Design of an Action Plan Regarding early detection and reduce Nurses' Health Hazards in Intensive Care Units

Nadia Mohamed Taha, Elham Hamad Mohamed

Medical Surgical Nursing Department, Faculty of Nursing, Zagazig University, Egypt
Email: drelhamhamad57@gmail.com

Abstract: Background: working at intensive care units leads to great exposure to health hazards. The nature of nursing work due to direct contact with some activities such as carrying and lifting patients, abnormal working conditions, sudden bending, and twisting put nurses at risk of musculoskeletal injuries **Aim of this study**: Design of an action plan regarding early detection and reduce nurses' health hazards, working in ICU at Zagazig University Hospital**. Research design***:* A quasi experimental research design was used. **Setting***:* Intensive care unit and coronary care unit at Zagazig University hospitals. **Subjects***:* convenient sample of 43 nurses working in ICU and coronary care units. **Tools of data collection:** five tools were used 1st tool Socio-demographic and job characteristics of nurses Questionnaire 2nd tool Questionnaire for assessing the health hazard of nurses in intensive care units. 3rd tool Knowledge assessment questionnaire, Tool Four: Questionnaire to evaluate varicose veins, Tool Five: Self-reported practice regarding care of health hazard. **Results:** There was high statistical significant improvement is studied nurses knowledge toward varicose vein (P value <0,001) related to all items pre/after action plan. There was high statistical improvement in nurses knowledge regarding (varicose vein grad, pain score, physical, psychological and social <0.001). Also there was high statistical improvement in nurses practice (Dealing with pain, Dealing with back pain,), Preventing varicose veins and, avoiding infection <0.001*) there was positive correlation between varicose vein grad, pain and negative correlation between knowledge and pain score and, total risk after action plan as compared to before action plan. **Conclusion**: the present study conclude that there was improvement of nurses' knowledge and practice of health hazards for studied nurses in post and following up intervention phase compared to pre intervention phase, but some decline occurred in the follow up phase compared with post intervention phase Moreover, the present study answered about researcher hypothesis: that the action plan had a positive effect on improving nurses' performance regarding reduce health hazards of ICU nurses. **Recommendation***:* The study should be replicated on large sample and different hospitals setting in order to generalize the results and development of an action plan.

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Key words: ICU nurses, Health hazards, Physical hazards, Psychological hazards & Varicose veins, Pain, Back pain, Action plan.

1. Introduction:

An intensive-care nurse is an occupational registered nurse who jobs in an intensive-care unit. Welcome the patient into the wing then gives the needful personal therapy after that conducts a follow-up of his health condition and has to be knowing of any alteration in the health situation of the patient. Help the medical doctor in the therapy in maximum that happens of needed recovery and in connecting into the required to be done instrument systems. This nurse has to respond with all the educational, legal, and coaching demands to practice as an occupational nurse, as wanted by a State Board of Nursing or similar licensing body. It is observed that by 2030, a lower of nurses will decrease from 9.0 to 7.6 million, these decrease may happened in the African and Eastern Mediterranean Regions will actually worsen [(1)].

Nurses work in an environment that is significant to be one of the greatest dangerous professional settings [(2-4)]. Moreover often workplace concerning exposures, nurses confrontation various danger due to their job-concerning activities [(5-6)]. A greater yearly propagation of back pain (77%) between healthcare jobs than other professional groups has been informed [(7-11)].

Back damages are related to an immediate price of $37,000 and no immediate price around from $147,000 to $300,000 [(8)]. Actually, ergonomic-concerning damage poses a considerable health danger to a job and yet it is the maximum predominate professional harm in the healthcare industry [(12,13)]. The nurses' infections are by blood-borne like HIV, TB, and hepatitis B and C. Essential mortality between these jobs unavoidably lead to loss of clever personnel and adversely affect healthcare services which are

previously exhausting in much low and middle-income countries [14].

Evidence from ICU indicates that nurses are considerably exposed to chemical, biological, physical, and psychosocial professional danger [6,15]. They are permanently in connect with patients that expose them to the state of being infected and consequently, it could demand appropriate preventative taken to decrease their danger of obtained of disease or damage. Information on professional dangers between nurses and their reduction has taken stay rare in ICU. Comprehension of the predisposing agents for professional dangers between healthcare jobs is required to know professional health and safety policy and programs for healthcare workers. Working at intensive care units leads to great exposure to health hazards. Nurses often work in ICU may be exposed to a wide array of psychosocial, chemical, biological, and physical hazards [16].

Physical and environmental dangers usually established in ICU involved slippery floors, electrical dangers, weakness lighting, and unsuitable ventilation and also characterizing the range of musculoskeletal damage in nurses [17]. Generality workplace exposures do not outcome in disease, may be due to either the danger is not patrimonial by the transported by airway. Moreover, the additional nurses inform around the possibility of professional health and safety danger, the further effective they will be in decreasing danger, bypass accidents, and reducing professional stress or results [15].

Definition of physical dangers is as physical pain and biological troubles, sleep disorders, leg, back, body and arm pains, shifts in appetite, digestive, visual, auditory, and respiratory troubles. Definition of physical dangers is a negative self-understanding, negative outlook on life in common and shifts in feeling quality of being sad, excitement with everything, absence of self-confidence, the sensation of emptiness, absence of self-control, bitterness, the sensation of failure, crying for no obvious cause, and negative image of oneself.

Definition of Social danger is as a sensation of isolation and condition of being difficult in family connections, influential connection hardness insensitivity across others, social life awkwardness, the difficulty in making friends, social isolation, condition of being difficult in making a resolution concerning personal life, and absolute aggressiveness. Nursing action plan addresses, human responses to potential and real health hazards and interventions directed toward the prevention of exposure to environmental hazards (primary intervention), the limitation of exposure to the hazards (secondary intervention), and treatment or rehabilitation after exposure to health hazards (tertiary intervention).

Aim:

Design of an action plan to early detection and reduce nurses' health hazards, working in ICU at Zagazig University Hospital.

Objectives:

- Assess health hazards (physical, psychological, and social hazards) self- reported by nurses working in ICU.
- Development and implementing of an action plan to reduce nurses' health hazards.
- Evaluate effect an action plan to reducing nurses' health hazards.

2. Subjects and Methods

1-Research design:

Quasi-experimental research design. There were two periods of data collection: pre-test and post-test periods. Post-test period occurred three months after applying an action plan.

2-Sample and Setting

A convenience sample of all available nurses (43) in intensive care unit and coronary care unit at Zagazig University hospitals, working at least one year in previous setting.

3- Data collection tools.

The study tools questionnaire and checklist were designed by the researchers after scanning related studies and literature. Five tools were used as the following:

Tool one: Socio-demographic and job characteristics of nurses Questionnaire

Part one:

Socio-demographic characteristics 10 open ended questions as: age, years of experience, monthly income, weight, length, number of working hours per day, the length of the day standing, Lift heavy weights, weights lifted (Kg), and No. of children. Part two Medical history of nurses covered BMI (Wt Kg divided L^2 meter) Normal (<25), Overweight (25-<30) and Obese (30+), No. of Gravidity, Use contraception, Use hormonal contraception, Have chronic dieses, had needle stick injection, and action taken. Part three covered family history of varicose veins, family history of chronic dieses.

Tool Two:

Questionnaire for assessing the health hazard of nurses in intensive care units Nurses' Measurement of work-related symptoms which was developed and validated by **Ferreira and Mendes (2007)** [18] utilized to estimate the appearance of danger-connecting agents, which adapted by the researchers It is regularly into three denominations: body dangers, psychological dangers, and social dangers, all out coming from the situations faced in work settings.: 1st part covered Physical hazards 14 Yes or No as: suffer from sleep disorders, pain in the

leg, back pain, knee pain, pain in the arm, neck and shoulder, suffer from headaches, fatigue and exhaustion at work, change in appetite and stomach disorders, disorder in the circulatory system (palpitations in the heart), digestive disorder (acidity), vision disorder, hearing disorder, breathing disorders, allergy of medical substances (disinfectants, sedics, medical guano powder, etc.), had an infection, and type of infection. 2nd parts Psychological hazards 11 Yes or No as: Feeling sad and distressed for no apparent reason, Feeling angry and nervous about everything, Feelings of loss of self-confidence, Feeling empty and idle most of the time during work, Feeling bitterness and depression without justification, Feeling defeated, cry without any reason, Desire to give up everything, Feeling permanent despair, Create a negative image for yourself, and Feeling stress and tension of changing the effectiveness of work. 3rd parts Social hazards 9 Yes or No as: Difficulties in family relations, difficulties in emotional relationships, difficulties in social life, difficulties in forming friends, lack of sense of others, suffer from social isolation, Lack of interest in others, aggressiveness out of control, and violence in workplace. Scoring system: if yes tack one score if No. tack zero score then collecting based on statistical analyses more than 60%or equal High risks for health hazards, if less than 60% low risks for health hazards. Reliability of the three parts by using Cronbach's alpha was 0.883.

Tool three:

Knowledge assessment questionnaire for nurse's health hazards in critical care unites adapted by the researchers based on litterateur review covered 7 main parts as definition of ICU, The work environment in the ICU setting, health risks in relation to occupational hazards, types of health hazards, Risks related to the ICU nurse, health and safety practices in the ICU, prevent hazards and reduce related risks. Correct answer one score incorrect answer zero score with total score 45. Based on statistical analyses more than 60% or equal satisfactory knowledge, if less than 60% unsatisfactory knowledge. Reliability of the tool by using Cronbach's alpha was 0.786.

Tool Four covered two parts: part one:

Questionnaire to evaluate varicose veins in critical care nurses The varicose intensity was classified into seven clinical degrees as follows C0 = no visible venous, C1 = telangiectatic or reticular veins, C2 = varicose veins, C3 = edema, C4 = skin changes without ulceration, C5 = skin changes with healed ulceration, ad C6 = skin changes with active ulceration **(Raju, & Neglén 2009)** [19]**.** Reliability of the tool by using Cronbach's alpha was 0.93.

Part two questionnaire to assess the severity of pain among nurses, in intensive care unit the Numeric Rating Scale (NRS) is the simplest and most commonly used numeric scale in which the rates of pain from 0 (no pain) to 10 (worst pain) 1-3 mild pain, 4-6 moderate pain, 7-9 sever pain **(Benjamin et al 2019)** [20] Reliability of the tool by using Cronbach's alpha was 0.92.

Tool Five: Self reported practice regarding care of health hazard:

Covered six parts as: Dealing with pain (6 points) Dealing with back pain (9 points) Preventing varicose veins (8 points) Avoiding infection (11 points) Avoiding psychological hazards (6 points) and Avoiding social hazards (5 points) total score 45 points done=one not done = zero. Based on statistical analyses more than 60% or equal satisfactory practice, if less than 60% unsatisfactory practice. Reliability of the tool by using Cronbach's alpha was 0.76.

Content validity

When the tools were a consideration, their face and content healthy of the tools were achieved by a panel of five experts in medical-surgical nursing who revised the tools for being a clear, relationship, applicability, involved and ease for achievement. According to their opinion, lesser amendments were applied.

Pilot study:

Pilot research was carried out on five nurses from the research setting to defined the visibility, applicability, relationship, and probability of the tools, to limit the hardness that may be faced through the application, and to evaluate the time necessary to the fulfillment of the research tools Amendments of the tools were done to reach to the finalized form. The patients who shared in the pilot research were not involved in the major research sample.

Administrative and ethical considerations:

To carry out the study the researchers obtained necessary approvals from the Head of the ICU and from the General Director of the Zagazig University Hospitals during letters published by the Faculty of Nursing, Zagazig University demonstrating the target and fulfillment of the research. All Helsinki principles of study ethics were followed. The action plan was approved by the ethics and studies committee at the Faculty of Nursing, Zagazig University. Informed approvals were guaranteed from each possibility participant after demonstrating the nature, goal, and advantage of the research, informing him/her around the truth to reject or pull at any time, and about the particularity of any acquired data. Anonymity was confirmed during the coding of all information. The research involvement has no foreseen potential harmful impacts on participants.

Study maneuver:

The study was carried out through assessment, design action plan, intervention of action plan, and evaluation of action plan. The assessment phase

started with recruitment of nurses and with informed oral consents. The investigators collected baseline information utilizing the completed tools and these were considered as the pre-involvement baseline information. Every nurse's meeting continues for 30-45 minutes. Each investigator was meeting with two nurses per day. In the designing phase, the investigators planning the action design based on specified nurses' educational necessities and guided by relevant literature [21]. It involved academic and also practical parts. The academic part supplied a background to Define health dangers, kinds of health dangers involved the physical environment of the ICU, working conditions, psychosocial, ergonomic, biological, and chemical agents, decreasing the working hours and workload, planning and arranging the work environment, prohibit danger and decrease concerning hazards, Staff practice involvement involved prohibition program concerning to physical, psychological, chemical, biological, ergonomic and other dangers in the ICU setting, safety exercise, danger administration program include planning, applying and estimating personnel, physical and organizational involvements that target to estimate and reduce professional hazards to nurses in ICU, Health screenings of ICU nurse, determination of hazard sources, determination of ICU nurses' responses across dangerous situations Therapy of damage and injury reason by danger, involving observation the long-term influences, a colored handbook was intended by the investigators and distributed to each nurse.

During the intervention of action plan, each nurse received the action plan, individually. Each nurse received three academically and five practical meetings. In the academically part, various educating planning were utilized as mini-lectures, discussions, and media like posters and videos. In the practical meetings, the investigators observed nurses how to deal with pain, preventing varicose veins avoiding infection, avoiding psychological hazards and avoiding social hazards by improve body mechanics appropriate lifting and situating, to implement appropriate back and leg exercises, to utilize hot or cold compresses and appropriate situations for pain, with back support. Each nurse was given the alternative to implement these activities during manifestation-re-manifestation.

The estimation phase involved a posttest after three-month assessments of the action plan effect utilizing the mentioned tools. The fieldwork was completed through three days weekly along with duration of twelve months from January 2017 to January 2018.

Statistical analysis:

Results entry and statistical analysis were achieved utilizing SPSS 16.0 statistical software package. Cronbach alpha degree was calculated to estimate the accuracy of the scale utilized during its situated on the inside uniformity. Quantitative results were compared utilizing the non-parametric Kruskal-Wallis tests. Qualitative categorical variables were compared utilizing chi-square test. Spearman rank attachment was utilized for the appreciation of the inter-connections between quantitative changing and ranked ones. In order to differentiate the independent foretellers of the pain and disability degrees, multiple linear regression analysis was utilized after testing for normality, and homoscedasticity and analysis of difference for the full regression models were done. Statistical significance was considered at p-value <0.05.

3. Results:-

Table 1: Show that more than over 35 years old of nurses with Mean±SD30.9±8.2, also show years of Experience more than half of them ten years with Mean±SD12.3±8.3, about 50.2% their income less than 1200, about three quarter (74.4%) of them have more than one child,95.3%of them stand long time and 74.4% lift heavy weight.

Table 2: Indicates that the mean of nurses BMI was 28.0± 5.4 and mean gravidity was 2.3 ±1.9. While 41.9% of them have constipation and 72.1% of them had needle stick injection.

Table3 Showed that none of nurses pre action plan dealing with pain and back pain while post action plan 95.3% dealing with pain and 93% dealing with back pain. (p<0.001), 4.7% of nurses pre action plan Preventing varicose veins while 100% post action plan Preventing varicose veins,11.6% of nurses pre action plan avoiding infection, while 90.7% post action plan. 7%of nurses pre action plan avoiding psychological hazards, 93% post action plan avoiding psychological hazards. 9.3% of nurses pre action plan avoiding social hazards increased to, 97.7% post action plan. There was high statistical significant improvement in studied nurses more of nurses' had total satisfactory knowledge pre action plane increased to 95.3 %post an action plan (P value <0,001) related to all items pre/after action plan.

Table 4 Show that (93%) of nurses had high risks for physical and psychological health hazards pre action plan, reduced to 48.8% and 44.2% post action plan. respectively. In relation to social hazard pre action plan reduced to 31.86. Also this table reveals that there was a high statistical difference between total health hazard pre 90.7%reduced to 44.2post action plan.

Table 5: Illustrate that there was high statistical improvement in nurses risk scores regarding (varicose

vein improvement in nurses practice regarding to avoiding physical hazards as avoiding psychological and social hazards (Dealing with pain, Dealing with back pain, Preventing varicose veins, Avoiding infection <0.001*)

Table 6: Emphasize that there was positive correlation between varicose vein grad, pain and total health hazards and negative correlation between knowledge and pain score, and total health hazards after action plan as compared to before action plan.

It is evident from table 7 that there was positive correlation between grade of varicose vein (with nurses age, years of experiences, BMI) and negative correlation between knowledge score (Experience, Hours of work, age, Gravidity and No. of children) as well as the total hazards after action plan as compared to before action plan.

Table 8: **Best** fitting multiple linear regression models for the Practice, varicose veins grade, pain and total health hazards score. Confirm that the only predictor factor affected on Practice score was intervention with r-square 91% and P value <0.001), also there was statistical significant relation between nurses gravidity and varicose veins score with r-square14% (p<0.001), there was a negative correlation between nurses pain score and use of hormonal contraception and nursing intervention r-square32%, (p<0.001), also there was a negative correlation between nurses total health hazards score and intervention r-square 41%, (p<0.001).

Table 1: Socio-demographic and job characteristics of nurses in the study sample (N=43)

Items	Frequency	Percent
Age:		
<35	25	58.1
35+	18	41.9
Range	19.0-45.0	
Mean±SD	30.9±8.2	
Median	27.0	
Experience years:		
<10	19	44.2
10+	24	55.8
Range	0.0-30.0	
Mean±SD	12.3±8.3	
Median	10.0	
Monthly income (LE):		
<1200	22	51.2
1200+	21	48.8
Range	850.0-2200.0	
Mean±SD	1285.6±61.8	
Median	1100.0	
No. of children:		
0	11	25.6
1+	32	74.4
Range	0-5	
Mean±SD	1.9±1.5	
Median	2.0	
Work hours/day:		
<1200	12	27.9
1200+	31	72.1
Range	6.0-12.0	
Mean±SD	9.2±2.3	
Median	8.0	
Stand long time:	41	95.3
Lift heavy weights	32	74.4
Weights lifted (Kg):		
<15	17	53.1
15+	15	46.9
Range	0.0-200.0	
Mean±SD	36.4±48.9	
Median	10.0	

Table 2: Medical history of nurses in the study sample (N=43)

	Frequency	Percent
BMI:		
Normal (<25)	14	32.6
Overweight (25-<30)	15	34.9
Obese (30+)	14	32.6
Range	19.4-43.0	
Mean ±SD	28.0±5.4	
Median	27.5	
Gravidity:		
0	11	25.6
1+	32	74.4
Range	0.0-7.0	
Mean±SD	2.3±1.9	
Median	2.0	
Use contraception:	23	53.5
Contraception used:		
IUD	11	47.8
Injection	3	13.0
Pills	7	30.4
Capsules	2	8.7
Use hormonal contraception:	12	52.2
Have:		
Constipation	18	41.9
Hypertension	4	9.3
Had needle stick injection	31	72.1
Action taken:		
None	3	9.7
Disinfection	18	58.1
Infection control	1	3.2
Cleaning	1	3.2
Lab testing	1	3.2
Alcohol	5	16.1
Tetanus injection	2	6.5
Have family history of varicose veins	14	32.6

Table 3: Nurses' knowledge of health hazards before and after the intervention

Satisfactory knowledge (60%+) of:	Time				X^2 test	p-value
	Pre (n=43)		Post (n=43)			
	No.	%	No.	%		
Avoiding Physical health hazards						
Dealing with pain	0	0.0	41	95.3	78.36	<0.001*
Dealing with back pain	0	0.0	40	93.0	74.78	<0.001*
Preventing varicose veins	2	4.7	43	100.0	78.36	<0.001*
Avoiding infection	5	11.6	39	90.7	53.80	<0.001*
Avoiding psychological hazards	3	7.0	40	93.0	63.67	<0.001*
Avoiding social hazards	4	9.3	42	97.7	67.49	<0.001*
Total knowledge:						
Satisfactory	0	0.0	41	95.3		
Unsatisfactory	43	100.0	2	4.7	78.36	<0.001*

(*) Statistically significant at p<0.05

Table 4: Nurses' health hazards before and after the intervention

High risks for health hazards (60%+)	Time				X^2 test	p-value
	Pre (n=43)		Post (n=43)			
	No.	%	No.	%		
Physical	40	93.0	21	48.8	20.36	<0.001*
Psychological	40	93.0	19	44.2	23.81	<0.001*
Social	30	69.8	13	30.2	13.44	<0.001*
Total health hazards:						
Low	4	9.3	24	55.8		
High	39	90.7	19	44.2	21.18	<0.001*

(*) Statistically significant at p<0.05

Table 5: Nurses' scores of varicose veins grade, pain, risk, and Practice before and after the intervention

Items	Pre (n=43)		Post (n=43)		Mann Whiteny Test	p-value
	Mean±SD	Median	Mean±SD	Median		
Varicose veins grade (max=3)	1.3±0.9	1.00	0.8±0.9	1.00	6.99	0.008*
Pain score (max=5)	3.2±1.3	3.00	1.8±0.9	2.00	24.41	<0.001*
Physical (max=14)	8.6±3.0	9.00	3.0±3.0	2.00	39.79	<0.001*
Psychological (max=11)	5.6±2.8	5.00	1.4±1.5	1.00	41.81	<0.001*
Social (max=9)	2.9±2.2	2.00	1.2±1.2	1.00	14.29	<0.001*
Total risk (max=3)	2.6±0.8	3.00	1.2±.0	1.00	31.86	<0.001*
Practice: Avoiding physical health hazards						
Dealing with pain (max=6)	1.3±0.6	1.00	5.7±0.6	6.00	70.11	<0.001*
Dealing with back pain (max=9)	1.8±1.0	2.00	8.6±0.9	9.00	68.60	<0.001*
Preventing varicose veins (max=8)	1.8±1.3	1.00	7.8±0.5	8.00	69.10	<0.001*
Avoiding infection (max=11)	3.0±2.7	2.00	8.7±0.8	9.00	60.96	<0.001*
Avoiding psychological hazards (max=6)	1.9±1.4	1.00	5.8±0.6	6.00	67.50	<0.001*
Avoiding social hazards (max=5)	1.7±1.0	1.00	4.9±0.4	5.00	69.63	<0.001*
Total practice (max=45)	11.4±6.3	9.00	41.4±2.4	42.00	64.88	<0.001*

(*) Statistically significant at p<0.05

Table 6: Correlation matrix of varicose veins (VV) grade, pain, health hazards, and knowledge scores

Scores	Spearman's rank correlation coefficient		
	Grade of V.V.	Pain score	Total health hazards
Grade of V.V.			
Pain	.330**		
Total health hazards	.187	.389**	
Knowledge	-.315**	-.418**	-.426**

(**) Statistically significant at p<0.01

Table 7: Correlation between nurses' varicose veins (VV) grade, pain, health hazards, and knowledge scores and their characteristics

Items	Spearman's rank correlation coefficient			
	Grade of V.V.	Pain score	Total health hazards	Knowledge
Age	.367**	.033	.240*	-.038
Experience	.388**	.021	.230*	-.033
Income	.280**	-.031	.111	-.040
BMI	.283**	-.033	.140	.026
Hours of work	-.024	.039	-.222*	-.015
Gravidity	.482**	.053	.198	.024
No. of children	.492**	.059	.173	.017

(*) Statistically significant at p<0.05 *(**) Statistically significant at p<0.01*

Table 8: Best fitting multiple linear regression model for the Practice, varicose veins grade, pain and total health hazards score

The Practice score	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Constant	-17.61	2.13		-8.260	<0.001	-21.90	-13.31
Intervention	29.43	1.35	0.96	21.833	<0.001	26.72	32.15
r-square=0.91 Model ANOVA: F=476.66, p<0.001 Variables entered and excluded: age, BMI, gravidity, hours of work, total health hazards score, grade of varicose veins and total knowledge.							
The varicose veins grade score	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Constant	.44	.33		1.329	.191	-.23	1.10
Gravidity	.28	.10	.40	2.927	.005	.09	.48
r-square=0.14 Model ANOVA: F=8.57, p<0.001 Variables entered and excluded: age, BMI, hours of work, use hormonal contraception, total health hazards score, knowledge score, practice and intervention							
The pain score	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Constant	5.02	0.51		9.810	<0.001	3.99	6.05
Intervention	-1.35	0.31	-0.54	-4.384	<0.001	-1.97	-0.73
Use of hormonal contraception	-0.62	0.31	-0.25	-2.031	.048	-1.25	0.00
r-square=0.32 Model ANOVA: F=11.67, p<0.001 Variables entered and excluded: age, BMI, gravidity, hours of work, total health hazardsscore, grade of varicose veins, knowledge and Practice score							
The total health hazards score	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Constant	4.17	0.36		11.588	<0.001	3.45	4.90
Intervention	-1.30	0.23	-0.65	-5.726	<0.001	-1.76	-0.85
r-square=0.41 Model ANOVA: F=32.78, p<0.001 Variables entered and excluded: age, BMI, gravidity, hours of work, grade of varicose veins, knowledge score							

4. Discussion

The results showed that all nursing professionals understood the meaning of health hazards in a satisfactory way. This was mainly based on professional experience, leading to palpable arguments on the subject. In this sense, we stress that health hazards are understood as possible situations that may affect nurses within their workplaces [(22).] The study was carried out aiming to: Design of an action plan to early detection and reduce nurses' health hazards, working in ICU at Zagazig University Hospital**.** According to the present findings, about two third of nurses more than 35 years old, while more than half above 10 years' experience, three quarter of nurses work hours more than 1200 and majority stand long time for ICUs nurses. This finding is in agreement with Salah et al (2012) [23] who reported in study at Ain-Shams University Hospitals, about "Effect of educational program on performance of intensive care nurses to decrement the low back pain" that, about two thirds of study nurses where extra than 35 years old and the majority from the female. Agreement with (Gomaa et al 2013) [24] The average years of experience were about eight, and eleven years for shock and postoperative ICUs nurses respectively. Furthermore, the present research results are conflicting with Bhagwanjee et al. (2008)[25]who noted that additional than twenty-five percent of nurses have lower than one year to five years of ICU experience. The current study findings also disagree with Gurses et al. (2009) [26] who detected that nurses had around seven years of experience as an ICU nurses. This results may be attributed to shortage of an ICU nursing specialties in our region. The current results explain the fact that, the majority of the studied nurses had children. This may be due to that the majority of nursing force working in Zagazig university hospitals are females. This result is in agreement with Bin Homaid, Abdelmoety & Alshareef., (2016) [27] who stated in study about "Prevalence and risk factors of low back pain among operation room staff at a Tertiary Care Center, Makkah, Saudi Arabia" that, the plurality of study sample were female, more than half of them had one to three child. Also, this result in agreement with Chiou, Wong & Lee., (2011)[28] who reported in study about "Epidemiology of low back pain in Chinese nurses" that, the plurality of the research nurses were married and nearly half of them had given birth. The nature of nursing work due to direct contact with some activities such as carrying and lifting patients, abnormal working conditions, sudden bending, and twisting put people at risk of musculoskeletal injuries (Mahmoudi, Kooranian and Mirzaeei 2015)[29]. On the other hand, in these professions there are tasks such as changing the nurses condition, carrying the patient and equipment, performing time-based procedures, etc. constantly and repeatedly carried out in most of their work shifts, resulting in injuries to musculoskeletal system. Moreover, who do these things constantly, most shifts is frequent, will lead to musculoskeletal injuries. Ways to prevent injury and damage from jobs, on the job training and the frequency of the program is training nurses.

Regarding physical dangers, it was confirmed that the maximum recurrent appearance was a pain in some part of the body, caused to the amount of physical potential put into patient care, which has not been decreased with the utilize of technology. The act of an ICU nursing team may consequently be characterized by uncertainties, changing the positioning, and the necessity for direct action, demanding high levels of information, cleverness, and efficiency, in additional psychomotor, influential and cognitive control which may generate fatigue.

Work related adverse health effect are group of painful disorders of the soft tissues (i.e., muscle, tendons, and nerves), occurring when there is a mismatch between the physical requirements of the job and the physical capacity of the human body. (Abo El Ata, El Desouky, Manawil et al., 2016)[30]. Nursing requires the nurse to incorporate knowledge and skills into practice. One component in which the nurse should have thorough knowledge and skill is "health hazard". Many nursing activities require muscle exertion. (Warming et al., 2009)[31]. The present study show that majority of nurses had physical risk of varicose vein before the action plan, while post action plan less than half of them had physical risk of varicose vein. Also present study show that high statistical improvement in nurses' practice dealing with pain, preventing varicose vein (P <0,001). This might be due to success of program, may be attributed to the fact that procedures were practiced under supervision and guidance of the researcher. The results of our study coincided with those of previous studies showing that VV incidence is directly associated with working hours in a standing position (Tüchsen et al 2010 [32], Sharif 2015 [17]). European Agency for Safety and Health at Work, (2015)[33] stated that, varicose veins indicate to any stretch windings and outstretched subcutaneous veins of the leg. Individual grievances of varicose veins and chronic venous incapability are often described as a sensation of heaviness and pain, a feeling of tumefaction of the legs, night-time calf cramps, and trouble legs. This grievance was greater through the course of the day, particularly after extended position.

Concerning nurses' pain assessment, the findings of the present research revealed that, the majority of the studied nurses had back pain in preprogram phase.

While, the percent slightly decreased in post program implementation phase to three quarters of studied nurses. This result is agreement with Ajibade., (2013)[34] who reported in his study about "Prevalence of musculo-skeletal disorders among nurses in Osun State, Nigeria" that, work-related musculoskeletal disorders are highly prevalent among nursing professionals and the most frequent complaints are low back pain, with a prevalence rate of 30 to 60%, followed by the neck and shoulder symptoms, with prevalence rates of 30 to 48% and 43 to 53%, respectively. The results also in the same line with Sorour & El-Maksoud., (2012)[35] who reported that, the most common sites of pain were the neck (67.2%), shoulder (65.5%), and lower back (63.8%). This finding agreement with Ovayolu et al., (2014)[36] who mentioned that, back pain could be serious, sub-serious, or chronic depending on the period. The pain could be differentiated as a boring pain or a combustion feeling. The pain may be radiated into the arms and hands and also the legs or feet and may involve parenthesis, anesthesia in the legs and arms. The anatomic classification of back pain follows the segments of the spine: neck pain (cervical), middle back pain (thoracic), lower back pain (lumbar) with the lumbar vertebrae area most common for pain. The high prevalence of back pain and musculoskeletal disorders among nurses is thought to be due to physical work demands involved in their profession, such as manual handling and transferring of patients, occupation-related psychological stress, as well as to work organizational factors, of which scheduling is an important component. Musculoskeletal injuries and pain (Bakker et al., 2015)[37]. regular review and assessment of competence (Polaski & Tatro., 2015)[38].

In addition, the majority of the nurses their pain started after any work procedure. This finding goes in the same line with, (Bakker, et al., 2015)[37] in study about "Spinal mechanical load as a risk factor for low back pain among nurses" who stated that, back pain is often starts after lifting something heavy, lifting while twisting, or a sudden movement or fall. Pain may include muscle spasms, tenderness upon touch. Pain is less when resting and worse during certain activities.

Related to frequency of pain the majority of studied nurses had intermittent pain in preprogram phase and continuously increased in post phase implementation. While less than one quarter of nurses had continuous pain. This finding is in agreement with Abd El-Hameed et al., (2011)[39] who were indicated the same finding. This finding agreement with Ibrahim & E. Elsaay., (2015)[8] who showed that, the majority of nurses had low back pain due to patient turning and positioning and more than two thirds of them had LPB related to cold, wearing shoes with high heels.

Concerning causes back pain, the majority of the studied nurses stated that, back pain was related to lifting a patient, lifting a heavy object, standing for a long time, doing heavy house work and more than half of them stated that pain was related to busy working conditions. This may be related to the fact that although there are many causes of back pain, the nature of the job is probably the major cause of the high prevalence of back pain among nurses due to high force, awkward postures or repetitive loading. Most of the government hospitals in Egypt are weakness equipped and understaffed. Maximum hospitals do not have patient lifting equipment, therefore, patients have to be pushed on mal-functioning trolleys to and from emergency and other hospital departments. Concerning to the studied subjects' total, information degree throughout the study phases, the findings of the current research detected that the plurality of study subjects had unsatisfactory information level in pre-involvement phase, while the plurality of them had satisfactory information level in post-involvement phase and the maximum of them in follow up phase. Also the results of present study revealed that, there was a highly statistically significant difference between pre/post and pre/follow up intervention phase as regarding to the total score for studied nurses' knowledge about adverse health hazards. This indicating the improvement of subjects' knowledge based on educational intervention about adverse health hazards. In the other hand, this finding disagrees with Bayomi., (2016)[40] who showed that, there was negative correlation between level of nurses' knowledge and practice with no statistical significant. Also, Alwasby., (2013)[41] who clarified that, there was no statistical correlation between level of knowledge and practice in both pre and post program. Also, this finding agrees with Zaytone., (2009)[42] in the study titled "Effect of training program on nurses, knowledge, and performance related to nursing care of post operative open heart patients in ICU at Zagazig University Hospital", who showed strong positive correlation between participant knowledge and their practice in post and follow up periods. This explained as knowledge and its application in clinical practice are most valuable for retention. So, knowledge alone without practice has no effect. Moreover, new technique based on, improving nurses' knowledge through nursing care standard could enhance their knowledge and consequently improve their performance.

The nurses psychological or emotional risks resulting from the characteristics and complexity of the intensive therapy activities, including patients' clinical instability and imminent death **Oliveira** (2012)[43]. Coping with these situations and with high

work requirements may result in emotional damage **Fogaça** (2010)[44].

Finally, analysis of data and discussion proved the research hypotheses in the current study showed that, nurses' knowledge and practice scores increased significantly immediately after implementing the program and three months later compared to preprogram. As well as improved nurses' pain intensity and functional disability level after implementing intervention program.

Conclusion:

All nurses of the studied sample hadn't satisfactory total knowledge pre action plan implementation regarding health hazard respectively. While, the majority of them had satisfactory knowledge post- action plan implementation. There was high statistical improvement in nurses practice post- action plan implementation. On the light of the current study results, it can be concluded that, nurses had high risks for physical and psychological health hazards pre action plan, reduced to 48.8% and 44.2% post action plan. respectively. In relation to social hazard pre action plan reduced to 31.86., there was a high statistical difference between total health hazard pre 90.7%reduced to 44.2post action plan. there was high statistical improvement in nurses risk scores regarding (varicose vein improvement in nurses practice regarding to avoiding physical hazards as avoiding psychological and social hazards (Dealing with pain, Dealing with back pain, Preventing varicose veins, Avoiding infection <0.001*)

Recommendations:

Periodic and continuous in-service training for ICU nurses about health hazards and further study is recommended to reduce hazards. The research should be replicated on a great sample and various hospitals setting may be due to generalizing the outcomes. Improve a simplified and including all handbook through guidelines around nurse's health hazard in ICU.

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