Music interventions during end-of-life care
C L Nightingale1, N M Cranley1, E L Kacel1, S S Wong1, D B Pereira1, G Carnaby1

Abstract
Introduction
Music interventions have been identified as a burgeoning area of integrative medicine services to promote quality of life and reduce suffering. The purpose of this review is to explore the impact of music interventions on quality of life and its reported physiological and clinical outcomes in patients and informal caregivers during end-of-life care.

Materials and methods
A literature search was conducted for eligible studies that (a) tested a music intervention, (b) focused on terminally ill patients receiving end-of-life care or informal caregivers of terminally ill patients, (c) measured quality of life or some aspect of quality of life (i.e., psychological, physical, social, spiritual) or a physiological or clinical outcome, (d) were accessible in full text, (e) peer reviewed, (f) used a quantitative design, and (g) were published in English from years 2000 – 2014. Data were abstracted from studies that met these eligibility criteria.

Results
Studies (N = 7) demonstrated heterogeneity across study design, patient diagnosis, intervention characteristics, and outcomes assessed. Studies noted a positive effect of music interventions from pre-intervention to post-intervention or when comparing the intervention and control groups in pain, anxiety, fatigue, tiredness and drowsiness, mood, and overall quality of life.

Conclusion
Our findings suggest a positive effect of music interventions on various aspects of quality of life during end-of-life care. Given the paucity of music intervention studies during end-of-life care, more research is needed in this population to confirm its value in supporting quality of life for this unique group. In addition, more research should explore the positive benefit on informal caregivers of terminally ill patients.

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Introduction
End-of-life care refers to the care of patients with a terminal illness that has become advanced, progressive, and incurable. Due to significant distress and poor quality of life in patients during end-of-life care1,2, medical testing and treatment often stop, and supportive care services, such as palliative care, are implemented to support overall quality of life and reduce physical and psychosocial suffering3-4. Healthcare costs during the last year of life account for approximately 27%, or $88 billion, of the total US healthcare budget5-6.

Consequently, an ongoing challenge in palliative care is identifying cost-effective, supportive care services that can translate into practical applications for end-of-life services. As such, the integration of music activities in palliative care is a burgeoning area of research that may provide a clinically and cost effective complement to existing supportive services at end-of-life. Substantial literature has shown that music in general can be therapeutic for patients undergoing end-of-life care2. Specifically, music has been found to reduce emotional and physiological pain9, induce relaxation9, provide spiritual support10, and increase distress tolerance11, feelings of belongingness, closeness, and acceptance12.

Implementation strategies for musical interventions vary within the medical field. For example, certified music therapists may facilitate interventions by tailoring approaches based on each client’s therapeutic and clinical needs. In contrast, some music-based interventions offer a less tailored approach and may be implemented by a clinical researcher, medical or healthcare personnel. Likewise, studies evaluating each approach have demonstrated mixed findings.

Several authors have synthesized the music intervention literature in an attempt to draw broader conclusions regarding its efficacy. For example, Nightingale et al.13 conducted a meta-analysis and systematic review on the impact of music interventions on anxiety among adult cancer patients. Although the narrative review indicated there was a positive effect on anxiety, the associated meta-analytic analyses did not corroborate this finding. Similarly, Archie et al.14 reviewed music interventions in palliative cancer care and reported that these interventions may have a positive effect on a variety of psychosocial and physical outcomes.

Bradt and Dileo15 conducted a review on music therapy during end-of-life care and found a lack of evidence in the mitigation of pain or anxiety. However, the review excluded studies that did not utilize a therapeutic approach facilitated by a trained music therapist. In addition, the review was also limited to randomized controlled trials, only15. In this paper, the aim is to review the impact of all music interventions independent on study design on quality of life and physiological and clinical outcomes in patients and informal caregivers during end-of-life care.

Materials and methods
Articles were searched using PubMed, PsycINFO, Web of Science, and CINAHL. Keywords included “music therapy”, “music intervention”, “end-of-life”, “palliative”, and “hospice.” Articles meeting the following inclusion criteria were selected: (a) tested a music intervention, (b) focused on terminal

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patients receiving end-of-life care or informal caregivers of these patients, (c) measured quality of life or some aspect of quality of life (i.e., psychological, physical, social, spiritual) or a physiological or clinical outcome (d) were accessible in full text. The following criteria were used to exclude studies: (a) not peer reviewed (b) used a qualitative design, (c) not published in English, and (d) published prior to the year 2000. Studies published prior to 2000 were excluded in an effort to provide the most current state of evidence for the impact of music interventions on physiological, clinical, and patient-reported outcomes.

Data were systematically abstracted from all articles by two authors (CN) using an evidence table. Data recorded included authors and publication year, sample size, participant type (i.e., patient or caregiver), and participant characteristics such as age, diagnosis and medical treatment type. Study details were also recorded such as design, the intervention and control activities, intervention facilitator, intervention duration and frequency, outcome(s) assessed and study results.

Results
A total of 7 studies met eligibility criteria and were included in this review. Reasons for not meeting eligibility criteria varied, although the most commonly noted reason included having a broad focus on palliative care patients in general, and not necessarily end-of-life patients, specifically.

Characteristics of Study Samples
Studies were conducted between 2001 and 2013. Sample sizes ranged from 10 to 200. Six studies focused on patients16,17,18,19,20,21, although two of these studies19,20,21 allowed family members to participate in the intervention activities. One study focused solely on caregivers22. Age was not reported in a consistent fashion across studies; however, for studies that reported mean age16,18,20,21, values ranged from 56 - 76 years of age. Participants were heterogeneous across studies with respect to diagnoses that qualified them for end-of-life care. However, of the four studies that reported diagnosis, patients with cancer were included in each sample16,17,18,19. See table 1 for characteristics of study samples.

Study Design
Three studies reported a randomized controlled trial design (see Table 2)16,17,18. Three additional studies used a pretest-posttest design19,20,22. Although two of these studies did not state their study design19,20, their design was determined during the data abstraction process for this review. Of these pretest-posttest design studies, only one included a control group22. The remaining study utilized an ABAB design, which used participants as their own controls21.

Intervention Facilitator
Interventions varied in regards to the use of a facilitator. A music therapist facilitated the majority of the interventions administered16,17,18,19. Wlodarczyk21 reported that the study researcher facilitated the music intervention in their study. One study did not report the intervention facilitator22. The facilitator for the remaining study was not clearly described, although the authors, reported that three therapists and two nurses were “present” during intervention delivery20 (p.164).

Intervention Activities
A variety of different activities were utilized as study interventions. The majority of the studies tailored intervention activities to participants’ preferences and needs17,18,19,21, only one study included multiple intervention conditions22. The level of subject participation in music activities ranged both within and across studies. For example, one of the conditions in Choi’s22 study included music listening only. In contrast, several studies incorporated more active music participation such as writing songs, singing, playing instruments, song discussion and lyric analysis17,18,19,20,21.

Some studies supplemented activities using non-musical techniques. One of the conditions in Choi’s22 study included progressive muscle relaxation in addition to music listening. Similarly, other studies included relaxation and imagery/visualization techniques16,18,19. In some cases, music was combined with additional activities such as counseling17,18, reminiscence or life review17,18,21, planning funerals or memorial services17, dedicating song gifts17,21, and music for prayer or worship21.

Control Group Activities
Control group activities included sitting in silence22, relaxation16, routine or standard care17, conversation and/or emotional support18, and conversation only21. Interestingly, Horne-Thompson and Grocke18 reported that control group participants received music therapy services outside of their study. Lastly, two studies did not include a control group19,20.

Outcomes Assessed
All studies assessed outcomes that pertained to various domains of quality of life. In addition, Nakayama et al.20 assessed cortisol, Horne-Thompson and Grocke18 assessed heart rate, and Hilliard17 assessed length of life during hospice care. Psychological constructs included anxiety18,22, depression18,19, and mood20. Physical outcomes included; fatigue22, drowsiness, tiredness18, aspects of pain16,18,19, nausea, appetite, shortness of breath18, physical status relative to palliative care17, physical comfort and relaxation19. Two studies measured quality of life as a broad construct17,22, and one study also assessed it by domain (i.e., functional, psychophysiological, and social/spiritual)17. Only one study assessed “well-being” as an outcome18.

Study Findings
The majority of studies reported a significant improvement in outcomes from pre-intervention to post-intervention16,17,18,19,20,22.
Critical review

Competing interests: None declared.
Conflict of interests: None declared.

All authors contributed to conception and design, manuscript preparation, read and approved the final manuscript. All authors abide by the Association for Medical Ethics (AME) ethical rules of disclosure.

Among these studies, significant improvements were noted in anxiety\(^{22}\), fatigue\(^{22}\), tiredness and drowsiness\(^{18}\), pain\(^{18}\), pain intensity\(^{16}\), pain control\(^{19}\), mood-related "refreshment"\(^{20}\), and overall quality of life\(^{17,22}\). Interestingly, anxiety, fatigue, quality of life\(^{22}\), and pain intensity\(^{16}\) significantly improved in control conditions as well. Additional findings included a significant reduction in cortisol output from pre-intervention to post-intervention for 60% of participants in Nakayama et al.'s\(^{20}\) study and a positive trend toward optimal spiritual well-being during music days for participants in Wlodarczyk’s\(^{21}\) study.

When focusing specifically on the five studies that compared a music intervention group with a control group\(^{16,17,18,21,22}\), the studies utilizing an RCT design (n = 3) noted at least one significantly better outcome in the intervention group\(^{16,17,18}\). Specifically, Gutgsell et al.\(^{16}\) noted a significantly greater reduction in pain intensity for

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### Table 1: Study Demographics

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Sample size</th>
<th>Patients/Caregivers</th>
<th>Age</th>
<th>Diagnosis</th>
<th>Medical Treatment type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choi(^{22})</td>
<td>N = 32</td>
<td>Caregivers (spouse = 20; adult child = 12)</td>
<td>45-54 (n = 1); 55-64 (n = 5); 65-74 (n = 14); 75-84 (% = 4); 85-94 (% = 8)</td>
<td>Patient diagnosis not reported</td>
<td>Patients were receiving hospice care</td>
</tr>
<tr>
<td>Gutgsell et al.(^{16})</td>
<td>N = 200 (intervention group n = 100; control group n = 100)</td>
<td>Patients</td>
<td>Overall mean = 56.09, SD = 15.08; Intervention group mean = 57.45, SD = 14.76</td>
<td>Cancer, Non-cancer</td>
<td>Not provided</td>
</tr>
<tr>
<td>Hilliard(^{17})</td>
<td>N = 80 (intervention group n = 40; control group n = 40)</td>
<td>Patients</td>
<td>Participants were evenly divided in each intervention group by age category (under 65 or over 65)</td>
<td>Terminal cancer</td>
<td>Residential hospice care</td>
</tr>
<tr>
<td>Horne-Thompson &amp; Grocke(^{18})</td>
<td>N = 25 (intervention group n = 13; control group n = 12)</td>
<td>Patients</td>
<td>Overall mean = 73.9; Intervention mean = 76.2; Control mean = 71.4</td>
<td>Cancer, end-stage organ failure</td>
<td>Not reported</td>
</tr>
<tr>
<td>Krout(^{19})</td>
<td>N = 80</td>
<td>Patients &amp; family members</td>
<td>Range = 38-97</td>
<td>Cancer, renal failure, encephalopathy, dementia, AIDS, coronary obstructive pulmonary disease, cardiovascular accidents, congestive heart failure, and others.</td>
<td>Not reported</td>
</tr>
<tr>
<td>Nakayama, Kikuta, &amp; Takeda(^{20})</td>
<td>N = 10</td>
<td>Patients</td>
<td>Mean = 73.10</td>
<td>Not reported</td>
<td>Not reported</td>
</tr>
<tr>
<td>Wlodarczyk(^{21})</td>
<td>N = 10</td>
<td>Patients &amp; family members</td>
<td>Mean = 67.6</td>
<td>Cancer, renal failure, AIDS, amyotrophic lateral sclerosis, cardiomyopathy, congestive heart failure</td>
<td>Not reported</td>
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</table>

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participants in the music intervention group compared to control group participants. In addition, music intervention participants demonstrated significantly decreased functional pain scores whereas the control group did not. Hilliard reported significantly higher quality of life scores for music intervention participants in comparison to control group participants. Lastly, Horne-Thompson and Grocke found significantly less anxiety in the music intervention group in comparison to the control group. Moreover, authors reported a significant decrease in pain, tiredness, and drowsiness for music intervention participants only.

Among the two studies that did not utilize a control group, significant improvements in scores were noted in at least one outcome from pretest to posttest scores. Krout reported a significant increase in pain control, physical comfort, and relaxation. In addition, Nakayama et al. reported a significant increase in “refreshment” from pre-test to post-test scores.

**Discussion**

The authors have referenced some of their own studies in this review. These referenced studies have been conducted in accordance with the Declaration of Helsinki (1964) and the protocols of these studies have been approved by the relevant ethics committees related to the institution in which they were performed. All human subjects, in these referenced studies, gave informed consent to participate in these studies.

Both terminally ill patients and their caregivers are affected by the nature of care received during end-of-life. Confronting a life threatening illness as a patient or caregiver imposes a complex mix of psychological, spiritual, and physical challenges, which may not be fully addressed by conventional standards of care.

Findings from this review indicate that research into the impact of music therapy has suggested that simple, cost-effective practices with few side effects may have an important impact on reducing physical and psychosocial distress in patients and caregivers in palliative care settings. In this regard, several studies have found that music interventions can improve quality of life and reduce symptoms such as pain and anxiety, which may be especially salient for patients in the advanced stages of disease.

This review has evaluated the impact of all types of music interventions during end-of-life care on quality of life and physiological and clinical outcomes. The studies included in this review highlight the diverse ways in which music therapy has been investigated in terminally ill populations. The included studies, while all demonstrating significant outcomes, were highly heterogeneous, creating challenges for clinicians and researchers attempting to synthesize conclusions about the effectiveness of music therapy. The designs used ranged across studies (e.g., RCT’s, pre-test-post-test). In addition, there are also great differences in the type of interventionist who facilitated the music therapy.

Typically, a music therapist was responsible for conducting the intervention, but some studies employed their own researchers as well as other types of therapists and nurses. For those studies that focused on music therapists, future research might include descriptions of participating therapist training or special certifications for working with medical and/or palliative care patients. This would be beneficial to determine if characteristics of the interventionist might play a role in the outcome of the intervention. Another variable, which differed across the studies included in this review, was the actual content of the intervention.

Although some studies included detailed descriptions of the procedures used in their respective interventions, many studies tailored the interventions to the preferences and needs of individual patients. Additionally, the range of outcomes explored in the included studies was vast. Some studies focused on physiological outcomes such as heart rate and length of life while others focused on psychosocial outcomes such as anxiety and mood. While the diverse design and implementation of these music interventions reduces comparisons between studies, it does create a rapidly growing and rich research base for continued explorations of music therapy applications. Future research that compares different protocols and facilitator types may clarify the mechanisms by which music therapy may help to reduce physical and psychosocial burden in dying patients and their caregivers.

The diversity of participants, both within and between studies, hinders the ability to compare effects of music interventions for specific populations. While the included studies highlight the experiences of cancer patients, studies in this review also included individuals with other advanced conditions (e.g., AIDS, congestive heart failure).

Unfortunately, the studies typically did not evaluate the effects of the interventions according to disease type or cancer type. Furthermore, many of these studies did not explore if the different types of treatments or symptoms experienced by patients with different diseases resulted in different levels of receptiveness or effectiveness of music therapies. Similarly, the studies included in this review had a limited age range of age 56 to 76.

As with disease type, perhaps the impact of music interventions is affected by patients’ age. Thus, future research should further explore the way patients of diverse ages respond to music interventions. Moreover, only one study evaluated the impact of music therapy on informal caregivers, which prevented comparative analyses of the efficacy of music interventions applied to patients versus caregivers.
### Table 2: Study Details and Results

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Study Design</th>
<th>Intervention Activity</th>
<th>Control Activity</th>
<th>Outcomes</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choi (22)</td>
<td>Pretest-posttest</td>
<td>Intervention included three different groups: music listening only, progressive muscle relaxation only, and music combined with progressive muscle relaxation. Participants listed to &quot;Awakening&quot; by Steven Halpern via a portable compact disc player for the music portion. The intervention facilitator was not stated. Intervention included two 30 min sessions per week for 2 weeks (4 sessions total).</td>
<td>Sit in silence</td>
<td>Anxiety, fatigue, QOL</td>
<td>● Significantly decreased anxiety and fatigue and increased QOL in all conditions across the four treatment sessions. ● No significant differences between conditions. ● QOL mean score differences were the greatest from pretest to posttest in the control group, followed by PMR, music + PMR, and the music group.</td>
</tr>
<tr>
<td>Gutgsell et al. (16)</td>
<td>RCT</td>
<td>Intervention was facilitated by a music therapist. A standard protocol was used for all participants which began with adjusting lights, providing a blanket, assessing comfort level, then introducing optional ocean drum tone. Session starts with verbal instructions for autogenic relaxation, awareness of breath, progressive muscle relaxation, and visualization of a &quot;safe place.&quot; Several musical pieces were played. At the conclusion of the music, the therapist invited the participant to re-enter the room. The therapist then left the room for 20 minutes.</td>
<td>Music therapist assessed comfort, adjusted lights, and provided blanket. Participant was told to relax (without specific instructions that were key to the intervention). The therapist then left the room for 20 minutes.</td>
<td>Pain intensity, behavioral observation of patient’s pain, functional pain</td>
<td>● Significantly decreased pain intensity from pre- to post-intervention in both groups, significantly greater decreased pain intensity in intervention group. ● Significantly decreased pain behavioral observation score in both groups but not significantly greater in intervention group. ● Significantly decreased functional pain scores in intervention group, but not control group.</td>
</tr>
<tr>
<td>Study</td>
<td>Design</td>
<td>Description</td>
<td>QOL</td>
<td>Findings</td>
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</table>
| Hilliard(17)           | RCT    | Intervention was facilitated by a music therapist (certified or intern). Interventions were designed to meet individual participant needs. Most interventions included one or more of the following music activities: song choice, music-prompted reminiscence, singing, live music listening, lyric analysis, instrument playing, song parody, singing with accompaniment using the iso-principle, planning of funerals or memorial services, song gifts, and music-assisted supportive counseling. Music was selected based on participant preference. Intervention included 2-13 sessions, depending on time of participant death. | Routine hospice care including three subscales: functional, psychophysiological, and social/spiritual. Physical status relative to life during hospice care. | ● Intervention group had significantly higher QOL scores after the first session and in comparison to the control group.  
● QOL significantly increased during the first and second session in the control group.  
● No significant differences between groups for well-being and social/spiritual well-being.  
● No significant differences between groups in length of life; however, persons lived an average of 12 days longer in experimental group. |
| Horne-Thompson & Grocke(18) | RCT    | Intervention was facilitated by a music therapist. Intervention varied at the discretion of the participant and music therapist. Options included playing live familiar music, singing, music and relaxation, music and imagery, improvisation, music-assisted counseling, reminiscence, and listening to recorded music. Intervention included a single session, 20 - 40 minutes, depending on the clinical state of the participant. | NA                                                                 | ● Intervention group had significantly less anxiety than the control group.  
● No significant difference in decreased heart rate between groups.  
● Intervention group demonstrated significant decrease in pain, tiredness, and drowsiness. |
| Krout(19)              | Pretest-posttest | Intervention was facilitated by a music therapist. Intervention was individualized to each participant and included song choice, singing, song discussion, songwriting, and relaxation and imagery techniques. Intervention included one session. | NA                                                                 | ● Significant increase in participant pain control, physical comfort and relaxation.                                                                                                                      |
Critical review

Lastly, in this review studies were not excluded on the basis of methodological rigor nor were quality ratings utilized for included studies. However, future studies should aim to consider the quality of the evidence in music intervention during end-of-life care using a systematic review and meta-analytic approaches once the corpus of studies increases.

Conclusion

A growing body of evidence supports the usage of alternative medicine treatments, which address terminally ill patient and caregiver needs from a holistic perspective. Music therapy interventions are one type of intervention that presents increasing evidence for its effectiveness in physiological, psychological, and physical domains, and has the potential to impact countless lives each year touched by life-limiting diseases. The findings of this review suggest a positive effect of music interventions on pain, anxiety, fatigue, tiredness and drowsiness, mood and overall quality of life. As this area of research continues to mature, it will be beneficial to make comparisons among the different types of music interventions to ascertain the most effective approach for terminally ill patients.

References

2. Wright AA, Keating NL, Balboni TA, Matulonis UA, Block SD, Prigerson HG. Place of death: correlations with quality of life of patients with cancer and predictors of bereaved caregivers’

Note. QOL = quality of life; PMR = progressive muscle relaxation; HR = heart rate


