Full Length Research Paper

Effective factors for improving the personnel's attitudes towards patient safety

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Emphasizing on the patient safety improvement has led to extensive tendencies towards measuring safety culture and improving it in the medical centers. So, a research was conducted in Shahid Modarres Hospital to measure safety culture before and after education and to determine the affecting factors. A population of 236 employees was defined, including top managers, middle managers and personnel. They were given the standard patient safety attitude questionnaire (SAQ) before and after education which covered six dimensions, including: team work climate, safety climate, job satisfaction, stress recognition, perception of management, and work conditions. Its validity, internal and external reliability were tested and verified. A Likert scale and the McNemar, regression and path analysis tests were utilized. An improvement in the attitudes was seen regarding all dimensions (p<0.05). The regression between the demographic variables (job, job background in this hospital, work group, education, field of service, ward, age and gender) and various dimensions showed special characteristics in each dimension. According to path analysis, the levels of the dimensions' influence on the total attitude before and after education were different. This difference encompassed both the amount of the effect of each dimension on the total attitude before and after the education and the rank of their effect on the total attitude before and after the education comparing each other. The results of the two phase safety culture assessment along with the amount and the rank of the effect of each dimension on the total attitude showed that regarding source limitations, we can concentrate education on the 6 dimension in the following order: safety climate, team work climate, perception of management, work conditions, job satisfaction, and stress recognition in order to achieve the optimal effectiveness.

Key words: Safety culture, factor analysis, education influence, patient safety.

INTRODUCTION

Despite all its benefits and advantages for the human generation, the industrial development has been a source for various perils and deficiencies, a fact confirmed by the dreadful and terrifying statistics from all over the world (Mohammadfam, 2001). According to the reports, an average of 17 American workers die and about 1600 others are injured per day as a result of work accidents leading to a cost of 110 million US Dollar (Vredenburgh, 1998). On the one hand, the errors and complications are rising especially in the field of health-care, being intensified by the technology advancement, increasing population growth and aging. On the other hand, the negative factors, such as: numerous job contradictions, long work hours and difficult care tasks, make serious problems even for the most laborious and aware health care professionals (Wilson, 2007).

According to the statistics, about 600000 to 800000

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work accidents occur for American health care personnel per year, as a result of the needle stick injuries. Moreover, there is a death toll of 44000 to 98000 among Americans per year as a result of medical errors (Hamaideh, 2004), whereas most researchers consider unsafe behaviors as the key factor in bringing about more than 70% of accidents (Mohammadfam et al., 2008). Also, Jajvandian et al. (2007) mentioned the major injury-causing factors as being: work fatigue, high stress, lack of safety facilities and the crowded hospital wards. While after a bad incident, the concentration on the patient safety is usually limited only to arrange inspections by supervisors and forming safety committees (Linddberg et al., 2008). Faghihi and Mansoori (2007) believe that the best approach to prevent the hospital accidents is to focus the maximum control on the physical pivots, equipments and behaviors of the people in charge of the healthcare system. Hereupon, most developed countries have found out that not only having modern technology and managerial systems, but also improving safe behaviors among personnel and in their values and beliefs, along with the positive changes in attitudes of both employees and their organization towards safety - which totally form "safety culture"- are among the most effective manners to prevent accidents (Alizadeh, 2005).

Considering the importance of cultural factors in controlling the dangers is based on the researches conducted in some of the creditable industries like nuclear energy and petrochemical industry. Tendencies towards safety culture began with the "Chernobyl Disaster" in 1986 (Ooshaksaraie, 2009). Investigations proved the presence of a weak safety culture to be the most probable cause of the accident. Considering the factual phrase of "To err is human", the researches of the Medical Institute Report have shown that health and medical organizations must improve their safety culture. Subsequently, many positive actions were performed, for example, in Great Britain, developing safety culture was recognized as the first of the seven phases to achieve the patient safety behaviors and in Canada, safety culture was regarded as one of the five goals (or necessities) of the patient safety in the health services accreditation center (Fleming, 2005). The positive safety culture accepts the inevitability of error and non-passively tries to recognize the potential arrangements, in spite of the pathological culture where the errors are either masked or followed by some punishments causing the personnel to evade the problems (Nieva and Sorra, 2003). In fact, the new safety approach concentrates on the system mostly rather than the people and errors are considered as the result of the system's deficiencies (Jones, 2007).

There is a strong agreement over the description of a positive safety culture among the specialists, but there are also differences in the modeling. However, no single model has ever been provided so that it could flexibly cover all aspects of the safety culture. Nevertheless, according to necessary opinion polls, some important factors were recognized, including: manager's commitment to safety, accessing efficient personnel, effective communications, and having a systematic approach to safety (International atomic energy agency, 2002). Another experience showed that the following eight phase process is necessary for maintaining and improving the work conditions: commitment of the senior managers, involving the personnel, recognizing the risks, recognizing the important actions to control the risks, creating the performance standards, having a measuring and feedback system, reinforcing the correct actions, and improving the processes (Mc Sween, 2003). Moreover, being aware of the safety culture level in an organization, we can take step towards its improvement. Education at all levels can be considered as one of the efficient methods in this way. Lingard (2002) showed that educational programs aiming at improving safety culture affect positively the occupational safety and safe behavior (Hamaideh, 2004).

Shahid Modarres Hospital is a teaching and therapeutical center in Tehran affiliated Beheshti University of Medical Sciences. This medical center encompasses a variety of services and speciatics including: cardiology, cardiac surgery, urology, nephrology, general surgery, thoracic surgery, internal medicine, hematology and oncology, pediatric cardiology, and transplantation. Presently, 100 medicine and 700 other personnel work in this hospital. Summing up the aforementioned facts, we can describe the aim of the present research as proper answers to the following questions: (i) can education lead to some improvements in the safety culture attitudes? And (ii) regarding the resource constraints, which factors can be considered to play the most prominent role in improving the personnel's safety attitudes in Shahid Modarres medical Center in 2010-2011?

METHODOLOGY

Our study was a semi-empirical research. In order to collect necessary data, first, the available questionnaires in the field of the patient safety (consisting of: safety attitude questionnaire (SAQ), Stanford instrument, modified Stanford instrument and hospital survey on patient safety culture (HSPSC)) were investigated regarding measurable elements, number of questions, reliability, and the weak and strong points (Fleming, 2005) and the safety attitude questionnaire was selected. Since the original questionnaire was in English and then translated to Persian, it was retranslated to English in order to preserve the validity turned into a self-made one. With purpose of measuring the validity, the questionnaire was sent to 13 related experts (including the specialists of the health services administration and the safety fields, and the hospital managers) leading to some tiny corrections, but the main content remained unchanged. In order to measure the internal reliability, the questionnaires were answered by 24 random participants. Then, the Cronbach Alpha was calculated which showed 87% for each dimension and 94% for the total, indicating an internal coherence. In addition, in order to measure the external reliability, the questionnaires were sent to the same population after a period of 10 days and then the Pearson Correlation Coefficient

was calculated over 94%.

The sampling method used was in two forms: first, each participant was assigned to one of the following work groups; top managers, middle managers, and (ordinary) personnel. Then, in order to determine the sample size, the following actions were done: The 20 top managers and 90 middle managers were selected through a census. As for the personnel, since their safety attitudes were scored rather low and about 30% rising to 50% after the safety culture education, a sample of 126 people with a reliability of 95% and power of the test of 90% was selected by a simple random method to respond to this study. Hence, the questionnaires were completed by a total sample volume of 236 people in each of the 3 groups. Moreover, since this research was a general study on the attitudes towards safety culture in various dimensions and different groups (before and after education), no control was exerted over other variables. The present research applied the six fields used by Sexton et al. (2006) to the questionnaire, including: Team work climate, safety climate, job satisfaction, stress recognition, perception of management, and work conditions. Each question was graded based on the five level Likert scale (including: 4=strongly agree, 3=agree, 2=neutral, 1=disagree, 0=strongly disagree). Then the subjects' marks were graded from 0 to 100 considering the scores over 60% as the positive attitudes towards safety culture which are equal to 3 and 4 in Likert scale (The direction of the questions was made monotonous before grading).

In the course of the education, first the reasons of deficiency in safety-related actions were mentioned as follows: lack of trust in profitability of those actions, lack of acquaintance with the risk controlling methods, shortage in law and regulations, lack of executive support for the regulations, weak monitoring systems, shortage in expert manpower, and weak educational systems. Secondly, the participants were informed of some statistics related to dangers and work accidents that happened to the personnel of the domestic and overseas medical centers along with the emergent loss of money. Then, each participant was requested to narrate one of their prominent experiences about the work incidents during their service period and also suggest some potential and probable solution to those problems. Afterwards, the safety culture education based on the above-mentioned dimensions was carried out with purpose of improving the attitudes towards the patient safety. Regarding the research population (consisting of 236 people in 3 groups), the need for a precise organization and planning and focusing on motivational factors was strongly felt.

After preparing the subjects with the education, their attitudes were examined anew via the questionnaires after a period of 3 months. We utilized the McNemar test in order to compare the safety attitudes of all 3 groups before and after education, the regression test to determine the effective demographic variables in each dimension and in the total, and the path analysis test to measure the effects of all dimensions and their relationship on the total attitudes towards safety. In all the tests, the significance level of p was less than 0.05. And finally, statistical packages were used for data analysis.

RESULTS

According to the Table 1, 164 out of 236 participants (69.5%) were women. Moreover, 28% of the subjects were less than 30 years old and 9.7% were between 30 and 34. 69.5% of them were married. Overall, 66.9% of them had a bachelor degree and 5.5% had got a post-doctorate degree. Also, 72.5% of them were working in the clinical divisions and 11.9% were working as AHPs (Allied Health Professionals). Additionally, 56.4% of them

were normal (official) employees and 7.2% were working as vocational trainees and etc. Meanwhile, 36% of them were working as the (rotating) shift workers and 8.9% were working constantly in the evening and night shifts. 28.8% had a background of 10 to 14 years and 14% had a background of 15 to 19 years in the current job. Finally, 43.6% of them had a job background of less than 5 years and 10.2% had that of 15 to 19 years in the hospital.

As shown in the Table 2, we can see a significant increase in the positive attitudes for all questions and in all dimensions after the education. A rise from 66.9% to 94.9% can be seen in the attitudes in the teamwork climate dimension. In other dimensions, we can envision the increase, as follows: from 55.9 to 96.2% for safety climate, from 56.8 to 89.4% for job satisfaction, from 17.4 to 24.6% for stress recognition, from 36.9 to 80.9% for perception of management, and from 60.6 to 84.7% for work conditions. And there was a rise from 50% before education to 93.2% after education for all dimensions. The results of the multivariate regression between the demographic variables and each dimension and also the total safety attitudes showed that the education influence has a direct relationship with the following people regarding the respective dimensions: with physicians, people with a little job background, senior and middle managers in the team work climate dimension, middle managers with a doctorate or post-doctorate education background which are working as office workers in the safety climate dimension, physicians and internal wards personnel in the Job satisfaction dimension, people with a doctorate or post-doctorate education background and young ones in the stress recognition dimension, people with a doctorate or post-doctorate education background and women in the perception of management dimension, and physicians and nurses in the work condition dimension.

As shown in Figures 1 and 2, the influence of the teamwork climate dimension on the total attitudes was calculated to be 0.9 before and after education. The respective statistics regarding the other dimensions before and after education are respectively as follows: 0.89 and 0.92 for safety climate, 0.58 and 0.51 for job satisfaction, 0.34 for stress recognition, 0.76 and 0.78 for perception of management, and 0.7 and 0.74 for work conditions. The significance level of p was less than 0.05. The interaction between the teamwork climate dimension and the other dimensions was significant ($p<0.05$) before education as follows: safety climate 0.83, job satisfaction 0.43, and stress recognition 0.29, perception of management 0.57, and work conditions 0.59. After education, we got the following values ($p<0.05$): safety climate 0.84, job satisfaction 0.34, and stress recognition 0.28, perception of management 0.63, and work conditions 0.65. Moreover, the interaction between the safety climate dimension and the other dimensions was significant ($p<0.05$) and yielded the following values before education: job satisfaction 0.29, stress recognition

Table 1. Background information of the subjects. Gender, current age, marital status, education, field of service, type of employment, work shift, job background in this current job and job background in this hospital.

Background	Amount / Range	Number	Percent
Gender	Female	164	69.5
	Male	72	30.5
Current age (year)	Less than 30	66	28
	30 - 34	23	9.7
	35 - 39	50	21.2
	40 - 44	47	19.9
	45+	50	21.2
Marital status	Never married	72	30.5
	Married	164	69.5
Education	Associate	26	11
	Bachelor	158	66.9
	Master	21	8.9
	PhD	18	7.6
	Post PhD	13	5.5
Field of service	Clinical	171	72.5
	AHP	28	11.9
	Official	37	15.7
Type of employment	Staff	133	56.4
	Contractual	65	27.5
	Time-limited contractual	21	8.9
	Vocational trainee	17	7.2
Work shift	Morning	77	32.6
	Morning and evening	53	22.5
	Evening and night	21	8.9
	Rotating	85	36
Job background in this current job	Less than 5	50	21.2
	5 - 9	42	17.8
	10 - 14	68	28.8
	15 - 19	33	14
	20+	43	18.2
	Less than 5	103	43.6
Job background in this current job	5 - 9	28	11.9
	10 - 14	50	21.2
	15 - 19	24	10.2
	20+	31	13.1

0.24, perception of management 0.54, and work conditions 0.69. After education, we had the following values: job satisfaction 0.3, stress recognition 0.29, perception of management 0.6, and work conditions 0.72.

Before education, the interaction between the job satisfaction dimension and stress recognition, perception of management and work conditions was calculated as 0.14, 0.55 and 0.19, respectively. After education, there

Table 2. Comparison of the safety attitudes before and after the safety culture education in different dimensions: Team work climate, safety climate, job satisfaction, stress recognition, perception of management, work conditions.

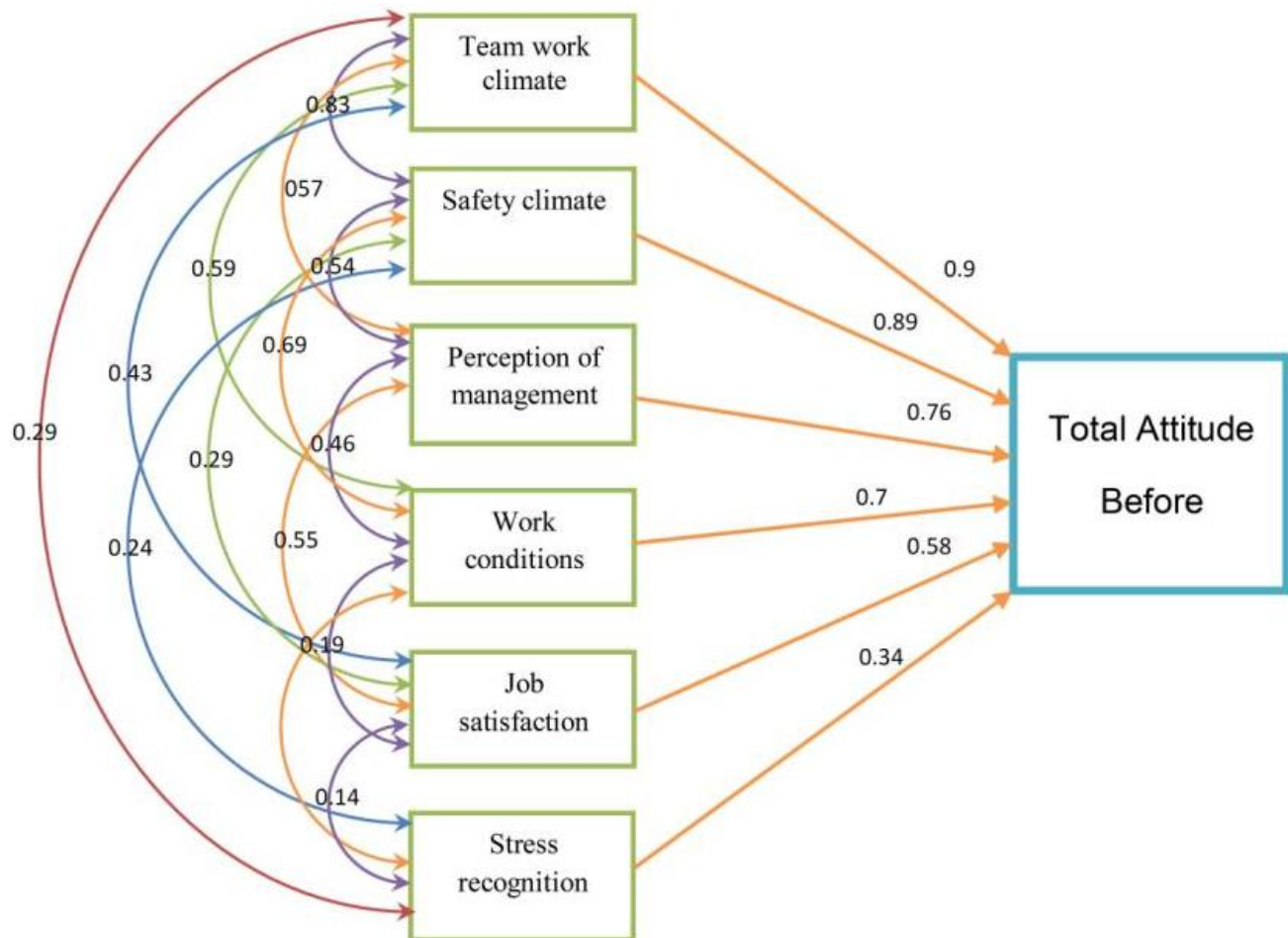| Dimension	Before education		After education		McNemar
	Number	Percent	Number	Percent	
Team work climate	158	66.9	224	94.9	0.001
Safety climate	132	55.9	227	96.2	0.001
Job satisfaction	133	56.4	211	89.4	0.001
Stress recognition	41	17.4	58	24.6	0.001
Perception of management	87	36.9	191	80.9	0.001
Work conditions	132	55.9	200	84.7	0.001
Total	118	50	220	93.2	0.001

Figure 1. Path analysis before education. Between total attitude and team work climate, safety climate, job satisfaction, stress recognition, perception of management and work conditions.

was no significant interaction with stress recognition (0.12) and work conditions (0.1) ($p>0.05$), but a significant interaction was seen with perception of management (0.55, $p<0.05$). There was an insignificant interaction before education between the stress recognition dimension and perception of management

(0.06) and work conditions (0.06). The same interaction became insignificant again after education with perception of management (0.02, $p>0.05$), but significant with the work conditions (0.17, $p<0.05$). And finally, there was a significant interaction between the perception of management dimension and work conditions before
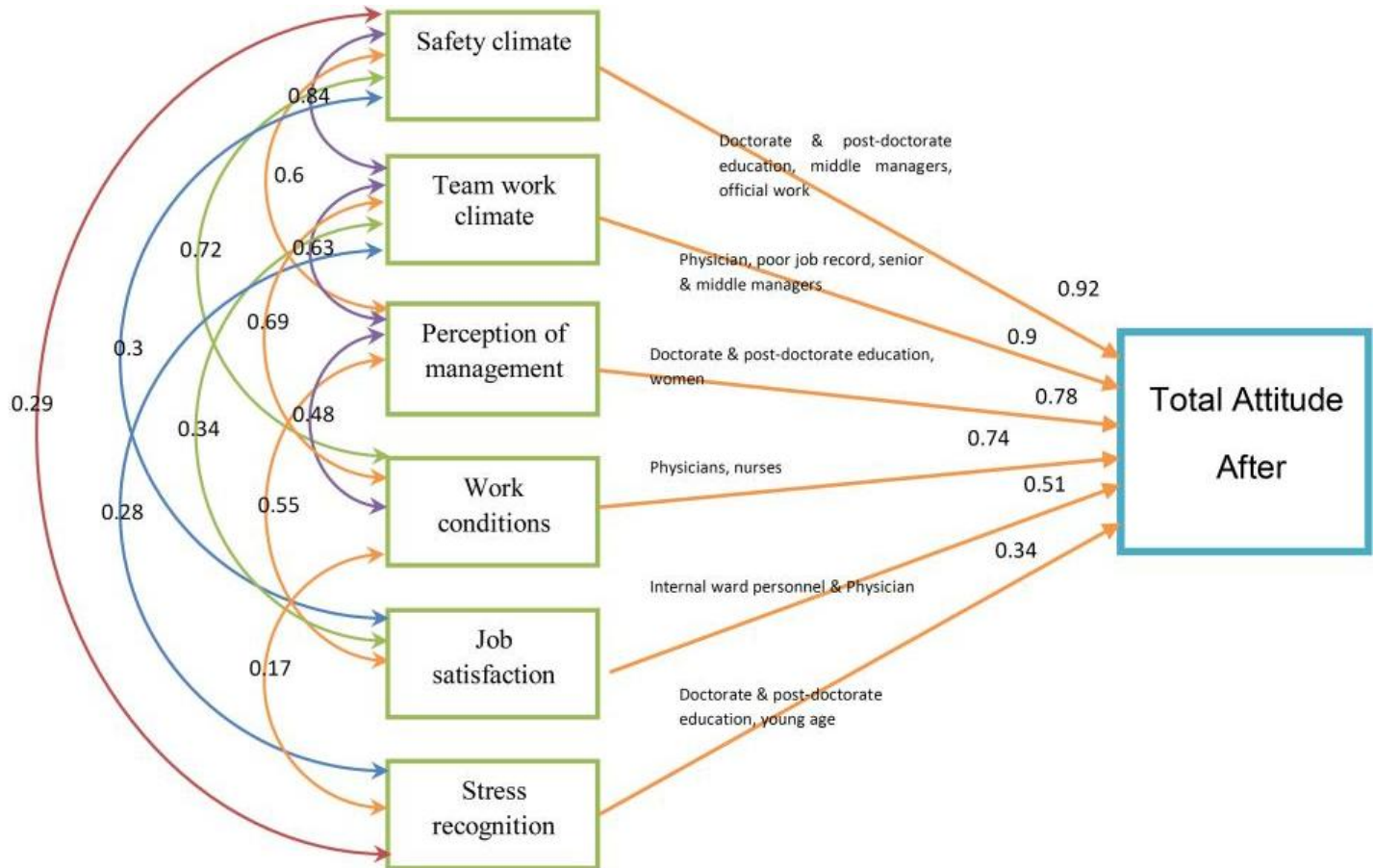
Figure 2. Path analysis after education. Between total attitude and team work climate, safety climate, job satisfaction. Stress recognition, perception of management, work conditions and background information.

education (0.46) and after education (0.48) ($p<0.05$).

DISCUSSION

As shown in the Figures 1 and 2, we found that after education, there was no change in the influence of the teamwork climate dimension on the total attitudes, but the intensity has fallen from the first rank to the second one. There was an increase in the influence of the safety climate dimension on the total attitudes and a rise in the intensity from the second rank to the first one. The influence of the job satisfaction dimension on the total attitudes fell, but the intensity has remained in the same rank. Moreover, there was no change in the influence of the stress recognition dimension on the total attitudes and in the intensity rank too. The influence of the perception of management dimension on the total attitudes has risen, but the intensity has remained in the same rank. And eventually, there was an increase in the influence of the work conditions dimension on the total attitudes and the intensity rank has remained unchanged.

According to the results of the path analysis, the safety culture education only caused changes in the intensity of the relationship between teamwork climate and safety climate dimensions and had no effects on the intensity of the relationship with the other ones. Also, there can be seen an increase in the influence of the safety climate, perception of management, and work conditions dimensions, and a decrease in the influence of the job satisfaction dimension, whilst the teamwork climate and stress recognition dimensions remained unchanged.

The relationship intensity had a significant increase after education between teamwork climate and safety climate, perception of management and work conditions, between safety climate and the job satisfaction, stress recognition, perception of management, and work conditions, and between perception of management and work conditions. The relationship intensity had a significant decrease after education between teamwork climate and job satisfaction and stress recognition. However, the intensity of the relationship between job satisfaction and perception of management had no change. According to a study by Wilson (2007), we can

allow for some equivalencies between the dimensions of the HSPSC model and those of the SAQ model , that is to say: patient safety grade, overall perception of safety and frequency of event reporting can be equivalent to safety climate, Supervisor expectations about safety, organizational learning, communication openness, feedback and communication about errors, non-punitive response to errors, and hospital management support for safety can be the same as perception of management, the staffing dimension can be equal to work conditions, and teamwork across units and teamwork within units and hand offs and transitions can both be equivalent to teamwork climate. There is no equivalent of "the number of events reported" in SAQ. Job satisfaction and stress recognition have no equivalent in HSPSC too.

In the present research, the maximal influence of the intervention factors is on the perception of management dimension and the minimal one is on the stress recognition dimension. Also according to a study by Van Noord et al. (2010), the maximal influence of the intervention factors is on the "hospital management support for safety", a sub-dimension of the perception of management dimension, but the minimal one is on the "hand offs and transitions", a sub-dimension of the teamwork climate dimension. Furthermore, teamwork climate and safety climate dimensions had the most influence on the total safety attitude respectively before the intervention, whilst according to a study conducted by Norden-Hagg et al. (2010) with the same instrument, the most influence belonged to teamwork climate and job satisfaction dimensions respectively.

In our study, the intervention factor caused an increase in attitudes in all dimensions, while as Timmel et al. (2010) has shown, attitudes were affected similarly in all dimensions except in the stress recognition. Also, in a research done by Donnelly et al. (2009) using the "HSPSC", the intervention factor brought about an increase in attitudes solely in the sub-dimensions of perception of management, safety climate, and work conditions. Our findings also suggest that the attitudes have improved in the safety climate dimension after the intervention, which correspond to a research done by Thomas (2005) who studied only nurses and not other work groups. Additionally, Jajvandian et al. (2007) suggested that according to the personnel who had been exposed to blood and secretions in the respective medical centers, the main reasons for such exposures would be work fatigue, high stress and inaccessibility to safety facilities, whereas as is shown in our study, the work conditions and stress recognition dimensions had less influence on the safety attitudes before and after the intervention.

According to the findings of the present research, education improved the significance in the safety culture of Shahid Modarres' personnel, a view which is supported by Alizadeh (2005), with the difference that he had studied the education influence not only on attitude,

but also on knowledge and performance.

Conclusion

Finally, after the safety culture assessment in two phases in this medical center, it is worth pointing out that though education improved the attitudes of all personnel towards safety, but regarding the resource constraints, we can concentrate the education on the six dimensions of safety climate, team work climate, perception of management, work conditions, job satisfaction, and stress recognition with the specific demographic features in order to achieve the optimal effectiveness.

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