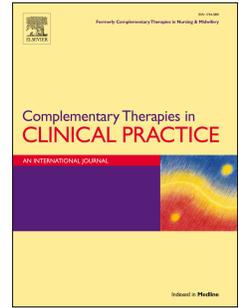


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The effect of guided imagery on anxiety, depression and vital signs in patients on hemodialysis

Yaser Beizae, Nahid Rejeh, Majideh Heravi-Karimooi, Seyed Davood Tadrise, Pauline Griffiths, Mojtaba Vaismoradi



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The effect of guided imagery on anxiety, depression and vital signs in patients on hemodialysis: A quasi-randomized controlled clinical trial

Running title: Guided imagery and hemodialysis

Authors

Yaser Beizae, (MScN, BScN), Graduated student, Shahed University, Department of Nursing, Faculty of Nursing and Midwifery, Tehran. Iran. Email: reje@shahed.ac.ir

Nahid Rejeh*, (PhD, MScN, BScN), Associate Professor, Shahed University, Department of Nursing, Faculty of Nursing and Midwifery, Tehran. Iran. Email: nrejah@yahoo.com

Majideh Heravi-Karimooi, (PhD, MScN, BScN), Associate Professor, Shahed University, Department of Nursing, Faculty of Nursing and Midwifery, Tehran. Iran. Email: majideheravi@yahoo.com

Seyed Davood Tadrisei, (MScN, BScN), Instructor, Faculty of Nursing, Baqiyatallah University of Medical Sciences, Tehran, Iran. Email: sdt1344@gmail.com

Pauline Griffiths (PhD, RN, PGCE, FE), Associate Professor (Honorary), College of Human and Health Sciences, Swansea University, Swansea, UK. Email: paulinemonica@hotmail.co.uk

Mojtaba Vaismoradi, (PhD, MScN, BScN), Full Professor, Faculty of Nursing and Health Sciences, Nord University, Bodø, Norway. Email: mojtaba.vaismoradi@nord.no

***Correspondence:** Nahid Rejeh, Associate Professor, Elderly Care Research Center, Department of Nursing, Faculty of Nursing and Midwifery, Shahed University, Opposite of Holy Shrine of Imam Khomeini-Khalij Fars Expressway, Postal/zip code: 3319118651, Tehran. Iran. Tel: +98 02166418590 Email: reje@shahed.ac.ir

The addresses of the institutions at which the work was carried out: Department of Nursing, Faculty of Nursing and Midwifery, Shahed University, Opposite of Holy Shrine of Imam Khomeini-Khalij Fars Expressway, Postal/zip code: 3319118651, Tehran. Iran. Tel: +98 02166418590

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Conflict of interest

No conflict of interest is declared by the authors.

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Authors' contribution

YB: Substantial contributions to the conception or design of the work, the acquisition, analysis, or interpretation of data for the work, drafting the work or revising it critically for important intellectual content, final approval of the version to be published.

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The effect of guided imagery on anxiety, depression and vital signs in patients on hemodialysis

Abstract

Background and purpose: Patients on hemodialysis experience anxiety and depression. This study aimed to investigate the effect of guided imagery on anxiety, depression, and vital signs in patients on hemodialysis.

Materials and methods: This randomized controlled clinical trial was conducted on 80 patients undergoing hemodialysis. The subjects were randomly assigned into two groups: a guided intervention group and a control group. The anxiety and depression were measured using the Hospital Anxiety and Depression Scale.

Results: After the intervention, the level of anxiety and depression were significantly lower in the intervention group compared with the control group ($p=0.030$, $p=0.001$), respectively. A statistically significant reduction in the respiratory rate and heart rate was reported in the intervention group ($p<0.05$).

Conclusion: Nurses are suggested to use guided imagery along with other interventions for the management of anxiety and depression. It is believed that it can alleviate adverse psychological responses among patients on hemodialysis.

Keywords: Anxiety; Guided Imagery; Hemodialysis; Hypnosis; Mental Imagery.

1. Introduction

Chronic renal failure (CRF) causes a progressive and irreversible destruction of renal function [1], and is frequently diagnosed at the advanced stages of the disease [2]. Patients with CRF usually need hemodialysis to increase their survival time. Hemodialysis involves cleaning blood through an artificial-kidney machine [3]. Patients on hemodialysis can experience both physical and psychological distress [4] and have the probability of hospitalization 1.5-3 times higher than other chronic diseases [5]. Hemodialysis requires that patients cope with a series of restrictions, such as fluid intake, diet regime, financial problems, hearing the distressing sounds of the hemodialysis device and frequent readmissions to the hospital due to exacerbation of the disease [6]. Mental health problems are prevalent among patients on hemodialysis and in particular anxiety and depression influence further their quality of life and length of hospital stay [7]. For instance, anxiety is a commonly overlooked psychiatric symptom in patients with CRF undergoing hemodialysis [1-3, 8]. The level of anxiety in these patients have been reported to be 27%-45.7% [8]. The prevalence of severe depression and mild to moderate depression in hemodialysis has been reported as 22% and 25%, respectively [9].

The signs and symptoms of anxiety and depression can be attributed to the presentations of CRF such as uremia [10]. While patients with CRF commonly experience psychological problems, they are not diagnosed. Also, the absence of a systematic psychiatric evaluation in the hemodialysis ward leads that patients do not receive appropriate care [11]. Therefore, the majority of patients with depression and anxiety are unaware of their mental health issues. The treatment of anxiety and depression in patients on hemodialysis requires effective assessment and planned interventions for the improvement of their mental wellbeing [12]. The treatment of mental health disorders needs both pharmacological and non-pharmacological methods [13]. Since hemodialysis patients need various medications that are eliminated mostly through kidneys [14], adding more medications to improve their mental health condition can lead to new health-related problems. Also, pharmacological methods are costly and have potentials of harmful drug reactions. Therefore, the patients often decline to take new drugs, especially oral anxiolytics as the side effects associated with this group of drugs mitigates against their utility to treat patients on hemodialysis [8]. Therefore, there is a need to identify non-pharmacologic methods to manage patients' mental health problems [8]. Non-pharmacologic methods including Complementary and Alternative Medicine (CAM) can relief their anxiety and depression [15] as

the incorporation of nontraditional treatment techniques into traditional patient care process. Such treatment modalities originate outside conventional Western medicine [16]. The National Center for Complementary and Integrative Health reports that the ten most common complementary health approaches among adults are natural products; deep breathing; yoga; chiropractic; meditation; massage; special diets; homeopathy; progressive relaxation; and guided imagery [17].

Recent studies have shown that concentration on a mental image and thinking positively can have positive effects on one's mood [18]. Guided imagery is a mind-body technique that uses mental images to promote relaxation and feelings of wellness. It can range from visualization and direct imagery-based suggestions to metaphor and storytelling [19], based on the perspective that the mind and body are interrelated and can have bilateral interactions. In guided imagery, the brain is activated to imagine an event in a positive and proactive manner prior to that an individual experience the actual event. In other words, the patient is guided to develop a desirable image mentally and to focus the imagination to feel, see, hear, and smell the event like a real event [20].

CAM interventions have demonstrated beneficial clinical effects on anxiety and depression. Various CAM modalities have demonstrated success in alleviating anxiety and depression that are difficult to be managed through common treatment methods among patients on hemodialysis. In guided imagery, the subject's thoughts and imagination are focused and directed toward a specific goal using a facilitator such as an audio recording. Guided imagery has the capacity to be integrated into traditional patient care in particular to alleviate pain and to promote relaxation. Guided imagery is designed to empower patients, to promote relaxation, and to guide patients to a place where they feel safe and relaxed. This is a low cost intervention and does not require specialized equipment or extensive education. Moreover, it is an easily organized technique and is not associated with adverse side effects. In guided imagery, the imagination is harnessed to help overcome physical symptoms and reduce psychological symptoms [21, 22]. The mechanism of action may be related to the power of guided imagery to send messages and data to the central nervous system and thus affect the body's physiological processes. Guided imagery represents a basic principle of psychophysiology in that every thought has a physiologic reaction. When a mental image is experienced, there is an associated emotion that connects the feeling state with the mind and body leading to a physiologic change [19].

The effects of guided imagery on anxiety and depression in patients on hemodialysis have not been discovered in previous studies. Therefore, the aim of this study was to investigate the effect of guided imagery on anxiety, depression and vital signs including systolic blood pressure [SBP], diastolic blood pressure [DBP], heart rate [HR], and respiratory rate [RR] in patients on hemodialysis.

2. Materials and Methods

2.1 Study design

This quasi-randomized controlled clinical trial with a pre-intervention-post-intervention design was conducted from December 2015 to May 2016.

2.2. Setting and sampling

The study setting was a hemodialysis center in an urban area of Iran, which was supervised by nephrologists affiliated with a medical sciences university. The hemodialysis treatment modalities and characteristics of the patients were similar. Patients undergoing hemodialysis in the morning and afternoon work shifts were recruited into this study. Inclusion criteria were: undergoing hemodialysis three times a week for at least six months (so that they were used to the procedure and setting), between 35 and 65 years of age, ability to read and write in Farsi, having no hearing impairments, no previous history of psychiatric disorders, intact cognitive functions based on a general assessment by the Abbreviated Mental Test (AMT). The AMT assesses older individuals for the presence of cognitive disorders, and a score lower than seven out of ten indicates cognitive impairment [23]. The Cronbach alpha coefficient of the AMT has been reported as 0.76 [24]. Exclusion criteria were unwillingness to take part in this study, taking tranquillizer or sedative drugs four hours before the intervention, and hemodialysis instability.

After obtaining permissions from the hemodialysis center, the researcher approached those patients who met the inclusion criteria and informed them of the aims and process of the study. Those patients that were willing to participate in this study signed the informed consent form. Patients were made aware that a refusal to participate would not affect their care.

2.3. Sample size estimation

Sample size calculation was based on a pilot study and the following power formula:

$$n = \frac{(z_{1-\alpha/2} + z_{1-\beta})^2 (S_1^2 + S_2^2)}{(\mu_1 - \mu_2)^2}$$

Given 95% confidence interval, alpha 0.5 and 10% samples' dropout, 40 patients in each group were needed for the rejection of the null hypothesis.

2.4. Randomization

A total of 80 subjects were randomly assigned into the intervention (n = 40) or control group (n = 40). A random sequence allocation method using permuted block randomization with the allocation ratio of 2:2 was used. Random allocation sequences were determined using the table of random numbers. Randomization allocation sequences were generated by a separate investigator, that assigned the patients to the groups. The sampling process continued until a sufficient number of the subjects were recruited into each group. A staff nurse, who was blind to the allocation of the patients, extracted the required data from patients' files, assessed their vital signs and calculated the Hospital Anxiety and Depression Scale (HADS) scores (Figure 1).

2.5. Data collection and measurements

Three data sources were utilized:

- a) Demographic characteristics including age, gender, the marital status, education level, length of hemodialysis treatment, smoking, employment status, marital status, history of hemodialysis and dry weight (i.e. the patient's normal weight without the fluid buildup that is removed by hemodialysis) were collected (Table1). Data was accessed from the subjects' medical files and by interviewing.
- b) Vital signs were measured and recorded. BP was measured on subjects' left arm (without fistula) using a mercury sphygmomanometer. The RR was also measured by a nurse for one minute without the patient being aware of the measurement. Also, instead of a manual measurement of pulse rate, the heart rate (HR) was monitored using a standard and calibrated monitoring machine manufactured by SAIRAN®.
- c) The Hospital Anxiety and Depression Scale (HADS) was utilized to collect data on anxiety and depression levels. The HADS measures distress quantitatively and has two subscales: 'anxiety' and 'depression', but it is not a categorical measure of clinical diagnoses [25]. The HADS has been developed by Zigmond and Sanith to identify the indices of anxiety and depression among patients in non-psychiatric care settings. It is consisted of 14 items with two subscales of anxiety (HADS-A) and depression (HADS-D). Each subscale contains 7 items as follow: anxiety items: 1, 3, 5, 7, 9, 11 and 13; depression items: 2, 4, 6, 8, 10, 12 and 14. The anxiety and depression subscales have a 4-point Likert scale from 0 (absence of symptoms) to 3

(the maximal presentation of symptoms). Scores for each anxiety and depression subscales range from 0 to 21 and scores are categorized as follows: normal: 0–7, mild: 8–10, moderate: 11–14 and severe: 15–21 [26]. Therefore, a higher score indicates a higher level of anxiety or depression. Scores 8 or above on the anxiety or depression subscales indicate the possibility of either anxiety or depression disorders [27]. The quantitative scoring of both subscales ranges from 0 to 27. Scores equal to or greater than five are associated with mild anxiety or depression. Scores equal to or greater than ten suggest moderate anxiety or depression. Scores equal to or greater than 15 indicate moderately severe anxiety or depression, whilst scores equal to or greater than 20 signify severe anxiety or depression [28]. The Farsi version of the HADS is acceptable as a valid and reliable tool for determining psychological distress, in which the Cronbach's alpha coefficient was reported as 0.78 for anxiety and 0.86 for depression subscales [29].

2.5. Intervention

The intervention group received the guided imagery intervention three times per week over four weeks, alongside their routine care, assisted by a certified psychologist. Thirty minutes prior to hemodialysis, the patients were requested to assume a comfortable position and to close their eyes. They were instructed to take deep abdominal and diaphragmatic breaths and to relax their muscles, while imagining a beautiful scenery. At the same time, they were listening to various nature sounds including the sound of falling water, sea waves, chirping jungle birds, and rain falling. Subjects were asked to imagine being in the place that the audio-recording depicted (e.g. the jungle or at the seaside). They were instructed to try hearing and smelling this places and so put themselves in the scene that the audio-recording depicted. The subjects wore disposable headphones (Sony, MDR-XD100[®]), that were attached to a device playing the sounds (Lenovo, G410[®]) so as to prevent environmental noise from distracting their attention and to ensure their concentration on the audio-recording. The device was placed so that the subjects could use it comfortably when they were sitting in a bed or a chair. To stimulate their imagination and enable them to feel relaxed, the subjects were instructed to listen to it 30 minutes before the commencement of hemodialysis [30].

The control group received routine care, which entailed recording of vital signs and weight and connection to the dialysis machine. Efforts were made by nursing staff to proceed silently within the unit and so prevent any confounding sounds. According to the Iran's standard clinical policy

at the hemodialysis unit, no patient companion is allowed to enter the unit during hemodialysis [31].

Blinding was impossible to be applied in the sample selection due to the nature of the intervention. However, the statistical analyzer was unaware of group assignments, thus aiding impartiality. Only after completion of statistical data analysis, the results disclosed to the researcher.

Both groups completed the HADS scale and their had vital signs measured before the intervention and immediately after the intervention. The mean scores of the severity of anxiety and depression were calculated in each group.

2.6. Statistical analysis

The Statistical Package for the Social Sciences software (SPSS, version 21.0, SPSS Inc., Chicago, IL, USA) was used for data analysis. Descriptive statistics (frequency, percentage, mean, standard deviation) and inferential statistics (independent t -test, χ^2 test, Cramer V test, Fisher's exact test, and Cohen test) were used for the presentation of findings. The Kolmogorov Smirnov test (K-S) was applied to examine the normal distribution of the data. The level of statistically significance was defined as $P < 0.05$.

2.7. Ethical considerations

This study was approved by the ethics committee affiliated with Shahed University (Protocol number: Shahed.REC.1394.64), that was conducted in compliance with the Declaration of Helsinki 1995, revised 2001. Also, necessary permissions were sought from the hospital authorities to enter the research zone. All patients were assured of anonymity and confidentiality of data. They had the right to refuse participation or withdraw from the study at any time. This study was performed under the supervision of a nephrologist in the hemodialysis center to intervene in case of any negative consequence of the intervention, but no side effects were reported during the study.

3. Results

3.1. The demographic characteristics of the patients

The samples were 47 male (58%) and 33 female (42%) hemodialysis patients with a mean age of 47.21 ± 8.34 years. The minimum and maximum age was 35 and 65 years. Sixty-six patients were married (82.5%) and fourteen were single (17.5%). The results of the t -test, Fisher's exact test and χ^2 test showed no statistically significant differences between the groups in terms of

demographic variables including age, gender, the education level, marital status, occupation status, and duration of hemodialysis (Table 1).

3.2. Hospital anxiety and depression scale (HADS) scores

After the guided imagery intervention, the level of anxiety was significantly lower in the intervention group compared with the control group ($X^2= 6.96$, $df = 3$, $p =0.030$). According to the Cramer V^2 test, the correlation between the intervention and patients' level of anxiety was moderate ($v^2 = 0.295$).

In the intervention group, the mean scores of anxiety before and after the intervention were 12.12 ± 3.24 and 10.50 ± 3.31 , respectively. In the control group, they were as 12.60 ± 3.34 and 12.30 ± 3.42 , respectively. The effect size of the difference in the anxiety level between the groups was reported as 0.69 demonstrating a medium effect size of the guided imagery intervention (Table 2).

In relation to the level of depression after the guided imagery intervention, level of depression was significantly lower in the intervention group compared with the control group ($X^2=9.133$, $df = 3$, $p = 0.001$). Also, the Cramer V^2 test revealed a moderate correlation between the guided imagery intervention and the level of depression ($v^2 = 0.33$).

In the intervention group, the mean scores of patients' depression before and after the intervention were reported as 10.82 ± 2.70 and 10.02 ± 2.58 , respectively. Similarly, in the control group, it was changed from 11.55 ± 2.29 to 11.65 ± 2.33 . The effect size of the difference in the depression level between the groups was reported as 0.62 demonstrating a medium effect size of the guided imagery intervention (Table 2).

3.3. Vital signs

The comparison of vital signs between the groups was shown in Table 3. There were no statistically significant differences between the groups before the intervention. While SBP, RR and HR significantly reduced after the intervention, no statistically significant difference was found in DBP in the intervention group after the intervention. The assessment of the Cohen test demonstrated a large effect size in SBP, a large effect size in RR, but showed a small effect size in HR (Table 3).

4. Discussion

The present study was conducted to assess the effect of guided imagery on anxiety, depression, and vital signs among patients undergoing hemodialysis. After the guided imagery intervention,

the levels of anxiety and depression was improved. SBP, HR and RR were reduced, but despite reductions in DBP, it showed no statistically significant reduction.

The findings of this study indicated that guided imagery could reduce anxiety and depression in patients undergoing hemodialysis. Guided imagery and other similar techniques can be applied as non-pharmacologic interventions, with no reported negative consequences on patients' health, to reduce anxiety and depression in patients undergoing hemodialysis.

In this study, the guided imagery intervention played a significant role in reducing the levels of anxiety and depression in the intervention group. There were statistically significant differences in the mean and standard deviation of anxiety and depression in the control and intervention groups. Similarly, Antall (2004) reported that guided imagery reduced anxiety, pain, duration of hospital stay, and the amount of painkillers used by patients [32]. Also, Gonzales (2010) and Forward et al. (2015) noted that guided imagery had a significant role in the reduction of anxiety [33,34]. Aboghasemi et al. (2010) found that guided imagery had a significant positive effect on anxiety, depression and hope for treatment (treatment expectancy) in women suffering from cancer [35].

Halpin et al. (2002) studied the effect of guided imagery on the level of anxiety, pain, satisfaction with treatment, length of hospital stay and treatment cost in patients undergoing the heart surgery. They showed that indicate guided imagery reduced patients' anxiety, length of hospital stay and treatment cost, and also increased their satisfaction [36]. Patricolo et al. (2017) showed that guided imagery effectively reduced anxiety in patients and improved their sleep status [37].

This study reported significant differences between the levels of anxiety and depression in the intervention group before and after guided imaginary. Comparison of the levels of anxiety and depression using the HADS tool before and after the intervention revealed some improvements in intervention group. These findings are promising and suggest that guided imagery could reduce anxiety and depression in this patient group. Some studies contradicted claims for the effectiveness of guided imagery. Krespi et al. (2016) studied the effect of visual imagery on the adjustment and quality of life of hemodialysis patients. Their findings indicated that the intervention did not have any effect on emotional adjustment or quality of life after the intervention and at follow-up. Nevertheless, the rate of patients' compliance with the intervention was moderately high and patients reported that they were satisfied with the

intervention procedure [38]. Thomas et al. (2010) also studied the reduction of anxiety in patients after the joint arthroplasty surgery and concluded that guided imagery had no statistically significant effect on the reduction of patients' anxiety [39]. Foji (2015) studied the effect of guided imagery on the anxiety level and hemodynamic measures in patients undergoing coronary angiography. It was shown that guided imagery had a significant effect on the reduction of anxiety, but the mean scores of hemodynamic symptoms before and after the intervention were not significantly different [40], and also no significant effect on BP was reported after the intervention. Contradictions in results can be attributed to differences in sampling process, subjects and contextual factors influencing patients' feelings of anxiety and depression during hospitalization.

In this study, guided imagery resulted in an increase in the body's parasympathetic activities leading to some changes in the physiological reactions, that in turn reduced anxiety and depression levels. The use of non-pharmacological methods to decrease anxiety and depression levels is advised in that they are safe and easy to use. Also, they do not require specific locations and equipment and the harmful side effects of pharmacological treatments can be avoided.

As the limitation of this study, the patients were not free to choose when to listen and how many times to listen to the audio-recording. Additionally, illiterate patients were not included in the study as the HAS tool should be self-completed. The patients could not become blind to the intervention due to the nature of guided imagery. There is a lack of enough knowledge of CAM such as guided imagery among healthcare providers in Iran. Also, a few studies are available regarding the effect of guided imagery on patients' wellbeing, which needs further investigations by future researchers. Since the completion of the questionnaires using patients' interviews might have affected the patients' answers, the use of other scales with pictures or numeric scales is suggested. In this study, a control group rather than a placebo group was used so the difference between guided imagery and placebo remains unclear, and needs future investigations.

Conclusion

This study showed that the patients' levels of anxiety and depression, and their RR and HR were improved by guided imagery. This study can be replicated with a larger sample size undergoing hemodialysis to examine the generalizability of findings to other contexts. It is suggested to compare the effects of guided imagery techniques with other relaxing techniques on patients'

wellbeing. Also, it can be replicated with illiterate participants, and empower patients to choose the type of music to listen to and when to listen.

Providing patients with the opportunity to verbalize their perspectives of whether guided imagery was beneficial, or if they would recommend it to others, can provide additional insights for utilizing this intervention in healthcare settings.

It is suggested that future research is conducted to study the benefits of guided imagery on hemodialysis patients' anxiety and depression over time to support the efficacy of guided imagery in patients' anxiety and depression. Anxiety and depression may continue throughout the treatment process, guided imagery should be repeated over time with subsequent measurements of anxiety and depression.

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Conflict of interest

The authors have no conflict of interest to declare.

REFERENCES

- [1] Couchoud, C. (2010). Le Réseau Epidémiologie et Information en Néphrologie (REIN) The epidemiology network and information in nephrology]. *Bulletin Epidémiologique Hebdomadaire*, 9(10), 75–77.
- [2] Hill, N. R., Fatoba, S. T., Oke, J. L., Hirst, J. A., O'Callaghan, C. A., Lasserson, D. S., & Hobbs, F. D. R. (2016). Global Prevalence of Chronic Kidney Disease – A Systematic Review and Meta-Analysis. *PLoS ONE*, 11(7), e0158765.
- [3] Yuo, T. H., Chaer, R. A., Dillavou, E. D., Leers, S. A., & Makaroun, M. S. (2015). Patients Started on Hemodialysis with Tunneled Dialysis Catheter Have Similar Survival After Arteriovenous Fistula and Arteriovenous Graft Creation. *Journal of Vascular Surgery*, 62(6), 1590–1597.e2.
- [4] Cooper, B., Dang, K., Jones, A., & Thomas, A. (2017). The psychiatry-integrated nurse practitioner role in hemodialysis: An opportunity to provide nurse practitioner care between the interface of psychiatry and hemodialysis. *Canadian Association of Nephrology Nurses and Technicians Journal*, 27(1), 13-8.

- [5] Heidari Gorji, M. A., Davanloo, A. A., & Heidarigorji, A. M. (2014). The efficacy of relaxation training on stress, anxiety, and pain perception in hemodialysis patients. *Indian Journal of Nephrology*, 24(6), 356–361.
- [6] Stark, S., Snetselaar, L., Hall, B., Stone, R. A., Kim, S., Piraino, B., & Sevick, M. A. (2011). Nutritional Intake in Adult Hemodialysis Patients. *Topics in Clinical Nutrition*, 26(1), 45–56.
- [7] Espahbodi, F., Hosseini, H., Mirzade, M. M., & Shafaat, A. B. (2015). Effect of Psycho Education on Depression and Anxiety Symptoms in Patients on Hemodialysis. *Iranian Journal of Psychiatry and Behavioral Sciences*, 9(1), e227.
- [8] Cohen, S. D., Cukor, D., Kimmel, P. L. (2016). Anxiety in patients treated with hemodialysis. *Clinical Journal of the American Society of Nephrology*, 22, 1-6.
- [8] Rahimpour, M., Shahgholian, N., & Yazdani, M. (2015). Effect of hope therapy on depression, anxiety, and stress among the patients undergoing hemodialysis. *Iranian Journal of Nursing and Midwifery Research*, 20(6), 694–699.
- [9] Čengić B, Resić H. Depression in hemodialysis patients. *Bosnian journal of basic medical sciences*. 2010;10(Suppl 1): S73-S78.
- [10] Teles, F., de Azevedo, V. F. D., de Miranda, C. T., de Melo Miranda, M. P., do Carmo Teixeira, M., & Elias, R. M. (2014). Depression in hemodialysis patients: the role of dialysis shift. *Clinics*, 69(3), 198–202.
- [11] Finkelstein, F. O., Wuerth, D., & Finkelstein, S. H. (2010). An approach to addressing depression in patients with chronic kidney disease, *Blood Purif*, 29, 121-4.
- [12] Johnson, S., & Dwyer, A. (2008). Patient perceived barriers to treatment of depression and anxiety in hemodialysis patients. *Clinical nephrology*, 69 (3), 201–206.
- [13] Xing, L., Chen, R., Diao, Y., Qian, J., You, C., & Jiang, X. (2016). Do psychological interventions reduce depression in hemodialysis patients? A meta-analysis of randomized controlled trials following PRISMA. *Medicine*, 95(34), e4675.
- [14] Miners JO, Yang X, Knights KM, Zhang L. The Role of the Kidney in Drug Elimination: Transport, Metabolism, and the Impact of Kidney Disease on Drug Clearance. *Clinical pharmacology and therapeutics*. 2017 Sep;102(3):436-449.
- [15] Grigoriou, S. S., Karatzaferi, C., & Sakkas, G. K. (2015). Pharmacological and Non-pharmacological Treatment Options for Depression and Depressive Symptoms in Hemodialysis Patients. *Health Psychology Research*, 3(1), 1811.
- [16] Kiefer, D., Pitluk, J., & Klunk, K. An overview of CAM: components and clinical uses. *Nutr Clin Pract*. 2009;24(5):549-559. doi: 10.1177/0884533609342437.

- [17] Clarke, T. C., Black, L. I., Stussman, B. J., Barnes, P. M., & Nahin, R. L. (2015). Trends in the Use of Complementary Health Approaches Among Adults: United States, 2002–2012. *National Health Statistics Reports*, (79), 1–16.
- [18] Apostolo, J.L., & Kolcaba, K. (2009). The effects of guided imagery on comfort, depression, anxiety, and stress of psychiatric inpatients with depressive disorders. *Archives of psychiatric nursing*. 23(6),403e11.
- [19] Jallo, N., Ruiz, R. J., Elswick, R. K., & French, E. (2014). Guided Imagery for Stress and Symptom Management in Pregnant African American Women. *Evidence-based complementary and alternative medicine: eCAM*, 2014, 840923. <http://doi.org/10.1155/2014/840923>
- [20] Bedford, F.L. (2012). A perception theory in mind-body medicine: guided imagery and mindful meditation as cross-modal adaptation. *Psychonomic bulletin and review*, 19(1),24-45. doi: 10.3758/s13423-011-0166-x.
- [21] Armstrong, K., Dixon, S., May, S., & Patricolo, G.E. (2014). Anxiety reduction in patients undergoing cardiac catheterization following massage and guided imagery. *Complementary therapies in clinical practice*. 20(4),334-338.
- [22] Nelson, E.A., Dowsey, M.M., Knowles, S.R., Castle, D.J., Salzberg, M.R., Monshat, K., Dunin, A.J., & Choong, P.F. (2013). Systematic review of the efficacy of pre-surgical mind-body based therapies on post-operative outcome measures. *Complementary therapies in medicine*. 21(6),697-711.
- [23] Faraj, J., Fallahi K.M., & Khankeh, H.R. (2013). The effect of Poetry therapy on the cognitive status in elderly residents of a nursing home. *Complementary medicine journal*, 2 (4),312-323.
- [24] Bakhtiyari F, Foroughan M, Fakhzadeh H, Nazari N, Najafi B, Alizadeh M, et al. (2014). Validation of the persian version of abbreviated mental test (AMT) in elderly residents of Kahrizak Charity foundation. *Iranian journal of diabetes and metabolism.*; 13 (6) :487-494.
- [25] Ingvar, B., Alv, A., & Tone, T. (2002). The validity of the hospital anxiety and depression scale: an updated literature review. *Journal of psychosomatic research*, 52(2),69–77. doi: 10.1016/S0022-3999(01)00296-3.
- [26] Zigmond, A.S., & Snaith, R.P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica*, 67(6),361-370.
- [27] Stafford, L., Berk, M., & Jackson, H. J. (2007). Validity of the Hospital Anxiety and Depression Scale and Patient Health Questionnaire to screen for depression in patients with coronary artery disease. *General Hospital Psychiatry*, 29(5), 417–424.

- [28] Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: Validity of a Brief Depression Severity Measure. *Journal of General Internal Medicine*, 16(9), 606–613. <http://doi.org/10.1046/j.1525-1497.2001.016009606.x>
- [29] Montazeri, A., Vahdaninia, M., Ebrahimi, M., & Jarvandi, S. (2003). The Hospital Anxiety and Depression Scale (HADS): translation and validation study of the Iranian version. *Health and Quality of Life Outcomes*, 1, 14. <http://doi.org/10.1186/1477-7525-1-14>.
- [30] Louie SW. (2004). The effects of guided imagery relaxation in people with COPD. *Occupational therapy international*, 11(3),145-59.
- [31] Parsapoor, A.R., Salari, P., & Larijani, B. (2013). implementation of Patient's Rights Charter: a Report from Ministry of Health and Medical Education, Iran. *Iranian journal of public health*. 42 (Supple1):9-12.
- [32] Antall, G.F., & Kresevic, D. (2004). The use of guided imagery to manage pain in an elderly orthopaedic population. *Orthopedic nursing*, 23(5),335e40.
- [33] Gonzales, E.A., Ledesma, R.J., McAllister, D.J, Perry, S.M., Dyer, C.A., & Maye, J.P. (2010). Effects of guided imagery on postoperative outcomes in patients undergoing same-day surgical procedures: a randomized, single-blind study. *Journal of the American Association of Nurse Anesthetists* ,78(3),181-188.
- [34] Forward, J. B., Greuter, N. E., Crisall, S. J., & Lester, H. F. (2015). Effect of Structured Touch and Guided Imagery for Pain and Anxiety in Elective Joint Replacement Patients—A Randomized Controlled Trial: M-TIJRP. *The Permanente Journal*, 19(4), 18–28. <http://doi.org/10.7812/TPP/14-236>
- [35] Abolghasami, S. H., Saeadi S., & MorriNajafi, N. (2011). The effect of guided imagery and logo therapy on depression, anxiety and hopefulness in women with cancer in Ahwaz. *Women and culture*,_ 2(5),31-47.
- [36] Halpin, L.S., Speir, A.M., CapoBianco, P., & Barnett, S.D. (2002). Guided imagery in cardiac surgery. *Outcomes management*,6(3),132e7.
- [37] Patricolo, G.E., LaVoie, A., Slavin, B., Richards, N.L. Jagow, D. & Armstrong, K. (2017). Beneficial Effects of Guided Imagery or Clinical Massage on the Status of Patients in a Progressive Care Unit. *Critical care nurse*, 37(1),62-69. doi: 10.4037/ccn2017282.
- [38] Krespi, M.R., Oakley, D., Bone, M., Ahmad, R.,& Salmon, P. (2009). The effects of visual imagery on adjustment and quality in life of hemodialysis patients, *Turkish journal of psychiatry* ,20(3),255-268.
- [39] Thomas, K.M., & Sethares, K.A. (2010). Is guided imagery effective in reducing pain and anxiety in the postoperative total joint arthroplasty patient? *Orthopedic nursing*, 29(6),393e9

[40] Foji, S., Tadayonfar, M.A., Mohsenpour, M., & Rakhshani, M.H. (2015). The study of the effect of guided imagery on pain, anxiety and some other hemodynamic factors in patients undergoing coronary angiography. *Complementary therapies in clinical practice*,21(2),119-23.

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Table 1. The demographic characteristics of the patients in the groups

Characteristics	Total (n = 80)	Intervention group (n = 40)	Control group (n = 40)	Statistical test and <i>p</i> value
Age (year) Mean ± SD	47.21 ± 8.34	47.20 ± 8.36	47.22 ± 5.43	t=-0.013 df=78 <i>p</i> =0. 980
Gender, n (%)				Fisher's exact test
Female	33(41.25%)	16(48.50%)	17(51.50%)	df=1
Male	47(58.75%)	24(51.10%)	23(48.90%)	<i>p</i> =0.520
Education level, n (%)				$\chi^2 = 0.59$
Primary school	24(30.00%)	13(32.50%)	11(27.50%)	df=2
Secondary school	45(56.25%)	21(52.50%)	24(60.00%)	<i>p</i> =0. 890
Tertiary education	11(13.75%)	6(15.00%)	5(12.50%)	
Marital status, n (%)				Fisher's exact test
Single	14(17.50%)	8(20. 00%)	6(%15.00)	df=1
Married	66(82.50%)	32(80.00%)	34(%85.00)	<i>p</i> =0.770
Occupation status, n (%)				$\chi^2 =1.41$
Unemployed	20(25.00%)	9(22.50%)	11(27.50%)	df=3
Employee	17(21.25%)	9(22.50%)	8(20.00%)	<i>p</i> =0. 840
Retired	17(21.25%)	10(25.00%)	7(17.50%)	
Housewife	26(32.20%)	12(30.00%)	14(35.00%)	
Place of residence, n (%)				Fisher's exact test
Urban	67(72.25%)	34(66.70%)	33(77.70%)	df=1
Rural	25(27.75%)	6(33.30%)	7(23.30%)	<i>p</i> =0. 990
Smoking, n (%)				Fisher's exact test
Yes	17(21.25%)	9(22.50%)	8(20.00%)	df=1
No	63(78.75%)	31(77.50%)	32(80.00%)	<i>p</i> =0. 990
Duration of hemodialysis (hour) Mean ± SD	7.02 ± 6.00	6.62 ± 5.00	7.42 ± 6.91	t =0.593 df=71.04 <i>p</i> =0. 550

* P values indicated the statistical significance of differences between the intervention and control groups using the independent t-test and chi-square test.

Table 2. The comparison of the levels of anxiety and depression before and after the intervention

Variables	Intervention group (n %)	Control group (n %)	Statistical test and p -value	95%CI Std. Error	Homogenous
<i>Before the intervention</i>					
Anxiety					
Normal	0(00.0)	0(00.0)	X ² =1.553 df=2 P ^a =0.460	-2.21,1.06	Yes
Mild	5(12.5)	4(10.0)			
Moderate	7(17.5)	9(22.5)			
Severe	28(70.0)	27(67.5)			
QRS (Mean ± SD)	12.12±3.24	12.60±3.34	Leven's test=0.38 t=-0.699 df=78 p=0.486		Yes
Depression					
Normal	0(00.0)	0(00.0)	X ² =0.57 df=2 P=0.751	-1.84,0.39	Yes
Mild	5(12.5)	2(5.0)			
Moderate	8(20.0)	8(20.0)			
Severe	27(67.5)	30(75.0)			
QRS (Mean ± SD)	10.82±2.70	11.55±2.29	Leven's test=0.48 t=-1.261 df=78 p=0.200		Yes
<i>After the intervention</i>					
Anxiety					
Normal	2(5.0)	0(11.1)	X ² =6.96 df=3 P=0.030	-3.58,-0.61	No Phi=0.295 Cramer's v ² =0.295 Small effect
Mild	9(22.5)	4(10.0)			
Moderate	10(25.0)	11(27.5)			
Severe	19(47.5)	25(62.5)			
QRS (Mean ± SD)	10.50±3.31	12.30±3.42	Leven's test=0.87 t=-2.819 df=78 p=0.006		No Cohen's d=0.69 r=0.32 Medium effect
Depression					
Normal	1(2.5)	0(00.0)	X ² =9.133 df=3 P=0.01	-2.62,-0.42	No Phi=0.338 Cramer's v ² =0.33 Medium effect
Mild	9(22.5)	3(7.5)			
Moderate	12(30.0)	8(20.0)			
Severe	18(45.0)	29(72.5)			
QRS (Mean ± SD)	10.02±2.58	11.65±2.33	Leven's test=0.62 t=-2.76 df=78 p=0.007		No Cohen's d=0.62 r=0.29 Medium effect

Note: *P-values indicated the statistical differences between the groups using the chi-squared test for the qualitative rating system of anxiety and depression. P-values were reported for the quantitative rating system using the t-test after considering the equality of variances.

The Cramer's v^2 showed the correlation between the intervention, anxiety and depression. Cohen's d represented the effect size of the intervention on anxiety and depression, while considering their qualitative scoring systems. QRS stands for the quantitative rating system.

Table 3. The comparison of physiologic symptoms before and after the intervention

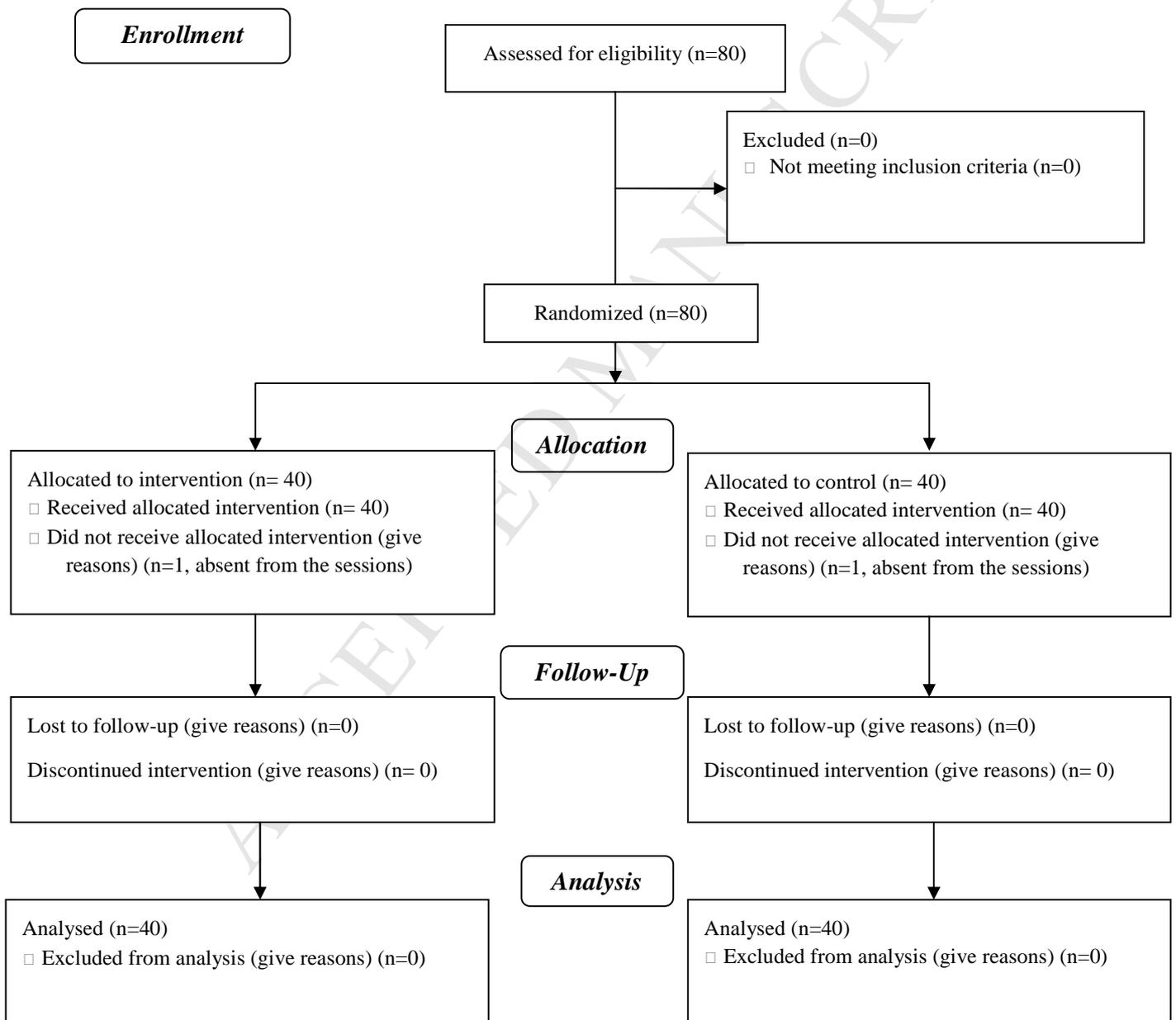
Symptom	Group	SBP Mean±SD	DBP Mean± SD	HR Mean±SD	RR Mean±SD
Before the intervention	Control	132.85±13.22	81.75±8.51	75.42±8.56	16.10±1.90
	Intervention	129.22±12.70	82.50±11.32	77.95±6.97	16.75±1.61
<i>Statistical test</i> <i>p-value</i>		Leven's=0.80 t=-1.25 df=78 p=0.210	Leven's=0.058 t=0.335 df=78 p=0.730	Leven's=0.216 t=1.44 df=78 p=0.150	Leven's=0.396 t=1.64 df=78 p=0.104
After the intervention	Control	134.87±12.68	81.87±8.14	77.22±7.92	16.95±1.66
	Intervention	121.75±12.73	81.00±10.32	73.75±6.25	14.40±0.98
<i>Statistical test</i> <i>p-value</i>		Leven's=0.87 t=-4.61 df=78 p=0.001	Leven's=0.234 t=-0.419 df=78 p=0.670	Leven's=0.354 t=-2.17 df=78 p=0.030	Leven's=0.015 t=-8.35 df=78 p=0.001
Effect size (Cohen's d)		d=1.03 r=-0.45 Large. effect		d=0.49 r=-0.24 Small. effect	d=1.87 r=-0.68 large effect

* (p < 0.05)

Data are represented as means ± standard deviation. P-values indicated differences between the groups using the independent t-test by considering the equality of variance.

Cohen's d represented the effect size of the intervention on physiologic parameters.

SBP: systolic blood pressure, DBP: diastolic blood pressure, HR: heart rate, RR: respiratory rate

Figure 1. The process of the study according to the Consort flow diagram (2010)

- Anxiety and depression are prevalent among patients on hemodialysis;
- Complementary and Alternative Medicine (CAM) can help reduce anxiety and depression;
- In guided imagery as one type of CAM, the imagination is harnessed to help overcome physical symptoms and reduce psychological symptoms;
- Guided imagery in this study improved the patients' experiences of anxiety and depression.