IMPACT OF HAZARDOUS PHYSICAL ENVIRONMENT ON NURSES' SAFETY PERFORMANCE BEHAVIORS IN ICUs/CCUs : *Conceptual Paper*

Original Research Article

ISSN : 2456-1045 (Online)
(ICV-MDS/Impact Value): 3.08
(GIF) Impact Factor: 2.174

Journal Code: ARJMD/MDS/V-17.0/I-1/C-6/SEP-2017
Category : MEDICAL SCIENCE
Volume : 17.0 / Chapter- VI / Issue -1 (SEPTEMBER)
Website: www.journalresearchijf.com
Received: 21.09.2017
Accepted: 30.09.2017
Date of Publication: 13-10-2017
Page: 28-35

Name of the Author:

Mohammad Adel Al-Bsheish [1a], Munauwar bin Mustafa [2b], Mohd Azril Ismail [3c]

[1a] *School of Business Management (SBM), Universiti Utara Malaysia, Malaysia.*

[2b] *School of Business Management (SBM), Universiti Utara Malaysia, Malaysia.*

[3c] *School of Technology Management and Logistics (STML), Universiti Utara Malaysia, Malaysia.*

Citation of the Article

Md. Al-Bsheish .A; Mustafa M. B. & Md.Ismail .A(2017). Impact of hazardous physical environment on nurses' safety performance behaviors in icus/ccus: conceptual paper; Advance Research Journal of Multidisciplinary Discoveries.17.0,C-6(2017):28-35; available at : http://www.journalresearchijf.com

ABSTRACT

Intensive care units (ICU) is one of the most essential units in hospitals due to a huge amount of critical lifesaving efforts there; however, occupational accidents are still quite high within these places; thus, mechanisms to improve workplace safety are needed. A growing body of safety research have kept attention to patient safety rather than providers' safety. Likewise, studies have focused on hazardous physical environment effect upon patients more than healthcare providers; therefore, expanding the body of literature related to nurses' safety as a major component of health care team is necessary. This paper aims to raise the level of ICU/CCU nurses' safety performance by inspecting factors that could predict safety compliance and safety participation. Subsequently, depending on Social Cognitive Theory (SCT), a possible link is expected between nurses' perception of hazardous physical environments which have not been under focus enough previously and both of safety compliance and safety participation as integral dimensions of safety performance behaviors.

Keywords:

Hazardous Physical Environment,
Safety Compliance,
Safety Participation,
Intensive Care Units (ICUs),
Coronary Care Units (CCUs),
Social Cognitive Theory (SCT)

I. INTRODUCTION

Currently, it is impossible to institute hospitals without adding special places to manage critical and advanced cases; these places are called intensive care units (ICUs). They include subtypes, such as Neonatal ICU, Pediatric ICU, Surgical ICU, Medical ICU, and Coronary ICU. According to Fontaine, Briggs and Pope-Smith, (2001), ICU is well-known as "an area with one of the highest concentrations of sophisticated biomedical equipment in the entire hospital". Thus, supreme specific procedures have been done there, for example, artificial ventilation, chock management and sustaining the blood circulation. Accordingly, declining patients mortality rate up to 60% is estimated in these units (Takrouri, 2004). Concerning this description, maintaining appropriate physical environment to patients and healthcare providers also is very important. However, the literature lacks of enough research that focus upon hazardous physical environment (Long, Jusoh, Ajagbe & Ghee, 2013).

Safety researchers in manufacturing, constructing and mining industry investigate deeply the employees' safety that may be due to one human element (workers) in such industry. On the other hand, in service industry, particularly healthcare services, there are two human components, they are: patients and providers. Hence, it is remarkable that available safety literature has focused in-depth on patient safety outcomes (Pousette, Larsman, Eklöf & Törner, 2017). Though healthcare providers' safety is an essential issue to maintain patients safety and succeed organizations' mission (Lockley *et al*., 2008; Stone *et al*., 2007), research effort related to ICU/CCU staff safety is still insufficient (Rashid, 2006).

In this regard, healthcare providers' safety is related to their safety performance (Lockley *et al*., 2008). Previously, safety performance had been conceptualized as a number of accidents, fatalities, injuries, and near-misses (European Transport Safety Council, 2001; Siu, Phillips, & Leung, 2003), and measured by reviewing the safety records statistics or incidents self-reporting (Hinze *et al*., 2013; Huang, Smith, Ho & Chen, 2006; Li, Jiang, Yao & Li, 2013; Siu, Phillips & Leung, 2004). In contrast, Vinodkumar and Bhasi, (2009) and Abozead *et al*. (2014) argued that these traditional methods could make these measurements inaccurate due to the under-reporting issue. For this purpose, new trend was established by Neal and Griffin (1997), who described safety performance as safety behaviors, mainly compliance and participation behaviors, which agreed with job performance theory (Motowidlo & Van Scotter, 1994). Thus, in order to minimize the occupational accidents, controlling of ICUs/CCUs nurses' behaviors concerning safety, such as compliance and participation, may well be beneficial to avoid the massive outcomes of accidents and achieve workplaces safety.

II. UNDERPINNING THEORY

Social Cognitive Theory (SCT) is considered as an extension to social learning theory (Stajkovi & Luthans, 2003). Additionally, SCT contended that employees' behaviors have been explicated as unidirectional causation; therefore, employees' behaviors are formed by environmental influences or personal characters (Bandura, 2001). This theory indicated that work environment affects the individual psychological aspects and form cognitive process and social behaviors (Bandura, 1977). According to SCT, "behavior, personal quality, and environmental characteristics are reciprocal determinants of each other in different times and different strengths" in order to influence the work outcomes (Bandura, 1991). Thus, employees' performance behaviors are explained as a result of the interaction between the employees' cognitions, behaviors, and the environment. According to Geller, (1989), who proposed Safety Triad Model of occupational safety based on the social cognitive theory, work environment is one key to determine individuals' safety behaviors. Cui, Fan, Fu & Zhu, (2013) also found significant findings empirically when they established integrative model between environment and safety behaviors based on social cognitive theory in Chinese mining context; therefore, this paper utilizes SCT as underpinning theory.

III. HAZARDOUS PHYSICAL ENVIRONMENT

Many negative work outcomes, such as stress, injuries and illnesses produced by inappropriate physical work environment in workplaces were spotted in previous literature (Joseph & Rashid, 2007). For example, staff who perceived their work as safe environment are likely to be exposed to less accidents (Hayes, Perander, Smecko & Trask, 1998). Therefore, employees' perceptions of hazardous physical environments in their workplaces have influenced their safety activity level (Cheyne, Cox, Oliver, & Tomás, 1998). Scholars have early accepted the vital role of physical work environment, e.g., Heinrich, Peterson and Roos, (1980) who generate Five Dominoes Theory in order to enhance safety and avoid accidents. Accordingly, the work environment reflects one domino; work environment includes physical hazards such as temperature, noise, humidity, hazardous objects, etc.

In general, hazardous physical environment refers to the perceived safety threats in one's operational environment (Cui *et al*., 2013). Several hazardous physical work environments were debated in the foregoing literature; these hazardous physical environments are different according to workplace settings. Bjerkan's (2010) findings revealed a significant correlation between safety, health, and physical work environments, besides a strong negative relationship between hazardous physical environment and occupational accidents ($\beta = -0.402$). Mearns *et al.* (2001) and Morrison, Haas, Shaffner, Garrett & Fackler, (2003) found that work stress could be resulted from hazardous physical environments, such as explosions, fires, transit accidents and blowouts produce stress at workplace. Rundmo (1992) concluded that inappropriate physical work environment increased the percentage of human errors and injuries in the workplace. Mroczek, Mikitarian, Vieira & Rotarius, (2005) indicated that staff' perceptions of hospitals physical environment had a positive effect on quality work life. Physical work environment is an important predictor of worthy safety performance and workers' health (Seo, 2005). In other words, physical and mental well-being of being ICUs/CCUs nurses are influenced by the hazardous physical environment (Aiken, 2002). Moreover, Clissold (2006) claimed that hazardous physical environment is a central origin of unsafe performance and workplace accidents.

3.1 Hazardous Physical Environment in ICUs/CCUs

Globally, ICUs/CCUs contain four major zones including clinical support zone, patient rooms zone, unit support zone, and patient families and visitors support zone (Rashid, 2006; Thompson *et al*., 2012). Healthcare providers used these zones to sort out their duties and task in challengeable physical and psychological work environment. For instance, Alameddine *et al*. (2009) summarized the aforementioned studies concerning work environment challenges that were reported in ICUs; three main categories were found; firstly, physical environment, such as visual and auditory alarms, lighting, noise, and overcrowding; secondly, emotional environment where the mortality rate and life and death decisions are common there; and lastly, professional environment which includes communication, autonomy and supportive management. However, physical environment is the most common performance obstacles in ICUs/CCUs (Gurses & Carayon, 2009). According to Chaudhury *et al.* (2009), environmental

elements, such as lighting, noise levels, ventilation and crowdedness upsurges the medication and medical errors in ICUs. Previous studies have arranged four major hazardous physical environments in ICUs/CCUs, they are: occupational noise, inadequate lighting, unit's design and inefficient ventilations (Alameddine *et al*., 2009; Gurses & Carayon, 2007, 2009; Mroczek *et al*., 2005).

- Occupational Noise

Noise is defined as ''undesirable sound'' (Berglund, Lindvall & Schwela, 2000). Occupational noise is considered as a common type of noise (Basner *et al*., 2014); it includes the unwilling sound produced inside the hospitals department. Accordingly, medical staff and patients are directly influenced by this type (Basner *et al*., 2014). Further types of noise, such as environmental noise and social noise were recognized also (Basner *et al*., 2014). Noise is measured by decibels (dB) (Berglund *et al*., 2000) and the normal value arranged between 40-45 dB during day shifts and 35 dB during night shifts (Hilton, 1985; Kinstler *et al*., 2015). However, occupational noise in the ICU exceeds the noise normal levels (Pugh *et al*., 2007). Moreover, high noise level is the most frequent obstacle in ICU (Gurses & Carayon, 2009). Occupational noise sources in ICU are numerous, for example, monitors alarms, mechanical ventilators, phones ringing, downfall of metallic items and suction machines (Fontaine *et al*., 2001; Tsiou, Eftymiatos, Theodossopoulou, Notis & Kiriakou, 1998). According to Pugh *et al*. (2007), noise rises the probabilities of accidents and increases the stress which, in turn, causes "burn-out" among ICUs nurses. Ryherd *et al*. (2008) informed that 91% of nurses claimed that noise have negative impact on their work environment. Gurses and Carayon's (2007) study indicated that 46% of respondents showed that nurses complain from noise in their work environments, which is deemed the major performance obstacles.

- Inadequate Lighting

Healthcare providers in ICUs also complain from inadequate lighting and absence of natural light (Fontaine *et al*., 2001). Either too dark or too bright lighting disturbs task performance (Chaudhury *et al*., 2009). Consequently, adequate lighting is needed to improve healthcare providers' safety as well as enhance their performance (Taylor *et al*., 2013). Furthermore, adequate lighting within ICUs environment contributes to the success of healthcare staff to act their critical tasks as well as adding benefits for both staff and patients (Ulrich, Zimring, Quan, Joseph & Choudhary, 2004). For example, maintaining appropriate lighting could reduce the staff stress and improve patient's safety status (Rollins, 2004). On the contrary, contact to artificial lights leads to negative consequences, for example, the use of light source during surgical interventions could possibly cause retinal damage among surgical team (Fox & Henson, 1996). Also, nurses may perhaps feel to be very bad when they are exposed to fluorescent lighting (Scott, 2004). Therefore, nursing staff are high risky to injuries from medical equipments, such as high-intensity surgical-light sources.

- Unit's Design

Poor unit's design produces many undesirable outcomes, such as nurses' annoyance, stress, fatigue and lack of safety compliance procedure (e.g. hand washing), which in last lead to reduce their efficiency in delivering work tasks in ICUs/CCUs (Joseph & Rashid, 2007; Long, Jusoh, Ajagbe & Ghee, 2013). According to Gurses and Carayon (2009), insufficient workspace is an evident problem in intensive care units, particularly during day shifts. This is related to crowdedness; around 37% of nurses contended that crowded work environments related to unit's design also hinder their work performance. It is not surprising if you see physicians, medical students and technicians as well as nurses, who are already working in intensive care unit, at the same time and the same place, which, in turn, could lead to overcrowded workplace and affect staff performance as a whole (Gurses & Carayon, 2009). Additionally, 25% of the nurses complain of insufficient workspace in intensive care units (Gurses & Carayon, 2007).

- Inefficient Ventilation

Ventilation is a factor that affects health environment in ICUs, for instance, Jiang *et al*. (2003) reported that good ventilation could reduce the viral spread significantly and contribute to protecting the Chinese health care providers from severe acute respiratory syndrome infection (SARS). Additionally, Smedbold *et al*. (2002) noticed that high quality of ventilation leads to a dramatic decrease of infections among healthcare staff. Ulrich *et al*. (2004) also suggested that adequate ventilation as well as maintain it frequently is necessary to ensure the nurses' and patients' safety. Li *et al*. (2007) indicated that the spread of infectious diseases, such as Tuberculosis, Influenza, Measles, and Severe Acute Respiratory Syndrome (SARS) is correlated strongly with the ventilation efficiency and the air movements inside hospitals buildings.

IV. SAFETY PERFORMANCE BEHAVIORS

Commonly, performance is described as activities performed or undertaken by workers (Burke, Sarpy, Tesluk & Smith-Crown, 2002). Many job performance dimensions were recognized previously; safety performance is one of these dimension (Ng & Feldman, 2008; Wu, Chen & Li, 2008). Safety performance behaviors are very important, particularly in hazardous workplaces which have dangerous work process (Clarke & Robertson, 2005). Thus, inappropriate safety behaviors lead to occurrence of injuries, deaths and additional substantial financial waste (Christian, Bradley, Wallace, & Burke, 2009; Hofmann & Morgeson, 1999).

Preceding literature has cited different safety behaviors dimensions. Hence, Andriessen (1978) documented that employees' compliance with safety rules is not enough to understand safety behaviors; so, he suggested to add safety initiatives to represent safety behaviors. Likewise, Simard and Marchand (1994) utilized safety compliance and safety initiatives to describe safety behavior. Marchand, Simard, Carpentier-Roy and Ouellet, (1998) also confirmed that concentrating on compliance to safety only is inadequate to measure safety behaviors; however, they recommended that safety behaviors must be measured at least by two dimensions (bidimensional concept). Thus, safety initiative behaviors were utilized as safety behaviors. Accordingly, safety initiative is contributed to preventing accidents effectively. Marchand *et al*. (1998) also described safety initiative as "to the extent to which members of the workgroup take informal initiatives to improve the safe execution of their works, as well as suggested that exert pressures on the supervisor for improving the work environments". Later, Neal *et al*. (2000) produced a model in order to interpret safety performance components as safety compliance and safety participation. Neal and Griffin described the safety compliance as a core of safety activities in order to sustain workplace safety by adhering to safety policies and procedures, while safety participation is defined as "the behaviors that may not directly contribute to workplace safety, but they do help to develop an environment that supports safety" (Griffin & Neal, 2000).

However, additional theoretical model has explained the safety performance dimensions. Burke *et al*. (2002) accepted four dimensions of safety performance as follows: using the personal protective equipment (PPE), engaging in work practice and procedures, effective communicating of threats and accidents, and effective training for employees regarding safety behaviors.

Hofmann, Morgeson & Gerras, (2003) and Conchie and Donald (2009) also utilized safety citizenship behaviors to represent safety performance which includes six behaviors; helping and assisting others related to safety activity, voice safety activity stewardship, whistleblowing action toward safety, initiating safety-related change and keeping employees informed.

Another study conducted by Liu *et al*. (2015) utilized the safety compliance, personal protective equipment (PPE) and safety initiatives of safety performance in the Chinese manufacturing industry. Past literature attempted to differentiate safety performance behavior to particular dimensions as mentioned before, but these attempts in fact indicate two main dimensions, namely safety compliance and safety participation.

To clarify that, studies used the personal protective equipment (PPE) (e.g., Burke *et al.*, 2002; Liu *et al.*, 2015) were considering the level of hazard of the studies targets industry. However, researchers in safety performance field hypothesized that the use of PPE is one kind of compliance to safety rules and procedures (Clarke, 2012; Neal & Griffin, 2006; Vinodkumar & Bhasi, 2010). Moreover, other dimensions, such as engaging in work practices is also under safety compliance umbrella (Cheyne *et al.*, 1998).

Burke *et al.* (2002) employed the communicating health and safety information and effective training as safety performance behaviors, while the previous literature employed familiar communicating health and safety information and effective training as important components of the safety climate perception (Flin, Mearns, O'Connor & Bryden, 2000).

Some studies discussed safety initiative and safety citizenship behaviors (Andriessen, 1978; Conchie & Donald, 2009; Hofmann, Morgeson & Gerras, 2003; Liu *et al.*, 2015; Marchand *et al.*, 1998; Simard & Marchand, 1994). Actually, these dimensions are analogous to the safety participation core meaning. According to Christian *et al*. (2009) and Clarke (2012), safety participation includes the safety citizenship behaviors, formation safety suggestions, safety-related workers' involvement, participation in health and safety activities, and ensuring co-workers safety; while the safety compliance includes the use of PPE, compliance with rules or procedures, safe work behaviors, unsafe work behaviors or safety violation.

As a conclusion, remarkable empirical studies agreed upon safety compliance and safety participation as components of safety performance behaviors. The next table shows the number of studies that employed the safety compliance and safety participation as safety performance dimensions.

Table1: Some of studies that used the safety performance behaviors as safety compliance and safety participation

Authors Name	Industry & Place
Neal *et al*. (2000)	Hospital-Australia
Griffin and Neal (2000)	Mining industry-Australia
Zacharatos *et al.* (2005)	Petroleum and telecommunications industries-Canada
Neal and Griffin (2006)	Hospital-Australia
Parboteeah and Kapp (2008)	Manufacturing industry-United State
Tharaldsen *et al*. (2010)	Platforms installation-United Kingdom and Norway
Vinodkumar and Bhasi (2010)	Chemical manufacturing industry-India
Jiang *et al*. (2010)	Petroleum and chemical industry-China
Mullen *et al*. (2011)	Health care industry-Canada
Pedersen and Kines (2011)	Wood manufacturing industry-Denmark
Turner *et al*. (2012)	Healthcare industry -United Kingdom
Mark *et al.* (2013)	Research service company-Australia
Sampson *et al*. (2014)	Pipefitters-United States
Lee and Dalal (2016)	Manufacturing industry- South Korea

V. CONCEPTUAL FRAMEWORK

Safety performance is still under expectation mainly among healthcare providers (e.g. nurses) (Abozead *et al*., 2014; Hassan, Wahsheh, Shishani & Pryor, 2008). Hence, nurses' safety performance in healthcare care organizations is required to access other predictors in order to reach workplace safety (Al-bsheish, Mustafa & Ismail, 2017). This paper offers conceptual framework in order to enhance safety performance depending on social cognitive theory which supports the role of work environment to change behaviors. Accordingly, it is accepted that this conceptual framework adds to safety performance literature a significant predictor termed hazardous physical environment in order to expand the safety performance literature.

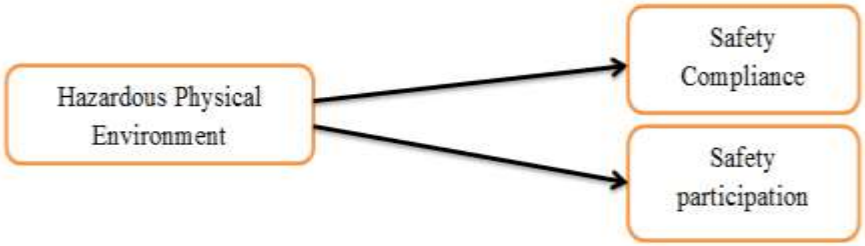

Figure 1: Conceptual Framework

VI. CONCLUSION AND RECOMMENDATION

Forgoing studies were mainly focused on the physical environment effect upon patients' outcomes. They lack of research concerning healthcare providers' safety (e.g., nurses) (Mroczek *et al*., 2005) in ICUs/CCUs. In an effort to provide more nurses' performance safety, more seminal studies are recommended to get more predictors of safety compliance and safety participation (Al-bsheish *et al*., 2017). Hence, occupational noise, inadequate lighting, unit's design, inefficient ventilations are all essential in weakening safety performance in these areas in hospitals.

This study employs the social cognitive theory to confirm the role of hazardous physical environment as antecedent of safety performance behaviors. This work also adds to the current literature by theoretically representing that hazardous physical environment elements, such as occupational noise, inadequate lighting, inefficient ventilations and units' design have a critical role in enhancing nurses' safety in ICUs/CCUs. As a practical issue, it is strongly advised that health policy makers and safety managers have to recognize the importance of physical work environment upon safety performance; they must also support their nursing staff in the ICUs/CCUs in their efforts to be compliance and participant in safety activity. Moreover, implementing the appropriate interventions to heighten the physical work environment in their hospitals is necessary in order to reduce undesirable outcomes, such as fatigue, stress, burnout, turnover, and occupational accidents, which are common among nurse worldwide.

VII. ACKNOWLEDGEMENT

The research was completed by a funding from University Utara Malaysia (UUM).

REFERENCES

[1] **Abozead, S. E., Abuhasheesh, M., Nawafleh, H., Kawafha, M. M., & Al-tarawneh, O. (2014).** Knowledge and practices of Jordanian nurses on needlestick injuries : An evaluative study. Infectious Diseases in Clinical Practice, 23(1), 1–5.

[2] **Aiken, L. H. (2002).** Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. Journal of the American Medical Association, 288(16), 1987–1993. http://doi.org/10.1001/jama.288.16.1987

[3] **Alameddine, M., Dainty, K. N., Deber, R., & Sibbald, W. J. (2009).** The intensive care unit work environment: Current challenges and recommendations for the future. Journal of Critical Care, 24(2), 243–248.

[4] **Al-bsheish, M. A., Mustafa, M., & Ismail, M. A. (2017).** Enhancing safety performance by recognizing the role of perceived management commitment to safety in Jordanian healthcare Industry : Conceptual framework. International Journal of Business and Social Research, 07(01), 1–10.

[5] **Andriessen, J. H. T. H. (1978).** Safe behaviour and safety motivation. Journal of Occupational Accidents, 1(4), 363–376. http://doi.org/10.1016/0376-6349(78)90006-8

[6] **Bandura, A. (1977).** Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84(2), 191–215. http://doi.org/10.1037/0033-295X.84.2.191

[7] **Bandura, A. (1991).** Social cognitive theory of self-regulation. Organisational Behaviour and Human Decision Processes, 50, 248–287. http://doi.org/10.1016/0749-5978(91)90022-L

[8] **Bandura, A. (2001).** Social cognitive theory of mass communication. Mediapsychology, 265–299. http://doi.org/10.1207/S1532785XMEP0303

[9] **Basner, M., Babisch, W., Davis, A., Brink, M., Clark, C., Janssen, S., & Stansfeld, S. (2014)**. Auditory and non-auditory effects of noise on health. The Lancet, 383(9925), 1325–1332. http://doi.org/10.1016/S0140-6736(13)61613-X

[10] **Berglund, B., Lindvall, T., & Schwela, D. (2000).** New WHO guidelines for community noise. Noise & Vibration Worldwide, 31(4), 24–29.

[11] **Bjerkan, A. M. (2010).** Health, environment, safety culture and climate – analysing the relationships to occupational accidents. Journal of Risk Research, 13(4), 445–477. http://doi.org/10.1080/13669870903346386

[12] **Burke, M. J., Sarpy, S. A., Tesluk, P. E., & Smith-Crown, K. (2002).** General safety performance: A test of a grounded theoretical model. Personnel Psychology, 55(2), 429–457. http://doi.org/10.1111/j.1744-6570.2002.tb00116.x

[13] **Chaudhury, H., Mahmood, A., & Valente, M. (2009).** The effect of environmental design on reducing nursing errors and increasing efficiency in acute care settings: A review and analysis of the literature. Environment and Behavior. http://doi.org/10.1177/0013916508330392

[14] **Cheyne, Cox, S., Oliver, A., & Tomás, J. M. (1998)**. Modelling safety climate in the prediction of levels of safety activity. Work & Stress, 12(3), 255–271. http://doi.org/10.1080/02678379808256865

[15] **Christian, M. S., Bradley, J. C., Wallace, J. C., & Burke, M. J. (2009).** Workplace safety: A meta-analysis of the roles of person and situation factors. Journal of Applied Psychology, 94(5), 1103–1127. http://doi.org/10.1037/a0016172

[16] **Clarke, S. (2012**). The effect of challenge and hindrance stressors on safety behavior and safety outcomes: A meta-analysis. Journal of Occupational Health Psychology, 17(4), 387–397. http://doi.org/10.1037/a0029817

[17] **Clissold, G. (2006).** An Application of Bandura's Social Cognitive Theory to the Explanation of Safety-Related Behavior. Unpublished Ph.D. Dissertation. Monash University, Melbourne.

[18] **Conchie, S. M., & Donald, I. J. (2009).** The moderating role of safety-specific trust on the relation between safety-specific leadership and safety citizenship behaviors. Journal of Occupational Health Psychology, 14(2), 137–47. http://doi.org/10.1037/a0014247

[19] **Cui, L., Fan, D., Fu, G., & Zhu, C. J. (2013).** An integrative model of organizational safety behavior. Journal of Safety Research, 45, 37–46. http://doi.org/10.1016/j.jsr.2013.01.001

[20] **European Transport Safety Council. (2001).** Transport Safety Performance Indicators. Brussels. Retrieved from http://etsc.eu/wp-content/uploads/2003_transport_safety_stats_eu_overview.pdf

[21] **Flin, R., Mearns, K., O'Connor, P., & Bryden, R. (2000).** Measuring safety climate: Identifying the common features. Safety Science, 34(1), 177–192. http://doi.org/10.1016/S0925-7535(00)00012-6

[22] **Fontaine, D. K., Briggs, L. P., & Pope-Smith, B. (2001).** Designing humanistic critical care environments. Critical Care Nursing Quarterly, 24(3), 21–34.

[23] **Fox, R. A., & Henson, P. W. (1996).** Potential ocular hazard from a surgical light source. Australasian Physical & Engineering Sciences in Medicine/supported by the Australasian College of Physical Scientists in Medicine and the Australasian Association of Physical Sciences in Medicine, 19(1), 12–16.

[24] **Geller, E. S. (1989).** Managing occupational safety in the auto industry. Journal of Organizational Behavior Management, 10(1), 7–37.

[25] **Griffin, M. A., & Hu, X. (2013).** How leaders differentially motivate safety compliance and safety participation: The role of monitoring, inspiring, and learning. Safety Science, 60, 196–202. http://doi.org/10.1016/j.ssci.2013.07.019

[26] **Griffin, M. A., & Neal, A. (2000).** Perceptions of safety at work: A framework for linking safety climate to safety performance, knowledge, and motivation. Journal of Occupational Health Psychology, 5(3), 347–358. http://doi.org/10.1037/1076-8998.5.3.347

[27] **Gurses, A. P., & Carayon, P. (2007).** Performance obstacles of intensive care nurses. Nursing Research, 56(3), 185–194.

[28] **Gurses, A. P., & Carayon, P. (2009)**. Exploring performance obstacles of intensive care nurses. Applied Ergonomics, 40(3), 509–518.

[29] **Hassan, Z. M., Wahsheh, M. A., Shishani, K. R., & Pryor, E. R. (2008).** Hepatitis needs assessment among Jordanian healthcare workers. International Nursing Review, 55(2), 142–147. http://doi.org/10.1111/j.1466-7657.2007.00583.x

[30] **Hayes, B. E., Perander, J., Smecko, T., & Trask, J. (1998).** Measuring perceptions of workplace safety : Development and validation of the work safety scale. Journal of Safety Research, 29(3), 145–161. http://doi.org/10.1016/S0022-4375(98)00011-5

[31] **Heinrich, H. W., Peterson, D., &Roos, N. (1980).** Industrial accident prevention: A safety management approach. McGraw-Hill Companies.

[32] **Hilton, B. A. (1985).** Noise in acute patient care areas. Research in Nursing & Health, 8(3), 283–291. http://doi.org/10.1097/00003465-198605000-00011

[33] **Hinze, J. W., Hallowell, M. M. R., Baud, K. C., Pellicer, E., Carvajal, G. I., Rubio, M. C., … Diethelm, S. (2013).** Construction-safety best practices and relationships to safety performance. Journal of Construction Engineering and Management American Society Civil Engineering, 139(10), 1–8. http://doi.org/10.1061/(ASCE)CO.1943-7862.0000751.

[34] **Hofmann, D. A., Jacobs, R., & Landy, F. (1995).** High reliability process industries: Individual, micro, and macro organizational influences on safety performance. Journal of Safety Research, 26(3), 131–149. http://doi.org/10.1016/0022-4375(95)00011-E

[35] Hofmann, D. A., & Morgeson, F. P. (1999). Safety-related behavior as a social exchange: The role of perceived organizational support and leader-member exchange. Journal of Applied Psychology, 84(2), 286–296. http://doi.org/10.1037/0021-9010.84.2.286

[36] Hofmann, D. A., Morgeson, F. P., & Gerras, S. J. (2003). Climate as a moderator of the relationship between leader-member exchange and content specific citizenship: Safety climate as an exemplar. The Journal of Applied Psychology, 88(1), 170–178. http://doi.org/10.1037/0021-9010.88.1.170

[37] Huang, Y.-H., Smith, G. S., Ho, M., & Chen, P. Y. (2006). The relationship between safety climate and injury rates across industries: The need to adjust for injury hazards. Accident Analysis and Prevention, 38(3), 556–562. http://doi.org/10.1016/j.aap.2005.11.013

[38] Jiang, L., Yu, G., Li, Y., & Li, F. (2010). Perceived colleagues' safety knowledge/behavior and safety performance: Safety climate as a moderator in a multilevel study. Accident Analysis and Prevention, 42(5), 1468–1476. http://doi.org/10.1016/j.aap.2009.08.017

[39] **Jiang, S., Huang, L., Chen, X., Wang, J., Wu, W., Yin, S., ... & Li, J. (2003).** Ventilation of wards and nosocomial outbreak of severe acute respiratory syndrome among healthcare worker. Chinese Medical Journal, 116(9), 1293–1297.

[40] **Joseph, A., & Rashid, M. (2007).** The architecture of safety : Hospital design. Current Opinion in Critical Care, 13, 714–719.

[41] **Kinstler, A., Vidonish, W. P., Wagner, M., Lin, L., Davis, K. G., Kotowski, S. E., & Daraiseh, N. M. (2015).** Impact of noise on nurses in pediatric intensive care units. American Journal of Critical Care, 24(5), 377–384.

[42] **Lee, S., & Dalal, R. S. (2016).** Climate as situational strength: Safety climate strength as a cross-level moderator of the relationship between conscientiousness and safety behaviour. European Journal of Work and Organizational Psychology, 25(1), 120–132. http://doi.org/10.1080/1359432X.2014.987231

[43] **Li, F., Jiang, L., Yao, X., & Li, Y. (2013).** Job demands, job resources and safety outcomes: The roles of emotional exhaustion and safety compliance. Accident Analysis and Prevention, 51, 243–251. http://doi.org/10.1016/j.aap.2012.11.029

[44] **Li, Y., Leung, G. M., Tang, J. W., Yang, X., Chao, C. Y. H., Lin, J. Z., … Yuen, P. L. (2007).** Role of ventilation in airborne transmission of infectious agents in the built environment - A multidisciplinary systematic review. Indoor Air, 17(1), 2–18.

[45] **Liu, X., Huang, G., Huang, H., Wang, S., Xiao, Y., & Chen, W. (2015).** Safety climate, safety behavior, and worker injuries in the Chinese manufacturing industry. Safety Science, 78, 173–178. http://doi.org/10.1016/j.ssci.2015.04.023

[46] **Lockley, S. W., Barger, L. K., Ayas, N. T., Rothschild, J. M., Czeisler, C. A., & Landrigan, C. P. (2008).** Effects of health care provider work hours and sleep deprivation on safety and performance. The Joint Commission Journal on Quality and Patient Safety, **33(11), 1–18.**

[47] **Long, C. S., Jusoh, A., Ajagbe, M. A., & Ghee, L. C. (2013).** A review on job stressor in the perspective of health care industry. Research Journal of Recent Sciences, 2(3), 81–86.

[48] **Marchand, A., Simard, M., Carpentier-Roy, M. C., & Ouellet, F. (1998).** From a unidimensional to a bidimensional concept and measurement of workers' safety behavior. Scandinavian Journal of Work, Environment and Health, 24(4), 293–299. http://doi.org/10.5271/sjweh.323

[49] **Mearns, K., Whitaker, S. M., & Flin, R. (2001).** Benchmarking safety climate in hazardous environments: A longitudinal, interorganizational approach. Risk Analysis, 21(4), 771–786. http://doi.org/10.1111/0272-**4332.214149**

[50] **Morrison, W. E., Haas, E. C., Shaffner, D. H., Garrett, E. S., & Fackler, J. C. (2003).** Noise, stress, and annoyance in a pediatric intensive care unit. Critical Care Medicine, 31(1), 113–119. http://doi.org/10.1097/01.CCM.0000037164.66392.AF

[51] **Motowidlo, S. J., & Van Scotter, J. R. (1994).** Evidence that task performance should be distinguished from contextual performance. Journal of Applied Psychology, 79(4), 475–480. http://doi.org/10.1037/0021-9010.79.4.475

[52] **Mroczek, J., Mikitarian, G., Vieira, E. K., & Rotarius, T. (2005).** Hospital design and staff perceptions: An exploratory analysis. Health Care Manager, 24(3), 233–244. http://doi.org/Article

[53] **Mullen, J. E., Kelloway, E. K., & Teed, M. (2011).** Inconsistent style of leadership as a predictor of safety behaviour. Work & Stress, 25(1), 41–54. http://doi.org/10.1080/02678373.2011.569200

[54] **Neal, A., & Griffin, M. A. (2006).** A study of the lagged relationships among safety climate, safety motivation, safety behavior, and accidents at the individual and group levels. Journal of Applied Psychology, 91(4), 946–953. http://doi.org/10.1037/0021-9010.91.4.946

[55] **Neal, A., M.A.Griffin, & P.M.Hart. (2000).** The impact of organizational climate on safety climate and individual behavior. Safety Science, 34(1-3), 99–109. http://doi.org/10.1016/S0925-7535(00)00008-4

[56] **Neal, A. & Griffin, M.A. April, 1997,** 'Linking theories of work performance and safety climate', paper presented at the 12th Annual conference of the Society for Industrial Psychology, St. Louis, Missouri.

[57] **Ng, T. W. H., & Feldman, D. C. (2008).** The relationship of age to ten dimensions of job performance. The Journal of Applied Psychology, 93(2), 392–423. http://doi.org/10.1037/0021-9010.93.2.392

[58] **Parboteeah, K. P., & Kapp, E. A. (2008).** Ethical climates and workplace safety behaviors: An empirical investigation. Journal of Business Ethics, 80(3), 515–529. http://doi.org/10.1007/s10551-007-9452-y

[59] **Pedersen, L. M., & Kines, P. (2011).** Why do workers work safely? development of safety motivation questionnaire scales. Safety Science Monitor, 15(1), 1–10.

[60] **Pousette, A., Larsman, P., Eklöf, M., & Törner, M. (2017).** The relationship between patient safety climate and occupational safety climate in healthcare – Amulti-level investigation. Journal of Safety Research. http://doi.org/10.1016/j.jsr.2017.02.020

[61] **Pugh, R. J., Jones, C., & Griffiths, R. D. (2007).** The impact of noise in the intensive care unit. Intensive Care Medicine, 942–949.

[62] **Rashid, M. (2006).** A decade of adult intensive care unit design : A study of the ohysical design features of the Best-Practice Examples. Critical Care Nursing, 29(4), 282–311.

[63] **Rollins, J. A. (2004).** Evidence-based hospital design improves health care outcomes for patients, families, and staff. Pediatric Nursing, 30(4), 338–339.

[64] **Rundmo, T. (1992).** Risk perception and safety on offshore petroleum platforms - Part II: Perceived risk, job stress and accidents. Safety Science, 15(1), 53–68. http://doi.org/10.1016/0925-7535(92)90039-3

[65] **Ryherd, E. E., Waye, K. P., & Ljungkvist, L. (2008).** Characterizing noise and perceived work environment in a neurological intensive care unit. Journal of the Acoustical Society of America, 123(2), 747–756. http://doi.org/10.1121/1.2822661

[66] **Sampson, J. M., DeArmond, S., & Chen, P. Y. (2014).** Role of safety stressors and social support on safety performance. Safety Science, 64, 137–145. http://doi.org/10.1016/j.ssci.2013.11.025

[67] **Scott, H. (2004).** Working environments have a direct impact on care. British Journal of Nursing, 13(15), 893.

[68] **Seo, D.-C. (2005).** An explicative model of unsafe work behavior. Safety Science, 43(3), 187–211. http://doi.org/10.1016/j.ssci.2005.05.001

[69] **Sharon Clarke, & Robertson, I. T. (2005).** A meta-analytic review of the big five personality factors and accident involvement in occupational and non-occupational settings. Journal of Occupational and Organizational Psychology, 78(3), 355–376. http://doi.org/10.1348/096317905X26183

[70] **Simard, M., & Marchand, A. (1994).** The behaviour of first-line supervisors in accident prevention and effectivenss in occupational safety. Safety Science, 17(3), 169–185.

[71] **Siu, O. L., Phillips, D. R., & Leung, T. W. (2003).** Age differences in safety attitudes and safety performance in Hong Kong construction workers. Journal of Safety Research, 34(2), 199–205. http://doi.org/10.1016/S0022-4375(02)00072-5

[72] **Siu, O. L., Phillips, D. R., & Leung, T. W. (2004).** Safety climate and safety performance among construction workers in Hong Kong: The role of psychological strains as mediators. Accident Analysis and Prevention, 36, 359–366. http://doi.org/10.1016/S0001-4575(03)00016-2

[73] **Smedbold, H. T., Ahlen, C., Unimed, S., Nilsen, A. M., Norbäck, D., & Hilt, B. (2002).** Relationships between indoor environments and nasal inflammation in nursing personnel. Archives of Environmental Health, 57(2), 155–161. http://doi.org/10.1080/00039890209602930

[74] **Stajkovi, A. D., & Luthans, F. (2003).** Social cognitive theory and self-efficacy: Implications for motivation theory and practice. In Motivation and Work Behavior (7 Ed, pp. 126–140). McGraw-Hill lrwin. http://doi.org/10.1016/0024-6301(93)90245-B

[75] **Stone, P., Mooney-Kane, C., Larson, E., Horan, T., Glance, L., Zwanziger, J., & Dick, A. (2007).** Nurse working conditions and patient safety outcomes. Medical Care, 45(6), 571–578. http://doi.org/10.1097/MLR.0b013e3180383667

[76] **Takrouri, M. S. M. (2004).** Intensive care unit. The Internet Journal of Health, 3(2), 2–4.

[77] **Taylor, P., Dianat, I., Sedghi, A., Bagherzade, J., Jafarabadi, M. A., & Alex, W. (2013).** Objective and subjective assessments of lighting in a hospital setting: Implications for health, safety and performance. Ergonomics, 56(10), 1535–1545. http://doi.org/10.1080/00140139.2013.820845

[78] **Tharaldsen, J. E., Mearns, K. J., & Knudsen, K. (2010).** Perspectives on safety: The impact of group membership, work factors and trust on safety performance in UK and Norwegian drilling company employees. Safety Science, 48(8), 1062–1072. http://doi.org/10.1016/j.ssci.2009.06.003

[79] **Thompson, D. R., Hamilton, D. K., Cadenhead, C. D., Swoboda, S. M., Schwindel, S. M., Anderson, D. C., … Petersen, C. (2012).** Guidelines for intensive care unit design. Critical Care Medicine, 40(5), 1586–1600. http://doi.org/10.1097/CCM.0b013e3182413bb2

[80] **Tsiou, C., Eftymiatos, D., Theodossopoulou, E., Notis, P., & Kiriakou, K. (1998).** Noise sources and levels in the Evgenidion Hospital intensive care unit. Intensive Care Medicine, 24(8), 845–847. http://doi.org/10.1007/s001340050676

[81] **Turner, N., Stride, C. B., Carter, A. J., McCaughey, D., & Carroll, A. E. (2012).** Job Demands–Control–Support model and employee safety performance. Accident Analysis & Prevention, 45, 811–817. http://doi.org/10.1016/j.aap.2011.07.005

[82] **Ulrich, R., Zimring, C., Quan, X., Joseph, A., & Choudhary, R. (2004).** The Role of the Physical Environment in the Hospital of the 21 st Century : A Once-in-a-Lifetime Opportunity. Concord, CA: The Center for Health Design.

[83] **Vinodkumar, M. N., & Bhasi, M. (2009).** Safety climate factors and its relationship with accidents and personal attributes in the chemical industry. Safety Science, 47(5), 659–667. http://doi.org/10.1016/j.ssci.2008.09.004

[84] **Vinodkumar, M. N., & Bhasi, M. (2010).** Safety management practices and safety behaviour: Assessing the mediating role of safety knowledge and motivation. Accident Analysis & Prevention, 42(6), 2082–2093.

[85] **Wu, T. C., Chen, C. H., & Li, C. C. (2008).** A correlation among safety leadership, safety climate and safety performance. Journal of Loss Prevention in the Process Industries, 21(3), 307–318. http://doi.org/10.1016/j.jlp.2007.11.001

[86] **Zacharatos, A., Barling, J., & Iverson, R. D. (2005).** High-performance work systems and occupational safety. The Journal of Applied Psychology, 90(1), 77–93. http://doi.org/10.1037/0021-9010.90.1.77

****

Corresponding author : Mohammad Al-Bsheish RN, MHCM, College of Business, Universiti Utara Malaysia, PO Box 59 Taman University, Kedah, Malaysia. Tel: 60-175289282
Email : gandour1984[at]yahoo[dot]com