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The Effect of Music Therapy on the Length of Life of Extubated Hospice Patients: A Post-Hoc Analysis

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THE EFFECT OF MUSIC THERAPY ON THE LENGTH OF LIFE OF EXTUBATED HOSPICE PATIENTS: A POST-HOC ANALYSIS

By

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ABSTRACT

The purpose of this study was to examine the effects of music therapy on the process of terminal extubation. Subjects were selected from patients who had previously undergone removal from mechanical ventilation and had died under the care of Hospice of Palm Beach County, Inc. in Palm Beach County, Florida. Subjects were assigned to either the control group (N=10) or an experimental group (N=10), made up of patients who received music therapy during the process of extubation. Descriptive and inferential statistics were calculated for age, number of doctor’s orders and number of medications given to each patient, and length of life in minutes from time of extubation until time of death. Analysis by Mann-Whitney U test indicated that there was no significant difference between the control group and experimental group for the factors of age, number of orders for each patient and number of medications given. Length of life was also not statistically significant between the control and experimental groups; although comparisons of mean length of life following removal of mechanical ventilation between the groups did indicate that patients receiving music therapy lived longer than those in the control group. As there is little research examining the effects of music therapy on the extubation process, additional studies are necessary, particularly using a larger sample of patients.
Introduction

Hospice care, also called palliative care, is defined as care which “relieves without curing” (Webster’s College Dictionary, 1997). The goal of palliative care has been described as attempting “to achieve the best quality of life by meeting the physical, psychological, social, spiritual, and existential expectations and needs of patients while remaining sensitive to personal, cultural, and religious beliefs, values and practices,” (Hilliard, 2005b). Hospice care is the holistic care of those with terminal illnesses, meaning care is given to the patient’s physical, psychosocial and spiritual needs. Care and support are given to the patient’s family and many hospice organizations offer bereavement support following the death. Patients are referred to hospice by their doctor when their disease has progressed to a stage when they have an expected prognosis of six months or less. Palliative care can be provided in a variety of settings, including patient’s homes, hospitals, nursing homes, assisted living facilities, inpatient care facilities, hospice houses and other settings such as prisons. Additionally, specialty hospice programs exist for children with terminal illnesses. Hospice services are often provided by a team of health care workers including doctors, nurses, social workers, chaplains, volunteers, and can include music therapists or other therapists such as massage, aromatherapy or other integrative therapists.

Music therapy, which has existed as a therapeutic intervention since the 1940s, has been shown to be effective in many settings, including hospice care. Research has proven that music therapy can effectively treat several patient problems, such as pain, anxiety, and anticipatory grief. Music therapy has also been used during painful procedures, such as dressing changes, needle sticks or during removal of life support, to alleviate symptoms and provide support to the patient and family.
Review of Literature

The Development of Hospice Care

Hospices have been in existence since the 1100s. In ancient times, hospices were places where victims of the plague went at the end of their illness and where dying pilgrims went for care. Hospices were also locations where weary travelers sought rest, recuperation and found spiritual sanctuary. In fact, the words “hospice,” “hospital,” and “hostel” were used interchangeably during the Middle Ages (Krout, 2000). Primarily, hospice care was provided by members of the church, but as care for the very ill was taken over by doctors who turned their focus on curing patients, hospices became less popular (Hilliard, 2005b). However, several hospices remained open throughout the Reformation when healthcare was being revised. Almouses and workhouses took over care of the dying as hospitals became focused on curative, rather than palliative care.

Cultures throughout the world have been described by Therese Rando in her book *Grief, Dying and Death*, as either “death-accepting,” “death-defying,” or “death-denying” (1984). Some societies, particularly Eastern religions and some native tribes, view death as a natural part of life. Early Egyptians believed that death did not change anything and would bury their leaders with all of their worldly possessions, believing they would be used in the next world. The United States is an example of a death-denying culture. America has become focused on how to prolong life and new products promoting perpetual youth are advertised on mainstream television. Many young Americans view death as something that could not happen to them and engage in risky behavior such as drinking and driving and drug use. Hospice has become an alternative to this view of death and seeks to provide education as well as end of life care.

One of the earliest hospices in the Untied States was operated by Rose Lathrop in her house where she provided palliative care for those with terminal cancer in the late nineteenth century (Hilliard, 2005b). In 1906, St. Joseph’s hospice opened in England, run by the English Sisters of Charity. It was at this hospice that Cicely Saunders received her training in end of life care in the 1950s and 1960s. Cicely Saunders is credited with being the founder of the modern hospice movement. She began as a nurse, but eventually
became a physician and social worker. Her training made her uniquely suited to change the focus of hospice care a more holistic approach. In 1967, Saunders opened St. Christopher’s House, funded in part from a gift from a dying man Saunders had visited in a surgical ward, who urged her to build a home-like place for those facing the end of their lives (Hilliard, 2005b). When Saunders presented her philosophy to medical professionals, scholars and students at Yale, they were inspired to start their own hospice in New Haven, which opened in 1974. The hospice movement began to spread across the United States with hospices opening in California, Arizona and New York City.

Another key development in hospice care was the work of Elizabeth Kübler-Ross in the 1960s and 1970s. Kübler-Ross got her start interviewing medical professionals and patients on their thoughts about death and dying. She published these in her 1969 book *On Death and Dying*, which was instrumental in stimulating discussion on the care of those with terminal illnesses. She suggested that dying is a natural part of life and that care should focus on symptom control and the psychological process the patient experiences during the course of his or her illness (Kübler-Ross, 1969).

In the early 1970s, the National Hospice Organization (NHO) was founded. It was later renamed to the National Hospice and Palliative Care Organization. This organization served to support and advocate for hospice care and the number of members grew quickly. The NHO published standards of hospice care in 1979 (Krout, 2000). In 1982, a Medicare hospice benefit was established, and this reimbursement for services has allowed hospice programs to grow more prevalent. As the so-called Baby Boomer generation continues to age and reach retirement and the end of life stage, demand for hospice care is expected to increase.

**Hospice Extubations**

Although surveys show that over 70 percent of people prefer to die at home, it is estimated that approximately one fifth of all deaths in the United States occur in a hospital, usually following a stay in the intensive care unit (ICU) (Willms & Brewer, 2005; Solloway, LaFrance, Bakitas, & Gerken, 2005). It is estimated that 70 to 90 percent of those deaths occur following a decision by medical staff and a patient’s family
to limit or withdraw life-sustaining therapies (Willms & Brewer, 2005). These life-
supporting therapies can include hydration, artificial nutrition and mechanical ventilation. 
In a 2005 study, Solloway, LaFrance, Baitas, & Gerken found that 19 percent of 789 
patients surveyed had undergone interventions such as being placed on a ventilator, 
surgery or extubation.

Extubation, also called removal of mechanical ventilation or ventilator 
withdrawal, is a process used in both curative and palliative medicine. In palliative care, 
extubation is often referred to as terminal extubation or terminal ventilator withdrawal. 
Terminal extubation is often recommended by medical professionals in hospice care once 
it has been determined that a patient can no longer benefit from aggressive care on the 
mechanical ventilator. Withdrawal occurs with the goal that the patient will either begin 
to breathe independently, or, more frequently in hospice care, that the patient will die 
naturally. “Terminal extubation is a term often used to describe removal of mechanical 
ventilatory support, usually accompanied by extubation, from a patient who is expected 
to die as a result of the removal of support,” (Willms & Brewer, 2005). Death usually 
occurs faster in intubated patients who have sepsis on maximal blood pressure support 
(von Gunten & Weissman, 2003c). A 2005 study found that 18 of 21 patients examined 
during and after ventilator withdrawal died .83 hours after extubation (O’Mahony, 
McHugh, Zallmam & Selwyn).

There are two options in the removal of mechanical ventilation: immediate 
extubation or terminal weaning. In terminal weaning, the ventilator rate, positive and 
end-expiratory pressure, and oxygen levels are gradually decreased until the patient 
begins breathing around the endotracheal tube or stops breathing (von Gunten & 
Weissman, 2003a). This process can usually take from 30 to 60 minutes, but may take 
longer. If the patient survives, the endotracheal tube can either be left in with a Briggs T-
piece or can be removed. Immediate extubation usually occurs if the patient is conscious, 
the amount of secretions in the trachea is low and the airway is likely not to be 
compromised after removal of the tube (von Gunten & Weissman, 2003a). In immediate 
extubation, the patient is given medications, suctioned, and the endotracheal tube is 
removed. After removal, the patient is given humidified air or oxygen to prevent the 
airway from drying (von Gunten & Weissman, 2003a).
Patients undergoing terminal extubation are kept comfortable through the use of medications. Patients are often kept in a state of altered consciousness or coma throughout the process. Truog, Burns and Mitchell (2000) related that some physicians debate the ethical considerations of pharmacologically paralyzing patients during terminal extubation. They report that doctors’ actions may not be beneficent when medicinally paralyzing patients to be extubated. There is a chance that the patient could survive extubation and pharmacological paralyzation minimizes the ability of the patient to interact with his or her family. Campbell, Bizek & Thill (1999) found that low doses of morphine and benzodiazepines were effective in keeping patients comfortable throughout the terminal weaning process. O’Mahony, McHugh, Zallman and Selwyn (2003) reported that opioid or benzodiazepine medicines were used during extubation to control symptoms such as dyspnea, agitation, anxiety or discomfort. Bolus doses are also used to control symptoms and one third of patients in O’Mahony, McHugh, Zallman & Selwyn’s 2003 study required continuous infusions of medications.

Von Guten and Weissman (2003b) recommend the following medication protocol:

1. Discontinue paralytics; do not use paralytic agents for ventilator withdrawal.
2. Before ventilator withdrawal, administer a bolus dose of morphine 2-10 mg intravenously and start a continuous morphine infusion at 50% of the bolus dose/h. Also, administer 1-2 mg of midazolam intravenously (or lorazepam), and begin a midazolam infusion at 1 mg/h. Note: Sedation should also be administered to the comatose patient. For children, obtain dosing advice from a pharmacist or pediatric intensivist.
3. Titrate these drugs to minimize anxiety and achieve the desired state of comfort and sedation prior to extubation.
4. Have additional medication drawn up and ready to administer at the bedside so it can be rapidly administered, if needed to provide symptom relief.
5. After ventilator withdrawal: If distress ensues aggressive and immediate
symptom control is needed. Use morphine 5 to 10 min, and/or midazolam, 2-4 mg intravenous push every 10 min, until distress is relieved. Adjust both infusion rates to maintain relief.

6. Remember that specific dosages are less important than the goal of symptom relief. A general goal should be to keep the respiratory rate less than 30, heart rate less than 100 and eliminate grimacing and agitation.

7. For symptoms refractory to the above treatments, use a barbiturate (e.g. pentobarbital) haloperidol or propofol.

Extubation often occurs in the hospital but can also be performed by hospice staff at a patient’s home. Removal of mechanical ventilation is often carried out by a Respiratory Therapist (RT) in the hospital (ICU). Williams and Brewer (2005) surveyed RTs and found that many RTs perform extubations but are often not consulted when the decision to remove mechanical ventilation is made. The study also suggested that RTs feel troubled by the fact that the doctor’s orders for terminal extubation are often not sufficiently clear.

The decision to remove mechanical ventilation is a difficult one for both medical staff and the patient’s loved ones. Support throughout the process is very important. The use of spiritual rituals or special music may provide comfort for the patient and family. Music therapy is one way to provide support throughout the extubation process.

**Music Therapy in Hospice Care**

Music has been used to promote healing dating back to ancient times. Music therapy, as a modern profession, stems from the time after both World Wars when injured veterans were visited by volunteering professional musicians. Medical staff noticed the veterans who listened to music had shorter recovery times, required less pain medication and enjoyed emotional benefits. After examining this phenomenon, researchers discovered that there are proven physical, psychological, social and spiritual benefits to the use of music. From this research, college programs were developed to give musicians the training to use music therapeutically. Music therapists are certified to practice by a national board in charge of assuring a standard of care is provided. Music therapists
work in a variety of settings including schools, hospitals, psychiatric facilities and hospices (Hilliard, 2005b).

An interaction between a music therapist and a patient was described by Elizabeth Kübler-Ross in her book *Questions and Answers on Death and Dying* in 1974 (Hilliard, 2005b). Kübler-Ross described how a music therapist elicited a reaction from a patient who had been in a coma. Upon hearing the music therapist play and sing a hymn, the patient opened her eyes and tearful remarked that the song being sung was her favorite. The patient then began singing along with the therapist and her family who were present.

Music has been used in the care of dying patients by health care workers who are not board certified music therapists. Music thanatology, promoted in the research literature by Therese Schroeder-Sheker, uses live music (usually harp and voice) to address the needs of the patient who is actively dying. The dying process is seen as natural and an opportunity for spiritual growth by the music thanatologist. Thanatologists are usually present during the “death vigil” and thanatology sometimes relates the dying process to the birthing process in its techniques (Hilliard, 2005b). Counselors and health care troubadours also use music in their work with people with terminal illnesses.

Board certified music therapists use various techniques to address the needs of hospice patients and their families. These techniques include the use of live, patient preferred music, imagery and music, the iso-rhythmic principle, music to elevate mood, music to facilitate life review, song writing, lyric analysis, creating a legacy project or recording, active music participation by patients and families, improvisation, song choice, passive music listening, supportive counseling, the iso-moodic principle, music assisted relaxation, vibration experience, and music combined with therapeutic touch (Haghighi & Pansch, 2001; Hilliard, 2001; Hilliard, 2005a; Krout, 2000).

Music therapy is used in hospice care to address the many needs of the palliative care patient. Studies indicate that music therapy can be effective even for those patients who have reached a point in their disease process where they are no longer responsive to other stimuli. Kerr’s 2004 study found that music listening resulted in lowered heart rates and respiration rates with non-responsive hospice patients. Segall (2007) indicated that non-responsive patients showed more response to live patient-preferred music than to
recorded music. There was found to be no significant difference in terms of respiration rate or heart rate.

In *Effectiveness of Music Therapy Procedures: Documentation of Research and Clinical Practices*, Krout (2000) summarized the other patient needs which can be addressed by music therapy including pain, anxiety, anticipatory grief, spiritual needs, depression, ineffective coping, ineffective communication, agitation, altered thought processes, isolation, ineffective breathing, and altered sleep patterns. Hilliard (2005a) summarizes the research documenting the effectiveness of music therapy in meeting the above mentioned needs of the hospice patient. Starr (1999) provides case examples of how music therapy addressed the needs of hospice patients at a hospice in New York City. Cardozo (2004) describes the use of music in a medical setting, listing its benefits in providing distraction from pain and aiding in relaxation. She specifically cites the importance of patient preference in music. One of the most important needs a patient with a terminal illness has is maintaining quality of life in the midst of progression of the disease. The emotional and spiritual needs as well as coping challenges of the patient’s family, friends and caregivers can also be addressed through music therapy.

Krout (2001) found that one session of music therapy was effective in increasing both the observed and self-reported levels of hospice patients’ pain control. His study also showed that physical comfort and relaxation could be increased with a single session of music therapy. Curtis (1986) examined patients’ self-report on pain relief, physical comfort, contentment and relaxation after receiving no intervention, listening to a recording of hospital sounds, or listening to patient preferred music. The results of the study indicated no statistical significance for the study variables, but the author stated that individual responses indicated the music therapy may have had some positive effect. Also to be noted is the fact that only nine people participated in the study. Magill-Levreault (1993) found that music therapy served as a distraction from pain in those with terminal illnesses and increased feelings of internal control.

Music therapy has also been shown to reduce the patient’s anxiety and agitation. Gross and Swartz (1982) found that patients with chronic health conditions who participated in music therapy experienced a significant reduction in anxiety as compared to the control group. Calovini’s (1993) master’s thesis examined the effects of music
therapy on state anxiety in hospice patients. The study found no statistical significance in pre and post test scores on anxiety after a single session of music therapy. The author recommended further study using an anxiety assessment tool designed specifically for those with terminal illnesses. Hilliard’s (2005) pilot study found patients who received music therapy had statistically significantly lower ratings of pain, reported reductions in anxiety and an increase in mood. Horne-Thompson and Groke (2008) demonstrated that a single session of music therapy was effective in reducing self-reported anxiety in patients with terminal illnesses as compared with a control group.

Anxiety and agitation in hospice patients can be caused by physical or emotional factors. Pain, shortness of breath, and what has been called “terminal restlessness” can all be present in hospice patients. As people near the end of their lives, patients may moan or thrash and breathing may become labored. This can be very traumatic for family and friends who are present. While medications can ease these symptoms, integrative therapies can have an immediate effect while the pharmacological interventions begin to work (Hilliard, 2005b). Music therapy can also provide comfort for family who are witnessing the end of a loved one’s life. Okamoto’s 2005 research indicated that mean scores on a quality of life index were higher for those patients in the experimental group. Results on a survey of terminal patients’ family members across the categories of grief, coping strategies, spirituality, satisfaction with hospice services, and perception of the patient’s quality of life showed that the subjects receiving music therapy scored higher than those in the control group. Hilliard (2006) examined the effects of various approaches to music therapy on the caregiver burden and team building of professional hospice caregivers. He found that both structured music therapy activities and a more freely organized approach to music therapy used with professional hospice caregivers was effective in increasing team building, but had no significant effect on compassion fatigue.

Music therapy has been shown to effectively address the emotional and spiritual needs of hospice patients and their families. Dudley, Smith, & Millison (1995) report that assessing the spiritual needs is the responsibility of every member of the hospice interdisciplinary team. West (1994) described using music therapy to address the tasks of dying, grief issues and spiritual needs. Hilliard (2001) presented four case studies
detailing the ways music therapy can address the multifaceted needs of families and hospice patients as they near the end of life. Wlodarczyk’s (2003) master’s thesis described how the author instructed patients to fill out a spiritual well-being questionnaire with subjects serving as their own control. Cognitive-behavioral music therapy was provided and results indicated that patients rated their spiritual well-being significantly higher during the music therapy treatment as compared to no intervention. Clements-Cortès (2004) shared case study examples of how terminal patients were effective in meeting their goals of decreasing symptoms of depression and social isolation, increasing communication and self-expression, stimulating reminiscence and life review and enhancing relaxation through the use of music therapy. Techniques used by the researcher were also provided. Nguyen’s 2003 master’s thesis found that song writing music therapy interventions used with hospice patients in a hospital setting resulted in lower anxiety scores on an evaluation for the experimental group as compared with a control group and a 97% satisfaction of music therapy.

The Effect of Music Therapy on Length of Life

Hilliard (2003) studied the effects of music therapy on the quality of life and length of life of patients with terminal cancer. He divided a total of 80 patients into a control and experimental group, with the experimental group receiving up to two sessions of music therapy. Hilliard found that quality of life was rated higher among those patients in the experimental group and quality of life ratings increased the more music therapy sessions the patients had. This study found there was no significant difference between groups in terms of length of life.

Hilliard (2004) performed a post-hoc analysis of nursing home residents who had received hospice care, examining length of life after the last music therapy session as compared with the last social work visit, as well as the number of sessions and total time spent by nurses, social workers, and music therapists directly working with patients. His results indicated that at this particular hospice, patients received more music therapy visits than social work visits, and that music therapists spent more direct time with patients than did social workers. Females were shown to live longer than males in this
study and there was no significant difference in the time of death related to last visit from the music therapist or the social worker. Patients receiving music therapy services lived significantly longer than those patients in the control group.

Music Therapy During the Removal of Mechanical Ventilation

To this author’s knowledge, no studies exist examining the effects of music therapy on the extubation process. There have been a few studies examining the effects of music therapy on patients receiving mechanical ventilation, but these studies were primarily conducted by nursing staff and not by board-certified music therapists.

Besel’s (2006) thesis examined the effects of music listening on mechanically ventilated patients. Her study looked at the comfort, pain, anxiety, heart rate, respiratory rate, and systolic and diastolic blood pressure. Her results showed that although music did not result in significantly improved comfort scores, the music condition was positive. There was also no significance between the experimental and control groups on anxiety or pain. There was also no significance in heart rate, respiratory rate or the blood pressure readings between the control and experimental groups. Besel’s study only included 5 people, and as such, the results of her study are not generalizable.

Chlan, Tracy, Nelson, and Walker’s 2001 pilot study examined the effects of patient selected music therapy on the anxiety levels, heart rate, respiratory rate, and blood pressure of five patients on mechanical ventilation. However, due to missing data the physiological measures were not able to be interpreted. The authors speculate that using music for patients receiving ventilatory support would be an effective intervention and a subject for future studies.

Lusk and Lash (2005) listed music therapy as one intervention for addressing the additional stress patients on ventilators can experience. Chlan, Engeland, Anthony, and Guttormson’s (2007) pilot study examined the effects of music listening on four biomarkers of stress, corticotropin, cortisol, epinephrine and norepinephrine, in patients on mechanical ventilation. They found that the levels of stress hormones did not differ significantly between patients who listened to music and those who did not. However,
their study was limited in the number of patients included and the authors stipulated that more research was needed. Lee, Chung, Chan & Chan (2004) found that patients who listened to music for 30 minutes while on mechanical ventilation showed greater physical relaxation and an increase in comfort behaviors.

Almerud and Petersson (2003) found that patients temporarily on mechanical ventilation in an ICU who listened to music demonstrated a decrease in systolic and diastolic blood pressure during the music and that there was a rise in both measures following cessation of music listening. Heart rate also decreased during music, but the change was not statistically significant. The researchers interviewed the subjects later and found that none of the patients reported remembering listening to music, possibly due to the fact that music was played during night sleep. In a 2001 study of Chinese patients receiving mechanical ventilation, Wong, Lopez-Nahas, and Molassiotis found that music listening was more effective in decreasing state anxiety than an equal period of uninterrupted rest. Blood pressure and respiratory rate showed no difference over the course of the experimental period, but showed a significant difference at the end of the intervention with music therapy resulting in lower blood pressure and decreased respiratory rate as compared to the control group.

Phillips’ 2007 unpublished master’s thesis examined the effect of entrainment on the respiration of patients in the ICU receiving mechanical ventilation. Entrainment is the matching of live music to the rhythm of the patient’s breathing. In this study, music therapy was performed during the breathing test phase of the process of weaning subjects off the ventilator. Results showed a decrease in the rapid shallow breathing index for the experimental group and a decrease in oxygen saturation rates for cardiac patients. These results were statistically significant.
CHAPTER 2

METHOD

Subjects

All of the subjects (N=20) were selected from the medical records of previously expired patients who had been extubated under the care of Hospice of Palm Beach County, Inc. in Palm Beach County, Florida. These patients were admitted to Hospice of Palm Beach County before they were extubated, meaning that they were certified by two physicians as meeting the criteria for end of life care and were additionally recommended for removal of mechanical ventilation by the medical staff in charge of their care. The subjects who underwent terminal removal of mechanical ventilation were divided into a control group and an experimental group with patients who experienced music therapy during the process of extubation.

The subjects in both groups ranged from age 48 to 88 years. In the control group, there were six males and four females. The experimental group consisted of seven males and three females. The racial demographics of the subjects used were: 13 were Caucasian, four were African American, two subjects were Asian and one was of Hispanic decent. The control group consisted of seven Caucasians, one African American patient, one subject who was Hispanic, and one Asian patient. The experimental group consisted of six Caucasian patients, three African patients and one Asian patient.

The most common diagnosis for all of the patients in this study was Chronic Obstructive Pulmonary Disease (COPD) including Acute and Chronic Respiratory Failure and Obstructive Chronic Bronchitis with Acute Exacerbation (N=5). Two subjects had each of the following diagnoses: Intra-cerebral Hemorrhage, Anoxic Brain Damage, End Stage Renal Failure and Cerebral Thrombosis. Other patients included in this study had the following diagnoses: Cancer of the Bladder, Cardiomyopathy, Cerebral Aneurysm, Colon Cancer, Debility and Congestive Heart Failure. Two subjects had the most frequent secondary diagnosis which was Intracerebral Hemorrhage. Other
secondary diagnoses included Cancer of the Gallbladder, Encephalopathy, Subdural Hemorrhage, Systemic Inflammatory Response Syndrome (SIRS), Amyloid Sarcoidosis (ALS), Pneumonitis Due to Inhalation of Food or Vomitus and Anoxic Brain Damage. The demographic information for the subjects included in this study is included in Table 1.

Table 1 Subject Demographics

<table>
<thead>
<tr>
<th>Experimental/Control</th>
<th>Gender</th>
<th>Age</th>
<th>Race</th>
<th>Primary Diagnosis</th>
<th>Secondary Diagnosis, if any</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control #1</td>
<td>Male</td>
<td>72</td>
<td>Caucasian</td>
<td>Intra-cerebral Hemorrhage</td>
<td></td>
</tr>
<tr>
<td>Control #2</td>
<td>Female</td>
<td>58</td>
<td>African American</td>
<td>Anoxic Brain Damage</td>
<td></td>
</tr>
<tr>
<td>Control #3</td>
<td>Male</td>
<td>74</td>
<td>Caucasian</td>
<td>End Stage Renal Failure</td>
<td></td>
</tr>
<tr>
<td>Control #4</td>
<td>Male</td>
<td>76</td>
<td>Caucasian</td>
<td>Intra-cerebral Hemorrhage</td>
<td></td>
</tr>
<tr>
<td>Control #5</td>
<td>Male</td>
<td>84</td>
<td>Caucasian</td>
<td>Cerebral Thrombosis with Cerebral Infarction</td>
<td></td>
</tr>
<tr>
<td>Control #6</td>
<td>Female</td>
<td>61</td>
<td>Caucasian</td>
<td>Cardiomyopathy</td>
<td></td>
</tr>
<tr>
<td>Control #7</td>
<td>Male</td>
<td>82</td>
<td>Caucasian</td>
<td>Cerebral Aneurysm Nonruptured</td>
<td>Subdural Hemorrhage</td>
</tr>
<tr>
<td>Control #8</td>
<td>Male</td>
<td>67</td>
<td>Asian</td>
<td>Debility Unspecified</td>
<td>SIRS</td>
</tr>
<tr>
<td>Control #9</td>
<td>Female</td>
<td>86</td>
<td>Caucasian</td>
<td>Chronic Heart Failure</td>
<td>Intracerebral Hemorrhage</td>
</tr>
<tr>
<td>Control #10</td>
<td>Female</td>
<td>57</td>
<td>Hispanic</td>
<td>Other Malignant Neoplasm Involving Intra-Abdominal Lymph Nodes</td>
<td>Anoxic Brain Damage</td>
</tr>
<tr>
<td>Experimental #1</td>
<td>Female</td>
<td>69</td>
<td>Asian</td>
<td>COPD</td>
<td></td>
</tr>
<tr>
<td>Experimental #2</td>
<td>Male</td>
<td>48</td>
<td>Caucasian</td>
<td>Malignant Neoplasm of Bladder, Part Unspecified</td>
<td>Malignant Neoplasm of Gallbladder</td>
</tr>
<tr>
<td>Experimental #3</td>
<td>Male</td>
<td>59</td>
<td>African American</td>
<td>End Stage Renal Failure</td>
<td></td>
</tr>
</tbody>
</table>
The patients in this study were given a variety of medications before, during and after extubation. Additionally, the doctors in charge of their care wrote orders for other procedures such as suctioning, the discontinuation of other medications or laboratory tests, and the discontinuation or administration of oxygen. The subjects in both groups had from four to 19 separate orders written for them. The number of orders in the control group ranged from five to 19 orders. The number of orders in the experimental group ranged from five to 13 orders. The number of medicines ordered and given for both groups ranged from two medications to 15 medications. The control group received from two to 15 medications and the subjects in the experimental group took from two to nine separate medications. The data for the orders and medications given are included in Appendix A. Data were collected on length of life of patients was measured in minutes. Time for the length of life started at time of extubation and ended at the time of death.
Patients in the control group lived from eight to 493 minutes following removal of life mechanical ventilation. Patients in the experimental group lived from 10 to 29470 minutes after extubation. Data for the length of life after terminal extubation are shown for each patient in Appendix A.

**Design and Music Therapy Interventions**

This study was a post-hoc analysis with a control and an experimental group. The independent variable was the music therapy intervention. Music therapy was performed by several music therapists employed at Hospice of Palm Beach County, Inc. The music therapy interventions could have included the use of any of the following for the patient or their family members or loved ones: live, patient preferred music; entrainment; the isorhythmic principle; active listening; and/or emotional support and counseling. The dependent variable was length of life after removal of mechanical ventilation measured in minutes. The null hypothesis stated that there would be no significant difference between the length of life after extubation between the control group and the experimental group. The alternative hypothesis suggested that there would be a significant difference between the length of life post extubation between the control group and the experimental group. An alpha level of .05 was established a priori.
CHAPTER 3

RESULTS

To quantify the data, a series of averages were calculated. Both groups together had an average age of 70.2 years. The mean age of the experimental group was 69.6 years and the mean age of the control group was 71.7 years. The patients in this study had an average of 8.3 orders written for them with the patients in the control group receiving 8.7 orders and the patients in the experimental group having 7.9 orders. The patients were given an average of 5.95 different medications with the patients in the control group receiving an average of 6 medications and the experimental group taking an average of 5.9 average medications. The mean length of life after removal of mechanical ventilation was 1722 minutes with the patients in the control group living an average of 85.1 minutes and the experimental group living 3358.9 minutes after extubation.

Next, a series of Mann-Whitney U tests were calculated by the author. Statistical analysis was first performed to test whether the subjects in the control and the experimental groups came from the same population. Analysis was calculated by Mann-Whitney U between the two groups in terms of age. Critical value for a two-tailed test at an alpha level set at .05 a priori with n=10 in both groups was 23. The obtained value was 44.5. As the obtained value was greater than the critical value, the author failed to reject the null hypothesis, meaning that there was no significant difference between the control group and the experimental group in terms of age.

Analysis by Mann-Whitney test was performed to determine whether each of the groups were equal in terms of number of orders. The critical U value for a two-tailed test with n=10 in both groups and a .05 level of significance was 23. The obtained U value for the numbers of orders was calculated to be 42. As the obtained U value 42 was greater than the critical value of 23, the null hypothesis was failed to be rejected. No significance was found between the control group and the experimental group on number of orders. Therefore, both groups came from the same population.
No statistical significance was found by t-test analysis between the two groups in terms of numbers of medications each patient was given. The critical value was 23 for groups with n=10 at an alpha level of .05 selected a priori. The obtained U value was calculated to be 41.5, which was greater than the critical value therefore resulting in the failure to reject the null hypothesis. In terms of number of medications, the control group and the experimental group came from the same population.

In terms of length of life after extubation, analysis by Mann-Whitney test showed that there was again no significant difference between the control group and the experimental group. Critical value was calculated to be 23 and the obtained t value was found to be 32.8. Analysis by Mann-Whitney U indicated that the differences between the control and experimental group in terms of length of life after extubation were not statistically significant.
CHAPTER 4

DISCUSSION

The lack of statistical difference between the control group and the experimental group in terms of age, number of orders and number of medications indicates that the subjects in this study come from the same population. Though the difference in the length of life between the control group and the experimental group was not statistically significant, comparing the calculated means (85.1 minutes in the control group and 3358.9 minutes in the experimental group) shows that music therapy did have an effect on the length of life of patients following removal of mechanical ventilation. Patients experiencing music therapy during extubation lived longer than the patients in the control group. These results show some consistency with Hilliard’s 2004 study. The lack of statistical significance could have been due to the small size of the sample. A larger group of subjects might result in statistical significance.

The desired outcome of this study is not clear. Would it be better for patients to live longer after extubation or die more quickly? On the one hand, patients who live longer will have more time with their families. Since hospice staff is committed to maintaining the proper amounts of medication to keep patients free of pain after removal of mechanical ventilation, patients may not suffer by living longer after extubation. The decision to remove life support is a difficult one for family members and loved ones, and having the patient live longer may ease some of the mental suffering caused by deciding to terminate mechanical ventilation.

However, it may not be desirable for patients to live longer after extubation. In hospice, terminal extubations are performed with the expectation that the patient will die peacefully within a short amount of time after mechanical ventilation is removed. Having the patient linger might create logistical and emotional complications for family members who may have traveled from out of town to say goodbye to their loved ones, or might have taken time off from work to stay by the bedside during the death vigil. The waiting period while the hospice patient declines and eventually dies can be emotionally draining on families and friends and extending this period may be detrimental. Even
though imminent patients are given medications to control pain, no one knows exactly what a patient goes through once they become non-responsive and there may be a chance that the patient may suffer by living longer after extubation.

Since the results of this study seem to suggest that music therapy may result in patients living longer, one must speculate as to what about this treatment process leads to this possible result. As the body naturally begins to shut down following extubation, breathing becomes uneven which may be stressful for the patient. One of the documented results of music therapy research with patients who are minimally responsive is that breathing becomes more stabilized. Perhaps the music therapy calms the patient after extubation resulting less stress for the patient and they then stay alive longer. Another documented result of music therapy with hospice patients is that the patients report an increase in their perceived quality of life. Perhaps this is true for the patients experiencing music therapy during extubation: the quality of life may improve with the music therapy and so the patient may live longer following removal of mechanical ventilation. Music therapy also addresses the spiritual needs of the patient during extubation and seeks to increase feelings of spiritual support. Perhaps patient makes a decision to continue to live once they feel spiritually supported. There may be many reasons why patients appear to live longer when they experience music therapy during extubation.

Considering the dearth of research on the subject of music therapy during extubation, there is an obvious need for additional exploration of this topic. Future studies may further define the effects, if any, of music therapy on the process of the removal of mechanical ventilation. Additional studies will need to focus on other physical effects of music therapy during extubation, such as whether music therapy reduces pain or discomfort during extubation, slows breathing, or increases oxygen saturation. Other research could examine whether there are measurable effects of music therapy on the experience of family members and friends. Perhaps music therapy eases the grief process for loved ones experiencing the removal of mechanical ventilation of their family member or increases the feeling spiritual support, or creates a feel of a ritual honoring the patient rather than the simple removing of tubes and machines.
Table 2 Orders and Medications

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Table 3 Length of Life Following Extubation

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REFERENCES


BIOGRAPHICAL SKETCH

Name: Shashanna Hummer Orellano
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