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Effectiveness of music therapy within community hospitals: an EMMPIRE retrospective study

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Abstract

Introduction: Given the challenges health systems face in providing effective nonpharmacologic treatment for pain and psychological distress, clinical effectiveness studies of evidence-based strategies such as music therapy (MT) are needed.

Objectives: This study examined changes in patient-reported outcomes (PROs) after MT and explored variables associated with pain reduction of ≥2 units on a 0 to 10 numeric rating scale (NRS).

Methods: A retrospective review was conducted on initial MT interventions provided to adults receiving community hospital care between January 2017 and July 2020. Sessions were included if participants reported pre-session pain, anxiety, and/or stress scores of ≥4 on the NRS. Data analysis included a bootstrap analysis of single-session changes in PROs and a logistic regression exploring variables associated with pain reduction (ie, ≥2 units vs <2 units).

Results: Patients (n = 1056; mean age: 63.83 years; 76.1% female; 57.1% White; 41.1% Black/African American) reported clinically significant mean reductions in pain (2.04 units), anxiety (2.80 units), and stress (3.48 units). After adjusting for demographic, clinical, and operational characteristics in the model (c-statistic = 0.668), patients receiving an MT session in which pain management was a goal were 4.32 times more likely (95% confidence interval 2.26, 8.66) to report pain reduction of ≥2 units than patients receiving an MT session in which pain management was not a session goal.

Conclusion: This retrospective study supports the clinical effectiveness of MT for symptom management in community hospitals. However, additional research is needed to determine which characteristics of MT interventions and patients influence pain change.

Keywords: Music therapy, Pain management, Electronic health record, Integrative medicine, Community hospitals

1. Introduction

Managing acute pain for hospitalized patients has become increasingly challenging as health care systems have attempted to shift from relying on opioid medication toward providing evidence-based nonpharmacologic pain treatment while maintaining high-quality patient-centered care.[11,56] In 2018, the Joint Commission established a requirement for hospitals to promote and provide nonpharmacologic pain treatments, such as music therapy (MT).[53–56] With this requirement, there is an opportunity to advance clinical knowledge about the effectiveness of nonpharmacologic interventions for pain and symptom management because these approaches are increasingly used in clinical practice within large health systems.[43]

Adults receiving inpatient hospital care often experience psychological distress, which can complicate medical treatment.[51] Recent studies have found associations between psychological symptoms and diagnoses (eg, depression and anxiety) and increased length of stay in various clinical populations.[1,8,19] A review of the 2016 National Inpatient Sample found that hospital admissions for patients with mental and/or substance use disorders had a higher cost ($14,300 vs $11,500) and length of stay (5.4 vs 4.2 days) than hospital admissions for patients without these conditions.[40]

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Several clinical effectiveness studies have evaluated the impact of inpatient integrative therapies for pain management, with most studies taking place in academic medical settings. For example, a study of acupuncture provided during 1867 hospital admissions for adults undergoing total hip or knee arthroplasty found an average short-term pain reduction of 1.91 units on the 0 to 10 numeric rating scale (NRS).[9] Hospitalized adults receiving various integrative therapies (eg, acupuncture, massage therapy, MT, and/or holistic nursing) provided during 2730 hospital admissions reported an average pain reduction of 2.05 units, which was associated with a cost savings of $898 per admission.[11] A subsequent study limited to first integrative therapy sessions provided during 3635 admissions found clinically meaningful reductions (ie, at least 1.3 units[7]) in acute pain (1.97 units) among hospitalized adults after adjusting for severity of illness, clinical population, sex, treatment, and pain medication status. Pain medications (ie, narcotic, nonnarcotic, both, or none) active at the time of the intervention were not significantly associated with pre-to-post session pain changes, and patients receiving maternity care reported the largest reductions in pain (2.34 units).[12] Outside of the academic medical setting, a study of nurse-delivered aromatherapy provided to 10,262 hospital admissions across 10 hospitals found that patients receiving a variety of essential-oil aromatherapy treatments reported significant reductions in pain (3.31 units in response to sweet marjoram), anxiety (2.73 units in response to lavender and sweet marjoram), and nausea (2.02 units in response to ginger).[26]

Music therapists have provided services within medical settings in the United States since the mid-20th century.[52] Several randomized controlled trials (RCTs) support the efficacy of MT for improving symptom management in patients with cancer[6]; patients with sickle cell disease[47,48]; patients receiving palliative care[18]; patients undergoing orthopedic,[15,30] breast,[42] or spinal surgery[39]; and patients receiving cardiovascular care.[17,36,50] Recent systematic reviews support the use of music interventions for addressing pain,[27] anxiety,[34] and stress.[10] However, some systematic reviews do not distinguish between studies of MT (interventions provided by board-certified music therapists) and music medicine (listening to prerecorded music offered by medical staff).

Despite convincing evidence from RCTs and the increased delivery of MT in clinical care, few clinical effectiveness studies have evaluated the impact of MT within health systems. To date, most clinical effectiveness studies of MT have been limited to adult inpatient oncology, with studies reporting clinically significant improvements in pain, anxiety, fatigue, and depression.[3,4,16,29,31,32] Given the paucity of clinical effectiveness research evaluating MT within general medical/surgical areas and the overall lack of research investigating any integrative therapies in community medical settings, studies are needed to evaluate the impact of MT on patient-reported outcomes (PROs) within community medical settings and examine whether demographic and clinical characteristics are associated with changes in PROs.

University Hospitals Connor Whole Health is currently conducting a large research project entitled *Effectiveness of Medical Music therapy Practice: Integrative Research using the Electronic health record* (EMMPIRE). The first aim of EMMPIRE is a retrospective study examining the effectiveness of MT throughout 10 medical centers (2 academic and 8 community medical centers) in the University Hospitals (UH) Health System. Thus, the purpose of this retrospective study was to examine changes in PROs and explore variables associated with pain reduction of 2 or more units among hospitalized patients with moderate-to-severe pain, anxiety, and stress who received at least 1 MT session within community medical centers.

2. Methods

2.1. Participants and design

This study is a retrospective review of all initial individualized MT sessions provided to adult patients (ages 18 and older) receiving care at 1 of 8 UH community medical centers between January 1, 2017 and July 30, 2020 who met the following criteria: (1) the MT session was the first session provided during the hospital admission; (2) the patient was hospitalized for at least 24 hours; (3) the patient had at least 1 pre-session PRO of ≥4 on a NRS (ie, moderate-to-severe pain, anxiety, and/or stress)[41]; (4) the patient either reported a complete (pre- and post-session) set of PROs or reported a pre-session PRO and fell asleep in response to the MT intervention; and (5) the session featured at least 1 MT intervention (ie, not an assessment and/or education session). Music therapy sessions not meeting these criteria were excluded from the sample.

2.2. Setting and care delivery

Within each of the 8 community medical centers, music therapists routinely collaborate with the medical care team (eg, physicians, advanced practice providers, nurses, social workers, chaplains, etc.) to address patients' symptoms and enhance psychosocial support. Music therapists developed specific initiatives such as interdisciplinary pain rounds, a collaboration with pharmacy and nursing to optimize pain management and minimize patients' exposure to opioids. Music therapy services were designed to be initiated through referrals recorded in the electronic health record (EHR) from the medical team or through EHR lists of patients reporting pain scores of ≥7 on the NRS at the time of admission.

The focus of each MT session, including goals and interventions, are determined by the music therapist in a collaborative therapeutic relationship with the patient following an assessment of the patient's coping skills, music preferences, and symptoms. Each MT session may have 1 or more goals (eg, coping, pain management, and/or anxiety reduction) and may include multiple MT interventions (eg, active music making, songwriting, and/or music-assisted relaxation and imagery [MARI]). After the MT session, the music therapists document the details of the MT intervention and clinical outcomes in the EHR. During the retrospective study period, assessment of patients' symptoms (ie, pain, anxiety, and/or stress) was not established as a clinical expectation in all MT sessions. In most cases, if patients reported a particular symptom during the music therapist's assessment, that symptom was documented in the EHR using the appropriate NRS.

2.3. Ethics and permissions

This study was approved by the UH Cleveland Medical Center Institutional Review Board (STUDY20191213) as a retrospective chart review with a waiver of informed consent. This study was conducted in accordance with the Declaration of the World Medical Association.

2.4. Data collected

The following data were extracted from all EHR records meeting eligibility criteria: (1) demographic information including age, sex,

race, ethnicity, marital status, and primary insurance; (2) clinical characteristics including International Classification of Diseases (ICD)-10 codes for primary and mental health diagnoses, discharge location, and length of stay; (3) MT documentation data including session beginning and end time, session goal(s), MT intervention(s) used, session narrative, pre- and post-session PROs (ie, 0–10 NRS measures of pain, anxiety, and stress), and whether the patient had fallen asleep in response to MT. The NRS is a validated and widely used measure for acute pain intensity,[41] and acute pain intensity reductions of 1.3 to 1.9 units are considered clinically meaningful in noncancer patients.[7] The 0 to 10 NRS has been used to measure other domains including anxiety in clinical effectiveness studies of integrative medicine[24–26] and stress in a RCT of MT.[49]

2.5. Data analysis

To summarize patients' primary diagnoses, ICD-10 codes were categorized into Major Expanded Diagnosis Clusters (MEDCs). Descriptive statistics were calculated for patient demographics (ie, age, sex, race, ethnicity, and primary insurance), clinical characteristics (ie, inpatient length of stay, primary diagnosis, and mental health diagnosis), and MT session characteristics (ie, length, goals, and interventions). Means and bootstrapped 95% confidence intervals (CI) were used to summarize unadjusted pre- and post-session pain, anxiety, and stress scores among patients reporting pre-session symptoms of ≥4 of 10. Prior studies of integrative therapies for patients with cancer have described reductions in Edmonton Symptom Assessment Scale (ESAS) 0 to 10 scores of ≥1 as being clinically significant.[33] However, other studies of acupuncture[37] and MT[4] among patients with cancer have defined NRS reductions of ≥2 units as clinically significant. Thus, we reported counts and percentages of NRS reductions of ≥1 and ≥2 units in defining clinical significance in this study. Instances of patients falling asleep during MT sessions were described with counts and percentages and subcategorized as asleep post-session or awake post-session. Sessions in which patients fell asleep in response to MT (and thus did not provide a post-session NRS rating) were not included in the paired comparisons or logistic regression analysis.

Before examining paired differences in PROs, histograms, box plots, and normal Q–Q plots were examined. This revealed that the data were not normally distributed. Therefore, we used a bootstrapping approach to calculate 95% CI for the changes in mean PROs (ie, post-session score minus pre-session score) with 10,000 bootstrap samples, as previously recommended in the literature.[35,38] Bootstrapping is an alternative method of comparing means that does not require normally distributed data and involves examining a large number of samples with replacement from the original sample to determine a mean that is deemed to be statistically different from 0 if the 95% CI does not include 0.[21] Descriptive statistics and bootstrapping procedures (ie, "smean.cl.boot" function from the "Hmisc" library[20]) were performed within RStudio Version 2022.12.0 + 353[45] and R Version 4.2.2.[44]

A logistic regression model was used to explore variables associated with pain reduction of ≥2 units. Analyses of stress and anxiety reduction were beyond the scope of this article and not as feasible given the smaller samples of complete pre- and post-session data on these measures. The model included 751 observations in which (1) pre-session pain was rated ≥4, (2) post-session pain was rated, (3) the patient was discharged from either a medical/surgical or intensive care unit, and (4) there were no missing data related to race, sex, or marital status. Model covariates included (1) demographic characteristics including age, sex (ie, female or male), marital status (ie, divorced/separated/widowed, married/life partner, or single), and race (ie, Black/African American, White, or other); (2) clinical characteristics including the type of floor from which the patient was discharged (ie, medical/surgical or intensive care unit) and

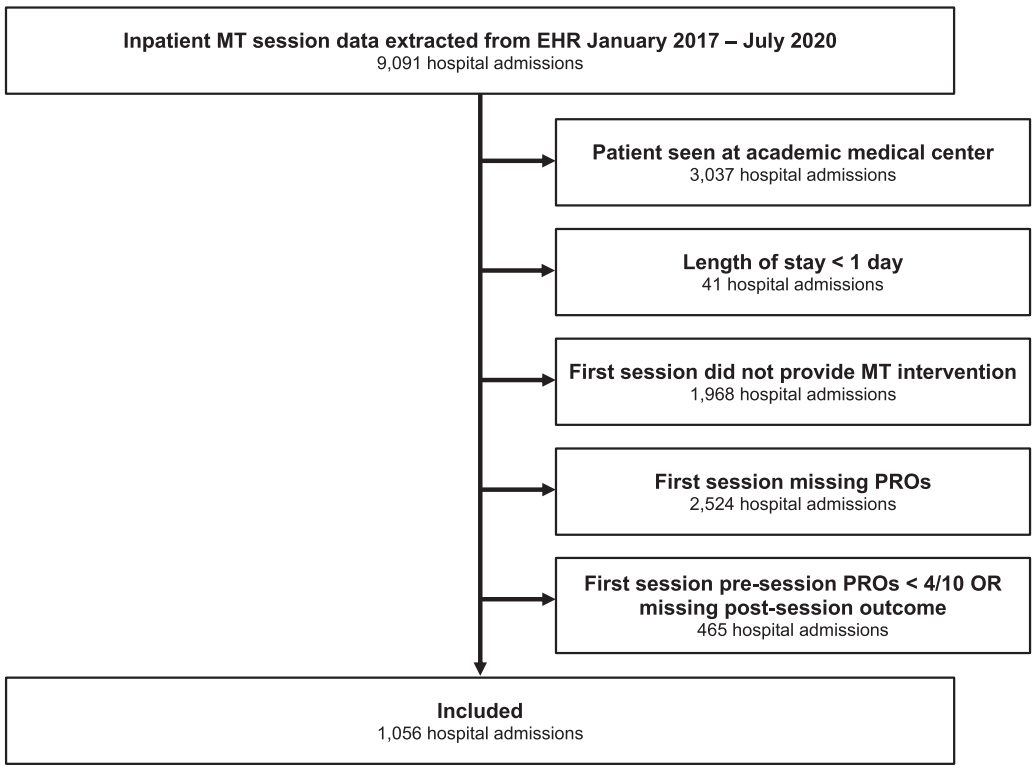

Figure 1. Flow diagram of study participants. EHR, electronic health record; MT, music therapy; PROs, patient-reported outcomes.

whether the patient had any of the following primary diagnoses that had a prevalence of ≥28 within the sample (ie, cardiovascular, general surgery, musculoskeletal, gastrointestinal/hepatic, infectious disease, respiratory, endocrine, general signs and symptoms, genitourinary, neurologic, renal, or toxic effects and adverse events); (3) operational characteristics including the calendar year in which the patient was hospitalized and the medical center where the patient was admitted (ie, hospitals coded as 1–8); and (4) whether pain management was a goal of the MT session. There were no imputation processes used to model missing covariates or pain scores. The logistic regression model was generated using Proc Logistic within SAS software, Version 9.4 of the SAS System for Windows (Cary, NC).

Model covariates were chosen based on their availability within the EHR, associations with pain in previous studies, and their role in examining predictors of pain intensity change in prior studies of inpatient integrative therapies.[12] Specifically, age and sex were chosen because a recent analysis of the 2019 National Health Interview Survey found that chronic pain prevalence increased with age and was higher among women.[59] Marital status (ie, divorced/widowed/single) has been associated with higher pain intensity ratings among female participants in a study of 416 patients undergoing cardiac surgery.[5] Race was included given the history of racial bias among health care professionals treating pain, racial disparities in pain management,[14] and findings from a recent study where Black patients with cancer receiving MT reported higher pre-session pain (4.2 vs 3.1 on ESAS) than White patients with cancer receiving MT.[29]

Year, floor type, and medical center were included as covariates to account for the development of the MT program as it expanded to different locations from 2017 to 2020 and differences in pain management practices based on floor type and medical center. Primary diagnoses that had a prevalence of ≥28 within the sample were included as binary indicators to determine whether odds of pain reduction ≥2 differed based on the major clinical populations prevalent within the sample. A cutoff of 28 was chosen to avoid convergence issues with smaller clinical populations (ie, n < 28) in the sample (**Table 2**). Finally, pain management as a session goal was included as an indicator of music therapists' intention to prioritize this domain within the session. Music therapy intervention categories described in **Table 3** were not included in the model because these categories were applied retrospectively based on an analysis of music therapists' free-text descriptions of their interventions and may not have reflected the total scope of the interventions they provided.

3. Results

3.1. Demographics and clinical characteristics

Figure 1 provides a flow chart of the patients, hospital admissions, and MT EHR documents/notes included in this sample. Between January 2017 and July 2020, music therapists provided 1056 MT sessions meeting eligibility criteria to adults hospitalized in community medical centers. **Table 1** summarizes the demographics of the study sample. Patients were mostly female (76.1%), White (57.1%) or Black/African American (41.1%), and non-Hispanic (96.6%). The mean age at the time of hospital admission was 63.83 ± 15.98 years, and patients were insured under Medicare (43.9%), Medicaid (13.2%), or private insurance (11.0%). **Table 2** summarizes the clinical

Table 1
Demographics.

Variables	All admissions (n = 1056)
Age (y)	
Mean ± SD	63.83 ± 15.98
Range	18–105
Sex, n (%)	
Female	804 (76.1)
Male	252 (23.9)
Race*, n (%)	
White	603 (57.1)
Black/African American	434 (41.1)
Other	19 (1.8)
Ethnicity, n (%)	
Non-Hispanic	1020 (96.6)
Declined/missing	16 (1.5)
Hispanic or Latino	20 (1.9)
Marital status, n (%)	
Married/life partner	330 (31.3)
Single	325 (30.8)
Widowed	232 (22.0)
Divorced	141 (13.4)
Separated	23 (2.2)
Unknown	5 (0.5)
Primary insurance, n (%)	
Medicare	464 (43.9)
Medicaid	139 (13.2)
Private	116 (11.0)
Missing†	310 (29.4)
Other	21 (2.0)
Self-pay	6 (0.6)

* Race, including multiracial, is reported exactly as it was entered into the EHR.
† Insurance information was not available for all hospital admissions in the retrospective analysis at the time the data were extracted from the EHR. Missing insurance information does not indicate that the patients were uninsured.

Table 2
Clinical characteristics.

Variables	All admissions (n = 1056)
Primary diagnosis, n (%)	
Musculoskeletal	198 (18.8)
Cardiovascular	121 (11.5)
General surgery	108 (10.2)
Respiratory	91 (8.6)
Gastrointestinal/hepatic	79 (7.5)
Infectious disease	74 (7.0)
Neurologic	63 (6.0)
General signs and symptoms	53 (5.0)
Renal	46 (4.4)
Toxic effects and adverse events	45 (4.3)
Endocrine	37 (3.5)
Genitourinary	28 (2.7)
Malignancy	25 (2.4)
Hematologic	20 (1.9)
Rheumatologic	13 (1.2)
Psychosocial/mental health	12 (1.1)
Female reproductive	11 (1.0)
Other diagnosis*	32 (3.0)
Discharge location, n (%)	
Medical/surgical unit	1004 (95.1)
Intensive care unit	43 (4.1)
Other unit†	9 (0.9)
Mental health diagnosis, n (%)	376 (35.6)
Length of stay	
Mean ± SD	5.54 ± 4.90
Median [range]	4 [1–47]

* Other principal diagnoses Major Expanded Diagnosis Cluster groups with n < 10 included allergy; administrative; skin; nutrition; ear, nose, and throat; reconstructive; dental; and genetic.
† Other unit locations included inpatient psychiatric and physical rehabilitation units.

Table 3

Music therapy goals and interventions.

	Description	All admissions (n = 1056)	
MT goals, n (%)			
Pain management	Reduce pain intensity	775	73.4%
Coping	Promote/reinforce adaptive skills for managing hospitalization	259	24.5%
Stress reduction	Reduce feelings of psychological or emotional strain	236	22.3%
Relaxation	Promote release of tension	164	15.5%
Anxiety reduction	Reduce feelings of worry, fear, or nervousness	155	14.7%
Mood modification	Improve affect/emotional state	104	9.8%
Self-expression	Provide means of expressing thoughts, feelings, and emotions	59	5.6%
Normalization	Promote acceptance of hospital environment	26	2.5%
Improve well-being	Promote a positive feeling of overall health and functioning	16	1.5%
Improve locus of control	Improve perception of control over situation	12	1.2%
Provide comfort	Promote feelings of ease	11	1.0%
Other goals addressed	eg, spiritual support, emotional support, and family support	57	5.4%
MT interventions, n (%)			
Music listening	Therapist provides music. Patient listens and/or discusses	908	86.0%
Live	Therapist provides live music	622	58.9%
NOS*	Therapist provides music not specified as live or recorded	285	27.0%
Recorded	Therapist provides recorded music	15	1.4%
MARI†	Therapist engages patient with live or recorded music and guided relaxation, breathing, and/or imagery	185	17.5%
Active music making	Patient engages in making (improvising/recreating, etc.) music on any instrument including voice	92	8.7%
Song choice	Patient chooses songs used in MT session	24	2.3%
Song discussion	Patient discusses meaning/significance related to songs used	20	1.9%
Songwriting	Therapist assists patient in creating a new song	13	1.2%
Lyric analysis	Therapist engages patient in analyzing lyrics of a song	10	0.9%
Music-assisted life review	Therapist helps patient reminisce and/or reexamine the past	10	0.9%
Iso-principle	Therapist matches patient's current state and then shifts musical elements (tempo/dynamics) in desired direction to affect change	7	0.7%
Listening/support	Therapist provides support, validation, and/or verbal processing	7	0.7%
Other intervention	eg, neurologic MT techniques	4	0.4%

More than 1 goal and MT intervention may be included within each MT session. Language used to describe goals were derived from music therapists' free-text descriptions. Thus, some goals (ie, provide comfort, relaxation) may address similar domains but with different language.

* Music listening not otherwise specified (NOS) was defined as MT interventions for which a live or recorded descriptor was not included. Most of these interventions are assumed to be live.

† MARI, music-assisted relaxation and imagery.

MT, music therapy.

characteristics of patients' hospital admissions. Patients were primarily discharged from general medical/surgical units (95.1%). Patients' hospital admissions (median length of stay 4 days) were primarily for musculoskeletal (18.8%), cardiovascular (11.5%), general surgery (10.2%), respiratory (8.6%), or gastrointestinal/hepatic (7.5%) conditions. In addition, 376 hospital admissions (35.6%) included a mental health diagnosis in the patients' EHR.

3.2. Music therapy session characteristics

Table 3 summarizes the MT session characteristics of the 1056 MT interventions with descriptions of each goal and intervention. Music therapists primarily addressed goals including pain management (73.4%), coping (24.5%), stress reduction (22.3%), relaxation (15.5%), anxiety reduction (14.7%), and mood modification (9.8%). Within the MT interventions (mean length: 30.48 ± 13.53 minutes), music therapists primarily used music listening (live or recorded) (86.0%), MARI (17.5%), and active music making (8.7%).

3.3. Effects on patient-reported outcomes

Table 4 summarizes the effectiveness of MT on pain, anxiety, and stress for patients reporting moderate-to-severe pre-session symptoms. Of the 847 patients reporting a pain score of ≥4, 118 (13.9%) fell asleep during MT sessions. These patients included 70 (8.3%) who were asleep at the end of the MT session and 48 (5.7%) who fell asleep and later awoke before the end of the MT session. In addition, 85 patients (10.0%) had a severe pre-session pain score (mean = 7.51) and fell asleep during the session without providing a post-session pain score. Complete pre- and post-session scores were available for moderate-to-severe pain (n = 756 sessions, pre-session mean = 7.11), anxiety (n = 185 sessions, pre-session mean = 6.71), and stress (n = 153 sessions, pre-session mean = 6.92). Patients reported clinically significant mean changes in pain (−2.04, 95% CI: [−2.20, −1.89]), anxiety (−2.80, 95% CI: [−3.08, −2.53]), and stress (−3.48, 95% CI: [−3.81, −3.17]). Among sessions with complete pre- and post-session scores, clinically significant reductions in symptoms (ie, ≥1 unit) were reported by 76.3% of patients reporting pain, 91.9% of patients reporting anxiety, and 95.4% of patients reporting stress. Reductions of ≥2 units were reported by 51.1% of patients reporting pain, 84.9% of patients reporting anxiety, and 90.2% of patients reporting stress.

3.4. Predictors of pain reduction ≥2 units

Table 5 summarizes the logistic regression model, which had a c-statistic of 0.668 indicating poor discrimination.[23] Demographic and clinical characteristics had no statistical association with pain reduction of ≥2 units. After adjusting for all other covariates in the model, patients receiving an MT session in which pain management was a goal (n = 683) were 4.32 times more likely (95% CI: [2.26, 8.66]) to report pain reduction of ≥2 units than those receiving an MT session in which pain management was not a goal (n = 68). In addition, patients receiving MT sessions in 2019 (n = 295) were 41.9% less likely (odds ratio [OR] = 0.58, 95% CI: [0.36, 0.94]) to report pain reduction of ≥2

Table 4

Effectiveness of music therapy on pre-session moderate-to-severe patient-reported outcomes.

Outcome	N	Result	95% CI*
Pain			
Pre-session, mean	847	7.15	7.02, 7.27
Pre-session (with complete post-session score), mean	756	7.11	6.98, 7.24
Post-session, mean	756	5.07	4.89, 5.26
Change, mean	756	**−2.04**	**−2.20, −1.89**
≥1 unit reduction, (%)†	577	76.3%	
≥2 unit reduction, (%)†	386	51.1%	
Sleep response, (%)‡	118	13.9%	
Asleep post-session, (%)‡	70	8.3%	
Awake post-session, (%)‡	48	5.7%	
Anxiety			
Pre-session, mean	204	6.69	6.41, 6.98
Pre-session (with complete post-session score), mean	185	6.71	6.42, 7.01
Post-session, mean	185	3.91	3.59, 4.23
Change, mean	185	**−2.80**	**−3.08, −2.53**
≥1 unit reduction, (%)†	170	91.9%	
≥2 unit reduction, (%)†	157	84.9%	
Stress			
Pre-session, mean	169	7.00	6.70, 7.29
Pre-session (with complete post-session score), mean	153	6.92	6.62, 7.23
Post-session, mean	153	3.44	3.08, 3.79
Change, mean	153	**−3.48**	**−3.81, −3.17**
≥1 unit reduction, (%)†	146	95.4%	
≥2 unit reduction, (%)†	138	90.2%	

* Bootstrapped confidence interval performed with 10,000 iterations using the "smean.cl.boot" function from the "Hmisc" library in RStudio Version 2022.12.0 + 353 and R Version 4.2.2.

† Percent reductions were calculated with the total number of sessions with complete pre- and post-session scores as the denominator.

‡ Percentage of sleep responses were calculated with the total number of sessions with complete pre-session pain scores as the denominator (n = 847).

CI, confidence interval.

units than those receiving MT sessions in 2020 (n = 137), and patients receiving MT sessions at hospital 8 (n = 16) were 4.6 times more likely (95% CI: [1.26, 22.72]) to report pain reduction of ≥2 units than those receiving MT sessions at hospital 1 (n = 295). Supplementary Figure 1 (available at http://links.lww.com/PR9/A189) provides a receiver operating characteristic (ROC) curve for the model.

4. Discussion

The purpose of this retrospective study was to examine changes in PROs and explore variables associated with pain reduction of ≥2 units on the NRS among hospitalized patients with moderate-to-severe pain, anxiety, and/or stress who received at least 1 MT session within community medical centers. Like previous studies of inpatient integrative therapies,[24–26] patients within our sample were mostly female (76.1%), had a mean age of 63.83 years, and were primarily insured through Medicare (43.9%). Patients with a primary or secondary mental health diagnosis made up a higher proportion of our sample (35.6%) than the proportion reported among all 2016 inpatient stays in the United States (27.8%).[40] Unlike prior studies, patients identifying as Black/African American made up a greater proportion of our sample (41.1%) than prior clinical effectiveness studies of inpatient integrative therapies[11,26] where Black/African American patients represented <10% of the sample. These racial demographic trends reflect the population of the region where more than 30% of Cuyahoga County residents and 48% of Cleveland residents self-identify as Black/African American.[58]

Given the moderate-to-severe symptom prevalence within this sample, it is clinically appropriate that the most frequently documented MT session goals included pain management (73.4%), stress reduction (22.3%), relaxation (15.5%), and anxiety reduction (14.7%). To address these symptoms and patients' other psychosocial needs during hospital admissions, music therapists often educate patients on music-based coping skills, hence the focus on coping (24.5%) within this sample. Brief measures evaluating patients' perceived ability to cope pre- and post-session are needed to understand the effectiveness of MT for addressing this psychosocial domain and will be incorporated in a future EMMPIRE study. Most sessions in this study used receptive interventions such as music listening (86.0%) and MARI (17.5%). This selection is consistent with other studies that have applied receptive MT interventions.[18,42,50] It should be noted that active music making has also been shown to be efficacious for managing acute pain.[48] However, it can be challenging to facilitate patients' musical engagement during the first session before a therapeutic relationship has been established between music therapist and patient.

Patients in this study with moderate-to-severe pre-session symptoms reported clinically meaningful reductions in pain (2.04 units), anxiety (2.80 units), and stress (3.48 units) following a single MT session. Furthermore, observed sleep responses of patients are significant given the sleep challenges patients with moderate-to-severe pain face during hospitalization.[2,22] With the foundational evidence from several RCTs demonstrating the efficacy of MT for improving these outcomes,[10,27,34] our findings support the real-world effectiveness of MT for pain and symptom management across a large health system. Patients' reported pain reductions of 2.04 units are comparable to prior clinical effectiveness studies of various integrative therapies (2.05 units)[11] and acupuncture (1.91 units).[9] Accordingly, our data support MT's clinical effectiveness and inclusion as an evidence-based nonpharmacologic pain modality in accordance with the Joint Commission guidelines.[53–56]

Patients' demographic and clinical characteristics were not associated with pain reduction of ≥2 units. This finding is consistent with prior inpatient integrative therapies research,[12] where patients' sex, type of integrative therapy, and pain medication status were not associated with pain change. This quantitative analysis supports the generalizability of MT for pain relief in community hospitals regardless of patients' demographic and clinical characteristics. Given the prevalence of Black/African American patients within our study, the historical lack of Black representation within the MT[28,46] and integrative medicine literature,[11,12,24–26] and racial disparities in pain management in the United States,[13,57] future research should incorporate efforts to understand Black patients' experience of MT for managing acute pain.

The observed association between the year 2019 and pain reduction of ≥2 units (OR = 0.581) may be attributed to the growth of the MT program as more pain data were available in 2019 (295 MT sessions provided by 9.0 clinical fulltime equivalent [FTE] music therapists across 8 hospitals) than in 2017 (176 MT sessions provided by 4.6 clinical FTE music therapists across 6 hospitals) and 2020 (137 MT sessions limited to the first 7 months of the year). The observed association between hospital 8 and pain reduction of ≥2 units (OR = 4.60) should be interpreted with much caution because only 16 sessions at this hospital were included within the model.

Our data indicate that music therapists' inclusion of pain management as a session goal is associated with increased odds of pain reduction of ≥2 units (OR = 4.32). Although our analysis included broad MT intervention categories (eg, live music listening and active music making), specific details of these interventions such as instrumentation, patient engagement, and relaxation prompts were not available within this retrospective data set and

Table 5

Results from logistic regression of 751 music therapy sessions.

Variable category	Comparison	Odds ratio	95% CI	
			Lower	Upper
Age	10-y increase in age	1.035	0.923	1.160
Sex	Female vs male	1.149	0.792	1.668
Pain management goal	Pain management goal (yes vs no)	**4.316**	**2.261**	**8.655**
Discharge location	Intensive care vs medical/surgical	0.917	0.382	2.810
Marital status	Divorced/separated/widowed vs single	1.004	0.667	1.510
	Married/life partner vs single	0.928	0.617	1.395
Race	Black/African American vs White	1.143	0.804	1.627
	Other vs White	0.541	0.136	1.861
Year	2017 vs 2020	0.721	0.399	1.291
	2018 vs 2020	0.836	0.459	1.517
	2019 vs 2020	**0.581**	**0.356**	**0.940**
Medical center	Hospital 2 vs hospital 1	0.458	0.301	0.693
	Hospital 3 vs hospital 1	0.904	0.521	1.569
	Hospital 4 vs hospital 1	1.771	0.620	5.219
	Hospital 5 vs hospital 1	1.387	0.348	6.985
	Hospital 6 vs hospital 1	0.632	0.197	1.871
	Hospital 7 vs hospital 1	1.049	0.619	1.782
	Hospital 8 vs hospital 1	**4.600**	**1.255**	**22.716**
Primary diagnosis	Cardiovascular dx (yes vs no)	1.487	0.750	2.970
	General surgery admission (yes vs no)	1.066	0.556	2.048
	Musculoskeletal dx (yes vs no)	1.123	0.627	2.015
	Gastrointestinal/hepatic dx (yes vs no)	0.907	0.440	1.862
	Infectious disease dx (yes vs no)	1.695	0.782	3.729
	Respiratory disease dx (yes vs no)	1.002	0.492	2.046
	Endocrine disease dx (yes vs no)	0.851	0.343	2.084
	General signs/symptoms dx (yes vs no)	0.792	0.358	1.733
	Genitourinary dx (yes vs no)	0.748	0.246	2.232
	Neurologic disease dx (yes vs no)	1.534	0.696	3.452
	Renal disease dx (yes vs no)	0.591	0.225	1.488
	Toxic effects/adverse events dx (yes vs no)	1.936	0.798	4.889

Examining associations with pain reduction of ≥2 units. Bold values represent odds ratios, where 1 is not included in the 95% CI. Model c-statistic = 0.668.
CI, confidence interval; dx, diagnosis.

were thus excluded from the logistic regression model. Our future EMMPIRE research will investigate how MT sessions are tailored when pain management is a goal and whether these modifications affect patients' pain. Given the limited predictive value of the variables included in this logistic regression model (c-statistic = 0.668), analyses accounting for more specific MT session characteristics (ie, MT intervention type, instrumentation, and patient engagement) are needed to improve model performance in predicting changes in PROs.

Notable strengths of this study include the large sample size, diversity of sociodemographic and clinical populations distributed throughout 8 community medical centers, novel approach to using EHR data to measure the real-world effectiveness of MT, and collection of PROs immediately before and after MT sessions among patients with moderate-to-severe symptoms. Important limitations include the limited predictive value of the variables included in the model (c-statistic = 0.668); lack of control for pain medications, which were not available in the EHR data extracted for this analysis; the use of observational data among a convenience sample without a comparison group; not including specific MT interventions within the model; and the use of single-item NRS rather than more comprehensive instruments for pain, stress, and anxiety. As part of our ongoing work with the EMMPIRE study, we have established procedures and trainings to expand PRO collection and specific MT intervention documentation in a more routine fashion within MT sessions for future research. We expect this prospective study to include an analysis of PROs that accounts for the influence of pain medications administered by medical providers.[12]

5. Conclusions

Results of this study support the clinical effectiveness of MT for symptom management in community medical settings for patients with moderate-to-severe pain, anxiety, and/or stress. Additional research is needed to determine which characteristics of MT interventions influence changes in symptoms, whether these symptom improvements contribute to reduced use of pain medications within the health system, and whether MT addresses longitudinal outcomes across patients' hospital admissions.

Disclosures

The authors have no conflict of interest to declare.

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Data availability: The data sets generated and/or analyzed during this study are not publicly available due to privacy restrictions as the databases contain information that could compromise the privacy of research participants. However, the deidentified data sets are available from the corresponding author on reasonable request.

Appendix A. Supplemental digital content

Supplemental digital content associated with this article can be found online at http://links.lww.com/PR9/A189.

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