

## Occupational Hazards, Illnesses and Injuries among Nurses Working in Different Clinical Areas of Work (Units)

Namrata Arora Charpe<sup>1\*</sup> and Rennie Joshua<sup>2</sup>

<sup>1</sup>Associate Professor, Banasthali Vidyapith, India

<sup>2</sup>Nurse Educator, Dubai Hospital, Dubai, UAE

\*Corresponding Author: Namrata Arora Charpe, Associate Professor, Banasthali Vidyapith, India.

**Received:** June 24, 2020

**Published:** August 31, 2020

© All rights are reserved by **Namrata Arora Charpe and Rennie Joshua**.

### Abstract

Health and wellbeing of employees in the workplace are important concerns that should continue to receive attention in any organisation. Traditionally hospitals are directed towards curative services, not preventive services, it is very important to maintain optimum health of the staff in the healthcare industry as they take care of the sick clients. The study was conducted with the major objective to assess the risk and hazards faced by nurses in different clinical areas of work (Units). Quantitative descriptive cross-sectional method was used for the study. The study was conducted with a sample of 588 respondents (unit managers, registered nurses and assistant nurses). The findings revealed that nurses do encounter a considerable level of occupational hazards. Critical Care and Cardiology Unit were found to be the units with the highest risk of occupational hazards and injuries while the lowest risk was observed in the outpatient and day care unit. Chi square analysis of data revealed a significant association of Clinical Area of work (Unit) with exposure to blood borne pathogens and biological hazards, radiation, toxic fumes and anaesthetic agents, irritation from disinfectants and sterilants and chemical/toxic medication.

**Keywords:** Occupational Hazards; Nursing; Workplace Risk Factors; Clinical Areas of Work; Healthcare Professionals; Workplace Injuries; Hazard Exposure

### Introduction

Healthcare professionals form a huge global work sector, and are crucial for the healthy sustenance of people of any nation. The most constant injuries reported among healthcare professionals are musculoskeletal disorders, burns and fractures and the most commonly occurring illnesses are upper respiratory tract infections, skin and hepatic disorders and drug reactions. There are many identified chemicals used in the hospitals that have adverse effects on people working in the environment.

It is necessary to identify and reduce the exposure to risks in their working environment as these risks not only influence their own health but also affect patient care. In the nursing workplace environment, many stressors are present that can lead to diseases and injuries, these hazards can impair the health status acutely or

in long term. The awareness of occupational hazards is minimum among the nurses [25]. Most of the studies on occupational health have focused mainly on worker's compensation, insurance, absenteeism, and economic consequences towards the organisation. Very little focus is made towards the impact on the life of the workers affected due to workplace injuries and illnesses. The repercussions of these workplace injuries reach the victim's workplace, home, hospitals, courts, and the local community. The type and severity of the illnesses or injuries matter a lot to define its consequences and effects for e.g. an employee with a severe disabling back injury will face more consequences than an employee with minor sprain will.

The study was conducted with the major objective to assess the risk and hazards faced by the nurses in different clinical areas of work (Units).

## Literature Review

In a study on the effect of transfer, lifting and repositioning procedures among health care providers out of the total injuries among the health care providers, nurses were found to be the most affected, mainly with back, neck and shoulder injury [1]. Holman, *et al.* [9] reported that in a shift, 20% of the time spent by nurses is on patient handling task and the job culture of nurses during patient handling situations is always to consider patient safety above their own. 40% of nurses believed that sprain, strain and a sore back is the part of their job. Approximately 20% of nursing jobs include patient handling and mobilisation; that is the reason adequate training on safe patient handling and mobilisation is essential. In a study conducted by Zaidi, *et al.* [27] most of the health care providers preferred to treat themselves rather than opting to follow hospital protocol and incident reporting system. Shreedharan, *et al.* [21] reported that 97% of nurses were familiar with the idea of standard precautions. 61.2% believed that all patients' blood and body fluids are potentially infected whereas 27.6% thought only diagnosed patients are infected and 11.2% believed only patients who are suspected of infection are infectious. The study emphasised to implement an educational program to improve the knowledge of nurses on standard precautions. Collins [4] reported that health care workers are more prone to musculoskeletal disorders when compared with other jobs, which are physically more demanding like in construction, mining, and manufacturing. The main reason for musculoskeletal injuries in health care workers is due to positioning, transportation and assisting patients [18]. Among all occupations, nursing is ranked highest for musculoskeletal disorders ranging from 40 - 80% among all populations [20]. Dawson [6] reported that 62% of nurses had reported disabling musculoskeletal injury was their major concern and 56% had experienced musculoskeletal pain, which was worsened due to the nature of their job.

The main reasons for leg and foot pain symptoms in nurses working in intensive care units are due to shift duties and longer working practice [19]. Prolonged untreated MSDs that is symptoms more than 6 months of the period can lead to sickness, absenteeism and significantly decreased productivity [22]. Working condition of nurses includes several risk factors, for example, operation theatre nurses experience prolonged twisted and static postures [8,17].

Approximately £600,000 per year is the estimated cost towards needlestick injuries that is compensated by NHS in the United

Kingdom, including prophylaxis treatment, lab investigations, treatment, counselling and legal procedures [23]. Many articles have reported that one of the reasons for needle stick injuries is a feeling of urgency. In a study of 33,327 Taiwanese nurses on work-related injuries and illnesses done by Chiou, *et al.* [3], the findings revealed that the nurses working in critical care areas and operating rooms have highest levels of radiation exposures. Health care workers are more at risk for infections as they are in close contact with patients and handle human biological wastes like sputum, faeces, urine, blood and this can also lead to public health implications as health care workers can be a source of transmission to other patients and other people in the community associated with them [11].

It is very important to explore factors that contribute to work-related injuries and illnesses for maintaining a healthy and safe work environment to enhance healthcare professional's health and promote quality patient care.

## Materials and Methods

Quantitative descriptive cross-sectional method was used for the study by using a wide range of Demographical variables (age, work experience, professional experience, training, the risk associated with work etc.). The study was carried out in a multi speciality 600 bedded hospital catering the needs of both nationals and multinationals being admitted in the hospital, in order to assess the association (if any) of risk factors with the clinical areas of work (Units).

The convenience sampling method was used for the study. The study was carried out among nurses (Unit Managers, Registered Nurses and Assistant Nurses) who were involved in direct or indirect patient care. The data was collected using OHS Vulnerability Measure Tool, developed at the Institute for Work and Health, Canada (2016). Approximately 60 % of the total staff was taken as a sample group to achieve a desirable result. A sample of 685 nurses was taken for the collection of data. The response rate was 87 %, a total of 594 completed questionnaires were obtained back out of which 588 were complete in all aspects. Thus, the analysis was done on the data obtained from 588 respondents (Critical Care and Cardiology Unit n = 185, Medical and Surgical Unit n = 181, Gynaecology, Maternity and Paediatrics Unit n = 164 and Outpatient and Day Care Unit n = 58).

Variable	Group	n (%)
Job title	Charge Nurse	10 (1.7)
	Senior Staff Nurse	35 (5.9)
	Staff Nurse 3	38 (6.4)
	Staff Nurse 2	469 (79.7)
	Assistant Nurse	36 (6.1)
Unit (clinical area of work)	Critical Care and Cardiology Unit	185 (31.4)
	Medical and Surgical Unit	181 (30.7)
	Gynaecology, Maternity and Paediatric Units	164 (27.8)
	Out Patient and Day Care Units	58 (9.8)
Years of experience	1-5 years	223 (37.9)
	6-10years	97 (16.4)
	11-15years	133 (22.6)
	16-20years	48 (8.1)
	21-25years	25 (4.2)
	26-30years	62 (10.5)
Age	20-30 years	131 (22.2)
	31-40 years	255 (43.3)
	41-50 years	130 (22.1)
	51-60 years	72 (12.2)
Nationality	Indian	365 (62.07)
	Filipino	188 (31.9)
	Arab	27 (4.5)
	Others	8 (1.3)
Direct patient care provider	Yes	564 (92.5)
	No	24 (4.08)
Time spent in direct patient care activities	0-2 hours	36 (6.1)
	3-5 hours	36 (6.1)
	6-8 hours	244 (41.4)
	8 hours and above	272 (46.2)
Usual length of shift/work day	7-8 hours	467 (79.4)
	9-10 hours	118 (20.06)
	11-12 hours	2 (0.3)
	13-14 hours	1 (0.1)
Average working hours per week	31-40 hours	368 (62.5)
	41-50 hours	220 (37.4)
Unplanned overtime per month	Never	307 (52.2)
	1-2 times	205 (34.8)
	3-4 times	52 (8.8)
	5-6times	24 (4.08)

**Table 1:** Sample profile.

A sample of 68 nurses was obtained using purposive sampling technique. The pilot study participants varied in diversity to ensure proper representation of the available population.

### Findings of the Study

#### Clinical area of work (units) and exposure to chemicals/toxic medication

The exposure to chemicals toxic medication was found to be the highest among Critical care and Cardiology Units, followed by Medical and Surgical Units, Gynaecology and Maternity and Paediatrics Units. Lowest level of exposure was found in nurses working in Outpatient and Day Care Units where only 15.5% respondents were exposed to the chemicals toxic medication on weekly basis, while 31.4% respondents in Critical care and Cardiology Units, 29.8% respondents in Medical and Surgical Units and 30.5% respondents in Gynaecology and Maternity and Paediatrics Units were exposed to the chemicals toxic medication on weekly basis (Table 2).

#### Clinical area of work (Unit) and irritation from disinfectants and sterilants

The exposure and irritation from disinfectants and sterilants was reported to be highest among respondents working in Medical and Surgical units, followed by those in Critical Care and Cardiology Units; Gynaecology, Maternity, and Paediatric Units compared to Outpatient Department and Day Care Units (Table 3).

#### Clinical area of work (Unit) and exposure to toxic fumes

Some highly toxic elements identified in surgical smoke are hydrocarbons, nitriles, fatty acids and phenols [7] (Table 4).

In a similar study conducted by Moual, *et al.*, [13] to compare the risk of severe persistent asthma between the nurses of operation theatre (where there is a high risk of exposure to certain inhaled agents) with administrative nursing staff, the risk of persistent asthma was reported to be significantly higher in operation theatre nurses.

#### Clinical area of work (Unit) and exposure to anaesthetic agents

the effect of exposure to anaesthetic gases like chloroform, ether and nitrous oxide in higher concentration leads to a headache, irritability, fatigue, nausea, drowsiness, confusion, and effect on liver and kidneys [5] (Table 5).

#### Clinical area of work (Unit) and risk of slip and fall

Falls are a growing concern in the health care industry. Yeoh, *et al.* [26] reported that non-fatal fall-related injuries are highest among the nursing profession, mainly in females aged between 45 to 64 years and around 25% of falls result in 31 work days being lost. Also, risk of fall was observed more in nursing aides when compared to registered nurses. Bureau of Labor Statistics [2] reported that 11% of total occupational injuries result from falls in the workplace (Table 6).

	Once a year	Every 6 months	Every 1-3 months	Weekly	N	p Value
Critical Care and Cardiology Units	91 (49.2%)	10 (5.4%)	26 (14.1%)	58 (31.4%)	185	<b>0.032</b>
Medical and Surgical Units	65 (35.9%)	24 (13.3%)	38 (21.0%)	54 (29.8%)	181	
Gynaecology, Maternity and Paediatrics Units	73 (44.5%)	15 (9.1%)	26 (15.9%)	50 (30.5%)	164	
Outpatient and Day Care Units	30 (51.7%)	7 (12.1%)	12 (20.7%)	9 (15.5%)	58	

**Table 2:** Percentage distribution of respondents working in different clinical areas of work (units) on exposure to chemicals/toxic medication.

The p Value (0.032 < 0.05) derived from chi-square analysis of the data revealed a significant association among unit and exposure of respondents to chemicals/ toxic medication.

	Once a year	Every 6 months	Every 1-3 months	Weekly	Total	p Value
Critical care and Cardiology Units	76 (41.1%)	9 (4.9%)	22 (11.9%)	78 (42.2%)	185	0.017
Medical and Surgical Units	67 (37%)	13 (7.2%)	23 (12.7%)	78 (43.1%)	181	
Gynaecology, Maternity and Paediatrics Units	66 (40.2%)	11 (6.7%)	18 (11%)	69 (42.1%)	164	
Outpatient and Day Care Units	36 (62.1%)	6 (10.3%)	8 (13.8%)	8 (13.8%)	58	

**Table 3:** Percentage distribution of respondents working in different clinical areas of work (units) on experiencing irritation from disinfectants.

The p value (0.017<0.05) obtained from chi-square test analysis revealed a significant association among unit and irritation from disinfectants and sterilants.

	Once a year	Every 6 months	Every 1-3 months	Weekly	Total	p Value
Critical care and Cardiology Units	116 (62.7%)	7 (3.8%)	13 (7%)	49 (26.5%)	185	0.007
Medical and Surgical Units	126 (69.6%)	8 (4.4%)	20 (11%)	27 (14.9%)	181	
Gynaecology, Maternity and Paediatrics Units	111 (67.7%)	15 (9.1%)	15 (9.1%)	23 (14%)	164	
Outpatient and Day Care Units	45 (77.6%)	3 (5.2%)	6 (10.3%)	4 (6.9%)	58	

**Table 4:** Percentage distribution of respondents working in different clinical areas of work (units) on exposure to toxic fumes.

The p value (0.007<0.05) derived from chi-square analysis revealed a statistically significant association among unit and exposure to toxic fumes.

	Once a year	Every 6 months	Every 1-3 months	Weekly	Total	p Value
Critical care and Cardiology Units	102 (55.1%)	10 (5.4%)	22 (11.9%)	51 (27.6%)	185	0.001
Medical and Surgical Units	128 (70.7%)	11 (6.1%)	15 (8.3%)	27 (14.9%)	181	
Gynaecology, Maternity and Paediatrics Units	131 (79.9%)	7 (4.3%)	14 (8.5%)	12 (7.3%)	164	
Outpatient and Day Care Units	41 (70.7%)	2 (3.4%)	6 (10.3%)	9 (15.5%)	58	

**Table 5:** Percentage distribution of respondents working in different clinical areas of work (units) on exposure to anaesthetic agents. The p value (0.001<0.05) derived from Chi-square analysis revealed a statistically significant association among unit and exposure to anaesthetic agents. The exposure to anaesthetic gases was highest among respondents working in Critical care and Cardiology Units, Medical and Surgical Units, Gynaecology and Maternity and Paediatrics Units, compared to Outpatient and Day Care Units.

	Once a year	Every 6 months	Every 1-3 months	Weekly	Total	p Value
Critical care and Cardiology Units	126 (68.1%)	6 (3.2%)	13 (7%)	40 (21.6%)	185	0.155
Medical and Surgical Units	134 (74%)	8 (4.4%)	17 (9.4%)	22 (12.2%)	181	
Gynaecology, Maternity and Paediatrics Units	106 (64.6%)	7 (4.3%)	16 (9.8%)	35 (21.3%)	164	
Outpatient and Day Case Units	43 (74.1%)	5 (8.6%)	4 (6.9%)	6 (10.3%)	58	

**Table 6:** Percentage distribution of respondents working in different clinical areas of work (units) on risk of slip and fall.

The p value (0.155 > 0.05) obtained from chi-square analysis revealed a non significant association among unit and risk of slip and fall.

The risk of fall or tripping mainly happens due to the wet floors or cluttered space. Within the outpatient department and day care unit the risk is least as there is adequate space within the work environment due to less equipments and cleaning of the floors are not as frequent as in in-patient units.

#### Clinical area of work (Unit) and latex allergy

Health care professionals with type 1 hypersensitivity to natural rubber latex can continue to work by reduction of exposure to latex and use of low-allergen non-powdered natural-rubber latex gloves whenever possible [14].

	Once a year	Every 6 months	Every 1-3 months	Weekly	Total	p Value
Critical care and Cardiology Units	108 (58.4%)	9 (4.9%)	12 (6.5%)	56 (30.3%)	185	0.141
Medical and Surgical Units	108 (59.7%)	6 (3.3%)	16 (8.8%)	51 (28.2%)	181	
Gynaecology, Maternity and Paediatrics Units	103 (62.8%)	9 (5.5%)	8 (4.9%)	44 (26.8%)	164	
Outpatient and Day Care Units	45 (77.6%)	4 (6.9%)	3 (5.2%)	6 (10.3%)	58	

**Table 7:** Percentage distribution of respondents working in different clinical areas of work (units) on latex allergy.

The p value (0.141 > 0.05) obtained from chi-square analysis revealed a non significant association among area of work (unit) and latex allergy.

#### Clinical area of work (Unit) and exposure to radiations

Radiation hazards are categorised as ionising radiation hazards (radionuclides in nuclear medicine, diagnostic imaging and radiation therapy, X-Rays) and non- ionising radiation hazards (magnetic resonance imaging, lasers, ultraviolet lights).

A study by Chiou., *et al.* [3] with same results found that nurses working in emergency rooms, intensive care units and wards have a more ill effect on health when compared to staff working in the outpatient department and administration. Nurses working in critical care units and operation theatres had high radiation exposures when compared to others.

	Once a year	Every 6 months	Every 1-3 months	Weekly	Total	p Value
Critical care and Cardiology Units	70 (37.8%)	13 (7%)	23 (12.4%)	79 (42.7%)	185	0.001
Medical and Surgical Units	121 (66.9%)	17 (9.4%)	20 (11%)	23 (12.7%)	181	
Gynaecology, Maternity and Paediatrics Units	98 (59.8%)	8 (4.9%)	22 (13.4%)	36 (22%)	164	
Outpatient and Day Care Units	47 (81%)	2 (3.4%)	3 (5.2%)	6 (10.3%)	58	

**Table 8:** Percentage distribution of respondents working in different clinical areas of work (units) on exposure to radiation.

The p value (0.001 < 0.05) obtained from chi-square analysis revealed a significant association among unit and exposure to radiation.

**Clinical area of work (Unit) and low back pain**

Hospital personnel routinely face work-related injuries due to lifting, moving or shifting of patients (Table 9).

Nurses working in intensive care units and neonatal intensive care unit nurses show the lowest prevalence of back pain and the

highest prevalence of back pain is seen among medical intensive care unit staff.

**Clinical area of work (Unit) and shoulder pain**

Use of extreme force for lifting, pushing, pulling in awkward positions such as bending, twisting, repetitive motion, vibration, working overhead can lead to ergonomic exposures (Table 10).

	Once a year	Every 6 months	Every 1-3 months	Weekly	Total	p Value
Critical care and Cardiology Units	27 (14.6)	14 (7.6%)	32 (17.3%)	112 (60.5%)	185	0.194
Medical and Surgical Units	24 (13.3%)	11 (6.1%)	27 (14.9%)	119 (65.7%)	181	
Gynecology, Maternity and Pediatrics Units	36 (22%)	9 (5.5%)	19 (11.6%)	100 (61%)	164	
Outpatient and Day Care Units	12 (20.7%)	3 (5.2%)	14 (24.1%)	29 (50%)	58	

**Table 9:** Percentage distribution of respondents working in different clinical areas of work (units) on experiencing low back pain. The p Value (0.194 > 0.05) obtained from chi-square analysis revealed no significant association between Unit and Low back pain.

	Once a year	Every 6 months	Every 1-3 months	Weekly	Total	p Value
Critical care and Cardiology Units	47 (25.4%)	14 (7.6%)	23 (12.4%)	101 (54.6%)	185	0.495
Medical and Surgical Units	43 (23.8%)	6 (3.3%)	29 (16%)	103 (56.9%)	181	
Gynaecology, Maternity and Paediatrics Units	39 (23.8%)	6 (3.7%)	24 (14.6%)	95 (57.9%)	164	
Outpatient and Day Care Units	20 (34.5%)	3 (5.2%)	6 (10.3%)	29 (50%)	58	

**Table 10:** Percentage distribution of respondents working in different clinical areas of work (units) on experience of shoulder pain. The p Value (0.495 > 0.05) obtained from Chi-square analysis revealed no significant association among Unit and experience of shoulder pain among nurses.

Lövgren., *et al.* [10] reported that 50% respondents had constant prevalence and incidence of neck and shoulder pain even more than back pain which was reported by 40% respondents in a study conducted on student nurses.

**Clinical area of work (Unit) and wrist pain**

Musculoskeletal symptoms are very common in nurses, especially the direct patient care providers [12].

**Clinical area of work (Unit) and needle stick injury**

In a hospital setting, needle stick injury is a serious occupational hazard. The main factors which lead to needle stick injuries are an urgency to complete work, shift duties, less experience, decreased skill etc. [16]. The incidence of sharps injuries among health care providers was in nurses mainly due to recapping of the needles [24].



	Once a year	Every 6 months	Every 1-3 months	Weekly	Total	p Value
Critical care and Cardiology Units	67 (36.2%)	14 (7.6%)	25 (13.5%)	79 (42.7%)	185	0.248
Medical and Surgical Units	76 (42%)	6 (3.3%)	25 (13.8%)	74 (40.9%)	181	
Gynaecology, Maternity and Paediatrics Units	65 (39.6%)	12 (7.3%)	12 (7.3%)	75 (45.7%)	164	
Outpatient and Day Care Units	27 (46.6%)	2 (3.4%)	9 (15.5%)	20 (34.5%)	58	
	46.6%	3.4%	15.5%	34.5%		

**Table 11:** Percentage distribution of respondents working in different clinical areas of work (units) on experience of wrist pain. The p Value (0.248 > 0.05) obtained from Chi-square analysis showed a non significant association among Unit and experience of wrist pain among nurses.

	Once a year	Every 6 months	Every 1-3 months	Weekly	Total	p Value
Critical care and Cardiology Units	126 (68.1%)	9 (4.9%)	8 (4.3%)	42 (22.7%)	185	0.138
Medical and Surgical Units	120 (66.3%)	7 (3.9%)	14 (7.7%)	40 (22.1%)	181	
Gynaecology, Maternity and Paediatrics Units	120 (73.2%)	8 (4.9%)	13 (7.9%)	23 (14%)	164	
Outpatient and Day Care Units	47 (81%)	2 (3.4%)	5 (8.6%)	4 (6.9%)	58	

**Table 12:** Percentage distribution of respondents working in different clinical areas of work (Units) on incidence of needle stick injuries.

The p value (0.138 > 0.05) derived from Chi-square analysis showed no significant association among Unit and incidence of needle stick injuries among nurses.

Factors that are associated with needle stick injuries are gender, age, department, and experience. Age and the area of work or the unit are the most important risk factor contributing to needle stick injuries [28].

Waleed, *et al.* [24] reported that highest number of needle stick injuries occur in the emergency room followed by a dialysis unit.

#### Clinical area of work (Unit) and exposure to blood borne pathogens and biological hazards

The risk of infection is a common risk to health care providers. Any hospital-acquired illness can lead to increased total number of sick leave or absenteeism caused by the illnesses or by a cost of medical attention and compensation. Health care workers are at continuous risk of blood-borne viral infections with hepatitis

B virus, hepatitis C Virus and human immune-deficiency virus. During an epidemic like EBOLA and SARS or pandemic like COVID-19 health care workers are at very high risk for infections due to their contact time with patients (Table 13).

Preventive measures include education, immunisation, adherence to universal precautions, post-exposure advice and prophylaxis [15].

Critical Care and Cardiology Unit were found to be the units with the highest risk of occupational hazards and injuries while the lowest risk was observed in the outpatient and day care unit. Chi square analysis of data revealed a significant association of clinical areas of work (Units) with exposure to blood borne pathogens and biological hazards, radiation, toxic fumes and anaesthetic agents,

irritation from disinfectants and sterilants and chemical/toxic medication. On the other hand, a non significant association was revealed among clinical areas of work (Units) with incidence of needle stick injuries; pain in wrists, shoulders and low back; latex allergy; and risk of slips and falls.

## Conclusion

The healthcare workers face a lot of challenges in their day to day work life. There is a dire need to address these occupational hazards so that they can be well taken care of in time, in order to reduce incidences of illnesses and injuries among them. A strong medical workforce is the key to a healthy world. Proper precautions and standard procedures should be an integral part of work for every individual, especially those working in the healthcare work-sector. Injuries and hazards should be minimised in order to ensure a safe working environment for the personnel. Wherever required, guidelines and interventions should be provided to minimise the risk of workplace factors leading to injuries and illnesses.

## Bibliography

1. Black TR., *et al.* "Effect of transfer, lifting, and repositioning (TLR) injury prevention program on musculoskeletal injury among direct care workers". *Journal of Occupational and Environmental Hygiene* 8.4 (2011): 226-235.
2. Bureau of Labor Statistics. Incidence rates for nonfatal occupational injuries and illnesses involving days away from work per 10,000 full-time workers by industry and selected events or exposures leading to injury or illness (2009).
3. Chiou ST., *et al.* "Health issues among nurses in Taiwanese hospitals: National survey". *International Journal of Nursing Studies* 50.10 (2013): 1377-1384.
4. Collins J W. "Safe patient handling and lifting standards for a safer American workforce" (2010).
5. Dalagkozi P., *et al.* "The effects of exposure of health care professionals to volatile anesthetic gases" (2018).
6. Dawson J. "ANA releases 2011 Health and Safety Survey results" (2012).
7. Hensman C., *et al.* "Chemical composition of smoke produced by high-frequency electrosurgery in a closed gaseous environment". *Surgical Endoscopy* 12.8 (1998): 1017-1019.
8. Hill James JS and Russi MB. "Antropometric measurements, job strain and prevalence of musculoskeletal symptoms in female sonographers". *Work* 33 (2009): 181-189.
9. Holman GT., *et al.* "Nurses' perceptions of how job environment and culture influence patient handling". *International Journal of Orthopaedic and Trauma Nursing* 14.1 (2010): 18-29.
10. Lövgren M., *et al.* "Neck/shoulder and back pain in new graduate nurses: A growth mixture modeling analysis". *International Journal of Nursing Studies* 51.4 (2014): 625-639.
11. Memish ZA., *et al.* "Middle East respiratory syndrome coronavirus infections in health care workers". *The New England Journal of Medicine* 369.9 (2013): 884-886.
12. Menzel NN., *et al.* "The physical workload of nursing personnel: Association with musculoskeletal discomfort". *International Journal of Nursing Studies* 41.8 (2004): 859-867.
13. Moual NI., *et al.* "Are operating room nurses at higher risk of severe persistent asthma? the nurses' health study" (2013).
14. Peter M Ranta., *et al.* "A review of natural-rubber latex allergy in health care workers". *Clinical Infectious Diseases* 38.2 (2004): 252-256.
15. Riddell LA and Sherrard J. "Blood-borne virus infection: The occupational risks". London, England: SAGE Publications (2000).
16. Rohde KA., *et al.* "Minimizing nurses' risks for needlestick injuries in the hospital setting". *Workplace Health and Safety* 61.5 (2013): 197-202.
17. Roll SC., *et al.* "An analysis of occupational factors related to shoulder discomfort in diagnostic medical sonographers and vascular technologists". *Work* 42 (2012): 355-365.
18. Schoenfisch AL., *et al.* "Musculoskeletal injuries among hospital patient care staff before and after implementation of patient lift and transfer equipment". *Scandinavian Journal of Work, Environment & Health* 39 (2013): 27-36.
19. Segzin D and Esin MN. "Predisposing factors for musculoskeletal symptoms in intensive care unit nurses". *International Nursing Review* (2014).
20. Smith DR., *et al.* "Musculoskeletal disorders among professional nurses in mainland China". *Journal of Professional Nursing* 20 (2004): 390-395.
21. Sreedharan J., *et al.* "Knowledge about standard precautions among university hospital nurses in the United Arab Emirates". *Eastern Mediterranean Health Journal* 17.4 (2011): 331-334.
22. Taylor K and Green N. "What are the productivity losses caused by musculoskeletal disorders (MSDs)? A review of current literature". Wellnomics Ltd (2008).



23. Trueman P, *et al.* "The cost of needlestick injuries associated with insulin administration". *British Journal of Community Nursing* 13 (2008): 413-417.
24. Waleed Mazi, *et al.* "In a tertiary hospital: Aph.sagepub.com benchmarking using patient days". (2015).
25. Wu Q, *et al.* "Knowledge, attitude, and practices regarding occupational HIV exposure and protection among health care workers in china". *Journal of the International Association of Providers of AIDS Care (JIAPAC)* 15.5 (2016): 363-369.
26. Yeoh HT, *et al.* "Nonfatal occupational falls among U.S. health care workers, 2008-2010". *Workplace Health and Safety* 61.1 (2013): 3-8.
27. Zaidi MA, *et al.* "Blood and body fluid exposure related knowledge, attitude and practices of hospital based health care providers in United Arab Emirates". *Safety and Health at Work* 3.3 (2012): 209-215.
28. Zhang X, *et al.* "Needlestick and sharps injuries among nurses at a teaching hospital in china". *Workplace Health and Safety* 63.5 (2015): 219-225.

#### Assets from publication with us

- Prompt Acknowledgement after receiving the article
- Thorough Double blinded peer review
- Rapid Publication
- Issue of Publication Certificate
- High visibility of your Published work

**Website:** [www.actascientific.com/](http://www.actascientific.com/)

**Submit Article:** [www.actascientific.com/submission.php](http://www.actascientific.com/submission.php)

**Email us:** [editor@actascientific.com](mailto:editor@actascientific.com)

**Contact us:** +91 9182824667