Music to reduce stress in hospitalized patients

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Abstract

Purpose: To determine the impact of music on the physiologic and psychological stress experienced by hospital inpatients.

Methods: This pilot study monitored vital signs; utilized pain, anxiety, and agitation rating scales; and gathered verbal feedback from 50 participating inpatients at the authors' healthcare facility as they listened to music via an audiovisual interactive patient engagement technology system.

Results: After listening to music for 30 minutes, patients reported significantly lower pain and anxiety.

Conclusion: Music offered a helpful tool to reduce pain and anxiety for patients in the ICU and telemetry units at the authors' healthcare facility. Future research may be geared toward incremental expansion and monitoring of this music intervention in other units.

Music to patients' ears

Nurse researchers have examined the effects of music on patients in perioperative settings to relieve preoperative anxiety, patients in postoperative settings to reduce pain and anxiety, patients with schizophrenia to improve quality of life and reduce auditory hallucinations, older adults with Parkinson disease to improve gait and memory, and patients in the ICU to reduce anxiety and improve comfort. In this study, the authors examined the effects of music on physiologic and psychological stress in hospitalized patients.

Each patient's respiratory rate, heart rate, and BP was recorded over time, self-reported pain and anxiety levels were measured, and the patients provided verbal feedback regarding their experiences. Patient-reported anxiety and pain were significantly reduced, which limited potential researcher biases based solely on observations of the patient. Specifically, the authors also used the Wong-Baker FACES pain rating scale, the Faces anxiety scale, and the Richmond Agitation Scale, each of which has high reliability and validity and represent common, well-understood tools that allow nurses to communicate their patient assessment across disciplines.[1-3]

This article also offered perspective on the opportunity to implement sustainable music programs in any healthcare environment. The authors noted that music should be offered to all patients with more varieties in terms of genre and artists, as well as the availability of personal rather than prescribed music choices and more flexibility and freedom in streaming services. Additionally, they describe the importance of a board-certified music therapist in music therapy.

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PATIENTS ADMITTED to hospitals often experience physiologic and psychological stressors related to their condition, unfamiliar environments, limited privacy, strange noises and lights, financial concerns, and anxiety about pain management and mortality.[1] Signs and symptoms of physiologic stress may include headaches, nausea, fatigue, chest pain, tachycardia, muscle tension, shaking, and insomnia; signs and symptoms of psychological stress may include restlessness, agitation, anxiety, depressed mood, forgetfulness, poor judgment, changes in appetite, and racing thoughts.[2] This article discusses a pilot study conducted to determine the impact of music on the physiologic and psychological stress of patients in ICUs and telemetry units.

Background

Stress is associated with the release of numerous chemical mediators that can negatively impact bodily functions, particularly when individuals experience chronic stress.[3] Certain nursing interventions can counteract the stress of hospitalization and help patients overcome these physiologic and psychological stressors without

potential adverse reactions to medications. One such intervention is noise reduction. Higher noise levels contribute to sleep deprivation, delirium, and an increased perception of pain. According to one 2018 study, the most common cause of noise in hospital units was staff conversation. Sharing this finding with the healthcare staff heighted their awareness of noise levels and resulted in reduced decibel meter readings.[4]

Other interventions that can help patients cope with hospital stress include relaxation strategies. For example, a study from 2017 demonstrated benefits of guided imagery and massage in patients admitted to progressive care units. The authors found that massage reduced pain and anxiety and guided imagery reduced pain and anxiety and also improved sleep in that sample.[5]

Listening to music can cause physiologic changes in the body, including the release of neurotransmitters that produce pleasure signals in the brain.[6] Music can also initiate a brainstem response to regulate BP, heart rate (HR), and respiratory rate through a cascade of neurologic responses. Specifically, the tempo of music may affect how the brainstem neurons fire, with slower tempos corresponding to slower neuron firing.[7]

In a 2018 study involving patients who were terminally ill with cancer, listening to music reduced anxiety and improved vital signs. The authors concluded that music is an inexpensive intervention that can be used in a variety of patient settings to improve quality of life without being invasive and without placing the patient at risk for adverse reactions.[8]

Although multiple studies have been conducted on the effects of music, most were limited to select groups such as pediatric and neonate patients, those with specific conditions such as cancer, and those in specific units such as the ICU. Those studies also focused on patients who were on mechanical ventilation, recovering from cardiac surgery or a stroke, or diagnosed with Alzheimer disease or dementia. The authors' present study involved a broader group of adult patients with various diagnoses.

Certain nursing interventions can counteract the stress of hospitalization and help patients overcome these physiologic and psychological stressors without potential adverse reactions to medications.

Method

This pilot study included adult patients admitted to the ICU and telemetry units at the authors' healthcare facility. It was approved by the Institutional Review Board at the authors' healthcare organization. Participants were recruited from the ICU and telemetry unit at a midsize northern California community hospital. Participation was voluntary, and informed consent was obtained and documented for each participant. Convenience quota sampling was used to engage 50 participants according to the inclusion criteria: nonintubated, conscious patients with adequate hearing, who were able to self-consent and follow commands. Patients were included without limiting diagnoses.

An audiovisual interactive patient engagement technology (iPET) system was used at each facility within the hospital's healthcare network. Besides educating patients about their medications, the system could be used to watch videos on the plan of care, watch movies, listen to music, and even request spiritual care services. The technology was controlled from the corded, handheld call light and pillow speaker in each patient's room and could be navigated via push-button technology. A headphone jack was located on the side of the pillow speaker.

The iPET is available to all patients 24 hours a day at the authors' healthcare organization. The service is free and requires no intervention from staff. It features several music categories and genres, including but not limited to easy listening, classic rock, inspiring instruments, classic country, and jazz. It also allows users to select tempo categories such as energy, relax, sleep, and wake. Patients in the present study were able to select their preferred musical genre, which allowed for a greater psychophysiological response to music. To control for the tempo of the chosen music, the "relax" tempo setting was utilized for all participants.

Patients participated in 30-minute listening sessions. Before each session, the nursing staff was consulted to determine whether participants were scheduled for any tests, procedures, or medications. Nurses were also asked to attend to any immediate patient needs. The principle investigator (PI) then met with each patient to explain how to use the iPET and how to select a preferred genre.

To gather pretest data, the PI asked participants to rate their pain and anxiety. The ***Wong-Baker FACES pain rating scale*** was used to assess pain. This validated and reliable tool

Statistical terminology[13-16]

Paired t-test: compares two sets of observations to evaluate the differences.

***P*-value:** evaluates the strength of the hypothesis; smaller *P*-values (≤.05) suggest lower probability that the statistical outcomes are attributable to chance alone, suggesting that the intervention is the source of the identified change.

Wilcoxon signed-rank test: compares scores from two groups of the same participants in a nonparametric statistical assessment.

is often used in healthcare and measures the patient's self-report of pain on a scale of 0 to 10, with 0 representing no pain and 10 representing the worst pain.[9] The ***Faces anxiety scale*** was also used to assess anxiety. This validated and reliable tool measures the patient's self-reported anxiety on a scale of 0 to 10, with 0 representing a "balanced mood" and 10 representing "out-of-control behavior, self-harm."[10] The PI also quantified each patient's level of sedation and agitation using the ***Richmond agitation sedation scale* (RASS).** The RASS is a valid tool used to measure the agitation or sedation level of patients who are critically ill. It is scored on a 10-point scale from -5 to +4, with -5 to -1 representing levels of sedation, 0 denoting a calm and alert state, and +1 to +4 representing levels of agitation.[11]

Patient visitors were encouraged to leave the room during listening sessions, at which point the participating nurses would lower the lights, draw the curtains if available, and offer hospital-provided single-use earphones. Once the patient was ready to begin, a "do not disturb" sign was placed outside the room, and data collection began. Baseline BP, HR, and respiratory rate were recorded before the music listening session. The patient was then left alone in his or her room, and the PI recorded HR and respiratory rate at 5-minute intervals for 30 minutes from a remote central monitor. BP was not taken during the session, only at the 30-minute mark.

If the session was interrupted for any reason, the procedure was terminated and the PI offered to reschedule. After successful sessions, the PI reassessed patient self-reported pain and anxiety levels, and the PI again assessed for agitation and sedation using the RASS score. Finally, the PI asked two final questions:

- On a scale of 0 to 10, with 0 representing not at all and 10 representing very effective, do you feel like listening to music helped you relax?
- On the same scale, how likely are you to use music to help with symptoms of stress or anxiety in the future?

Patients were able to select their preferred musical genre, which allowed for a greater psycho-physiological response to music. As a control, the "relax" tempo setting was utilized for all participants.

Results

Seventy-two patients were invited to participate in this pilot study. Of those, 19 declined and 3 withdrew or were eliminated due to interruptions for a total of 50 participants. Twenty-nine patients were located in the ICU, and the remaining 21 patients were in the telemetry unit. The mean length of stay (LOS) for patients in the ICU was 3.55 days (standard deviation [SD] = 3.26), and the mean LOS in the telemetry unit was 4.57 days (SD = 6.90). LOS days were based on unit stay and did not reflect the patient's entire hospital stay. The overall mean LOS for the 50 participating patients was 3.98 days (SD = 5.08).

All patients were age 18 or older. The mean age of those in the ICU was 66.62 (SD = 15.5), while the mean age of those in the telemetry unit was 67.67 (SD = 16.68). The overall mean age of the participating patients in the two units was 66.06 (SD = 15.88).

In the combined units, 31 (62%) of study participants were female and 19 (38%) of study participants were male, with 16 female and 13 male patients in the ICU and 15 female and 6 male patients in the telemetry unit. There were no significant differences between the mean LOS ($P = .49$), age ($P = .82$), or gender ($P = .24$) between the two units, and the results suggest no bias among these variables.

The following variables were measured only at pretest (0 minutes) and posttest (30 minutes) so as not to interfere with the patients' listening and relaxation experience: anxiety level, pain level, RASS score, and BP. Paired t-testing was used to analyze self-reported anxiety levels gathered at pre- and posttest initially, but the authors switched to the Wilcoxon signed rank test to compare pre- and posttest anxiety after detecting a positively skewed distribution in the differences between scores. (See *Statistical terminology*.)

• Wilcoxon signed rank test revealed a statistically significant ($P < .001$) 44.9% reduction in anxiety after the music intervention when comparing pre- (M = 3.70, SD = 2.93) and posttest anxiety (M = 2.04, SD = 2.43).
• Paired t-testing revealed a statistically significant 31.1% reduction in pain ($P < .001$) between pre- (M = 3.20, SD = 3.23) and posttest (M = 2.14, SD = 2.78).
• Systolic BP dropped between pre- (M = 131.56, SD = 22.27) and posttest (M = 128.44, SD = 24.52), but this 2.4% reduction was statistically insignificant ($P = .123$).
• Diastolic BP also dropped between pre- (M = 68.32, SD = 14.40) and posttest (M = 66.12, SD = 1.57); this 3.2% reduction was statistically significant ($P = .04$).
• The final paired t-test analyzed RASS scores. Like the pre- and posttest result regarding patient anxiety levels, these data exhibited a positive skew and the Wilcoxon test was used to compare the pre- (M = 0.80, SD = 0.274) and post-RASS scores (M = 0.00, SD = 0.00), demonstrating a statistically significant ($P < .05$) 100% reduction. (See *Pre- and posttest monitored biometrics*.)

HR and respiratory rate were unobtrusively measured seven times in 5-minute intervals during the 30-minute session from a remote cardiac monitor at the central station. According to the ANOVA repeated measures, patient HR significantly decreased by 2.18% ($P = .032$) between pre- (M = 75.24, SD = 16.35) and posttest (M = 73.60, SD = 16.26). Following a minor decline in HR during the first 5 minutes of the session, the remaining measurements were consistently lower than the baseline HR at 0 minutes. The primary decline typically occurred around the 10-minute mark and continued at a sustainable rate for the remaining 20 minutes.

Similarly, patient respiratory rate demonstrated a statistically significant ($P < .001$) 18% decrease between pre- (M = 24.40, SD = 7.59) and posttest (M = 20.00, SD = 5.64), according to the ANOVA repeated measures. The steady decline in respiratory rate was consistently lower compared with baseline at 0 minutes, with the most substantial drop occurring within the first 5 minutes.

In response to the two final questions at the end of the 30-minute session, most patients (66%) responded between 8 and 10 on a 0-to-10 scale of the effectiveness of the music in helping them relax (M = 7.44, SD = 2.94). Similarly, most participants (56%) responded between 8 and 10 on the same 0-to-10 scale for how likely they were to use music in the future to help with symptoms of stress and/or anxiety (M = 7.66, SD = 2.53).

Pre- and posttest monitored biometrics

Below are the Wilcoxon comparison statistics for participating patients' levels of anxiety and pain, BP measurements, and RASS scores. Δ% represents the percent change.

Metric	Pretest M (SD)		Posttest M (SD)		Δ%	*P*
Anxiety	3.70	(2.94)	2.04	(2.43)	-44.9	<.001
Pain	3.20	(3.23)	2.14	(2.79)	-33.1	<.001
Systolic BP	131.56	(22.28)	128.44	(24.52)	-2.4	.12
Diastolic BP	68.32	(14.41)	66.12	(11.11)	-3.2	.04
RASS	0.08	(0.27)	0.00	(0.00)	-100.0	.05

Discussion

After listening to music for 30 minutes, patients reported significantly lower pain and anxiety. Approximately 33.3% of the patients fell asleep during the session and no supplemental medications were involved in inducing sleep. The Sleep Foundation describes the relationship between pain and sleep as bidirectional, stressing the importance of restorative sleep to aid in acute and chronic pain conditions.[12] The data demonstrated positive results, and the study was deemed successful in helping reduce pain and anxiety.

To better serve the patients at the authors' facility, incremental expansion and monitoring of this music intervention in other domains may be considered, including all nursing units.

Despite the positive results, the authors are reconsidering the utility of the RASS instrument in this setting. Most patients had a RASS score of 0, indicating that they were alert and calm. Those who scored a +1 (restless) during the pretest later scored a 0 (alert and/or calm) during the posttest. This tool may be better

represented with a larger sample size. The metrics related to pain and anxiety rendered better results, suggesting that music helps improve these outcomes. HR and respiratory rate also demonstrated a steady decline throughout the 30-minute session.

Some patients were dissatisfied with the music choices or stated that the genre they chose was not what they expected, causing irritation; others enjoyed the music and asked to continue to listen after the data collection period was complete. One possible recommendation may be to have patients bring their own music on personal devices or to expand the variety of music available on the iPET with a streaming service. Similarly, the iPET did not allow users to skip to the next song, and a few participants noted that the songs were not always from the original artist, making certain selections dissatisfying. Mp3 players may remedy this concern by allowing individualized playlist options and the flexibility to change songs. Additionally, the participants recommended a scenic screen while listening to music, as they were able to view only a playlist of what was playing in this study. A board-certified music therapist may also be beneficial in selecting appropriate music based on individual patient preferences.

Limitations

After a minor incident involving the automatic BP monitor, which continued despite setting the cycle for 30 minutes, the PI began entering patients' rooms at the end of the 30-minute session to press the cycle button manually. However, this could have introduced reactivity and influenced the BP readings.

Another potential limitation was that some patients had private rooms, while others were in shared rooms with higher noise levels. Additionally, lowering the lights and asking visitors to step out during the intervention may have produced more anxiety for some patients, potentially compromising the data. The authors also noted that some patients had pacemakers, while others were in atrial fibrillation, which may have confounded some of the HR data. In future studies, these variables should be excluded or statistically controlled.

Conclusion

To better serve the patients at the authors' facility, incremental expansion and monitoring of this music intervention in other domains may be considered, including all nursing units, as well as preoperative units, the ED, the recovery room, and outpatient chemotherapy infusion centers. The iPET system is available to all patients at the authors' facility, and they may access the playlist of their choice at any time. Healthcare staff have also been educated on the positive effects of music, particularly on anxiety and pain, and have been encouraged to use this intervention regularly to supplement other approaches to symptom management.

In the future, volunteer live musicians will be invited to play for patients and staff, and the organization may benefit from this no-cost intervention. Additionally, the facility currently utilizes a guided imagery channel, which is also available via the iPET, and practices an "afternoon quiet period" in which the lights are dimmed and the staff strives for minimal noise levels. ■

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