

# Sleepiness and Changes in Vital Signs among the Clinical Shift Workers Staff at Imam Khomeini Hospital of Ilam

Saber Moradi<sup>1</sup>, Fatemeh Mansouri<sup>2</sup>, Faramarz Sori<sup>3</sup>, Abdolhessein Pournajaf<sup>2</sup>, Ali Mohammad Abbasi<sup>2</sup>, Arash Akbarzadeh<sup>4</sup>, Faramarz Gharagozlou<sup>5</sup>, Mahsa Hami<sup>6</sup>, Mohsen Karchani<sup>7\*</sup>

<sup>1</sup> Department of Occupational Health, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran <sup>2</sup> Department of Occupational health, School of Public Health, Ilam University of Medical Sciences, Ilam, Iran <sup>3</sup> Department of Medical Physiology, Medicine College, Iran University of Medical Sciences, Tehran, Iran <sup>4</sup> Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran <sup>5</sup> Department of Occupational Health Engineering, School of Public Health, Kermanshah University of Medical Sciences and Health Services, Kermanshah, Iran <sup>6</sup> Firoozkooh Branch, Islamic Azad University, Firoozkooh, Iran <sup>7</sup> Department of Occupational Health, School of Public Health, Tehran University of Medical Sciences, International Campus (TUMS- IC), Tehran, Iran

## Abstract

**Background and Objectives:** Today, 24-hours work is an unavoidable component in several industries. Night-work is an imperative situation for an important part of the work forces. Shift-working is called to work at hours out of the usual day-work time (7:00 am to 6:00 pm). This cross-sectional descriptive-analytic research was carried out in order to investigate sleepiness and changes in vital signs among the clinical shift workers at Imam Khomeini hospital in Ilam, Iran.

**Methods:** Statistical population of the research was determined to be 79 persons, and data collection process was carried out in a simple random manner. Two questionnaires were employed to collect the required data; a demographic questionnaire, and the Stanford Sleepiness Scale (SSS) questionnaire. A medical thermometer and a manometer were also used to gather the data related to oral temperature and blood pressure, respectively. The difference in the mean intensity of sleepiness between the different demographic groups was examined using t-test and ANOVA. Potential relationship between sleepiness and demographic and professional factors was explored using Pearson's correlation coefficient.

**Findings:** Sleepiness was found to be significantly correlated with age, work experience, and Body Mass Index (BMI), and level of education ( $P < 0.05$ ). In addition, sleepiness showed significant inverse correlations with body temperature and blood pressure ( $P < 0.05$ ).

**Conclusions:** Our results identified a number of important factors influencing sleepiness in clinicians. Considering these factors is of great importance when selecting staff for shift working in order to enhance the health care performance and prevent medication errors.

**Keywords:** Sleepiness, Vital signs, Clinical shift workers

## Background and Objectives

Shift work is described as any work regularly done at the time out of the day work time [1,2]. Evidence indicates that sleep disorder is the major complain among the staff working at industrial, hygienic and medical environments based on a shift work system [3].

A normal individual needs to sleep 7 to 7.5 hours/day, whereas the mean sleep time for a shift worker is around 4 to 6 hours, which is 5-20% lower than the sleep time of day-shift workers [4]. Sleepiness is a physiologic state that most of people experience at least once during a 24-hour period. However, when

occurring at an inopportune time or at the time that is undesirable for us, it can also be considered as an abnormal event [5]. In order to keep the mental balance, a person needs sleeping, and sleeping disorder is considered as a psychological disease [6].

In the field of health care, doctors and other clinical staff are often ready to offer medical services, or are practically offering services based on a 24-hour system. Studies show that shift working in medical centers is more frequent than in other workplaces. Therefore, a large number of work forces may be affected by the problems caused by shift working in the medical centers. The imbalance in the cycle of sleeping-waking [7] results in inconsistency of the individual's psychological and somatic state, and as a consequence, disorders such as digestive problems, heart problems, panic attacks, hallucination, aggression, poor emotional

\*Corresponding author: Mohsen Karchani, Department of Occupational Health, School of Public Health, Tehran University of Medical Sciences, International Campus (TUMS- IC), Tehran, Iran, Tel: +98 21 88951390, Fax: +98 21 88954781, Email: m-karchani@razi.tums.ac.ir

health and lack of concentration [8].

On the other hand, sleeping problems, associated with the shift working, may cause problems in the vital duties of the healthcare staff, and weaken the quantity and quality of services. In addition, sleeping problems in the healthcare workers can lead to medication error incidents, resulting in undesired patients' outcome. Researches show that long-time shift works (shift working more than five times per month) could increase the probability of medical errors up to five times more than in the months without long-time shift works [8]. According to the studies, even a 24-hour shift work per month increases the possibility of important medical errors due to sleepiness by three times [8,9].

Suzuki *et al.* (2005) distributed a questionnaire among 4407 nurses in order to investigate sleep patterns and occupational incidents' history. The prevalence of sleepiness among the nurses was found to be 26 %, and there was a remarkable statistical relationship between the history of occupational incidents over the past 12 months and sleepiness [9].

Drake *et al.* (2004) investigated the prevalence of inordinate sleepiness among the workers with rotational shift, constant night shift, and constant day shift. Those who were in the shift work group showed a higher rate of sleepiness-related incidents, depression, and family and social problems than the day shift workers. It was also concluded that those having sleeping disorder related to shift work were exposed to dangers larger than to health and behavioral related problems. It was recommended that the prevalence of sleeping disorder among shift work and night work workers should be reduced by 10 % [10].

It has been reported that staff's degree of awareness varies during the different hours of a shift work, as time closes to the last hours of a shift work the degree of awareness and attention is decreased [11]. The purpose of this study was to assess sleepiness among the clinical staff at Imam Khomeini Hospital in Ilam, and profiling their vital signs at different times of the shift work.

## Methods

This cross-sectional descriptive-analytic research was carried out at Ilam's Imam Khomeini Hospital in 2012. The study population included the clinical staff, who have been working on shift work basis for at least one year with no history of long-term medicine consumption or working at night work shift for two consecutive nights. A sample size of 79 was determined based on the confidence level of 95%, test power of

8%, and absolute error of 25%. The participants were selected using random sampling. Both the first shift workers' group working from 8:00 PM to 3:00 AM (49 persons), and the second shift workers' group working from 8:00 PM to 1:30 AM (30 persons) were present at their workplace. All personnel had the same shift work schedule.

A questionnaire asking age, gender, BMI score, education level, marital status, time of working on shift work system, and smoking of the employees was used to collect the demographic data. The SSS questionnaire with the validity of 0.68 and reliability of 0.88 (as demonstrated in a previous study [12]) was used for measuring the intensity of the sleepiness.

Based on the considered schedule, the questionnaires were completed by the first group at 9:00 pm, 10:30 pm, 12:00 pm, 1:30 am, and 3:00 am, and by the second group at 9:00 pm, 10:30 pm, 12:00 pm, and 1:30 am. Oral temperature and blood pressure were simultaneously measured using a thermometer and a mercury sphygmomanometer at the noted times. Pearson's correlation test was used to examine the relationship of the sleepiness variable with BMI score, years of shift work experience, age, and marital status, and t-test and ANOVA were employed to compare the mean values. SPSS software, version 16 (SPSS Inc. Chicago Illinois, United States of America) was utilized for data analysis.

## Ethical issues

The approval of Ilam University of Medical Sciences was obtained for conducting the study. All participants were presented about the objectives of the study, and their informed consent was obtained.

## Results

The mean age of the participants was  $35.24 \pm 6.35$  years. Fifty five percent of them were female. The mean work experience was  $14 \pm 3.6$  years. Singles made up 30.4% of the workers who participated in study, and 69.6% of the participants were married. The mean of BMI score was  $24 \pm 3$ . Only one participant (1.26%) was smoker. Also 57% of the participants had the education degree lower than B.Sc., 36.7% had B.Sc., and 6.33% had a degree higher than B.Sc.

Figure 1 compares the intensity of sleepiness along the shift work time between the day- and night-shift working groups. Figures 2-3 show the changes in body temperature, and Figures 4 and 5 show the changes in blood pressure during the shift work time

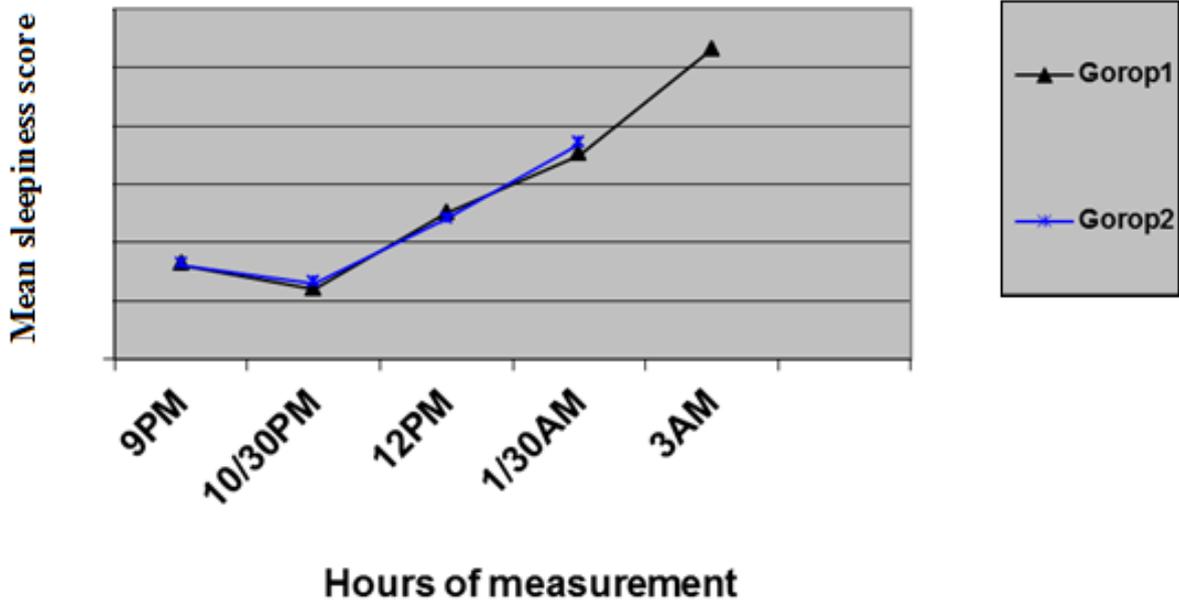


Figure 1 Changes in sleepiness at several work hours in the two groups' staff

between the two groups.

A significant difference in the level of sleepiness among the three different age groups (20-30 years old, 30-45 years, and more than 45 years) was identified (P = 0.001). Similarly, the employees of different BMI scores (<18.5, 18.5-25, and >25) and education level (lower than B.Sc., holding B.Sc. degree, and higher than B.Sc.) showed significant differences with respect to their sleepiness (P = 0.027 and 0.001,

respectively). The level of sleepiness was also found to be significantly different among the employees of different work experience (P=0.001). No significant difference in sleepiness was identified between the single and married employees.

Pearson's test identified a significant and direct correlation between the level of sleepiness and age, work experience and BMI score (r = 0.240 – 0.589, P < 0.050). However, no significant relation-

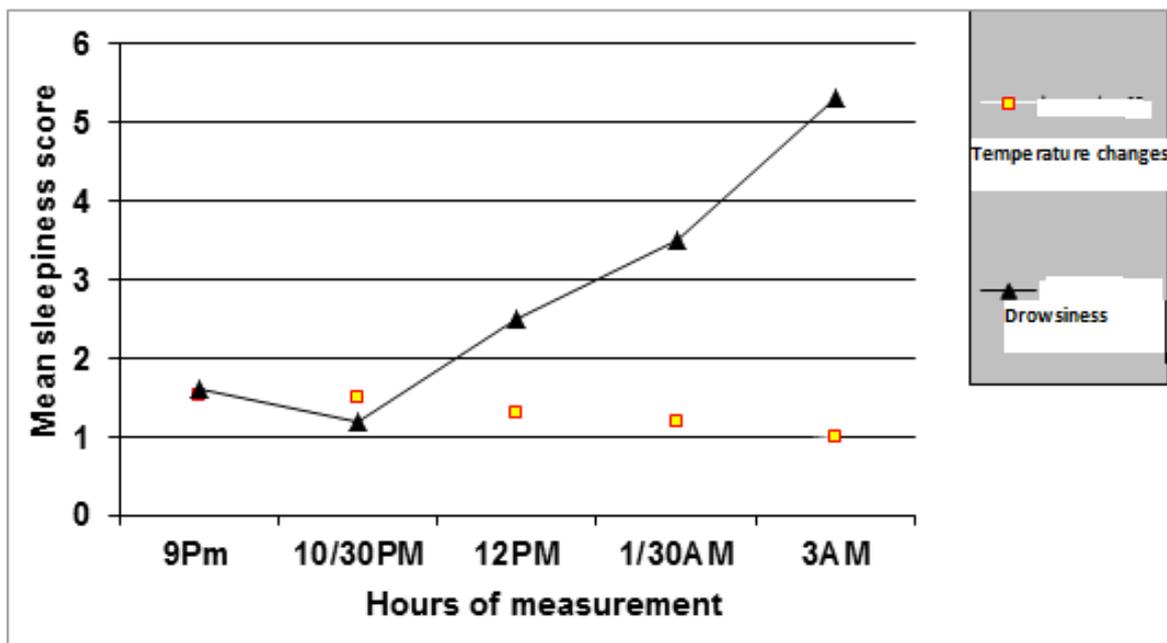


Figure 2 Changes in the body temperature with sleepiness in the first group's several work hours

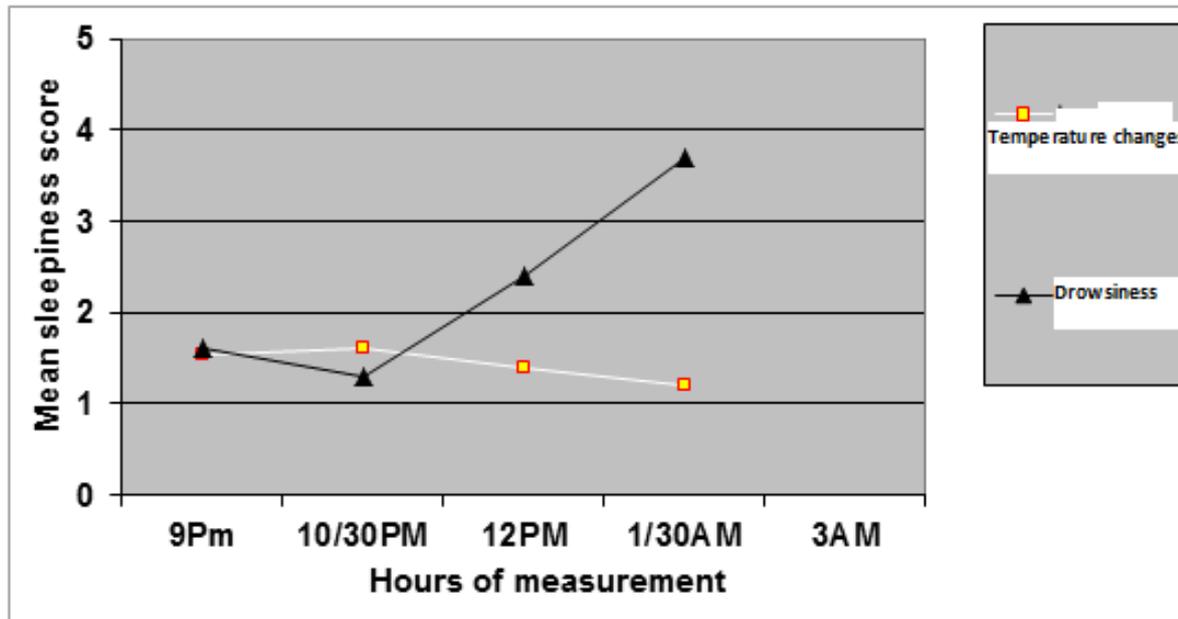


Figure 3 The body temperature with sleepiness in the second group's several work hours

ship was observed between the level of sleepiness and marital status ( $P > 0.050$ ). Body temperature and body pressure were also found to be significantly correlated with the intensity of sleepiness ( $r = 0.210, 0.419$ , respectively,  $P < 0.050$ ). In addition, Chi-Square test detected a significant relationship between sleepiness and the level of education ( $P < 0.050$ ).

## Discussion

Our results showed that the highest level of sleepiness occurs, firstly, at 3:00 am, and then at 1:30 am. This result is similar to that of another study, which shows that the maximum sleepiness occurs during the night shift at 2:00, 4:00, and 6:00 am [12]. Based on these observations, one could conclude that work shift affects the quality of sleeping. Studies have shown that melatonin secretion, which

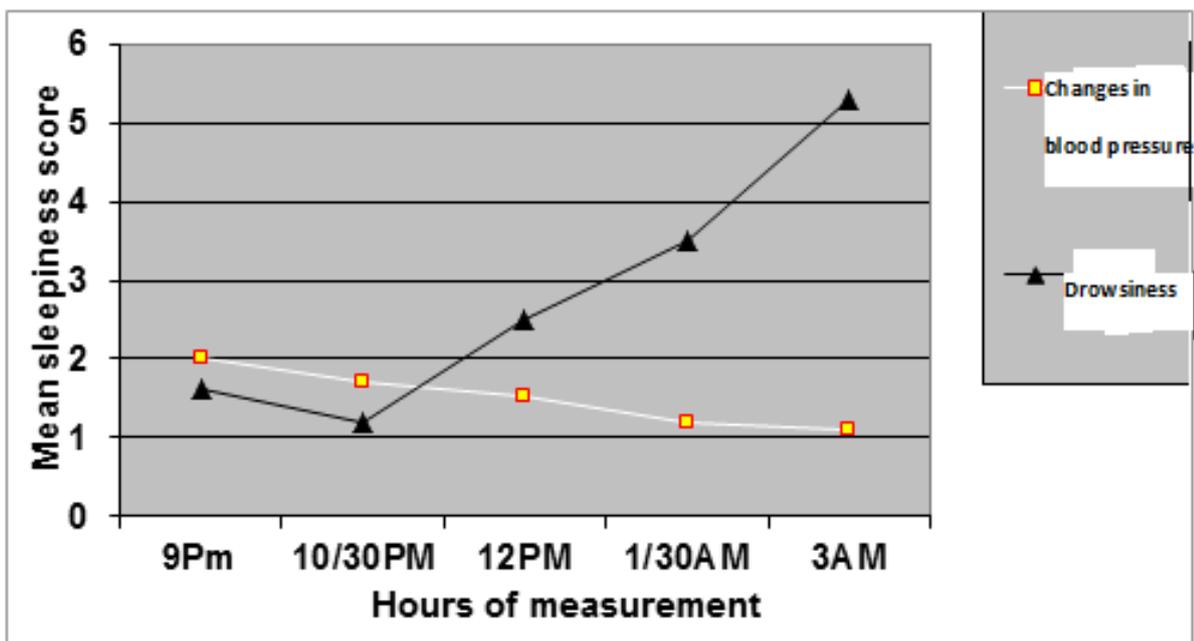


Figure 4 The rate of changes in blood pressure with sleepiness in the first group staff's work hours

helps to feel sleepy, is increased at these certain times in the morning [13]. During a study on shift worker nurses, Kakooei et al. found that the melatonin secretion peak at 4:00 am gets significantly higher than at other hours of the day ( $P = 0.001$ ) [14].

As noted before, body temperature usually shows fluctuations with the minimum occurring around 5:00 am, and the maximum occurring around 9:00 pm. Difference in the body temperature between these times is almost 0.7 °C. Figures 2-5 show that increased sleepiness results in decreased mean body temperature and blood pressure.

The finding that there is a direct relationship between the years of working on shift work system, and sleepiness implies that more work experience results in more problems in adapting to shift work.

The results of a study by Akrestedt et al. (2009) indicated that shift work and the associated sleepiness have a negative effect on the performance of the workers [15]. The significant difference in the level of sleepiness among the different age groups observed in this study is consistent with the results obtained by Haema et al, which was carried out in the experimental form and under controlled conditions, showing that younger people are less sleepy compared to older ones [16].

As demonstrated, there was also a significant difference between the rates of sleepiness in the employees with various BMI scores. As the evidence shows, it can be expected that individuals having high BMI score get sleepier than other groups. A similar result was obtained by Zarei-fard et al., who conducted a study in Metallurgy industry [17].

## Conclusions

Our study identified a direct relationship between sleepiness and age, BMI score, level of education, and work experience of the shift working employees. Also there was an inverse relationship between the level of sleepiness and the body temperature and blood pressure. The results obtained indicate the effect of age and work experience on the level of sleepiness and adapting to shift work. As a conclusion, it is very important to pay due attention to the demographic and physiological characteristics of employees when choosing suitable staff for shift working.

## Abbreviations

(BMI): body mass index, (SSS): Stanford sleepiness scale

## Competing Interests

The authors declare no competing interests.

## Acknowledgments

The authors gratefully acknowledge the financial support for this work provided by Ilam University of Medical Sciences, Iran.

## References

1. Moonk T, Folkard S. Shift work, problems and solutions. *Translation by: Choobineh AR(3rd Ed), Shiraz: Publishers of Shiraz University of Medical Sciences 2005.* [In Persian]
2. Jaffe MP, Smolensky MH, Wun CC. Sleep quality and physical and social well-being in North American petrochemical shift workers. *South Med J* 1996, 89(3):305-12.
3. Weitzman ED, Goldmacher D, Kripke D, MacGregor P, Kream J, Hellman L. Reversal of sleep-waking cycle: effect on sleep stage pattern and certain neuroendocrine rhythms. *Trans Am Neurol Assoc* 1968, 93:153-7.
4. Ruggiero JS. Health, work variables, and job satisfaction among nurses. *J Nurs Adm* 2005, 35(5):254-63.
5. Akerstedt T, Kecklund G, Gillberg M. Sleep and sleepiness in relation to stress and displaced work hours. *Physiol Behav* 2007, 92(1-2):250-5.
6. Haack M, Mullington JM. Sustained sleep restriction reduces emotional and physical well-being. *Pain* 2005, 119(1-3):56-64.
7. Pease EC, Raether KA. Shift working and wellbeing: a physiological and psychological analysis of shift workers. *UW-L J Under Res* 2003:1-5.
8. Muecke S. Effects of rotating night shifts: literature review. *J Adv Nurs* 2005, 50(4):433-9.
9. Suzuki K, Ohida T, Kaneita Y, Yokoyama E, Uchiyama M. Daytime sleepiness, sleep habits and occupational accidents among hospital nurses. *J Adv Nurs* 2005, 52(4):445-53.
10. Drake CL, Roehrs T, Richardson G, Walsh JK, Roth T. Shift work sleep disorder: prevalence and consequences beyond that of symptomatic day workers. *Sleep* 2004, 27(8):1453-62.
11. Fischer FM, Teixeira LR, Borges FN, Goncalves MB, Ferreira RM. [How nursing staff perceive the duration and quality of sleep and levels of alertness]. *Cad Saude Publica* 2002, 18(5):1261-9.
12. Farvaresh E, Monazam M, Abbassinia M, Asghari M, Sa-deghi A, Mohammadian F. Investigation the relationship between sleepiness and general health of shift workers in the automobile industry. *Journal of North Khorasan University of Medical Sciences* 2012. [In Persian]
13. Wetterberg L. Melatonin in humans physiological and clinical studies. *J Neural Transm Suppl* 1978(13):289-310.
14. Kakooei H, Zamanian Ardakani Z, Karimian S, Ayatollahi S. Twenty Four-hour circadian melatonin profile among women shift work nurses. *ZUMS Journal* 2009, 17(68):75-84. [In Persian]
15. Akerstedt T, Wright KP, Jr. Sleep Loss and Fatigue in Shift Work and Shift Work Disorder. *Sleep Med Clin*

- 2009, 4(2):257-71.
16. Harma MI, Hakola T, Akerstedt T, Laitinen JT. Age and adjustment to night work. *Occup Environ Med* 1994, 51(8):568-73.
  17. Zarei-fard K KM, Kakooei H, Nasl Seraji J, Sadeghniat Kh. Relationship between body mass index (BMI) and the level of sleepiness in shift workers of a metallurgical industry. *Healthy Work Quarterly Journal* 2009:31-6. [In Persian]

**Please cite this article as:**

Saber Moradi, Fatemeh Mansouri, Faramarz Sori, Abdol-hessein Pournajaf, Ali Mohammad Abbasi, Arash Akbarzadeh, Faramarz Gharagozlou, Mahsa Hami, Mohsen Karchani. Sleepiness and Changes in Vital Signs among the Clinical Shift Workers Staff at Imam Khomeini Hospital of Ilam. *International Journal of Hospital Research* 2014, 3(1):19-24