A Systematic Review on Exploring and Prioritizing Factors Affecting Human Errors in Health Care Environment

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ABSTRACT

Introduction: Despite continuous efforts to reduce human error in various systems, unsafe behaviors and errors are the main causes of incidents in the workplace. Hospitals are one of the places where human error events are abundant. Human errors, same as any other error, can be reduced greatly if factors affecting on the error get identified and eliminated. Therefore, a systematic review of past studies is the best way to share the useful findings of studies and the availability for future studies in the field of human error.

Objective: The main purpose of this systematic review study, is to identify and classify the main causes of human error in the healthcare environment.

Methodology: The electronic search of databases in English was within the period of 2005-2019. Bibliographic sites, including the Web of Science, PubMed, and Scopus were searched based on various search strategies.

Results and discussion: A total of 19 resources were selected, and 28 indicators were found. Results revealed that the lack of skills, inadequate and insufficient equipment, and lack of experience are the three main factors affecting human error. Performance error and retrieval error were reported as the highest and the lowest types of error, respectively.

Conclusion: Results of this systematic review of published research can be used to improve patient safety status. This study can also provide a quick guide for non-experienced researchers being enthusiast to work on human errors.

Keywords: Effective Factors, Human Error, Systematic Review, Health Care Environment, Hospital

1. INTRODUCTION

1.1 General instructions

The unwanted failure of targeted and planned activities to achieve a desirable result is considered as human error (Edmondson, 2004). In medicine, error is the inability to perform an action, according to using an incorrect program to achieve a specific purpose at the system level which clearly leads to undesirable consequences (Kariuki & Löwe, 2007; Oliveira, Duarte, Abelha, & Machado, 2017). These consequences are events in which the patient is unintentionally harmed and sustained multiple injuries (Strauch, 2017). International studies show that human error of personnel of sectors in health and treatment has had a major role in harming clients and patients that has caused enormous human and financial damage. In this regard, the findings show that human errors in the health sector, cover 87% of the causes of accidents that threaten patient safety in the healthcare environment (Edmondson, 2004). Studies show that error in healthcare sector is the third leading cause of death in the United States (Makary & Daniel, 2016).

In the United States, 98,000 deaths from medical errors are reported and recorded annually in the US hospital system (Helmreich, 2000). While 70.5% of these incidents lead to a disability for less than 6 months, 6.2% of the injuries cause permanent disability and a percentage lead to death, which in some cases also result in complaints and litigation (Robinson et al., 2002). The country also accounts for about 17 percent of hospital admissions resulting in an adverse effects (Rubin, George, Chinn, & Richardson, 2003). A high percentage of these incidents are reported to have occurred, with serious risks in the intensive care unit, with an average of 1.7 errors per patient per day (Organization, 2008).

Interaction between healthcare and technology providers and the environment reduces the risk of errors and adverse effects for patients and employees (Classen et al., 2011). Ignoring this fact, in addition to impeding their safe work, poses many problems such as heavy job pressure (Van Den Bos et al., 2011). According to the findings, occurrence of errors or unsafe actions is strongly influenced by working conditions (Mazlomi et al., 2011). unsafe actions can be caused by improper mental processes such as forgetfulness, neglect, inattention, poor motivation, carelessness, and recklessness (Allahyari, 2007). On the other hand, injuries to healthcare workers as well as medical errors are created or enhanced by factors such as mental and physical exhaustion (Küng et al., 2013), unusual working hours, job stressors, experience, musculoskeletal disorders (Cousins & Heath, 2008), poor interpersonal communication, incomplete information processing, defective decision making (Zagheri Tafreshi, Rassouli, Zayeri, & Pazookian, 2014), inexperience (Johnstone, 2007), Role violations, job management failures, and deficiencies in standardization of orders (Kalra, Kalra, & Baniak, 2013b). In addition, a wide distribution of other causes, such as unusual tasks and the need for more information (Andrews et al., 1997), inadequate training (Iraj Mohammadfam, Bashirian, & Bakhshi, 2017), Weaknesses in technology or equipment and displays (Iraj Mohammadfam, Movafagh, Soltanian, Salavati, & Bashirian, 2014), inadequate monitoring and rapid change within the organization, have also been identified.

1.2 Introduction purpose

Since numerous, dispersed, and sometimes contradictory reasons for the occurrence of errors in the healthcare environment have been reported; obviously to reduce the risk of human errors in healthcare environment causes of human errors have to get identified, evaluated and controlled. Thus, the main purpose of this systematic review study, is to identify and classify the main causes of human error in the healthcare environment.

2. MATERIALS AND METHODS

Electronic searches of databases English were conducted in the databases of PubMed, Scopus and Web of Science within the period of 2005-january 2019. The research strategy used was that of conducting a search for primary studies in mentioned sources. All searches were based on title, abstract and keywords. The research strategy used a set of key words applying the logical operators AND and OR. The key words used were: Performance Shaping Factors, PSF, Human Error, Human Errors, Health Care, Health System, Health Section, error.

After finishing the search in the databases, all the articles were monitored by Endnote software to identify any duplication in articles found. Two researchers considered screened articles separately based on the abstract to exclude unrelated articles. The full text of remaining articles monitored completely and those which were not answering the research question were excluded also. Fig. 1 shows the flowchart of the systematic review.

3. RESULTS and DISCUSSION

Examination of the studies revealed that all studies identified a set of factors as causes of errors (table 1). The results also showed that most of the studies have been done in USA (36.84%) and Canada (20%) and United Kingdom (16%) are in the second and third step respectively.

Analyzing the results revealed that the lack of skills, inadequate and insufficient equipment, and lack of experience are the three main factors affecting human error. Also, the highest and the lowest types of errors were reported as performance error and retrieval error, respectively.

The results showed that most studies on human error in the health sector belonged to the period 2005-2010 and then the frequency of such studies decreased. This finding is consistent with the life cycle of safety science in developed countries. During this cycle, studies of human reliability and human error began in the late 1980s, and since the beginning of the 20th century, with the introduction of high-reliability organizations, the safety culture has taken its place (Shirali, Mohammadfam, Motamedzade, Ebrahimipour, & Moghimbeigi, 2012).

The origin of human error studies, due to the criticality of the errors, has been in the military, aerospace and process industries. Throughout time, by changing the culture of safety in industries, these studies has gradually expanded to the health sector with a time lag (I Mohammadfam & Moghimbeigi, 2009). Frequency distribution of published articles with the highest frequency in the three countries, USA, Canada and the United Kingdom and also their focus on learning lessons from other contexts endorses the above.

In terms of frequency, most human error studies in the area of healthcare have been performed by physicians, operating room staff and office personnel (fig 2).

The main reason for the high number of studies in these working groups is the high error rates reported among them which is due to the diversity and multiplicity of factors affecting the activity of the three groups.

Among the most important factors affecting performance, lack of available time, high workload, doing two or more tasks concurrently, and the cooperation and interaction between colleagues can be mentioned (Iraj Mohammadfam, Movafagh, & Bashirian, 2016)

In a study by Huang et al., Aimed at assessing different levels of cardiac cardiovascular disease and its association with clinical errors, the findings showed that co-operative and cardiac rates were moderate in this study and positively correlated with nurses' reported functional error (Hwang & Ahn, 2015).

A study conducted in 2013 on the subject of testing the Nurses Drug Error Model based on the Risen Human Error Model in 150 nurses working in different wards of the hospital, found that according to the Nurses Error Model, encouraging people to report errors and using it as a way to learn from their colleagues in the future is very helpful. On the other hand, authorities can be very effective in creating a positive learning climate in the organization and modifying the punishment for unintentional errors and providing strategies to prevent it from happening again in the future (Küng et al., 2013).

4. CONCLUSIONS

Exploring and identifying factors leading to human errors in a healthcare environment can be considered as an early stage to manage and decrease the number of these kind of errors.

This systematic review of published research on Factors Affecting on the Human Errors in Health, had aim to identify and prioritize factors that lead to human errors in health care section. Considering the distribution of studies, most of the papers has been done in developed countries while the lack of a sufficient number of studies in developing countries is clearly felt. The results of this study identified 28 factors out of 19 studies. Among those three main factors are influencing human error were lack of skills, inadequate and insufficient equipment and lack of experience. Also, the highest and the lowest types of errors were reported as performance error and retrieval error, respectively.. Results of this study can be used to eliminate those factors to Improve patient safety status. This study can also provide a quick guide for non-experienced researchers being enthusiast to work on human error.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests.
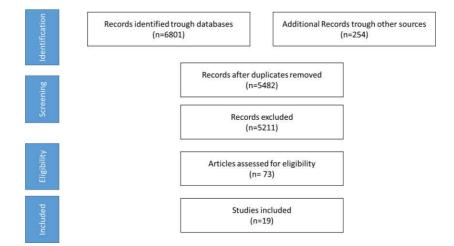
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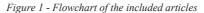Kalra, J., Kalra, N., & Baniak, N. (2013a). Medical error, disclosure and patient safety: A global view of quality care. *Clinical Biochemistry, 46*(13), 1161-1169. doi:https://doi.org/10.1016/j.clinbiochem.2013.03.025

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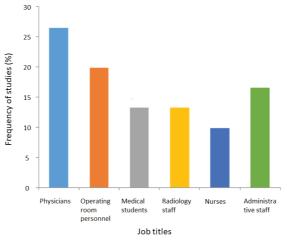
Figures

Figure 1 - Flowchart of the included articles

Figure 2 - Frequency of studies based on job titles

Table 1. Summary of identified factors

Author	Year	Country of first author	Factors affecting on the human errors	Error Type
(Kraemer & Carayon, 2007)	2007	USA	Poor communication security culture policy organizational structure	performance
(Carayon, 2006)	2006	USA	inappropriate clothes Patient characters Poor technologies	selection
(Kalra, Kalra, & Baniak, 2013a)	2013	Canada	tiredness inappropriate Equipment Work load Inappropriate working conditions	retrieval
(Huang et al., 2005)	2005	Canada	Inadequate equipment unavailability of equipment tiredness poor Communications	communication
(Fabri & Zayas-Castro, 2008)	2008	USA	Use of inadequate protection The devices are not calibrated Inappropriate physical conditions	performance
(Yeung, Bortolotto, Cosby, Hoar, & Lederer, 2005)	2005	Canada	Lack of skills lack of experience	selection
(Milligan, 2007)	2007	United Kingdom	Inadequate training Lack of skills Lack of experience	performance
(Stroud, Wong, Hollenberg, & Levinson, 2013)	2013	Canada	Lack of knowledge Lack of skills Poor attitude Lack of experience	checking
(Breitbach et al., 2013)	2013	USA	Poor communication Lack of knowledge Lack of skills Poor attitude Lack of experience	performance
(Clarke, 2005)	2005	USA	High work load Forgetfulness Low accuracy	selection
(Makary & Daniel, 2016)	2016	USA	Poor communication Lack of skills Lack of experience Repeated work	communication
(Smorti, Cappelli, Zarantonello, Tani, & Gensini, 2014)	2014	Italy	wrong observation Inadequate education Lack of experience	checking
(Ferrara et al., 2013)	2013	Italy	Lack of facilities Insufficient motivation Lack of skills	Performance
(Russo, Buonocore, & Ferrara, 2015)	2015	France	Insufficient motivation Inadequate training Inadequate equipment	retrieval
(Newland, 2011)	2011	USA	Lack of medical knowledge and information Poor education	performance
(Källberg, Göransson, Östergren, Florin, & Ehrenberg, 2013)	2013	Sweden	poor communication system Lack of skills Lack of experience	Communication
(Yaman & Cihan, 2009)	2009	Turkey	poor communications Inadequate equipment repeated work	Communication
(Undre, Arora, & Sevdalis, 2009)	2009	United Kingdom	hospital environmental pollution high work load	Checking
(Armitage, 2009)	2009	United Kingdom	Lack of skills Inadequate training Improper management	selection