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THE EFFECT OF MUSIC INTERVENTION ON CAM SCORES OF HOSPITALIZED OLDER ADULTS EXPERIENCING DELIRIUM

ABSTRACT

Older adults are vulnerable to developing while hospitalized is delirium. Research has shown that non-pharmacological interventions are effective in managing delirium and should be the first-line of treatment; however despite this, nurses find it difficult to address delirium. The purpose of this research study is to examine the effectiveness of classical music intervention in hospitalized older adults experiencing delirium by evaluating their Confusion Assessment Method (CAM) scores.

A pre-and-post study design to compare the CAM scores of patients before and after music intervention was implemented. Study participants were patients 65 years and older identified to be experiencing delirium by a CAM score of greater than 6 admitted to a medical unit of a community hospital. In a sample of 8 study participants, the paired t-test revealed the post-CAM score after music was played showed an average of 0.3 points lower than the pre-CAM ($p = .39$). Though the results of the study did not show a statistically significant difference, the study's participants' responses suggest that music, as an adjunct intervention, could aid in the management of delirium. These findings indicate the need to for further research in examining the relationship between music and delirium.

Keywords: delirium, music intervention, older adults

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THE EFFECT OF MUSIC INTERVENTION ON CAM SCORES
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DELIRIUM

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CHAPTER 1: INTRODUCTION

According to the National Institute on Aging (2007), there were approximately 500 million people worldwide aged 65 years and older in 2006, and by 2030, it is projected to increase to 1 billion. In the U.S. alone, in 2012, older adults accounted for 41.5 million of the U.S. population, which translates, to about 1 in every 7 Americans (U.S. Census Bureau, 2012). By 2030, this number will nearly double to 71 million, about 20% of the population. This dramatic change in the U.S. population highlights the need for healthcare professionals to be cognizant of the issues that surround this segment of the population.

Older adults are the core consumers of the healthcare industry. In 2007, nearly half of all non-obstetric hospital days were used by persons 65 years and older (Hall, DeFrances, Williams, Golosinskiy, & Schwartzman, 2010) and this number will only increase. Individuals 65 years and older are vulnerable to developing specific conditions while hospitalized, known as “geriatric syndromes” (Lakhan et al., 2011). One of the most common of these syndromes is delirium (Inouye, Westendorp, & Saczynski, 2014). Based on the *Diagnostic and Statistical Manual of Mental Disorders*, delirium is defined as a disturbance of attention and awareness that develops over a short period of time with clinical features of reduced ability to focus, disorientation, and fluctuation of symptoms throughout the day (American Psychiatric Association [APA], 2013). It has been commonly referred to by different care settings as “ICU psychosis”, “sundowning”, “acute brain failure”, and “encephalopathy”.

Numerous studies have advocated for the use of non-pharmacological interventions, including music, as the first line of treatment for delirium due to its efficacy and safety (Inouye, Marcantonio, & Metzger, 2014; Martinez, Tobar, Beddings, Vallejo, & Fuentes, 2012; Vidan et al., 2009). Rivosecchi, Smithburger, Svec, Campbell, and Kane-Gill (2015) conducted a meta-analysis review to examine the effectiveness of non-pharmacological intervention to address delirium. A total of 17 articles were reviewed with studies conducted in different acute care units and the most frequently used assessment tool being the Confusion Assessment Method (CAM). Interventions that were identified to be the most beneficial were mobilization, reorientation, staff education, and music therapy (Rivosecchi et al., 2015). Results of the study showed that non-pharmacological interventions reduced the incidence, duration, and severity of delirium (Rivosecchi et al., 2015).

Music has been well documented as an effective intervention in various patient populations, including dementia, pain, and COPD (Skingley & Vella-Burrows, 2010). Still in its infancy, music is also an emerging adjunct therapy for patients experiencing delirium due to its patient-centered focus and minimal cost for implementation.

Significance of the Problem

Negative Consequences of Delirium

Delirium is associated with considerable negative consequences. It has been linked to increased morbidity and mortality, especially in older adults. For patients that present to the emergency department with delirium, research demonstrated that there is about a 70% increase risk of death the first six months after their presentation (Han et al., 2010). Kennedy et al. (2014) supported this claim with patients experiencing delirium in

the emergency department having greater probability of 30-day mortality than those who did not present with delirium. This association between delirium and mortality was supported by a study by Pieralli et al. (2014) which found delirium to be an independent predictor on hospital inpatient death for patients with an admitting diagnosis of community acquired pneumonia.

Other negative consequences include a longer length of stay (Gleason, et al., 2015; Zhang, Pan, & Ni, 2013), higher rate of complications (Zhang et al., 2013), physical impairment (Quinlan & Rudolph, 2011), 30-day readmission (Gleason et al., 2015), and long-term care placement (Witlox et al., 2010; Zhang et al., 2013).

One of the significant risk factors in the development of delirium in older adults is dementia (Ahmed, Leurent, & Sampson, 2014). Likewise, several studies have noted delirium to be a predisposing factor for dementia (Girard et al., 2010; Witlox et al., 2010). A study by Davis et al. (2012) demonstrated that for those patients who experienced delirium, there was a decrease in the Mini-Mental State Examination score of one point per year, especially for those 85 years and older. This study supports the findings of Girard et al. (2010), which showed the association between the duration of delirium symptoms and cognitive impairment for critically ill patients.

Due to the cascade of events that occurs during and after delirium, cost associated with the development of delirium is substantial. Leslie, Marcantonio, Zhang, Leo-Summers, and Inouye (2008) reported that the cost of care for the delirium cases translated to about \$16,303 to \$64,421 (2005 dollars) per patient after conducting a chart review between the years of 1995 to 1998. Leslie and Inouye (2011) built on this previous study and hypothesized that the direct 1-year healthcare cost associated to

delirium was between \$143 billion to \$152 billion. And this takes into account the entire spectrum of care that patients receive from acute care setting to post-acute care.

The sequelae of events that occur after an individual 65 years and older experiences delirium highlights the need for the healthcare industry, especially nursing, to put this issue in the forefront. Furthermore, these calls for a more concentrated effort develop interventions that are evidence-based, cost-effective, and geriatric-centered.

Epidemiology

Lin, Heacock, Bhargave, and Fogel (2010) conducted a retrospective analysis of acute care hospitalizations in New York from 1998 to 2007. The researchers found that 59% of admissions had clinical associations with delirium on admission. Studies that specifically investigated delirium in older adults demonstrated that incidence and prevalence could be variable. Ryan et al. (2013) reported that approximately 20% of patients admitted in an acute care facility would develop delirium, with a higher prevalence seen in older adults. Dr. Sharon Inouye, who is the country's leading expert in delirium, and her colleagues reported that approximately 15% to 30% of older adults present with delirium on admission and about 56% will develop delirium while admitted (Inouye, Rushing, Foreman, Palmer, & Pompei, 1998).

Difficulty in Identification and Current Management

Coupled with the high prevalence of delirium in the acute care setting is the problem that healthcare professionals find it difficult to manage these patients. A qualitative study by McDonnell and Timmins (2012) found that nurses experienced subjective burden while caring for patients with delirium. Patient behaviors that were reported to be burdensome include restlessness and agitation. To address the burden in

managing patients with delirium, there must be accurate recognition of the nursing staff for the presence of delirium. Several studies have found that nurses were not able to accurately identify delirium (Hussein, Hirst, & Salyers, 2014; Inouye, Foreman, Mion, Katz, & Cooney, 2011,), which could further lead to under-treatment. With increased burden and poor recognition, nurses resort to strategies that can often lead to poor patient outcomes such as over sedation, restraint use, and even death.

Among the common strategies in dealing with delirium in the acute care setting include the administration of antipsychotic medications (Flaherty, Gonzales, & Dong, 2011; Hatta et al., 2013) and physical restraints (van der Kooi et al., 2015). Antipsychotic agents such as haloperidol, quetiapine, and risperidone are widely used to manage difficult behaviors associated with delirium; however, there is limited support on its efficacy and often these agents, result to greater harm to the patient (Inouye, Marcantonio, & Metzger, 2014). With regard to restraint use, van der Kooi et al. (2015) reported that one of the reasons for physical restraint use in the ICU of Dutch hospital was delirium. Grover et al. (2013) supported this finding and further reported that physical restraint was a significant predictor of mortality for patients 65 years and older. Addressing delirium could improve patient outcomes and the use of non-pharmacological interventions could be the better approach due to absence of minimal adverse events associated with it and low cost for implementation.

Research Question

Will classical music played for 30 minutes twice in one day for inpatients 65 years or older, result in a statistically significant decrease in the CAM scores compared to a day without music?

CHAPTER 2: THEORETICAL FRAMEWORK AND REVIEW OF THE LITERATURE

Theoretical Framework: Roy's Adaptation Model

The theory that will serve as the framework for the research is Roy's adaptation model (RAM). The model is grounded on the idea that human beings are open, holistic, and adaptive systems who are in constant interaction with their environment, both internal and external. Therefore, it is the goal of nursing to foster an environment that will enable individuals to adapt to their environment, which entails understanding each individual's life purpose.

Scientific Assumptions of RAM

Roy's model was heavily influenced by two scientific assumptions, the general systems theory by Ludwig von Bertalanffy and the adaptation-level theory by Harry Helson (Roy & Andrews, 1999). Based on the general systems theory, humans are defined as adaptive systems with control mechanisms that enable them to respond to stimuli. In addition to this, the theory stressed the relationship between inputs (stimuli) and outputs (behavior), which is central to the adaptation model. Core concepts within the general system theory that overlap with Roy's model include holism, feedback process, and complexity of the human response (Roy & Andrews, 1999). This feedback process is an essential concept for this study since external stimuli could influence patient behavior.

Helson's adaptation-level theory also played a fundamental role to Roy's conceptual view that the environment influences humans, and in turn, humans transform

the environment (Roy & Andrews, 1999). According to the theory, adaptation signifies being able to respond appropriately to the demands of the situation leading to greater realization of one's own being.

Relevancy of Roy's Adaptation Model in Music Intervention

According to the adaptation model, humans are holistic beings who respond to their environment. Holism is a major concept of the theory as it pertains to the idea that human systems are interconnected, thus, every aspect of a person should be addressed in order to achieve personal growth. Furthermore, humans are open adaptive systems that are in constant interaction with their environment. This emphasizes the importance of the relationship and symbiosis between individuals and their environment.

The ability of individuals to respond to the stimuli is related to their adaptation level (Roy & Andrews, 1999). This is the process by which the individual approaches the situation. Based on Roy's model, nurses need to be cognizant of how a patient's surrounding could be a contributing factor to a person's behavior. This is even more evident in older adults with delirium due to their change in cognition and inability to communicate effectively. Patients experiencing delirium often do not act in isolation; instead their behavior is a consequence of their inability to adapt to the changes in their surroundings. As it applies to the discipline, the goal of nursing is to promote health with interventions that take into account the role of environment and possibly, modify it, to aid in adaptation. It is the nurse's responsibility to identify the stimuli that are influencing the patient's response and modify those stimuli to elicit a positive outcome.

With music intervention, there is a manipulation of the stimulus by the nurse to promote effective adaptation processes and enhance coping abilities. Music alters the

surroundings by creating a calming and positive environment, which can influence the adaptive processes employed. This positive environment helps promote effective coping mechanisms that will enable the patient to react and behave effectively (Roy & Andrews, 1999). The intervention enhances the interaction between the patient and the environment allowing the patient to have an adaptive response and therefore, minimize behaviors such as agitation, restlessness, and anxiety present in delirious patients.

Roy's adaptation model's emphasis on the interaction between humans and the environment provides a strong foundation on implementing music intervention for patients experiencing delirium. Multiple factors can influence the behavior of patients with delirium and this includes the surrounding environment. Music intervention aims to alter this stimuli allowing for effective processes resulting to modification of responses and adaptive behaviors.

Literature Review

Music and Delirium

There are limited studies that explored the role of music intervention in patients experiencing delirium. Below are studies that specifically examined the efficacy of music on older adults experiencing delirium.

McCaffrey (2009) conducted the most recent study on the relationship between music and confusion. The research question for this study was to investigate if listening to music had an effect on cognitive function and confusion on older adult patients who underwent hip or knee surgery. Cognition function was measured using the Mini Mental State Examination (MMSE) while delirium or acute confusion was measured using the Neelon and Champagne Confusion Scale (NEECHAM). Using a randomized controlled

design, 11 patients were assigned to the control group and 11 patients were assigned to the experimental group. Data collection on the MMSE and NEECHAM occurred on the first three days of the postoperative period. Those in the control group received standard hospital care while those in the experimental group received a CD player, in addition to the standard hospital care. Specific music intervention included having a continuous lullaby played once the patient was transferred from the recovery area and having music played at least four times a day during the postoperative days.

Results of the study indicated that those in the experimental group had statistically significant higher MMSE scores than the control group demonstrating fewer decline in cognition for three days of the study. NEECHAM scores of the experimental group were significantly higher than the control group in all three days ($p = .000$, $p = .002$, $p = .000$, respectively) indicating that those who listened to music had lower levels of acute confusion. Study findings illustrated that music listening could be an instrumental in the prevention of cognitive decline in older adult patients who experienced delirium status post surgical intervention (McCaffrey, 2009). Limitations of the study include having a small sample size and having the same researchers administer the MMSE and NEECHAM pre-intervention and post-intervention, which can increase the likelihood of bias. Strength of the study is in its randomization approach and use of standardized tool to measure cognition and confusion.

McCaffrey and Locsin (2004) conducted a randomized clinical trial that posed two questions: a) will older adult patients who received music therapy after having elective surgery have fewer observed incidents of delirium than those who did not listen to music? and b) are older adult patients who received music therapy more likely to

exhibit readiness to ambulate than those who did not have the intervention? The study used a non-probability convenience sampling method for patients who underwent elective hip or knee surgery and was able to recruit 66 patients. Patients were randomly assigned to rooms, which determined whether they were in the intervention or the control group. Those in the control group received the usual level of care while those in the intervention group received a CD player that operated at most three times a day. To measure the effectiveness of the intervention, the electronic medical record of the participants were reviewed post discharge to determine the number of episodes of confusion, which was based on the nurse's description. The score for readiness to ambulate was determined by physical therapists when patients were taken out of bed for the first time.

Results of the study showed there was a statistically significant difference between the intervention group and control group. Patients in the intervention group had fewer episodes of confusion compared to the control group ($p = .001$). Furthermore, the control group scored lower in terms of the readiness to ambulate than the intervention group since higher scores showed more potential. The researchers concluded that implementation to music intervention could contribute to decrease delirium incidence for older adults who undergo hip and knee surgery (McCaffrey & Locsin, 2004). A limitation of the study included depending on the nurses' observation of the confusion episodes and not having a standardized tool. Strength of the study is in the randomization methodology and being able to incorporate music anytime during the patient's stay based on the nurses' professional assessment.

Music Intervention and Dementia

There are multitude of studies that explored the association between music intervention and patients with dementia. As previously mentioned, there are similarities between dementia and delirium with regard to difficult behaviors; therefore, it would be remiss not to examine the studies on dementia and music intervention.

Vink et al. (2013) examined music therapy as it relates to agitation, specifically, in patients diagnosed with dementia. This randomized control study aimed to compare the effects of the approach with other recreational activities. There were a total of 77 participants who resided in six Dutch long-term care facilities with 43 placed in the music therapy group and 34 placed in the general activities group. Those in the music group received 40 minutes of group sessions while the recreational group received activities that consisted of puzzles, cooking, and shuffleboard. Agitated behavior was measured at 1 hour pre-intervention and hours 1, 2, and 4 post-intervention using the Cohen-Mansfield Agitated Inventory (CMAI). A mixed model analysis with repeated measures was used to compare the effectiveness between the two groups.

The results of the study found that participants in the music therapy group had a decrease in agitated behavior compared to the activities group. However, when baseline cognitive impairment was adjusted, it was not statistically significant. The researchers concluded that music and recreational activities led to short-term improvement in agitation; however, music therapy did not show additional advantage (Vink et al., 2013). One limitation of the study is in the use of a modified CMAI, which only measured whether the behavior was present and the number of times the behavior was counted. This modification changes the validity and sensitivity of the instrument and could have

skewed the results of the study. Strength of the study was in the methodology, with the randomized and controlled design that helped control patient variables.

Raglio et al. (2008) wanted to assess how music therapy can help reduce behavioral and psychiatric symptoms of dementia such as agitation, anxiety, and irritability. In this experimental design, participants recruited from three long-term care facilities in Italy were randomly assigned to an experimental and control group. Inclusion criteria were as follows: a) diagnosis of dementia either Alzheimer's or vascular; b) less than or equal to 22 in the Mini Mental State Examination; c) higher than or equal to 12 in the Neuropsychiatric Inventory; and d) admission to the long-term care facility for at least six months. The researchers recruited 30 participants to the experimental group and 29 participants to the control group. Those in experimental group received 10 music therapy sessions that lasted 30 minutes and involved activities directed by trained therapists while the control group received activities such as reading a newspaper and assistance with activities of daily living. To evaluate the effectiveness of music therapy on behavior, sessions were videotaped and categorized using the Music Therapy Coding Scheme (MTCS). The MTCS evaluated the patients' behavior and level of acceptance with music therapy. Using a mixed analysis of variance, results of the study showed that those in the experimental group showed behavioral improvement and exhibited more behaviors of acceptance such as smiling and singing. The study demonstrated that music therapy could be beneficial for individuals with mild to moderate dementia experiencing behavioral disturbances (Raglio et al., 2008). Limitation of the study was the approach for randomization was not standardized.

However, strength of the study is that assessment of the behavior was done by two individuals who were not associated with the study; therefore, eliminating any bias.

Summary

The results of these studies support the value music intervention on patients' behavior related to common symptoms of delirium such as agitation and confusion. The research study is comparative in nature but the focus will be whether the addition of music intervention will lead to improvement in delirium symptoms. Furthermore, the study will utilize the Confusion Assessment Method (CAM) tool, which was specifically developed for the identification of delirium and previous studies of music and delirium have not employed. Finally, the research will evaluate the short-term effect of music intervention, which will be more applicable to the acute care setting where delirium often manifests.

Music Selection

The type of music selected was based on previous studies that demonstrated the positive effect of classical music in patients with cognitive disorders, primarily in patients with dementia. Gerdner (2000) compared the effect of individualized music to classical music in relation to the frequency of agitation in older adults with Alzheimer's dementia. The study found that there was statistically significant reduction in agitation compared to baseline after 20 minutes of classical music intervention. The particular music used titled *Meditation – Classical Relaxation Vol. 3* was a collection of a classical music from composers such as Beethoven and Schubert, which were deemed by music therapists to be soothing. Remington (2002) utilized a repeated measures experimental design on four groups on hand massage and calming music in the context of agitation in patients with

dementia. The study demonstrated that listening to music resulted in fewer episodes of verbally agitated behavior (Remington, 2002). The choice of music was a New Age arrangement of “Pachelbel’s Canon in D” which was described to be slow in tempo; thus, being calming in nature. Narme et al. (2014) found that music led to an improvement in the emotional state of patients with dementia by measuring discourse content, facial expressions, and mood. Additionally, music lessened the frequency of agitated behaviors. The particular music used by researchers included classical instrumental that had a slow to moderate tempo with the intention of creating a calming environment.

CHAPTER 3: METHODOLOGY

Subjects

Study setting was a community hospital in Silicon Valley, California; study unit was a 39-bed medical unit. The study received both hospital-based Institutional Review Board approval and California State University, Fresno approval. The sample population for the proposed study were adult patients, 65 years and older. Inclusion criteria included admission to the medical unit and identified to have delirium by a CAM score of greater than 6 completed and documented by nurses daily at 6:00 pm. Those excluded to the study were patients who did not have a proxy that can consent for participation in the study, had a dislike of classical music as reported by the proxy, patient was deaf/nearly deaf, or expected length of stay of less than 24 hours. To determine if the patient was deaf or nearly deaf, the patient's chart was reviewed and the patient's proxy was interviewed. For the results of the study to be statistically significant, the minimum enrollment target was 36 patients as determined through a random assessment of the unit's census.

Research Study Music Selection

Based on the literature review that advocated for the use of calming classical music, the research used music from Disc One of the compact disc (CD) titled "50 Classics for Relaxation", which is a compilation of excerpts from different classical works. The first 30 minutes of Disc One was played for each patient (Table 1).

Table 1. List of Music Played

1. Élégie by Massenet
2. Für Elise by Beethoven
3. The Nutcracker Suite: Waltz of the Flowers by Tchaikovsky
4. Humoresque by Tchaikovsky
5. Plaisir d'Amour by Martini
6. Liebestraum No. 3 in A Flat Major by Liszt
7. Romeo and Juliet Fantasy-Overture: Love Theme by Tchaikovsky
8. Étude No. 3 in E Major, Op. 10 ("Tristesse") by Chopin
9. Jesu, Joy of Man's Desiring by Bach
10. Flower Duet by Delibes

Measurement Tool: Confusion Assessment Method

The Confusion Assessment Method (CAM) was used to measure the effect of music intervention on patients with delirium. This is the most widely used instrument associated with delirium assessment. Initially introduced by Inouye et al. (1990), the instrument was developed to aid clinicians in detecting the presence of delirium. A systematic review of the CAM found that the overall sensitivity of the tool was 94% (95% confidence interval) while its specificity was 89% (Wei, Fearing, Sternberg, & Inouye, 2008). The instrument also received content and face validation from an expert panel and was found to be in agreement with the Mini-Mental State Examination (Wei et

al., 2008). Furthermore, the inter-rater reliability ranged from 84% to 100% (Wei et al., 2008).

Sample Selection

Study participants were identified using the inclusion criteria. Patients' proxies were approached in-person or by telephone for a written consent. If the proxy could only be reached by phone, two registered nurse signatures were required. One of the signatures was from the principal investigator who explained the procedure and the other was from a nurse who was independent of the study and validated the informed consent. Obtaining the consent from the proxy involved explanation of the purpose of the study, the procedure, risks, and benefits all of which are in the written consent form.

Study Protocol

This quantitative study used a pre-post intervention design with convenience sampling. By using the CAM for one day without music and one day with music patients acted as their own control. Prior to implementation, the staff of the medical unit was informed about the project and the intervention. Informing the staff was a critical step of the project since the staff was asked to contact the primary researcher regarding which patients are possibly experiencing delirium.

To select patients, the researcher performed the CAM on the referred patients to ensure that these patients were experiencing delirium at the time of the evaluation and the score will be entered in the electronic medical record (EMR). In addition to this, CAM scores from the previous day were also examined for participant recruitment. The primary investigator had an established CAM list as part of regular daily job function.

Hospital policy required that CAM assessment be performed once a day, but did not preclude additional CAM assessments.

Listed below were the specific steps for study implementation:

1. Once the patients were identified to be experiencing delirium through a positive CAM score (greater than 6) as performed by the primary investigator, the patients' proxies were contacted for consent regarding participation to the study due to patient's current condition.
2. Once consent was received, the patients were randomly assigned into one of two groups: Day 1 Music and Day 2 Music. Day 1 Music patients received the music intervention on day 1 of their participation and Day 2 Music patients received the music intervention on day 2 of their participation. Randomization was achieved using the patient's medical record number (MRN). If the MRN ended in an even number, the patient was assigned to Day 1 Music group. And if the MRN ended in an odd number, the patient was assigned to Day 2 Music group. This randomization helped determine if music intervention as an additional modality of treatment contributed to a decrease in the CAM score or if the usual standard of care was sufficient. Usual standard of care for patients experiencing delirium in the medical unit was composed of different interventions such as frequent reorientation, ambulation, presence of significant others, and promotion of sleep.
3. For patients in Day 1 Music, music was played on the first day of the study. The primary investigator used the CAM score to determine that the patient was experiencing delirium as the baseline CAM score for that day. On the same day, the nurses performed the CAM assessment at 6:00 p.m., which was already

integrated in their workflow and this served as the post-CAM score for that day.

The next day, the patients in Day 1 Music group were again assessed for the presence of delirium by the primary investigator by performing the CAM and entered in the EMR. On this day, the patients did not receive the adjunct music intervention, and just the usual standard of care. The nurses performed the CAM assessment at 6:00 p.m. on the same day, which will again serve as the post-CAM for that day.

4. For patients in Day 2 Music group, the primary investigator also used the CAM score that helped determine if the patient was experiencing delirium as the baseline CAM score for that day. On this first day, the patient received the usual standard of care and music was not provided. The nurses performed the CAM assessment at 6:00 p.m. on this day as well, which served as the post-CAM score for the day. The next day, patients in Day 2 Music group were again assessed for the presence of delirium by the primary investigator by performing the CAM and this served as the pre-CAM score for that day. On this day, the patients received the music intervention in addition to the usual standard of care. The nurses performed the CAM assessment at 6:00 p.m. on the same day, which will act as the post-CAM score for the day.
5. Both groups received 30 minutes of the same classical music that had been pre-selected by the investigator played in their room via a CD player twice a day, once in the morning and once in the afternoon.
6. The CD player was placed on the patient's bedside table with volume high enough to block out any environmental noise but low enough for conversation to

occur. After each music intervention, the CD player was cleaned with the appropriate disinfectant wipes for infection control purposes. The investigator left the room after music was started but was close enough to assess the patient every ten minutes to monitor for increase in agitation once the music was initiated but this did not occur.

To aid in uninterrupted music intervention, the patient's primary nurse was notified to appropriately plan care prior to initiation of the music. The study mimicked the multifactorial approach that has been shown to be effective to address delirium (Rivosecchi et al., 2015).

Data Collection Procedure

Identification of patients experiencing delirium occurred on a daily basis using the CAM. The primary investigator had an established list of patients assessed using the CAM as part of the investigator's daily functions.

The primary researcher performed the data collection and data were entered on an ExcelTM spreadsheet, in a password-secured personal computer. There was a separate spreadsheet that contained the patient's MRN and study code. CAM scores were collected and were extracted from the hospital's EMR. The subjects' demographic data were also collected: gender, age, diagnosis (categorized by system), race, and history of cognitive impairment (yes or no), length of stay at the time the patient was enrolled to the study, English as the primary language (yes or no), and whether antipsychotic medication was administered during the course of the study (yes or no). Data spreadsheet sent to a statistician for analysis. And a paired t-test approach was used to run the data with p-level set at .05.

CHAPTER 4: RESULTS

A total of 328 patients were screened from September 28th, 2015 to January 31st, 2016. There were 135 males and 193 females with the mean age of 83 years. CAM scores ranged from 0 to 8 with a mean CAM score of 1.10. Majority of the patients had a CAM score of 0 when initially screened by nurses (Table 2).

Table 2. Initial CAM Screening Distribution as Performed by the Nurses

Of the 328 patients screened, 15 (4.6%) patients were deemed to be experiencing delirium with a CAM score of greater than 6 when assessed by the principal investigator; however, only 12 patients were enrolled or consented in the study. One patient did not have a proxy identified so consent could not be obtained, another proxy declined to have the patient enrolled in the study, and one patient had significant hearing loss. The reason

for declination for the enrollment of the study was not provided. Of the 12 patients consented, 8 were able to complete the full course of the study, which is 2 days. Additionally, four patients were discharged from the hospital during the study and therefore were not included in the data analysis or results discussion (Figure 1).

Figure 1. Study Enrollment

Every patient had a pre and post CAM score regardless of when music was played (Day 1 or Day 2), pre-CAM scores were done by the investigator in the morning and post-CAM scores were based on the 6:00 p.m. nursing documentation.

The pre and post CAM scores were captured for Day 1 Music group (Table 3).

The pre and post CAM scores were captured for Day 2 Music group (Table 4).

Table 3. CAM Scores for Day 1 Music Group

	Day 1: Pre-Music CAM Score	Day 1: Post-Music CAM Score	Day 2: Morning CAM Score	Day 2: 6 p.m. CAM Score
Patient 1^a	7	7	5	5
Patient 4^{a,b}	8	8	8	8
Patient 5^b	7	7	4	7
Patient 10^{a,b}	7	7	5	2

^a Indicates patient received antipsychotic medication during the study

^b Indicates patient who had 1:1 observation

Table 4. CAM Scores for Day 2 Music Group

	Day 1: Morning CAM Score	Day 1: 6 p.m. CAM Score	Day 2: Pre-Music CAM Score	Day 2: Post-Music CAM Score
Patient 2^b	7	5	7	4
Patient 3^{a,b}	7	7	7	6
Patient 6^{a,b}	7	7	7	7
Patient 9^b	7	8	7	8

^a Indicates patient received antipsychotic during the study

^b Indicates patient who had 1:1 observation

Post-CAM scores of participants in the Day 1 Music group ($n = 4$) did not reflect any improvement the day music was played. However, review of the morning CAM score on day two demonstrated that three patients had a reduction in the score, of as much as 3 points (Table 3).

Two participants in the Day 2 Music group ($n = 4$) had a decrease in the post-music CAM score after music was given, of as much as three points (Table 4). Using a paired t-test approach to compare the pre and post CAM score the day music was played,

the post-CAM score was on average 0.3 points lower than the pre-CAM score and this was regardless of the day the music intervention was provided. This difference, however, was not statistically significant ($p = .39$)

The pre and post CAM score the day music was not played was on average 0.7 points lower than the pre-CAM score but this was not statistically significant ($p = .39$). The same statistical methodology was applied using all pre and post intervention CAM scores. The post-CAM scores was on average 0.5 points lower than the pre-CAM score, which was not statistically significant ($p = .24$).

The study sample ($n = 8$) consisted of mainly female patients (75%) with a mean age of 84.5 years. All of the patients were Caucasian with English being the primary language. In terms of admitting diagnosis, a predominant diagnosis among the sample was not identified with one patient admitted primarily for delirium. Four patients had a history of cognitive impairment, which included mild cognitive impairment, Alzheimer's Dementia, and possible Lewy Body Dementia. During the course of the study, five (62.5%) of the patients were administered an antipsychotic medication, which were often prescribed to help control behavioral disturbances for patients with delirium. An incidental finding revealed that seven (87.5%) of the patients required one-to-one observation or "sitter."

CHAPTER 5: DISCUSSION AND CONCLUSION

Discussion

This quantitative study sought to understand the relationship between music and CAM scores in older patients experiencing delirium. Due to the small sample size, it was difficult to determine if music intervention had an effect on CAM scores, let alone led to its decrease. Comparison of pre and post music intervention on CAM scores did not yield statistically significant results; however, some of the subjects did have a decrease in CAM scores on the day music was played. This trend suggests that music could be an effective adjunct approach in helping resolve delirium symptoms in older adults. Closer examination of the data showed the possibility of music's short-term and long-term effects, though not statistically significant.

These findings support McCaffrey's (2009) and McCaffrey and Locsin's (2004) studies that music could play a role in decreasing episodes of confusion in older adults. Both studies demonstrated surgical patients who listened to music experienced fewer episodes of confusion compared to those who did not. The difference between this study and previous studies is in the use of the CAM tool, which is specific for delirium assessment. Literature review that exclusively examined role of music in the management of delirium revealed that the CAM was not used as an assessment tool, which makes the current study distinctive. Though the results of this study were not statistically significant, it suggests that when music is used as an adjunct intervention, there is decrease in CAM score; thus resolution of certain manifestations of delirium.

The results also validate the findings from previous studies (Martinez et al., 2012; Martinez, Tobar, & Hill, 2015; Rivosecchi et al., 2015) that support the use of non-

pharmacological interventions to manage delirium. With music, being the non-pharmacological approach, there is the possibility it could help manage patients experiencing delirium. The results suggest that it could contribute to the resolution of delirium. Furthermore, it enforces the need for an implementation of a multicomponent interventions to address delirium as stressed by Inouye et al.'s (1999) landmark study since it mimics the multifactorial etiology of the disorder.

The findings fall within the theoretical framework of Roy's adaptation model that difficult behaviors are manifestations of poor adaptation to stimuli. The theory emphasizes the importance and influence of the environment on an individual. Patients experiencing delirium have difficulty responding to myriad of stimuli in the acute care setting; therefore, creating a calm and soothing environment through music could help patients cope. Through the use of music, nurses are able to manipulate the environment, which could help patients adapt to the stimuli in the hospital and respond with appropriate behaviors.

Four out of the 8 patients enrolled in the study had a history of cognitive impairment, which supports the systematic review by Ahmed et al. (2014) that revealed dementia to be one of the most and statistically significant factors in the development of delirium. Kennedy et al. (2014) identified dementia to be present in patients experiencing delirium in the emergency department. Data further demonstrate the need for nurses and the healthcare team to be mindful that patients with a history of cognitive impairment are at risk for developing delirium; thus, the importance of implementing non-pharmacological interventions early during the hospital stay for prevention. Additionally, it highlights the importance of prevention and effective delirium

management being that it has been determined to be a risk factor for dementia (Davis et al., 2012; Girard et al., 2010; Witlox et al., 2010).

Results of the study demonstrate that administration of antipsychotic medications was an approach used by the nursing staff ($n = 5$). Since the study did not preclude the use of these medications in the patients enrolled in the study, these could therefore, be contributory to the decrease (or change) in CAM scores. This approach to the management of delirium mirrored study results of Hatta et al. (2013), which found that pharmacological interventions were often used in the acute care setting. This could imply that delirium symptoms and behaviors were severe that it warranted medication administration. This could also suggest that due to the myriad of tasks that healthcare providers must perform there is a need for immediate resolution of delirium symptoms. Non-pharmacological interventions for delirium often require time commitment from the nurses and other staff members since this approach often involve patient and family engagement.

Incidental finding of the study revealed that patients experiencing delirium required a “sitter” or constant observation ($n = 7$; 87.5%). Though the rationale for the use of this additional resource was not explored in this study, one of the possible reasons is safety concerns, more specifically, the increased risk for falls. This would validate the study by Mangusan, Hooper, Denslow, and Travis (2015), which found that cardiac patients who experienced delirium had statistically higher prevalence of falls. DeCrane, Culp, and Wakefield (2012) reported similar findings in the long-term care settings where patients with delirium were more likely to experience a fall. This finding also corroborates the high cost of delirium as reported by Leslie and Inouye (2011). “Sitter”

use seems to be an added intervention for patients experiencing delirium to maintain patient safety. The results suggest the need to address delirium and the need to employ multicomponent, non-pharmacological approaches, such as music, being that it is not difficult to implement and is associated with low cost. As Rubin, Neal, Fenlon, Hassan, and Inouye (2011) reported implementation of these types of interventions could lead to formidable savings for acute care settings. The use of “sitters” could also imply severity of the patients’ symptoms, thus making them less perceptive to their environment. This could lead to decrease music efficacy, which could account for the results of the study.

Even though the study did not yield statistically significant results, anecdotal comments by patients’ significant others confirmed the importance of addressing delirium in the acute care setting and the need to focus efforts to improve the care provided to older adult patients. Majority of the patients’ significant others expressed great interest in having their loved ones enrolled in the study and appreciated the attention they were given. A patient’s son was teary-eyed during a conversation when he verbalized gratitude for the intervention because he believed that older adults are often dismissed and forgotten in today’s society. Another patient’s family reported that he noticed the patient became more interactive, such as smiling and answering simple questions after music was played. He described that while music was playing, the patient hummed and was even moving her hands along with the music, much like an orchestra conductor. The music eased the significant other’s anxiety and gave him a sense of comfort. The burden that significant others and caregivers experience in seeing patients who experience delirium is considerable. Comments made to the primary investigator often revolved around how the patient “does not usually act this way” and how “this is

not normal.” These interactions validate the findings in a qualitative study conducted by Toye, Matthews, Hill, and Maher (2014). The study sought to understand the experiences of families of older adults with delirium. Two of the four major themes identified in the aforementioned study revolved around feelings of distress in seeing the change in condition by the patient and the importance of having supportive and caring healthcare staff. The interaction with the patients’ significant others demonstrate the value of music intervention for older adult patients experiencing delirium. The intervention enables the nurse to provide humanistic and holistic care, which is integral in the care of patients experiencing delirium.

Nursing Implications

Despite the high prevalence of delirium in the acute care setting and the cost associated with it, nurses find it difficult to manage these patients, especially those with behavioral disturbances. Nurses need to have an understanding of the complexities of the disorder, such as its multifactorial etiology and its distinct interventions. Early intervention is keys to delirium management; especially in the acute care setting. Nurses play a significant role in preventing the development of delirium by recognizing what places patients at risk for delirium, addressing precipitating factors, and identifying which patients are experiencing delirium. Early diagnosis and early intervention is important. Moreover, nurses needs to explore the implementation of non-pharmacological interventions, such as music, as the first-line of treatment for delirium patients with behavioral symptoms, which advocates for a holistic nursing approach. These interventions are often associated with low cost and can be easy to implement. Current delirium interventions, such as antipsychotic use and application of physical restraints

should be reserved for situations that threaten the safety of both the patient and healthcare provider due to its association to poor patient outcomes. Nurses, therefore, need to advocate for the implementation of non-pharmacological interventions and spearhead efforts to manage these patients effectively. Finally, the study augments need to educate the entire healthcare team nurses, patients, and caregivers about the particular needs of older adults. Nurse needs to be the agents of change that will shift the healthcare industry to providing age-specific and geriatric-centered care.

Limitations

A major limitation of the study is in its small sample size. The study was not generalizable since the study was performed at one unit of a community hospital. The difficulty in recruiting the target sample size of 36 patients to the study could be attributed to the following factors: a) patients experiencing subsyndromal delirium; b) the study was conducted in a single unit; c) the unit had more patients that were age less than 65 years than anticipated; and d) presence of geriatric resource nurses and the NICHE (Nurses Improving Care for Healthsystem Elders) Program in the unit, which aims to improve the care delivered to older adults. With subsyndromal delirium, patients are described as having a milder state of delirium. There is the presence of delirium symptoms in these patients; however, these are non-specific and non-diagnostically defined. Another limitation is the lack of a heterogeneous study population with majority of the participants being female and all participants being Caucasian. This threatens the generalizability of the study since this does not fully represent the population.

Studies that have a strong internal validity conclude that the intervention provided or manipulated is the cause for the outcome, rather than potential extraneous variables.

Main threat to internal validity for this study is not being able to control confounding variables. In this case, the confounding variables are those interventions such as the presence of a “sitter” or family presence. Music intervention was an adjunct approach for these patients; therefore, there is the possibility that other interventions could be the cause of the study’s outcomes. With the setting being an acute care facility, manipulation of these interventions was difficult. There is also the threat of expectancy effects since both the researcher and nurses were not be blinded on who received the intervention.

One of the anticipated barriers of the primary investigator prior to the implementation of the study proved to be not so, which is the difficulty in finding a proxy who will consent to enrollment in the study. During the course of the study, only one patient did not have a designated proxy to provide consent, which is a difficulty one might face when conducting research on this population.

Future Studies

Due to limited research studies in this subject, there is a call for more research that explores the relationship between music and delirium in older adults. Recruitment proved to be difficult with this research; therefore, future studies need to occur in multiple areas of the hospital, such as the surgical unit where postoperative delirium is prevalent. Conducting a multi-site study could be challenging; however, not only will this yield a larger sample size but also a more diverse study population.

The use of preferred patient music is also worth exploring through reminiscence since this could result to better study outcomes, compared to studies that played same music for all participants. Interestingly enough, significant others of study participants who were consented suggested the use of patients preferred music instead classical music

during the study. Study participants could have responded better to music they are familiar with and this could be achieved by having a selection of different music genres.

One of the significant findings of the study are the positive comments by the participants' significant others for the implementation of music intervention. A qualitative study of family satisfaction on the use of music and non-pharmacological approaches could be another focus of future research. This could especially be valuable for acute care settings with reimbursement being linked to patient satisfaction.

Specific behaviors, such as agitation and anxiety could also be studied as it relates to music's effects with use of assessment tools such as a Pittsburgh Agitation Scale (PAS) and Geriatric Anxiety Scale (GAS). Finally, there is the possibility of creating a more rigid study protocol that will eliminate or control confounding variables, which could better identify music's effect.

Conclusion

With the growing number of older adults, nurses are faced with the challenge of addressing the specific and complex care needs of the population. Delirium is a concerning medical problem associated with significant consequences with aging. These negative patient outcomes include increased risk for dementia, physical impairment, long-term placement, and even mortality. Common interventions implemented to manage older adults with delirium are often not ideal with restraint and antipsychotic medication use.

In addition to this, healthcare providers, especially nurses, report the burden and difficulty in managing these patients. Numerous studies have advocated for the use of non-pharmacological interventions to manage delirium in older adults due to its efficacy

and absence of side effects. Evidence on the use of music on older adult patients experiencing delirium are few; however, growing evidence suggests that it can aid in the resolution of delirium symptoms. With the changing demographics, there is a call for geriatric-specific nursing interventions that specifically account for the comprehensive needs of this age group.

Though the study could not conclusively demonstrate the efficacy of music intervention in managing delirium, anecdotal reports indicate that despite a change in cognition, patients are in constant interaction with their environment and can play a significant therapeutic role. This, therefore, validates Roy's adaptation model, the study's conceptual framework. Furthermore, implementation of this non-pharmacological approach could result in an increase in family satisfaction. The non-quantifiable results of the study emphasize implementation of non-pharmacological approaches, such as listening to music, to address and manage delirium, since it improves experience through a patient-centered approach. Finally, support for the use of music also lies in its patient-centered and holistic approach, which is essential in the care of the older adults.

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