

## Conference Paper

# The Effect of Foot Massage on Hemodynamic among Patients Admitted in to the Intensive Care Unit of General Public Hospital, Indonesia

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**Abstract**

Several studies have suggested the effectiveness of foot massage on reducing stress and blood pressure. However, few studies examine the effect of foot massage on hemodynamic status especially among patients admitted to intensive care units, when the hemodynamics status was unstable and became a significant concern. This study aimed to examine the effects of on hemodynamic status especially among patients admitted to intensive care unit. This study was quasi-experimental with pre- and post-test in one group. Subjects were recruited from the intensive care unit of one general public hospital located in Garut, West Java, Indonesia. Patients who used a partial mode control of ventilator, mean arterial pressure > 70 mmHg, heart rate > 60 times per minute, respiration rate > 12 times per minutes, and oxygen saturation  $\leq$  100% were considered as eligible criteria in this study. The exclusion criteria were patients who have fractures, trauma, or leg injuries, in an anxious state, or diagnosed with deep vein thrombosis symptoms. A paired t-test was used to examine the effect of the intervention of mean arterial pressure, heart rate, respiration rate, and oxygen saturation. Of the 30 patients recruited, the mean age was 41.7 (SD=3.10) with the majority female (63.3%). We found that foot massage has a significant impact on the improvement of the mean arterial pressure, heart rate, respiration rate, and oxygen saturation at the second time measurement after 30 minutes intervention ( $p < 0.05$ ). Foot massage improves the hemodynamic status among patients admitted in intensive care unit. Future studies using a rigor method with large sample size is needed with control therapy and disease-associated factors.

**Keywords:** foot massage, hemodynamic, intensive care unit, intervention study

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## 1. Introduction

Hemodynamic monitoring of critically ill patients is a critical issue in intensive care medicine [1]. Most of the patients with the critical situation had a problem with haemodynamic status, such as blood pressure, mean of arterial pressure (MAP), heart rate (HR),

respiratory rate (RR), and oxygen saturation[1]. Therefore, they require intensive monitoring and treatment by using advance machine or invasive equipment such as mechanical ventilator or endotracheal tube. Complex environmental of the intensive care unit (ICU) induces anxiety, fear and even stress that would affect to the hemodynamic status [2]. There is growing evidence suggested the effect of complementary therapy on reducing stress as well as improve the hemodynamic status (blood pressure and HR) [3.4]. Massage is considered as a beneficial technique to improve health and physical well-being (including reducing pain, BP, pulse rate, and improved sleep patterns) [5]. However, there is paucity literature on the effect of massage on the critical illness patients.

Massage is a deliberate hitting and muscle stretching movement with the aim of providing comfort and enhancing relaxation. Nurses have always used effleurage to rub the back for patient comfort. Effleurage uses a rhythmic and slow hitting movement from the distal to extended muscular proximal areas such as the back or extremities. Consistent, steady, but supple hand pressure is applied to the entire hand to adjust to the contours of the body. Lotion can be used to reduce friction and increase moisture. Massage has been effective in reducing anxiety and improving relaxation. Effleurage performed in the leg area can cause peripheral vascular- utilisation of the blood vessels. The advantage of effleurage is that repeatability of the effleurage may lead to stretching of the tissues, rhythmic rubbing of effleurage has a sedative effect on spinal pain modulation, proximal stimulation of venous return and lymphatic circulation, thus reducing pain irritation, relaxation in patients, dilatation in capillaries and improve blood circulation if done with mild pressure, reduce muscle spasms and increase muscle flexibility

Foot massage is one of the massage effleurages. Several studies have shown a foot massage significantly decreased MAP, heart rate, and respiration rate, and increase oxygen saturation [6-9]. A study conducted in intensive care unit in Indonesia found that foot massage significant reduced MAP, HR, and RR but not increased oxygen saturation [10]. The aimed of this study was to test the effectiveness of foot massage on the hemodynamic among patients admitted in ICU.

## 2. Methods and Equipment

## 2.1. Study design and intervention

A queasy experimental design with one group, pre- and post-test was conducted to examine the effect of foot massage on the hemodynamic among patients admitted in ICU. This study was conducted at the secondary level of a hospital located in Garut, West Java. Our hypothesis was foot massage can significantly reduce the MAP, HR, and RR, and increase oxygen saturation.

The massage involved a light-pressure massage with long, gliding, rhythmical strokes and flexion, extension, and rotation of the toes, foot, and ankle. A lubricant was applied for the massage. Each session of the intervention, the participant received a standardized 10-minute massage on each foot (20 minutes in total). Hemodynamic status including MAP, HR, RR and oxygen saturation was collected after intervention and 2 hours later.

## 2.2. Sample

Population in this research is patient in ICU of a general public hospital located in Garut, West Java. The sampling technique used in this research was continuous sampling. Samples were taken using consecutive sampling by taking all the respondents who meet the inclusion criteria until the sample number is fulfilled. The inclusion criteria were patients who use a partial control mode ventilator, patients with MAP > 70 mmHg, heart rate > 60 times per minute, respiratory rate > 12 times per minute, and oxygen saturation  $\leq$  100% and patients who have not received sedation and/or muscle relaxant. Exclusion Criteria were patients who have fractures, trauma, or leg injuries, in an anxious state, have manifestations of deep vein thrombosis symptoms. Then, drop out criteria were patients experience a clinical worsening when treated with foot massage because patients in the ICU are vulnerably unstable.

## 2.3. Data Collection

Approval for ethical clearance has been obtained from the ethical committee of study hospital. The intervention was conducted once a day (20 minutes per section) for two days. The researcher extracted data each participant's systolic BP, diastolic BP, and HR immediately before and after each session from electronic vital sign monitors.

## 2.4. Data analysis

All of the data were expressed as a mean and standard deviation for continuous data and frequency for categorical data. The effects of the intervention on SBP, DBP, HR, RR, and oxygen saturation were analyzed using t-tests. Data analysis was performed using SPSS Statistics for Windows version 20.0 (IBM Corp., Armonk). The significant level was set at  $p < 0.05$ .

## 3. Results

Table 1 shows the characteristics of respondents. Of 30 patients admitted in ICU, the mean age was 41.7 (SD=3.10), ranged from 18 years to 70 years old, and the majority were female (63.3%). On average, the length of stay was 3.10 days (SD=0.92).

Table 1. Characteristics of respondent (n=30)

	n	%
<i>Continuous data</i>		
Age, years (Mean±SD)	41.7±3.10	
Range	18-70	
Length of stay, days (Mean±SD)	3.10±0.92	
Range	2-4	
<i>Categorical data</i>		
Gender		
Male	11	36.7
Female	19	63.3

Oxygen saturation 94.4±7.07 94.9±5.32 96.4±5.23 0.198 <0.001

Note MAP; mean arterial pressure, HR: heart rate; RR: respiratory rate

Table 2 shows the effect of foot massage on hemodynamics. After the intervention, only RR significant declined ( $p < 0.05$ ). But in the second measurement, there was significant declined in all hemodynamic indicators, including a MAP, HR, and RR, and significantly increased oxygen saturation.

## 4. Discussion

This study found a significant effect of foot massage on hemodynamics, including decreased in the MAP, HR, RR, and increased oxygen saturation. Previous studies also highlight the effect of foot massage on blood pressure and heart rate in 30 patients admitted to coronary care unit [11] and among patients with hypertension [12]. Our study proves that foot massage is useful to maintain hemodynamic status. When the patient is given a foot massage, the patient feels getting a touch on their body. The Theory of Jin Shin Jyutsu states that the dynamics of this touch can free up the blockage of energy which can further create the mechanical strength in the body [13] The mechanical energy

in the body can cause a sense of joy, calm, and physiologically the patient responds to a decrease in the MAP, heart rate, and respiratory rate within the normal range of values. Therefore, the results of this study indicate that there is a foot massage effect that is beneficial to the body physiologically and psychologically. Physiologically, foot massage is part of cutaneous stimulation that can help the body achieve homeostasis through the extrinsic and intrinsic arrangement of peripheral blood flow. In extrinsic settings, foot massage manipulation leads to vasomotor activity resulting in smooth muscle relaxation and vasodilation in arterioles [14–16].

While psychologically can make calm and relax. Massage is a sensory integration technique that affects the activity of the autonomic nervous system. When someone perceives touch as a relaxed stimulus, it will emerge a relaxation response [17]. Massage is widely acknowledged as an act that provides deep relaxation benefits so as to relieve physical and spiritual fatigue due to the sympathetic nervous system decreases activity which eventually leads to lower blood pressure [18], improves blood circulation in the muscles so as to reduce pain and inflammation, as massage improves both blood and lymph circulation [15], directly or indirectly improves the function of every internal organ based on the philosophy of energy flow meridian massage can improve the flow of energy (meridians) in the body to be positive, thus improving the body's energy which is already weak [19].

Acetylcholine is released by parasympathetic nerve fibers stimulated during a foot massage, approaching nodal cells and decreasing depolarization frequency and characterized by decreased heart rate [20, 21]. A decrease in heart rate can lead to longer ventricular filling time resulting in larger stroke volume and lead to increased cardiac output [14]. A good cardiac output can increase blood circulation throughout the body including the lungs so that the exchange of oxygen and carbon dioxide becomes balanced [14, 16]. With a balanced oxygen and carbon dioxide concentration in the tissue, it will show an increase in oxygen saturation value and the stimulation formed at the center of respiration is to lower the respiratory rate in the normal direction [10].

Limitation of this study should be acknowledged. For example, we did not control for patients disease condition and medical treatment which also will affect hemodynamic status, the study lacked a follow-up period; therefore, the long-term effects of the intervention remain unclear.

## 5. Conclusion

The results of the study showed that foot massage resulted in significant reductions in the MAP, HR and RR, and increased oxygen saturation. Therefore, the intervention could be an effective means to improve physical health in patients admitted to ICU. Future studies using a rigors method with large sample size is needed with control therapy and diseases-associated factors.

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