

# The combined effects of cold therapy and music therapy on pain following chest tube removal among patients with cardiac bypass surgery



## A B S T R A C T

### Keywords:

Chest tube  
Pain  
Cryotherapy  
Music therapy

**Background:** Chest tube removal is an extremely painful procedure and patients may not respond well to palliative therapies. This study aimed to examine the effect of cold and music therapy individually, as well as a combination of these interventions on reducing pain following chest tube removal.

**Methods:** A factorial randomized-controlled clinical trial was performed on 180 patients who underwent cardiac surgery. Patients were randomized into four groups of 45. Group A used ice packs for 20 minutes prior to chest tube removal. Group B was assigned to listen to music for a total length of 30 minutes which started 15 minutes prior to chest tube removal. Group C received a combination of both interventions; and Group D received no interventions. Pain intensity was measured in each group every 15 minutes for a total of 3 readings. Analysis of variance, Tukey and Bonferroni post hoc tests, as well as repeated measures ANOVA were employed for data analysis.

**Results:** Cold therapy and combined method intervention effectively reduced the pain caused by chest tube removal ( $P < 0.001$ ). Additionally, there were no statistically significant difference in pain intensity scores between groups at 15 minutes following chest tube removal ( $P = 0.07$ ).

**Conclusion:** Cold and music therapy can be used by nursing staff in clinical practice as a combined approach to provide effective pain control following chest tube removal.

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## 1. Background

In the absence of a standard recommended procedures to manage the associated pain, chest tube removal (CTR) remains a painful procedure for almost all patients [1]. Although this pain is usually treated with administration of analgesics, the resulted adverse effects have led physicians to use variety of non-pharmacological methods [2,3]. Music and cold therapy are common non-pharmacological pain control interventions [4].

Cold therapy is recognized as an efficient intervention in pain control since it slows the nervous stimuli conductance, cellular metabolism, tissue hypoxia and edema [8]. A few studies have examined the effect of cold therapy on CTR pain that mostly have yielded conflicting results [7,8]. While a study by Sauls et al. reported cold alters the pain severity ineffectively [5], another study by Hassanzadeh et al. has shown cold can successfully lessen the severity of CTR pain [6]. Likewise, the effect of music therapy in reducing CTR pain is still in doubt. Broschious et al. believes that music therapy has no effect on CTR associated pain [10]; while Liu suggests listening to music decreases the post-operative pain caused by CTR [9,14]. Therefore, the efficacy of the above interventions on pain control remains controversial.

Although several studies have examined the sedative effect of non-pharmacological interventions in general; and cold therapy and music therapy in particular, only a few have performed a

comparative study between different non-pharmacological therapies. In addition, applying both cold therapy and music therapy together has not examined yet, so that there is no evidence if there is some synergic effect when we apply these two non-pharmacological interventions together. This study aimed to examine the effects of cold and music therapy individually, as well as the effect of a combined therapy on pain control following CTR.

## 2. Materials & methods

### 2.1. Study design and participants

The study population was selected from patients who underwent cardiac surgery at Shahid Madani Hospital, Khorram Abad, Iran and then were admitted to the Cardiac Surgery Intensive Care Unit (CSICU) in 2016. The sample size was determined based on a previous study in which Mazloun et al. [11] investigated the effect of applying an ice pack on the intensity of pain associated with chest tube removal. According to their report, the mean  $\pm$  standard deviation of pain intensity following the intervention in the ice pack group, placebo and control groups were  $2.5 \pm 2.3$ ,  $4.2 \pm 3.2$ , and  $4 \pm 2.7$ , respectively; so that we came up with numbers such as  $\beta = 0.2$ ,  $\alpha = 0.05$ ,  $S1 = 2.3$ ,  $S2 = 2.7$ ,  $\mu1 = 2.5$  and  $\mu2 = 4$  for our study. It was estimated that each group needs

to include 40 patients. However, we recruited 45 patients in each group to compensate for probable attrition.

$$n = \frac{(z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2 (\sigma_1^2 + \sigma_2^2)}{d^2}$$

Patients were selected consecutively and were randomly assigned into the following groups using an eight-member block technique: group A (cold therapy), group B (music therapy), group C (cold and music therapy together), and group D (controls). Fig. 1 shows the study flow diagram. We performed a factorial randomized-controlled clinical trial in which patients were distributed to four groups. The study started in March 2016 and ended in August 2016.

The inclusion criteria consisted of age ranged 18–65 years; having a chest tube for no more than 120 hours and no less than 24 hours; no history of blindness or hearing loss; ability to respond to researcher's questions properly; having no history of mental disorders, use of narcotics, drugs or alcohol; as well as having a body mass index (BMI) of less than 30 kg/m<sup>2</sup>; no use of narcotics and sedative medications at least 1 h prior to CTR, no receive of supportive mechanical ventilation; and being eager to listen to folk and traditional music. The exclusion criteria included demonstration

of pain scored greater than 7, unwillingness to continue to participate, feeling discomfort with use of cold therapy, use of narcotics or sedatives during interventions, and sudden changes in vital signs to a level greater than 20% of baseline.

A two-part questionnaire was prepared. The first part contained 10 variables including age, gender, BMI, educational qualifications, occupation, marital status, type of surgery, history of chronic pain before surgery, history of regular use of painkillers, and placement of a chest tube prior to surgery. The second part of the questionnaire basically included the visual analogue scale (VAS) which measures the pain intensity from the scale of 0 (no pain) to 10 (the most severe pain ever experienced).

## 2.2. Procedures

Patients were provided information regarding cold and music therapy before applying those interventions. The interventions were performed by researchers during morning shift when chest tubes were removed by five experienced nurses in the CSICU using a similar technique. In order to minimize bias, data were collected by a nurse who did not belong to the study research team. Patients were asked to mark pain severity on a scale of 0–10. Before the intervention started, subjects were placed in a semi-fowler position

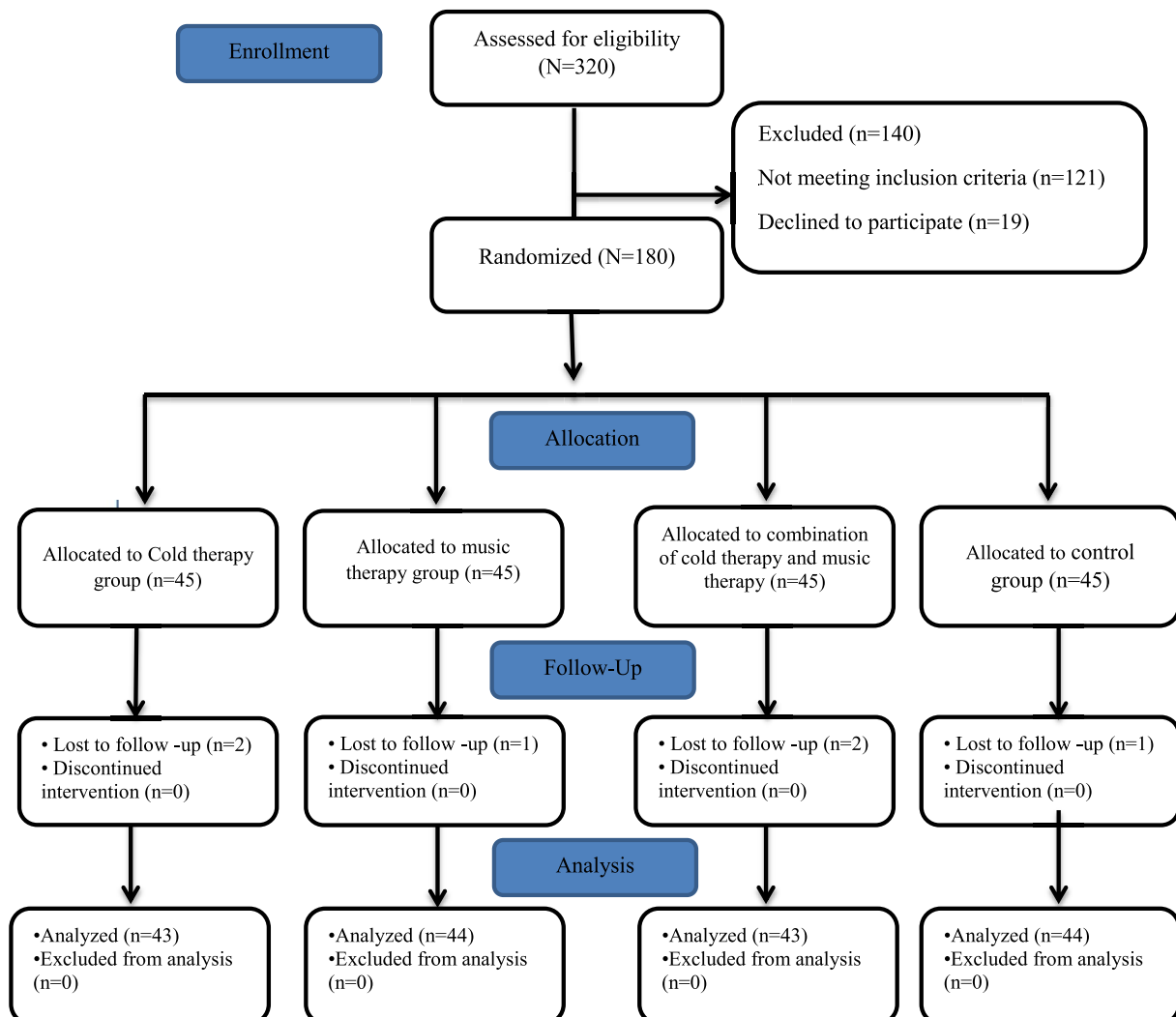


Fig. 1. The study flow diagram.

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