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Non-Pharmacological Management of Symptoms during Mechanical Ventilation and Chronic Obstructive Pulmonary Disease in Critical Care: Patient Directed Music Listening

Annie Heiderscheit

Abstract

This chapter provides a review of the literature on nonpharmacological management of symptoms with music listening for critically ill patients during mechanical ventilation and with chronic obstructive pulmonary disease. The critical care environment is high energy, intense, and noisy. These characteristics of the ICU can often exacerbate symptoms and overstimulate patients. Patients may experience increased agitation, anxiety, increased pain or discomfort, and sleep interruptions. Patients are often on various medications unique to their diagnosis and underlying health issues and may need additional medications to address symptoms associated with the hospitalization. Nonpharmacological management, such as music listening provides an intervention that can assist in managing multiple symptoms, can be utilized repeatedly or at various times through the day or evening, be tailored to patient preferences, can be safe and effective, and require minimal energy for patients to use. The chapter reviews the mechanisms of how music listening can help with symptom management and provides guidelines, recommendations, and contraindications for selecting music of patient use. A brief assessment tool is presented to help guide the process of determining patient music preferences and how music listening may be helpful. Lastly, recommendations are provided on how to make music listening accessible in the critical care environment.

Keywords: patient directed music listening, critical care, nonpharmacological, mechanical ventilation, COPD, symptom management

1. Introduction

Critical care is the highest level of care provided to the sickest of patients and thus requires and utilizes significant human and financial hospital resources, accounting for nearly 14% of overall hospital costs annually [1–3]. Patients with Chronic obstructive pulmonary disease (COPD) and those requiring mechanical

ventilatory (MV) support are often admitted to intensive care units (ICU). It is estimated that COPD affects 400 million people around the world and by 2030, this number will surpass the annual global economic cost of cardiovascular disease, costing the world $50 trillion (USD) a year [4, 5]. Further, due to the progressive nature of COPD, severe exacerbation of symptoms often results in an ICU admission, which leads to 26–74% of patients requiring MV [6]. The complexity and severity of the disease led the World Health Organization (WHO) Burden of Disease Project to identify COPD as the fifth leading cause of death and projected that by 2020 it would be the third leading cause of death. ICU occupancy data indicates that between 20 and 39% of beds are filled with patients requiring mechanical ventilation [7].

In the United States alone, more than 1 million people are admitted to intensive care units each year and require MV [8]. Additionally, it is projected that by 2020 over 625,000 adults will required prolonged MV, which includes being ventilated for >96 hours [9]. The ICU environment is an active setting due to the acuity of patients and the need to ICU clinicians to provide constant and prompt care and attend to the changing needs of patients [10]. This critical care environment can be noisy due to the numerous medical devices on the unit and increased number of staff required to provide care [11, 12]. Critically ill patients experience a variety of symptoms that are due to their illness, sedative medications, and stress from noise associated with the ICU environment and that can hinder recovery [13–16]. As a result, critically ill patients experience a wide array of distressing symptoms throughout the course of their hospitalization, which include pain, discomfort, anxiety, stress, agitation, weakness, sleep deprivation, and delirium [17–19].

In recent years, clinicians and researchers have been making concerted efforts to recommend and utilize lighter levels of sedation to promote weaning ventilator support and overall recovery [20] and implementing non-pharmacological interventions such as music listening to manage symptoms associated with care on the ICU [21, 22]. The remainder of the chapter will focus on reviewing the literature regarding the use of music listening with critical ill patients, define patient directed music listening, provide guidelines for best practices in using music listening interventions, how to assess patient music preferences, considerations and contraindications for music listening, and review of economic benefits of music listening.

2. Use of music listening to manage symptoms

Music listening has emerged as a nonpharmacological approach to manage ICU acquired symptoms such as pain, agitation, anxiety, sleep disturbances, and confusion [23–25]. Due to the fact that these symptoms impact prolonged intensive care, length of hospitalization, morbidity, mortality, and the complexity of interactions with co-morbidities, it is challenging to manage this multiplicity of symptoms [26]. Music listening does not carry the side effects or negative consequences that first line interventions such as sedative and pain medications [25].

Music listening pinterventions have been implemented to manage a vast array of symptoms, and to manage multiple symptoms simultaneously to support the care and comfort for patients undergoing procedures, as well as those admitted to ICUs. Studies to date have evaluated the use of music listening to reduce discomfort and pain, stress and anxiety, the presence of delirium, sedative exposure, improve self-quality and cognitive functioning [27–42].

Author	Setting & subjects	Music intervention	Timing of music intervention	Outcomes
Singh V et al. [43]	72 COPD hospitalized patients randomized to a music or progressive muscle relaxation (PMR) group	Classical Indian music pre-selected by researchers	Patients listened to music for 30 minutes	• Significant decreased in both music and PMR groups, however changes were greater in music group on trait and state anxiety, dyspnea, SBP, PR and RR
Beaulieu-Borie et al. [44]	49 ICU patients randomized to music or control group (no music) from ICU	Slow tempo music pre-selected by researchers	Patients listened 1 hour 2 times per day	• Prolactin and blood cortisol decreased after intervention – Trend toward decreases in Fentanyl
Chlan et al. [28]	373 MV patients randomized to patient directed music listening (PDM), headphones (no music) or usual care group from 12 ICUs	Patient preferred music as assessed and tailored for patients by a board certified music therapist	Patients determined when and how long they wanted to listen to music	• PDM group had significantly lower anxiety scores • By 5th day anxiety decreased by 36.5% in PDM group • By 5th day PDM group had 2 fewer sedative doses
Han et al. [45]	137 ICU patients randomized to music listening, headphones, or control group	Relaxing music pre-selected by researchers	Patients listened for a single 30 minute session	• Significant decreases in HR, BP and RR over time in music group • Significant decrease in anxiety in music and headphone group • Significant increase in HR, BP, and RR in control group over time
Korhan et al. [46]	60 ICU patients randomized to music listening or control group	Classical music pre-selected by researchers	Patients listened to music for 60 minutes one time	• Patients in music group had significant decrease in RR and BP compared to control group
Lee et al. [47]	85 ICU MV patients randomized to music listening or control group	Relaxing music pre-selected by researchers	Patients listened to music 30 minutes one time per day	• Patients in the music group had demonstrated significantly reduced anxiety, serum cortisol, HR, and BP
Su et al. [48]	28 MICU patients randomized to music listening or control group	Four pieces of relaxing piano music	Patients listened to 45 minutes of music at nocturnal sleep time	• Patients in the music group had shorter N2 stage sleep and longer N3 stage sleep in the first two hours of sleep and improved self-reported sleep quality • Patients in the music group had significantly lower HR

Author	Setting & subjects	Music intervention	Timing of music intervention	Outcomes
Chlan et al. [49]	373 MV patients randomized to patient directed music listening (PDM), headphones (no music) or usual care group from 12 ICUs	Patient preferred music as assessed and tailored for patients by a board certified music therapist	Patients determined when and how long they wanted to listen to music	• PDM reduced anxiety by 19 points on VAS • PDM resulted in a cost savings of $2,322 (USD) per patient compared to usual care
Khan et al. [42]	117 ICU patients randomized to personalized music (PM), slow tempo music (STM) and attention control (AC) group		Listening sessions were 1 hour, 2 times a day for up to 7 days	• Adherence to study intervention was higher in PM and STM groups (80%) compared to AC group (30%) • Patients in the PM and STM groups had more coma free days than AC group

Table 1.
Review of music listening research.

Table 1 highlights recent research utilizing music listening interventions with critical care, COPD, and MV patients. The table includes details regarding the patient population, the music utilized in the music intervention, the timing of the music intervention and study outcomes. It is important to note the music utilized for the music intervention, the length and frequency of the music listening intervention varies significantly within this body of research.

Protocols regarding the selection of music vary in music listening intervention research. A Cochrane Review of music interventions with mechanically ventilated patients indicated that only 1 of the 14 studies reviewed included a board certified music therapist as a member of the research team [22]. As a result, in many studies the music was selected by the researchers and provided patients only limited options of music to listen to throughout the course of the study [50–53]. While researchers may refer to this as patient-preferred music, in essence patients are choosing what music to listen to, based on a pre-determined and a restrictive list of music, thus choosing what to listen to from limited options. Patient directed music listening is modeled after patient controlled analgesia (PCA), in which the patient makes their own decision regarding when they need to take a dose of pain medication [54]. Patient directed music listening (PDM) empowers the patient to choose the music they want to listen to, when they want to listen to it, and how long they want to listen [28, 54–56].

Implementing a music intervention with patients necessitates understanding the role or function of the music in the intervention. Additionally, implementing a patient directed music listening intervention requires understanding the patient's music preferences. This can be accomplished by completing a music assessment to help determine what the patient likes and does not like related to music listening. In order for a music intervention to be successful, it is vital to have a clear process of delivering the music intervention [21, 57]. These topics will be thoroughly explored in the upcoming sections of this chapter. The first step in this process is to understand how music listening can be helpful to patients in the ICU and the characteristics in music that support and facilitate these processes.

2.1 The role of music in a music listening intervention

Music is an accessible tool as critically ill patients can easily engage with music listening even when they are tired and have low energy [21, 54–57]. Music can serve many different functions to critically ill patients and can address multiple symptoms simultaneously [25]. Additionally, music does not hold the negative side effects or consequences that patients may experience from pharmacological interventions such as sedative and pain medications [25]. While a patient may use music listening to address multiple symptoms, it is important to understand the various roles music can play and characteristics in the music that can help address these symptoms [21, 49, 58–60]. **Table 2** identifies the different functions of music, descriptions, and characteristics in the music that facilitate this.

It is vital to understand the patient need(s) that music can help to address as this helps to determine music that may be most appropriate and effective for the patient. Conducting an assessment is critical to understanding a patient's needs and to determine their music preferences. A music assessment can also provide information on ways a patient may already use music in their day-to-day life, that can be helpful for them to use during their hospitalization.

There are several reasons why a music listening intervention is a viable option in the critical care environment. Listening to music can help enhance and promote a healing environment. As the patient is able to focus on the music and shift their focus

Function of music	Patient need addresses	Characteristics and considerations in the music
Relaxation: Relaxation response helps the body move from a stress response to a state of rest and calm.	Anxiety Stress Discomfort Pain Delirium	Slow rhythms in music foster a relaxation response by slowing the rhythms of the body as the breathing and heart rate entrain or synchronize with the slow rhythms in the music. This is an automatic response and the will body gradually synchronize with the slow rhythm it hears. Music that is 60–80 beats per minute (BPM) is ideal for fostering this relaxation response. Music that is preferred by the listener is more effective in fostering relaxation [21, 28, 49–52].
Distraction: Distraction is a helpful relaxation intervention as it focuses on shifting or directing attention or focus away from, or toward, something.	Anxiety Stress Discomfort Pain	Melody and lyrics are the elements in music that capture and hold our attention. Preferred instrumentation can also draw one's attention. Music that is preferred by the patient is most effective in diverting one's focus. It is important to select music that may not overstimulate given the ICU can be overstimulating [21, 49, 51].
Support sleep: Sleep is designed to be a restorative state in which the body rests and restores in preparation for each day.	Sleep deprivation Delirium Healing and recovery	The body and mind need to slow down and relax in order to move into a deep sleep state. Very slow rhythms (40–60 bpm) in music help to slow down the rhythms of the body to achieve a deep sleep state (delta sleep). Music that is consistent in dynamics and instrumentation further helps to lull the mind and body [21, 49].
Manage and shift mood: The state and quality of our feeling impact experiences. Negative mood states can intensify pain, discomfort, impede sleep, and impact healing.	Anxiety Stress Discomfort Pain	Tonality (major or minor), instrumentation and rhythm are the elements that connect to mood. One's familiarity to the music can impact a mood as well. Selecting music that represents (sounds like) the desired mood state can support shifting mood [53].

Table 2.
Functions of music.

away from the noisy or over stimulating environment of the ICU, this can foster a sense of relaxation and calm. Music can provide a sense of comfort as well. When a patient listens to soothing or familiar music, this can reduce stress and anxiety associated with their hospitalization. A music listening intervention provides the opportunity for the patient to exert control. Providing patients with the power to choose the music they want to listen to fosters feelings of empowerment, which is important when so many aspects of their care in the ICU is outside of their control [21, 55–58].

2.2 Assessing music preferences

Conducting an assessment is a key part of any treatment process. Implementing a music intervention is no exception. A music assessment allows the clinician to gather information that impacts a patient's music preferences, such as education, cultural background, and religious and faith affiliations. It provides insight into ways the patient may currently use music in their daily life that may be effective during the course of their treatment. The music assessment provides information on music preferences and music the patient does not like. Gathering this information helps to ensure the clinician can provide the music that can be more effective for the patient because it is their preferred music and to avoid music the patient does not like [21, 55, 58].

Music is often thought to be innocuous and does not have any negative impact. Listening to music one does not like can cause agitation and negatively impact mood [21, 55]. Music can also be connected to significant life experiences and hearing songs that remind a patient of those experiences can foster a strong emotional response. As a result, it is important to understand which music may not be appropriate or helpful for the patient [55, 57].

The Brief Music Assessment Tool (BMAT) that follows can be utilized to effectively and efficiently assess a patient's music preferences. The BMAT is an abbreviated version of a music assessment tool (MAT) utilized in patient directed music listening research [28, 55, 57]. Recent research indicates that patients did not find the gathering of assessment data burdensome, as it could be collected quickly and easily [25] (**Table 3**).

Patient demographic information

Patient name:
Date:
Education:
Vocation:
Cultural background:
Religion or faith background:
Current mood state:
Hearing impairment: Specify:

Music preferences assessment

---

    1. Do you like to listen to music?   Yes   No

---

    2. Do you play an instrument(s)?   Yes   No
       If yes, what do you play?

---

    3. When do you like to listen to music? (Check all that apply)

      ____Relaxation   ___ Stress reduction

      ____ Pure enjoyment   ____ To pass time

      ____ During exercise   ____ During meals

      ____ With friends & family ____ For prayer

      ____ While working   ____ Other (please specify)

      _____

      _____

---

4. What types of music do you enjoy? (Check all that apply)

____ Classical   ____ Religious/Sacred

____ Classic rock   ____ Hard rock

____ Rhythm & blues   ____ Country

____ Hip hop   ____ Reggae

____ Jazz   ____ Rap

____ New age   ____ World music

____ Alternative   ____ Heavy metal

____ Oldies (1950–1970)   ____ Pop music

____ Other (please specify)

_____

_____

5. Are there any particular groups or artists you prefer?

_____

_____

6. What instruments or instrumental sounds do you like? (Check all that apply)

____ Orchestral   ____ Harp

____ Vocal   ____ Flute

____ Folk/acoustic guitar   ____ Piano

____ Synthesizer   ____ Strings (violin, viola, cello)

____ Electric guitar   ____ Bass

____ Saxophone   ____ Percussion/drumming

____ Brass or horns   ____ Clarinet or oboe

____ Ocean waves   ____ Environmental sounds

____ Others (please specify)

_____

_____

7. Are there any instruments or instrumental sounds that you DO NOT like? (Please specify)

_____

_____

8. Are there any genres of music you DO NOT like? (Please specify)

_____

_____

9. Are there any groups or artists you DO NOT like? (Please specify)

_____

_____

10. Are there any cultural considerations important for you when selecting music? (Please specify)

_____

_____

Table 3.
Brief music assessment tool (BMAT).

When the music assessment is complete and the clinician has a clear understanding of what patient needs that music can help to address, as well as what music the patient prefers and will be most effective, the next step is determining the delivery method of the music listening intervention. The method of delivery should be accessible at all times to enable the patient to utilize music listening when they want or need, and for their desired length of time [21, 56, 58].

2.3 Considerations of delivery of a music listening intervention

Music is easily accessible through many different platforms and various devices. Patients may have their preferred music available on their personal mobile devices

(iPhone, Smartphone, iPad, laptop, etc.) which they have available during their hospitalization. If so, it can be helpful to talk with the patient about the music they have available and how they can use it to manage symptoms. An intensive care unit may choose to make music available through a platform or device on the unit. There are several considerations when making music available for patient use.

It is imperative that the delivery process be accessible to patients whenever they may want or need to engage in music listening. Accessibility is a vital consideration when creating a delivery system, as well as one that does not burden ICU staff. Patients need to be able to access the music and any equipment needed to engage in music listening with as little assistance as possible. This will empower them to use the music listening for their own care, if they are not dependent upon family or staff to help them access it. It is important to provide music that is tailored to patients' music preferences. This can require having a diverse and extensive collection of music or access to music streaming. Providing limited genres of music for patients does not allow them to select their preferred music and can discourage use of the intervention. Additionally, given the noisy nature of the ICU it can be helpful for patients to use headphones or ear buds when listening to music. These devices can help block out environmental noise and to further enhance the listening experience, as well as to help avoid over stimulation [21, 56, 58]. **Table 4** provides more detailed information and considerations for the music listening delivery process.

Delivery process	Considerations	Suggestions
Music source **Streaming** (Spotify, Apple music, etc.) Playlists on iPad **Patient's own**	**Broad selection** Music selection needs to include a wide array of music to accommodate patients' preferred music **Management** If a collection is maintained by the institution, staff may be needed to manage and update **Budget** Music provided by the institution will require funding to purchase music or streaming service and equipment. Patients may have their own device and music for use.	Costs of streaming services available for institutional use should be reviewed and any restrictions that may apply. Institutions should evaluate what options are feasible and affordable based on patient care needs to determine the most viable option. Be sure to review copyright laws if purchasing music to be loaded onto iPads and make available for patient use.
Equipment: **Music storage** Internal platform (i.e. GetWell Network iPad **Patient's own** Patients or families may have a mobile device with preferred music **Headphones** Headphones and ear buds help to block out environmental noise and can enhance the music listening experience, allowing the patient to focus on the music	**Music platform** The platform selected needs to be easy for patients to use and manage, as they are often tired and have low energy **Individual availability** Many patients have their own mobile device, music and headphones/ear buds that they choose to use in lieu of institutional equipment. **Accessibility** The equipment and platform needs to be accessible to the patient to ensure they can engage in music listening when they want and need. **Security** Equipment that is provided by the institution needs to be secured so it is available to patient and so it is not misplaced, lost, or stolen.	Skills of patients to manage and operate the equipment must be considered when choosing the music delivery process. Patients may prefer to use their own equipment as it is familiar and includes their preferred music. Patient's may need some instruction on how to operate the equipment [25]. It can be helpful to provide written instructions for operating music listening equipment for patients and families to refer to. This can empower them in accessing and using the music. Equipment that is provided needs to follow institutional guidelines for infection and disease control. As a result consideration should be given to the ability to properly clean and disinfect equipment.

Delivery process	Considerations	Suggestions
Information and education: **Patients** Patients may have some idea of how music listening can be helpful but will benefit from additional information to be able to use it effectively. They may also feel overwhelmed, tired, confused, and as a result can benefit from information and reminders of how music listening can be helpful. **Staff** Care staff may or may not have a clear understanding of the benefits of music listening or how the music listening process has been set up for patient use on the unit. It is important to inform and educate staff to enable them to integrate music listening into their patient care regime.	**Educating patients** Most people listen to music and understand it is an enjoyable and relaxing. It is helpful to provide patients some simple information and education to help them understand the many different ways that listening to music can manage symptoms. This information and knowledge will encourage their use of music listening and empower them in their own care. **Staff** Staff can benefit from some education and training to ensure they are able to properly educate and inform patients regarding the use of music listening. It also empowers staff to know when it may be appropriate to suggest or recommend a patient try music listening [61].	Literature is available to help inform staff about implementing a patient directed music listening intervention [21, 25, 55, 56]. Institutions and critical care units may choose to consult a board certified music therapist (MT-BC) to utilize their expertise about the use of music and music listening with patients. Organizations can contact state or local music therapy organizations or contact the American Music Therapy Association to get assistance in locating a music therapist in the area.

Table 4.
Delivery process for patient directed music listening.

There are additional considerations for patients that are sedated during MV and are unable to complete the music assessment or make decisions regarding music preferences or when to listen to music. In these situations, staff should inquire with family or caregivers to ascertain as much of the information possible for the music assessment. While patients that are sedated are not able to communicate their desire to listen to music, if the staff are observing signs that patient is anxious, stressed, experiencing pain and discomfort, this is an opportunity to explore the use of music listening. Staff assist in providing the music for patients by ensuring it is the patient's preferred music and the volume level of the music is appropriate for the patient. Staff should take a few moments to observe the patient listening to notice how the patient may be responding to the music and confirm it is the appropriate intervention at this time. Music via headphones or in the patient room should not be played for hours on end for sedated patients. Music listening is an intervention that a sedated patient does not have control over, and is therefore dependent on staff and family members and loved ones to properly attend to the delivery.

These various considerations, and the choices a unit or institution makes surrounding them, will be unique to the patients, the staff, the ICU unit, and the organization. Therefore, it is important to determine the resources available to

dedicate to a music listening intervention and to ensure that unit staff are invested, dedicated, and educated in how it can benefit patients as well as how to implement the intervention with patients [21, 25, 56].

3. Conclusion

While the costs of the complex care of patients with COPD and who are mechanically ventilated continue to rise, these costs account significant portions of hospital budgets [1, 2]. As a result, viable options are needed that can enhance patient care, that do not impose further complications or negative consequences, and are cost-effective. Music listening has emerged as an ideal intervention as it meets this criteria. Music listening has garnered significant interest as a non-pharmacological intervention for critically ill patients due to its ease of delivery, limited cost of delivery, the variety of symptoms it helps to address, the potential to reduce sedation, and to reduce overall cost of ICU care [21, 55–60, 62]. Additionally, patients and their families report that music listening helps to reduce anxiety and improve sleep, and they appreciated being given the opportunity to choose music as a part of their treatment and care [25, 61, 62].

While music listening is an optimal intervention for critically ill patients, patient directed music listening, allows the patient to choose their preferred music and engage in listening to music whenever, and for as long as they want. This approach to music listening empowers patients in their care process and has demonstrated significant outcomes as a result of its tailored approach [28, 58, 61, 63]. It is important for the healthcare organization and ICU staff to understand how to implement a patient directed music listening intervention and carefully determine the best method of delivery for their respective setting.

Conflict of interest

The author declares no conflict of interest.

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