Silencing Pain with Music Intervention

Jennifer N. Stice

Queens University of Charlotte

Dr. Janie Best, Capstone Advisor

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Abstract

Background: Managing acute pain needs in the inpatient hospital setting is challenging. Studies have shown that uncontrolled pain can lead to negative patient outcomes. These negative outcomes delay patient healing and lead to prolonged inpatient hospitalizations. Current practices do not have standards for implementing therapies such as music to decrease acute pain.

Objective: The purpose of this research project was to measure the impact on pain scores and physiologic data on a medical telemetry unit at Carolinas Medical Center. The aim was to improve perceived pain experienced and decrease harmful physiologic effects from pain.

Methods: A quantitative quasi-experimental study was conducted on a designated medical telemetry unit. Staff was provided education about pain and its harmful effects. Music intervention along with prescribed pain medication was provided to an intervention group while a control group had a quiet time with prescribed pain medications. Pre and post implementation pain scores were measured as well as pre and post implementation systolic blood pressure, heart rate, and oxygen saturations. Participants were provided a questionnaire about their experience in the study before discharge.

Results: The overall average pain level in the intervention group and control group was decreased significantly. There was a strong correlation ($r = 0.9$) between music intervention and reduction of perceived pain levels in participants. Participants had positive impacts on physiologic including systolic blood pressure, heart rate, and oxygen saturations. Fifty-six percent of the intervention group stated that always had pain relief during music intervention times.

Conclusion: Music intervention has been shown to be effective in managing acute pain. Further studies need to be conducted to assess the sustainability of the findings in the adult medical telemetry setting.

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Silencing Pain with Music Intervention

A great challenge in health care is the management and treatment of acute pain needs. Traditional methods of treating pain with only medication have not provided desired results in many instances. For this reason complementary therapies such as music are becoming more common methods to help with pain management. Music has been utilized for centuries to influence health (Nilsson, 2008). The use of music can be traced back in nursing history to Florence Nightingale. She recognized the ability of music in hospitals to aid in healing for soldiers injured during the Crimean War (Nilsson, 2008). According to research the development of music as a therapeutic intervention was largely pushed in the mid-20th century (Joanna Briggs Institute, 2011). Since this time music's use for pain control has been proven successful in multiple research studies. This success has increased patient satisfaction as well as limited the associated problems that are caused by unrelieved pain.

Problem Identification

According to Özer, Özlü, Arslan, & Günes (2013) pain is a negative interference on a patient's ability to heal which contributes to prolonged hospitalizations. "Proper pain management is both a demand and a right of patients…" (Lin, Lin, Huang, Hsu, & Lin, 2011, p.960). When pain is unrelieved then it is an unrealistic expectation for patients to feel positively about their care. Pain as perceived by the patient is a focus of post hospitalization surveys.

One of the eight domains measured by the Hospital Consumer of Healthcare Providers and Systems (HCAHPS) is pain management. Adults from an acute care, medical telemetry unit are surveyed after discharge about how well controlled their pain was during admission. These patients are also asked the frequency with which hospital staff did everything they could to help

with pain. This particular medical telemetry unit has consistently produced poor scores on the HCAHPS related to pain management. The following are the scores broken down into quarters for 2013. First quarter of 2013 the unit scored 69.35 followed by a score of 72.41 in the second quarter. During the third quarter the unit received a score of 70.97. The last quarter proved to be the most lacking with a drop to 55.88. When comparing these scores to the value-based purchasing threshold there is evident need for improvement. The value-based purchasing threshold for 2013 was 74.16 when met and it is exceeded at a value of 82.87 or greater. The unit did not meet the value-based purchasing threshold in any quarter of 2013.

Currently this unit does not have any programs in place to address pain management. To increase patient satisfaction with the new changes in healthcare an action plan was implemented to address this issue.

Purpose, Goals, and Objectives

Purpose

The purpose of this project was to reduce perceived acute pain levels with music intervention on an adult medical telemetry unit.

Goals

The goals of this project were to obtain a greater reduction in patient reports of pain and decrease the negative effects on physiologic changes in the body as evidenced by the effects on systolic blood pressure, heart rate, and oxygen saturation levels.

Objectives

The objectives of this project were to:

1) Educate staff on the medical telemetry unit about the effects of unmanaged pain.

2) Implement music intervention in conjunction with the physician prescribed pain regimen for the intervention group. Implement a quiet time in conjunction with the physician prescribed pain regimen for the control group.
3) Measure pre and post pain scores, systolic blood pressures, heart rates, and oxygen saturation levels.
4) Determine the effectiveness of music intervention by comparing pain scores of the intervention group against the control group scores as well as patient physiologic data.

Theoretical Literature

The theoretical works of two nursing theorists were used to support music intervention as a method for pain reduction. Florence Nightingale and Katharine Kolcaba's works were utilized in conjunction with the Iowa Model of Evidence Based Practice to form the supporting framework for this project. Both Nightingale and Kolcaba view a patient as someone with complex needs that must be met. Likewise both viewed nursing as possessing the capability to implement interventions to meet these diverse needs. Nursing can utilize the Iowa model to decide on which interventions would best enhance care. This model highlights the importance of using research to guide practice (Doody & Doody, 2011).

The practice of using evidenced based practice to improve care is not a concept that nurses use as often as they should. The Iowa Model for Evidenced Based Practice helps nurses evaluate current practice as they question the need for change. It is nursing's responsibility to stay current with best practice and implement these changes at the bedside (Doody & Doody, 2011). The Iowa model breaks down the process of making practice changes in a step by step

method. The following are the steps of the Iowa Model: 1) problem identification, 2) formation of a team, 3) research current evidence, 4) review the evidence found, 5) create a practice change, 6) pilot the practice change, and 7) evaluate effectiveness of the practice change (Titler et al., 2001). Implementing evidence based practice changes guided by nursing theory will bring about positive results in patient care. This model along with the works of Nightingale and Kolcaba guided this music intervention project to improve patient pain scores on a medical telemetry unit.

In Nightingale's *Notes on Nursing,* (1860) she described the goal of nursing being one that assisted patients in meeting their needs so they would be in optimum position for healing. Nightingale believed that "nursing contributes to the ability of persons to maintain and restore health directly or indirectly through managing the environment" (Parker & Smith, 2010, p.49). A patient's environment can affect how they perceive pain. Nurses can manipulate the environment a patient is surrounded by to promote better outcomes. One of the environmental factors that nurses can address is noise. Nightingale (1860) wrote that unnecessary noises can actually cause harm to a patient. In contrast to this she noted that music, which was expensive in her time, could be beneficial. Nightingale (1860) stated that wind and string instruments that had the capability of continuous sound were those that could provide this benefit to patients. Using music is one environmental manipulation that nurses can encourage to help ease pain.

Katharine Kolcaba, like Nightingale, supported those actions nurses can perform to improve a patient's ability to heal. Her Comfort Theory viewed the idea of comfort as a complex term that should be viewed as a noun and an outcome instead of being used just as a verb, adverb, or process (Kolcaba, 1995). According to Kolcaba's theory there are three types of

comfort interventions. The three types of interventions are known as technical, coaching, and comfort food for the soul (Parker & Smith, 2010). In Parker & Smith 2010 the technical interventions are those such as medications, treatments, monitoring, or those dictated by nursing protocols. Coaching is supportive actions such as listening and comfort food for the soul are the time consuming extra actions nurses provide such as massage, music, art, or guided imagery (Parker & Smith, 2010). These extra actions can also be known as complementary therapies. When using a complementary therapy such as music with technical interventions better comfort can be obtained than with a single intervention. According to several articles found this is especially true when combining music and medication to treat pain.

Meeting the needs of others is not only a patient right but a responsibility of nursing. Nightingale and Kolcaba both shared this belief. Their works and the Iowa Model can guide nursing practice to make changes in the interventions that are provided to patients. The medical world is always evolving and therefore nursing must strive to keep up with these changes.

Review of Literature

A Boolean search of the EbscoHost database was conducted for this literature review. There were a total of six hundred eighty-three results identified using the key terms *music therapy* and *music intervention*. Twelve of these articles are included in this review of literature. Those not chosen were excluded for reasons such as: duplication, in a language other than English, did not measure effect on pain, did not focus on adult populations, and did not use music only sounds. This review focuses on the effect of music on pain and its characteristics. Elements of music, physiologic responses, and benefits of using a non-pharmacological intervention are examined further.

Elements of music

When selecting musical pieces for patient listening several elements must be taken under consideration. Articles tend to vary on what is recommended for elements music should possess. Some common elements mentioned in the literature are rhythm, melody, and pitch. Allred, Byers, & Sole (2010) and Chlan & Halm (2013) both state that music should have simple composition and consist of sixty-eighty beats per minute. Sendelbach, Halm, Doran, Miller, & Gaillard (2006) suggest that music should have no dramatic changes and be instrumental in nature with sixty-seventy beats per minute. Conversely not all articles placed these elements as being mandatory. Vaajoki, Pietilä, Kankkunen, & Vehviläinen-Julkunen (2011) state that for feeling well and healing that music should be a type in which the patient likes. Patient selected music and pre-selected music choices have mixed recommendations within the literature. Most provide the patient with a selection of music that has been chosen by the principal investigator or project leader. All of the above mentioned articles whether the music was patient selected or project leader selected had reduction in pain for the music therapy groups. Another differing element of music is the duration for listening. Sendelbach et al. (2006) recommends twenty minutes of uninterrupted listening while other studies recommend thirty minutes of listening (Vaajoki, Pietilä, Kankkunen, & Vehvilänen-Julkunen, 2013). Even with the differing findings within the literature on music elements there continues to be decreases in pain found.

Physiologic Responses

According to Özer, Özlü, Arslan, & Günes (2013) unrelieved pain is an unpleasant experience that leads to possible tissue damage, increased mortality, higher costs, and decreased quality of life. These reasons are why it is imperative for healthcare to place high value on pain

management. Better outcomes are attainable when the body does not have to undergo the stresses of unmanaged pain. In Richards, Johnson, Sparks, & Emerson (2007) early ambulation was found to be beneficial in reducing complications such as pneumonia, deep vein thrombosis, and altered skin integrity. Early ambulation was achievable because patients did not have pain levels that would hinder their ability to be mobile. Music therapy was used for these surgical patients with positive results by post-operative day number two.

Another study, Chan (2007), states that pain has a stimulating effect on the sympathetic nervous system which causes elevation in heart rate and constricting of blood vessels which will increase blood pressure. This can prolong the time needed for the body to heal appropriately. In this study there were significant reductions in heart rate, respiratory rate, oxygen saturation, and pain levels in patients who had underwent a C-clamp procedure. For each of these categories a statistical significance was found at ($p < 0.05$). For each the p values were < 0.001 proving to be statistically significant in the music intervention group. This study proved that music could produce a reduction in potentially harmful physiological responses.

In Comeaux & Steele-Moses (2013) music was used to improve pain and environmental noise satisfaction in patients on a surgical unit. Music was used as a distraction method to reduce the hospital noise level. A significant reduction in pain was found in the music therapy group ($p < 0.001$). Likewise there was an increase in environmental noise satisfaction with significance of ($p < 0.001$). While there was no significant findings on lowering anxiety in these patients producing an environment with decreased noise can promote better sleep and therefore overall health promotion (Comeaux & Steele-Moses, 2013).

Benefits of non-pharmacological intervention

Non-pharmacological interventions like music have been proven to affect pain. There are also additional benefits to using these methods. Richards et al. (2007) states, "Providing music as an intervention could decrease the need for opiates and thus decrease the negative side effects associated with their use (nausea, vomiting, constipation, urinary retention, confusion, drowsiness)" (p. 12). Some studies have found this to be true while others did not find any significant differences between intervention and control groups (Lin et al., 2011).

In one study, Ebneshahidi & MohSeni (2008), looking at the effect of music on post-operative pain in cesarean section surgery patients a cumulative opioid use was significantly lower for those in the music group. In this randomized controlled study pain scores and the use of opioids were found to be significant in the music group ($p < 0.05$). Reducing the need for pharmacological intervention and implementing more holistic means for analgesia will aide in recovery and promote better outcomes.

Not only is music a "beneficial adjuvant to other non-pharmacological and pharmacological pain relief methods" (Vaajoki, Pietilä, Kankkunen, & Vehviläinen-Julkunen, 2013, p.212) but it is also cost effective. This was not always the case as noted by Nightingale (1860). Today music is readily available and easy to implement. Nilsson (2008) informs readers that music does not require expensive equipment and does not require extra staff for implementation. Reducing medication side effects while still producing positive pain reducing results in a cost effective manner is a possible feat to manage with the use of non-pharmacological interventions like music.

Summary

Pain is not just a phenomenon treatable with medications. It is complex and in many instances hard to alleviate. Nurses have a duty to assist patients with their pain needs. Nightingale and Kolcaba both viewed nurses as having the power to interfere with pain acting upon a patient. By manipulating the environment and implementing comforting measures pain can be lessened and therefore tolerated. Research has proven that if pain is not managed then negative outcomes can occur. However, it has also proven that music can be used as a method of non-pharmacological analgesia with positive results.

Methodology

Research Question

Will the implementation of music intervention when used in conjunction with pain medication have a greater reduction in pain experienced in adult patients when compared to adult patients that have quiet time in conjunction with pain medication in a one month period of time?

Design

A quantitative quasi-experimental design was used for this study. Pain levels measured by a Numerical Pain Scale were measured pre and post medication and music intervention. Vital signs including systolic blood pressure, heart rate, and oxygen saturation were also measured pre and post intervention. The pain scores and vital signs of the experimental group were then compared with those of the control group that had no music intervention but a quiet time with their pain medication.

Sample

A twenty-four bed medical telemetry unit that cares for adult populations was chosen for this study. Each of the beds on the unit has medical telemetry and continuous pulse oximetry

capabilities. These monitoring tools are located at the nurses' station on the unit. The unit is comprised of a single hallway which is open at both ends. All beds on the unit with a patient assigned whom meets criteria were eligible for inclusion. Inclusion criteria for patients admitted with a diagnosis which caused acute pain were: eighteen years of age or greater, and an expected length of stay greater than one day. Exclusion criteria for patients were chronic pain, altered mental status, psychiatric diagnosis other than depression, hearing loss, alcohol or chemical dependency, taking mood altering medications, and self-report of suicidal ideation.

Variables

All unit employees were provided education prior to the implementation of music intervention. All nursing staff were eligible to participate in the study. Flyers were posted on the unit announcing education sessions dates and times (Appendix A). The project leader sent a copy of the flyer to every employee electronically. Hard copies were available for those wanting one. Employee attendance was monitored for each session via signed roster. Each education session had a duration of no longer than fifteen minutes. All education sessions were conducted by the project leader to keep the content of the material consistent. Education sessions were offered on each shift twice including weekends for a total of six educational sessions. A short PowerPoint presentation (Appendix B) was the delivery method to educate on the harmful effects of pain and the importance of complementary therapy such as music. Staff were educated about the music intervention study, including the Numerical Pain Scale used for measurement and signs to be posted on the patient's door during intervention.

After the employee education period implementation of music intervention was initiated. During the implementation phase patients will be assigned to the experimental group or control

group as they agree to participate in the study starting with the experimental group. This helped keep the groups close in number of participants. During implementation of music or quiet time patients will be undisturbed except in cases of emergency. A sign posted on the door informed all staff and visitors of the intervention taking place (Appendix C). The patient's environment was altered during the intervention to be conducive to relaxation. Lights were dimmed, blinds closed, televisions turned off, and doors were closed. Nursing staff assisted in maintaining an undisturbed quiet environment during the intervention period.

Patients had a script read to them during recruitment (Appendix I), gave verbal permission, to participate, and were given a Participant Education Leaflet (Appendix D). Patients in the experimental group had their vital signs taken before being given pain medication. When pain medication was given music intervention via compact disc player and personal earbuds were initiated. Participants listened to thirty minutes of music from a selection of twenty different musical pieces. The pre-selected music pieces were comprised of classical (Western and Chinese), jazz, easy listening, new age, harp, nature sounds and orchestral. Music was initiated at a level of fifty-sixty decibels but patients had the option to increase or decrease the volume as desired. The music intervention took place two times daily when patients received pain medication for acute pain needs. The project leader conducted the music intervention for each patient for consistency. At the end of the thirty minute music intervention session the patient's pain score was measured using the Numerical Pain Scale and vital signs were evaluated again.

Patients in the control group had their vital signs taken before pain medication was received. When pain medication was given then a period of quiet time was initiated. Participants

were encouraged to lie comfortably in bed for the duration of the thirty minutes. Every precaution was taken to ensure a quiet environment. The quiet time took place two times daily when patients received pain medication for acute pain. The project leader initiated the quiet time for each patient in this group for consistency. At the end of the thirty minute quiet time the patient's pain score was measured using the Numerical Pain Scale and vital signs were re-evaluated. Both groups had a sign on the door informing staff and visitors of the interventions that took place. The initiation time and end time was visible on the sign.

All music intervention was via compact disc player. All patients in the experimental group had their own personal set of ear buds or head phones if specified. The CD players were cleaned according to hospital policy for cleanliness. Patients on special isolation precautions had a designated CD player that was used in any other rooms. These were cleaned between uses of patients on the same type of isolation but were not used by any other patient.

Prior to discharge participants from each group filled out a short questionnaire (Appendix E) about the effectiveness of music intervention or quiet time. Questions asked whether the experimental group felts as though they had better pain relief with or without music interventions. They were also asked how they liked the selections of music. The control group was asked if they felt that a period of quiet time assisted them with better pain relief. At the end of this study patient satisfaction scores were measured to see how effective music intervention was on pain management.

Data Collection

The collection of data occurred every Friday, Saturday, and Sunday from 0700-0900 and 1700-1900 for a period of one month. The project leader was responsible for all data collection.

Appendix H outlined who was responsible for data collection if the PI was unable to. Pre and post implementation pain scores and vital signs data were recorded in an Excel spreadsheet (Appendix F). Responses to questionnaires were also recorded into an Excel spreadsheet (Appendix G). All of the spreadsheets were saved on a flash drive that was specific to the project. The flash drive was kept with all questionnaires in a locked cabinet on the unit. No other person had access to the locked cabinet except for the project leader.

Data Analysis

Analysis of the collected data was the sole responsibility of the project leader. Only the project leader had access to the information on the spreadsheets. Descriptive statistics were used to analyze the results on the patient questionnaires. An independent *t* test was used to compare the means of the physiologic data and pain scores between the intervention and control groups. A paired *t* test was used to test the significance in differences between the pre and post-test physiologic data and pain scores for each group. After data had been analyzed all questionnaires and spreadsheets were placed in a locked cabinet to keep for one year per policy then will be destroyed.

Results

Overall Pain Level

The overall average pain level in the intervention group decreased from 7.9 pre-implementation to 2.1 post-implementation (See Table 1). There was a strong correlation (r = 0.9) between the music intervention and reduction of perceived pain levels in participants. Also, the control group's results are surprisingly noteworthy. The overall average pain level in the control group was 8.2. This value saw a decline to a post-implementation score of 3 (See Table

2). The overall average pain levels for each group of participants was the average of all pre and post pain scores. The intervention group saw a greater reduction in perceived pain levels than the control group.

AM & PM Pain Levels

During the pre-implementation phase initial pain scores were minimally different. Initial AM pain scores between groups yielded the largest difference. The intervention group had an average pain rating of 7.6 whereas the control group had an average pain rating of 8.4. The intervention group ($p < 0.0001$) (See Table 3) saw a significant reduction in reported pain levels. The control group ($p < 0.0001$) (See Table 4) also had a significant reduction in participant AM pain levels. This held true for reported PM pain scores as well. The intervention group ($p < 0.0001$) (See Table 5) and the control group ($p < 0.0008$) (See Table 6) had reductions in perceived pain levels that were found to be significant. For both AM and PM scores the intervention group yielded a much smaller p value when compared to the control group.

Oral pain levels & Intravenous pain levels

Pain levels were analyzed further after breaking down the data into oral (PO) and intravenous (IV) routes of administration for each group. There was data found that each group experienced significant pain reduction from the initial report of pain to the post-implementation report of pain. Tables 10, 12, 13, and 14 are evidence of this reduction in perceived pain levels for the two groups. When comparing the differences in mean pain scores for each route in both groups it was evident that the intervention group receiving IV pain medication did experience a larger decrease in reported pain levels. This group had an average initial reported pain level of 9.5 which

was decreased to an average post-implementation pain score of 3.1. The control group receiving IV medication was slightly smaller of a reduction in pre and post reported pain levels.

Physiologic Data

Physiologic data including systolic blood pressure, heart rate, and oxygen saturation levels were recorded to assess the potential benefit music intervention can have on physiologic responses. Tables 15 and 16 exhibit the significant response of systolic blood pressure in both the intervention group ($p < 0.0001$) and the control group ($p < 0.001$). Of interest when analyzing the groups according to the route of medication administration the PO control group did not yield a significant result ($p < 0.08$) (see Table 23). This was the only result found that was not significant for systolic blood pressure.

When analyzing the response of participant heart rates it is noted that the results mirror those of the systolic blood pressure. Both groups (see Tables 25 and 26) again saw a significant reduction in the pre and post heart rates but the control group receiving PO pain medication ($p < 0.08$) (see Table 33) did not. The difference in the mean heart rate was relatively small for this group. The initial average heart rate was 86.2 and the post-implementation average heart rate was decreased to 81.6. This was the smallest decline seen in the average heart rate and was too small to be significant.

Oxygen saturation levels were the only physiologic response that yielded all significant responses. The overall oxygen levels for both groups are shown in Tables 35 and 36. Of note the *p* value is smaller in the control group as opposed to the music group which has been a consistent theme throughout the findings of this study.

Participant Questionnaire Results

All participants were asked to complete a short questionnaire inquiring about their experience in this study. The participant questionnaire (Appendix E) consisted of four questions for each participant to answer. The final two questions are specific to either the music group or the control group. 100% of participants (n = 18) were able to complete the questionnaire before discharge from the hospital. 50% of all participants stated that having music and/or quiet time always helped decrease their level of pain. Out of these participants the music group yielded a 56% confirmation that having music in conjunction with pain medication always decreased their level of pain. Tables 19, 20, and 21 show the responses by question made by the participants. The following tables show the responses by each group. The music group showed a clearly higher percentage of participants that agree that music help their pain levels and that their pain levels were lower during intervention times.

Discussion

Limitations

There were several limitations to this study that were identifiable. The first limiting factor was the lack of a prolonged time frame for data collection. The limited time of one month was inadequate to show any type of sustained response. Adding to this is the data collection periods were limited to three days per week during the times from 0700-0900 and 1700-1900. This excluded most week days from the study. Another limiting factor was the small sample size. The sample size utilized was one of convenience and was limited to only one unit of the facility. This number was much smaller than the anticipated number of participants. A last limiting factor was the fact the participants included were inpatient on a medical telemetry unit. These participants had very differing medical issues that led to their hospitalization. Surgical patient which are most

often found in the literature when utilizing music for pain intervention have much more standardized plans of care and are therefore easier to utilize in a study like this.

Findings Related to Literature

Participants in this study had decreased levels of pain experienced while using music intervention. Music has been seen as a method to control pain in literature as far back as the Crimean War (Nightingale, 1860). This complementary therapy in addition to pain medication, a technical intervention (Parker & Smith, 2010), does in fact lead to better comfort for patients as supported by Kolcaba's theory.

Participants' physiological responses were also affected by music intervention in a positive way in this study. Chan (2007) states that music intervention reduces harmful physiological responses that occur when stress from pain is not controlled. The intervention group in this study yielded no insignificant findings on the impact of physiological responses. Systolic blood pressure, heart rate, and oxygen saturation levels were impacted as found in literature.

There were no studies found in the literature related to medical patients exclusively. Most of the findings were limited to a type of surgery or surgical patients in general. Despite the lack of research on music intervention in medical units the results were very similar to those achieved in the literature.

Implications for Nursing

This study has several implications for nursing from the results. The result of significant pain reduction by using music as an intervention for pain management is a phenomenon that nursing can take ownership of. Music is inexpensive and easily accessible for use for all nursing types. Nursing should be implementing complementary therapies like music in addition to

physician prescribed pain regimens to gain better pain relief for patients in all settings. Quiet time was also found to be successful in the management of pain. While it did not yield the same results as music it did assist participants in this study with greater pain relief. This is another easy intervention nursing can perform on a daily basis.

Implications for Further Study

The topic of music intervention for pain management requires further study in the inpatient medical hospital setting. Most of the findings in research are centered on surgical patients that have very regimented plans of care. Medical patients vary as do their care plans. Replicating this study for a prolonged period of time would be beneficial if results were sustainable. This would also be of benefit to show how implementation of a complementary therapy such as music should be added to hospital plans of care. This study should also be replicated for chronic pain patients to see if this would be of any benefit for their pain needs.

Conclusion

Pain impacts patients in a negative and damaging way. These negative impacts are found throughout literature. Patients have negative outcomes when they experience unmanaged pain. Music has been proven to decrease pain felt by patients and has been proven to have a positive effect on the physiologic responses of the human body. A standard for implementing music within healthcare settings should be put in place to provide patients with more than physician prescribed pain regimens to alleviate uncontrolled pain. Controlling pain will lead to much better outcomes and have positive impacts on other aspects of healthcare not addressed by this study.

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Table 1: *All Music Group Pain Scores AM & PM: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	7.869565217	2.130434783
Variance	5.118577075	8.845849802
Observations	23	23
Pearson Correlation	0.529542481	
Hypothesized Mean Difference	0	
df	22	
t Stat	10.52560874	
P(T<=t) one-tail	2.35753E-10	
t Critical one-tail	1.717144374	
P(T<=t) two-tail	4.71505E-10	
t Critical two-tail	2.073873068	

Table 2: *All Control Group Pain Scores AM & PM: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	8.181818182	2.954545455
Variance	4.060606061	8.140692641
Observations	22	22
Pearson Correlation	0.274824076	
Hypothesized Mean Difference	0	
df	21	
t Stat	8.154085296	
P(T<=t) one-tail	3.02853E-08	
t Critical one-tail	1.720742903	
P(T<=t) two-tail	6.05705E-08	
t Critical two-tail	2.079613845	

Table 3: *All AM Music Group Pain Scores: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	7.666666667	1.916666667
Variance	6.424242424	5.901515152
Observations	12	12
Pearson Correlation	0.526595464	
Hypothesized Mean Difference	0	
df	11	
t Stat	8.24172737	
P(T<=t) one-tail	2.45822E-06	
t Critical one-tail	1.795884819	
P(T<=t) two-tail	4.91645E-06	
t Critical two-tail	2.20098516	

Table 4: *All AM Control Group Pain Scores: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	8.454545455	2.727272727
Variance	3.272727273	8.418181818
Observations	11	11
Pearson Correlation	0.178394098	
Hypothesized Mean Difference	0	
df	10	
t Stat	6.062177826	
P(T<=t) one-tail	6.08142E-05	
t Critical one-tail	1.812461123	
P(T<=t) two-tail	0.000121628	
t Critical two-tail	2.228138852	

Table 5: *All PM Music Group Pain Scores: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	8.090909091	2.181818182
Variance	4.090909091	10.56363636
Observations	11	11
Pearson Correlation	0.575286271	
Hypothesized Mean Difference	0	
df	10	
t Stat	7.359800722	
P(T<=t) one-tail	1.21292E-05	
t Critical one-tail	1.812461123	
P(T<=t) two-tail	2.42584E-05	
t Critical two-tail	2.228138852	

Table 6: *All PM Control Group Pain Scores: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	8	3.545454545
Variance	4.8	10.67272727
Observations	11	11
Pearson Correlation	0.391200775	
Hypothesized Mean Difference	0	
df	10	
t Stat	4.701984221	
P(T<=t) one-tail	0.000419519	
t Critical one-tail	1.812461123	
P(T<=t) two-tail	0.000839037	
t Critical two-tail	2.228138852	

Table 7: *All Music Group PO Pain Scores: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	6.090909091	1.090909091
Variance	3.490909091	6.090909091
Observations	11	11
Pearson Correlation	0.453445214	
Hypothesized Mean Difference	0	
df	10	
t Stat	7.136240321	
P(T<=t) one-tail	1.57802E-05	
t Critical one-tail	1.812461123	
P(T<=t) two-tail	3.15604E-05	
t Critical two-tail	2.228138852	

Table 8: *All Music Group IV Pain Scores: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	9.5	3.083333333
Variance	1	10.08333333
Observations	12	12
Pearson Correlation	0.529635371	
Hypothesized Mean Difference	0	
df	11	
t Stat	8.000184002	
P(T<=t) one-tail	3.26539E-06	
t Critical one-tail	1.795884819	
P(T<=t) two-tail	6.53079E-06	
t Critical two-tail	2.20098516	

Table 9: *All Control Group PO Pain Scores: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	6.1	2.2
Variance	0.544444444	4.177777778
Observations	10	10
Pearson Correlation	0.500976034	
Hypothesized Mean Difference	0	
df	9	
t Stat	6.882352941	
P(T<=t) one-tail	3.60378E-05	
t Critical one-tail	1.833112933	
P(T<=t) two-tail	7.20757E-05	
t Critical two-tail	2.262157163	

Table 10: *All Control Group IV Pain Score: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	9.916666667	3.583333333
Variance	0.083333333	11.17424242
Observations	12	12
Pearson Correlation	-0.227669915	
Hypothesized Mean Difference	0	
df	11	
t Stat	6.414846769	
P(T<=t) one-tail	2.48873E-05	
t Critical one-tail	1.795884819	
P(T<=t) two-tail	4.97745E-05	
t Critical two-tail	2.20098516	

Table 11: *All Music Group BP Scores AM & PM: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	146.826087	132.6956522
Variance	354.9683794	218.7667984
Observations	23	23
Pearson Correlation	0.812925731	
Hypothesized Mean Difference	0	
df	22	
t Stat	6.169223824	
P(T<=t) one-tail	1.64494E-06	
t Critical one-tail	1.717144374	
P(T<=t) two-tail	3.28989E-06	
t Critical two-tail	2.073873068	

Table 12: *All Control Group BP Scores AM & PM: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	146.4090909	139.7727273
Variance	278.1580087	202.0887446
Observations	22	22
Pearson Correlation	0.865455881	
Hypothesized Mean Difference	0	
df	21	
t Stat	3.724111281	
P(T<=t) one-tail	0.000627078	
t Critical one-tail	1.720742903	
P(T<=t) two-tail	0.001254157	
t Critical two-tail	2.079613845	

Table 13: *All Control PO BP Scores: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	138.7	132.5
Variance	196.0111111	135.1666667
Observations	10	10
Pearson Correlation	0.692523308	
Hypothesized Mean Difference	0	
df	9	
t Stat	1.906714756	
P(T<=t) one-tail	0.044463933	
t Critical one-tail	1.833112933	
P(T<=t) two-tail	0.088927866	
t Critical two-tail	2.262157163	

Table 14: *All Music Group HR scores AM & PM: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	88.52173913	82.47826087
Variance	163.2608696	122.3517787
Observations	23	23
Pearson Correlation	0.916997342	
Hypothesized Mean Difference	0	
df	22	
t Stat	5.640146789	
P(T<=t) one-tail	5.67774E-06	
t Critical one-tail	1.717144374	
P(T<=t) two-tail	1.13555E-05	
t Critical two-tail	2.073873068	

Table 15: *All Control Group HR Scores AM & PM: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	88.18181818	82
Variance	121.2987013	77.9047619
Observations	22	22
Pearson Correlation	0.867049503	
Hypothesized Mean Difference	0	
df	21	
t Stat	5.238894416	
P(T<=t) one-tail	1.70855E-05	
t Critical one-tail	1.720742903	
P(T<=t) two-tail	3.41709E-05	
t Critical two-tail	2.079613845	

Table 16: *All Control Group PO HR Pain Scores: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	86.2	81.6
Variance	134.1777778	40.04444444
Observations	10	10
Pearson Correlation	0.813689223	
Hypothesized Mean Difference	0	
df	9	
t Stat	1.962636428	
P(T<=t) one-tail	0.040649567	
t Critical one-tail	1.833112933	
P(T<=t) two-tail	0.081299135	
t Critical two-tail	2.262157163	

Table 17: *All Music Group Oxygen Saturation Levels AM & PM: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	95.34782609	97.30434783
Variance	5.691699605	5.85770751
Observations	23	23
Pearson Correlation	0.586987403	
Hypothesized Mean Difference	0	
df	22	
t Stat	-4.295910465	
P(T<=t) one-tail	0.000146431	
t Critical one-tail	1.717144374	
P(T<=t) two-tail	0.000292862	
t Critical two-tail	2.073873068	

Table 18: *All Control Group Oxygen Saturation Levels AM & PM: t-Test: Paired Two Sample for Means*

	Variable 1	*Variable 2*
Mean	94.54545455	96.81818182
Variance	5.974025974	3.393939394
Observations	22	22
Pearson Correlation	0.509540014	
Hypothesized Mean Difference	0	
df	21	
t Stat	-4.87618436	
P(T<=t) one-tail	4.01669E-05	
t Critical one-tail	1.720742903	
P(T<=t) two-tail	8.03338E-05	
t Critical two-tail	2.079613845	

Table 19: Music Group Questionnaire Answers

Music group question #1			Music group question #2			Music group question #3			Music group question #4		
A	0	0%	A	5	56%	A	0	0%	A	0	0%
B	2	22%	B	4	44%	B	2	22%	B	2	22%
C	2	22%	C	0	0%	C	0	0%	C	4	44%
D	5	56%	D	0	0%	D	7	68%	D	3	34%

Table 20: Control Group Questionnaire Answers

Control group question #1			Control group question #2			Control group question #3			Control group question #4		
A	2	22%	A	9	100%	A	1	12%	A	2	22%
B	3	34%	B	0	0%	B	2	22%	B	1	12%
C	0	0%	C	0	0%	C	2	22%	C	2	22%
D	4	44%	D	0	0%	D	4	44%	D	4	44%

Table 21: Both Groups Questionnaire Answers

Both Groups Question #1			Both Groups Question #2			Both Groups Question #3			Both Groups Question #4		
A	2	11%	A	14	78%	A	1	6%	A	2	11%
B	5	28%	B	4	22%	B	4	22%	B	3	17%
C	2	11%	C	0	0%	C	2	11%	C	6	33%
D	9	50%	D	0	0%	D	11	61%	D	7	39%

Appendix A

Educational Sessions Flyer

Silencing Pain

Music CAN HELP!

Presenter: Jennifer Stice

Location/Date/Time: TBD

Appendix B

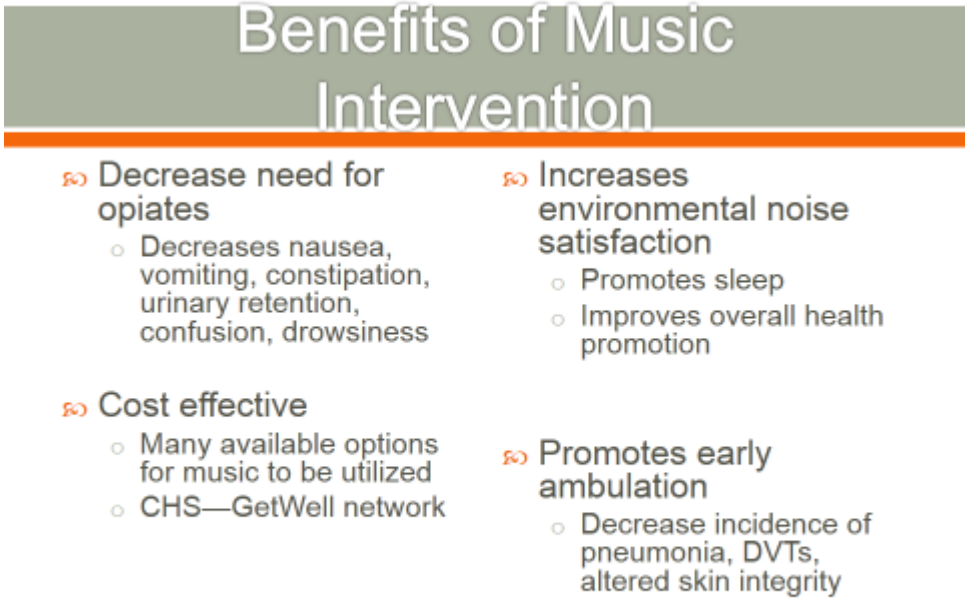
Staff Education PowerPoint

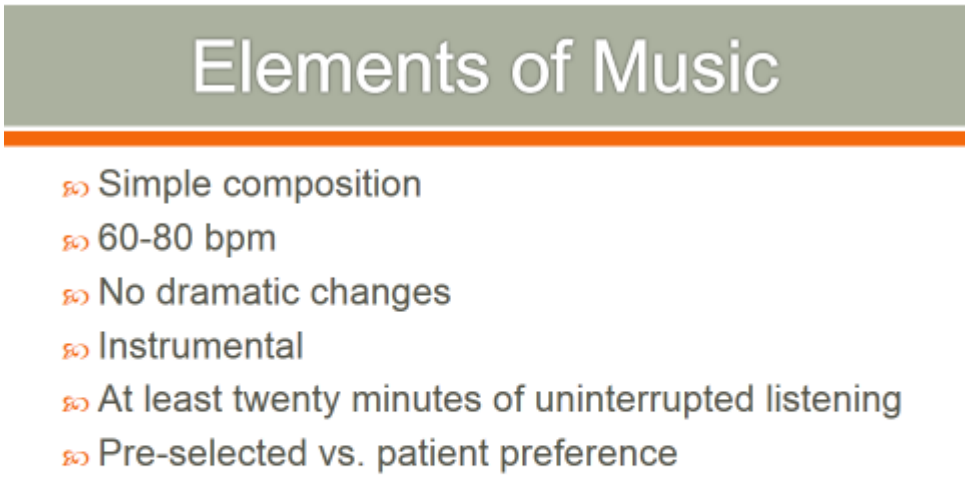
Pain

- "A negative influence on a patient's ability to heal" (Özer, Özlü, Arslan, & Günes,2013)
- Pain management is a "demand and a right of patients" (Lin, Lin, Huang, Hsu, & Lin, 2011, p.960).
- One of the eight domains measured by the Hospital Consumer of Healthcare Providers and Systems (HCAHPS) is pain management

Harmful Effects of Pain

- Unrelieved pain can lead to:
  - Possible tissue damage
  - Increased mortality
  - Increased costs
  - Decreased quality of life
- Pain Stimulates the Sympathetic Nervous System (SNS)
  - Increases HR
  - Constricts blood vessels
  - Increases blood pressure
  - Prolongs healing time


Benefits of Music Intervention
Decrease need for opiates
Decreases nausea, vomiting, constipation, urinary retention, confusion, drowsiness
Cost effective
Many available options for music to be utilized
CHS—GetWell network
Increases environmental noise satisfaction
Promotes sleep
Improves overall health promotion
Promotes early ambulation
Decrease incidence of pneumonia, DVTs, altered skin integrity


Elements of Music
Simple composition
60-80 bpm
No dramatic changes
Instrumental
At least twenty minutes of uninterrupted listening
Pre-selected vs. patient preference

Research Study

- Numerical pain scale
- Door signs during intervention
- Pre & Post intervention pain levels
- Pre & Post intervention vital signs
- Friday-Sunday days for study to be conducted, times 0700-0900 & 1700-1900
- Intervention twice daily for participants
- CD players and personal ear buds for intervention group
- Progress measured by patient pain scores, vital signs, patient questionnaire
- Questions?

References

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Thank You

- Staff may contact me at any time for questions regarding this study.
- Ascom # 66717

Appendix C

Participant Door Signs

PLEASE DO NOT

DISTURB

MUSIC INTERVENTION/QUIET TIME IN PROGRESS

Start Time _____

End Time _____

Appendix D

Patient Information Leaflet

Study Name: Silencing Pain With Music Intervention

Purpose

- . You are invited to participate in a research study focusing on reducing pain levels experienced in the hospital. You are being asked to take part because you experience acute pain. The purpose of this research study is to reduce pain levels by using music in addition to pain medication.

How The Study Works

- All participants wanting to participate will give verbal consent
- All participants will be divided in two groups:
  - Intervention/Music Group will listen to thirty minutes of music after getting pain medication
    - Music will be delivered via CD player and headphone/earbuds
    - Music will come from a pre-selected list that you will be able to choose from
    - You may adjust volume to your personal preference
  - The Control/No Music Group will not listen to music after receiving pain medication
- Both groups will have their pain level & vital signs (blood pressure, heart rate, oxygen level) checked before pain medication is given and thirty minutes after
- Before being discharged you will be asked to complete a short questionnaire about your experience in the study

Risks

- There are no known risks to participating in this study. If any arise you will be notified immediately.

Participation

- Your participation is completely voluntary. If you decide not to participate in this study it will in no way affect the care you will receive during hospitalization. You have the right to withdraw from participation at any time.

Reimbursements

- There is no payment for participation in this study.

Confidentiality

- None of your personal information will be used for this study. You will not be asked to provide this information at any time. No publications that may result from this study will contain any identifying information on any participant.

Questions

- If you have any questions about this study at any time contact the PI Jennifer Stice. The following phone number is the contact number for Jennifer Stice 704-446-6717.
- The Institutional Review Board is a group of people who review the research to protect your rights. If you have any questions about the conduct of this study you may call the Institutional Review Board of the Carolinas Healthcare System at (704) 355-3158

Appendix E

Participant Questionnaire

Please Circle the answer that best answers the question. Thank you.

1) Did having music with quiet time or quiet time help your level of pain?
    a. None of the time
    b. Some of the time
    c. Most of the time
    d. All of the time
2) Would you have preferred just having music/quiet time for pain intervention?
    a. None of the time
    b. Some of the time
    c. Most of the time
    d. All of the time
3) Was your pain level lower during intervention times (e.g music with quiet time or quiet time)?
    a. None of the time
    b. Some of the time
    c. Most of the time
    d. All of the time
4) Music Group Only—Did you like the selections of music?
    a. None of the time
    b. Some of the time
    c. Most of the time
    d. All of the time
5) Quiet Time Group Only—Did you find quiet times better for pain management as opposed to no intervention?
    a. None of the time
    b. Some of the time
    c. Most of the time
    d. All of the time

Appendix F

Participant Pre/Post Pain Scores & Vital Signs Data Sheet

Participant # ____

Pre Intervention Pain Score	Post Intervention Pain Score

*Dates/Times will be recorded for each data box at the time data is recorded

Pre Intervention Vital Signs			Post Intervention Vital Signs			Pain Medication Administered (drug, dose, route)
Blood Pressure	Heart Rate	Oxygen Saturation	Blood Pressure	Heart Rate	Oxygen Saturation	

*Dates/Times will be recorded for each data box at the time data is recorded

Appendix G

Participant Questionnaire Data Sheet

Music Group

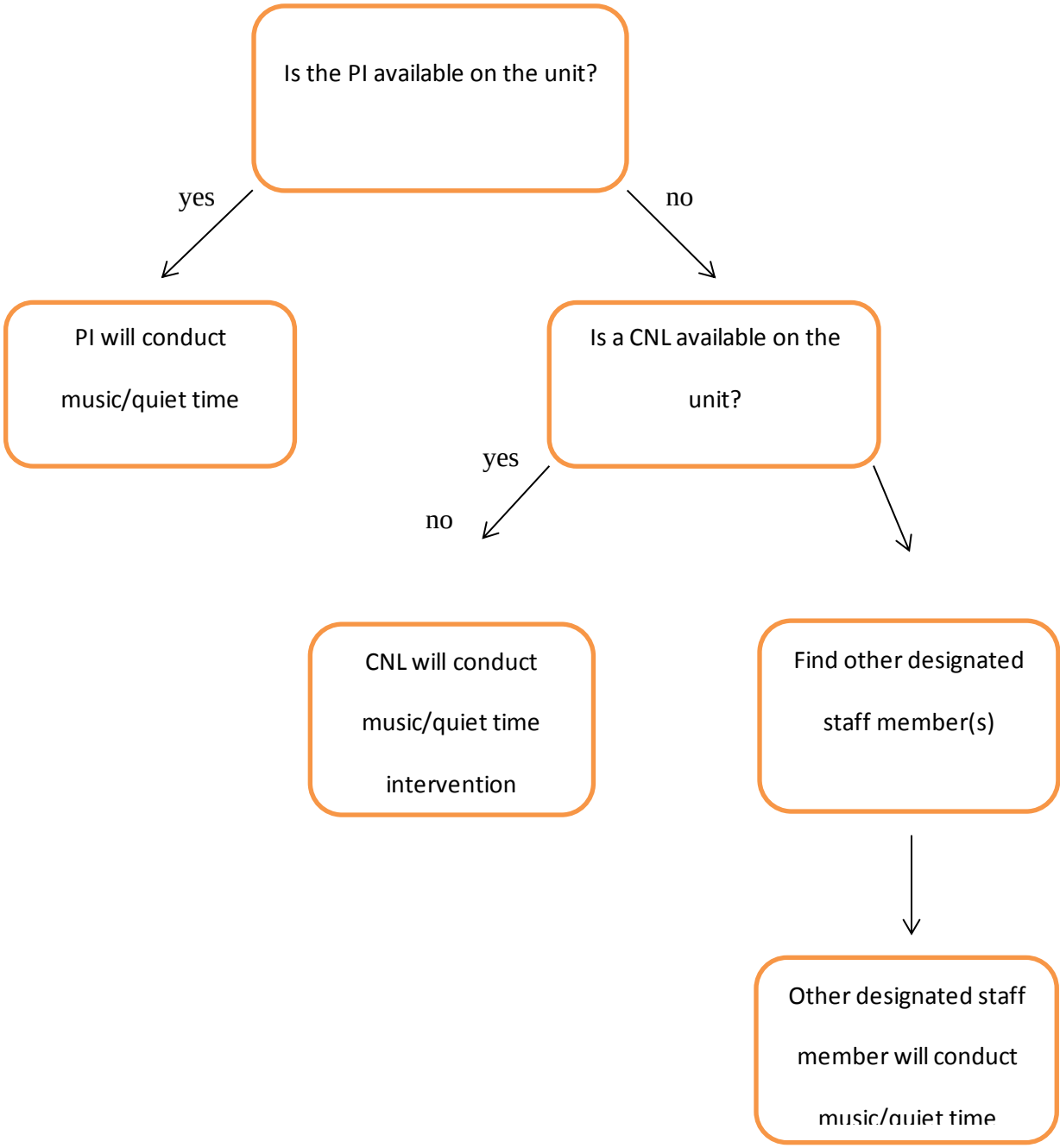
Question #	None of the Time	Some of the Time	Most of the Time	All of the Time
1				
2				
3				
4				

Quiet time Group

Question #	None of the Time	Some of the Time	Most of the Time	All of the Time
1				
2				
3				
4				

Appendix H

Persons for Data Collection



Appendix I

Script for Participants

Good morning/afternoon. My name is _____, and I will be conducting your music/quiet time intervention. I am going to explain each step that will be taken in case you have any questions. Before we get started I need to check your vital signs. This will include your blood pressure, heart rate, and oxygen saturation. I will then administer your prescribed pain medication. You will then have thirty minutes of music/quiet time in which we will try to prevent any interruptions from occurring. After the thirty minutes are complete I will recheck your vital signs and reassess your pain level. (At this point ask participant if they still want the selected music chosen when they consented to participate or if they would like to choose another selection.) Do you have any questions about your participation in the study at this time?