at the point-of-care (University of Michigan Comprehensive Cancer Center, 2008). At University Hospitals in Cleveland, Music Therapy Director Deforia Lane uses the Garage Band program in a therapeutic way to create legacy projects with patients who are dying, recording and mixing songs, stories, or a life review to create tangible objects (rendered onto CDs or DVDs) for patients to have or to give to family members (Lane, 2011).

Dr. Phillip Speiser sees **technology as an area of massive potential for music therapy, in part because new, easy-to-use devices allow the recording of sound and lyrics in the moment**—either as complete sound products or as sonic elements for sampling. According to Speiser, **this makes possible a new kind of "play" in a session, and allows a client who is not comfortable producing music in traditional ways to engage in music-making without singing or playing an instrument.** Because so many adolescents record and sample music already, technology can

provide an avenue of access to this age group, he says. As for any perceived dichotomy between the aesthetic value of live music as opposed to its mechanical counterpart, Speiser declares: "There's nothing to worry about. Music always needs a live creator."

With new technologies becoming more prevalent in health care settings, **those who care about the quality of musical interactions need to become involved with the planning of content and use**. One lesson from the almost universal presence of television in hospitals (and often in patient rooms) is that technology often seeks the lowest common denominator of content. High quality content needs advocates who can make a clinical case for its use.

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