

Association Between Electronic Health Record System And Patient Safety Culture In Hospitals Of Maldives: Nurses Perception

Aishath Selna¹, Dr.Zulhabri-Othman², Dr. Jacqueline Tham³, Dr. Adam Khaleel Yoosuf⁴

¹Postgraduate Centre, Management and Science University, 40100 Shah Alam, Selangor

²Postgraduate Centre, Management and Science University, 40100 Shah Alam, Selangor

³Postgraduate Centre, Management and Science University, 40100 Shah Alam, Selangor

⁴ADK Hospital, Male' Maldives

ABSTRACT

Electronic Health Record System (EHRs), when designed, implemented, and used in a proper manner can be a positive enabling method which can be used to transform the way health care is delivered. Reducing avoidable harm to patients is the main purpose of a patient safety culture (PSC). The general aim of the study presented in the paper was to assess the nurses' perception of Electronic Health Record System use in hospitals of Maldives and their effectiveness for Patient Safety Culture.

A cross sectional institutions-based study was conducted among the nurses who are working in hospitals in Maldives. A simple random sampling technique was used with 292 participants.

The findings study suggests that Electronic Health Record Systems used has a relationship with Patient Safety Culture. The correlation matrix for Electronic Health Record Systems and Patient Safety culture shows statistical significance with a slightly positive correlation. A linear regression analysis was carried out to calculate and predict the impact of Electronic Health Record Systems on Patient Safety Culture, the derived values were statistically significant.

A good Technology (Electronic Health Record System) is important for a Patient Safety Culture, but the existing Electronic Health Record Systems need to be evaluated for better understanding of how to positively improve on it, in lieu of patient safety such as electronic error reporting, alerts, and reducing paperwork.

Keywords: Patient safety culture, Health Information Technology, Electronic Health Records, Safety Outcomes, Maldives.

INTRODUCTION

The World Health Organization (WHO) defines patient safety as the absence of preventable unnecessary harm to patients by healthcare professionals. It has been reported that harm to patients during care delivery has led to a loss of 64 million disability-adjusted life years annually worldwide and is recognized as one of the top 10 causes of disability and death (Vaismoradi, Tella, Logan, Khakurel, & Vizcaya-Moreno, 2020). For enhancing patient safety, building a patient safety culture which is defined as a collective pattern of individual and organizational behavior, and also is based on shared values or beliefs that contributes in minimizing of patient harm ensuing from the processes of care delivery (Jang, Song, & Kang, 2017; Khoshakhlagh, Khatooni, Akbarzadeh, Yazdanirad, & Sheidaei, 2019). Investing on information technology has been used for communication, performing tasks, way of increase in revenue generation, and improving in quality care and safety (Mohammed, Mehrez, & Aladel, 2020). Mohammed et al., 2020 further enlightens on the topic of EHRs by stating that EHRs is mainly used to manage patients' health information and is seen to have a positive impact and for this reason, its use is increasing all over the world.

As a result of a widespread call for the adoption of EHR, the use of EHR in US hospitals increased an impressive 8-fold in 6 years, and today, 9 out of 10 hospitals using a government-certified EHR, while also its adoption among office-based physicians is above 80%, with which they found that there were some intended and unintended consequences requiring appropriate solutions while concluding that better understanding of the true positive effects of EHRs can be obtained by future systematic reviews and meta-analyses (Colicchio, Cimino, & Fiol, 2019). Hence, in developing countries implementation of EHRs is limited and the majority uses simple patient portal which is provided by institutions as a single healthcare unit or department (Alsaahfi, Gay, & Khwaji, 2020). While there is substantial influence of implementing the EHRs there are very limited studies on the effectiveness of EHRs on HCPs (Mohammed, Mehrez, & Aladel, 2020). Ministry of Health, Maldives is in collaboration with National Centre for Information and Technology is in the process of developing a national integrated system including EHRs as, the data collection system existing is mainly functional due to reporting formats through internet (Ministry of Health, 2016)

In recent times, technological advancements such as Healthcare Information Technology (HIT), which is mainly EHRs/EMRs has been used in healthcare settings for better patient care such as complete records and to minimize costs; and research supports further studies are needed to determine its incorporation into the setting of patient safety culture as there is a gap existing in technology and use of data, and therefore, closing the loop between information and action of using technology is important (Dhabbari, 2018; Abu-El-Noor, Abu-El-Noor, Abuowda, Alfaqawi,

& Bottcher, 2019; Behrens, Noteboom, & Bishop , 2019; Vaismoradi, Tella, Logan, Khakurel, & Vizcaya-Moreno, 2020).According to a study done by Tsai ,et al., (2020) EHRs adoption for clinicians did not change the amount of time they had to spent on a patient but it did help in quick retrieval of information, for nurses a great reduction in time spent on administrative tasks were observed. Another researcher did support this concept by stating that EHRS is a road map which helps in preserving efficacy in the work environment of health care facilities (Mohammed, Mehrez, & Aladel, 2020).

Some researchers have also suggested that future research is needed to address the complex nature of EHRs such as using common terminology , data structure and data exchange procedures and how to incorporate these into clinical settings, while also how EHRs implementation methods enhance patient safety, potentially avoiding patient harm (Campione, Mardon, & McDonald, 2018; Wienert, 2019; Abbasi, Khajouei, & Mirzaee, 2019).A patient safety culture is about minimizing adverse events and enhancing safe and quality care for patients, according to a multi- stakeholder collaborative report “ Partnership for Health IT for patient safety” which was released in 2018, stated that it is important to identify ways to integrate HIT (EHR/EMR) into existing programs and also to involve stakeholders to actively collaborate on safety as well as to incorporate safety as a culture and in the daily workflow to achieve the best in using HIT safety (Galt, Fuji, & Shah, 2019).

While keeping these points in consideration, it is importance to review the literature on the adoption of EHRs by patients and healthcare professionals and requires more attention on research due to the limited number of reported studies in literature (Tavares & Oliveira, 2016). There is limited evidence of published similar research in the Maldives too. The main aim of the study was to assess the importance of EHRs in establishing a Patient Safety Culture in Maldives. To attain this, the study has focused on finding Nurses Perception on the Association between EHRs and Patient Safety Culture in Tertiary Care Hospitals of Maldives. This will help to find out how the current EHR contributes and whether there in any impact on promoting a Patient Safety Culture.

Furthermore, in this research the term EHRS refers to any computerized patient health information record stored within the healthcare institutions.

Patient Safety Culture in Healthcare

Patient safety culture or “Just Culture” which is determined as reduction in adverse events and providing safe and quality care for patients, can be achieved by implementing a “Just Culture” also known as a blame free culture, with encouragement of increased transparency and accountability as well as voluntary error reporting. Investigating issues by trying to find the root cause, either to eliminate them or minimize them, while keeping the patient in the center of care should be an important aspect of a PSC. Furthermore, these can be achieved with the help of multiple factors such as EHR, digital data entry, barcode scanning, that includes human factor engineering (Bartman, Bertoni, Merandi, Brady, & Bode, 2019).

According to a study done in Iran (2019), Naderi et al., has emphasized establishing a PSC is crucial for providing a good quality service to patients. Karademirler and Manav (2021) supports this status by enlightening on evaluating the level of PSC to understand more about the existing safety culture in a health care organization. Akolo et al., (2019) brought to notice of health care providers that health policy and practice should improve on adverse event reporting by implementing strategies to promote a “blame -free environment” for the HCPs to report medical errors without fear of being held accountable for their mistakes and if the mistakes are not held against them.

In the healthcare environment there is a rapid increase in demands for safer healthcare, due to the increase in frequency of reported preventable incidences faced during delivery of care. The importance of a culture of safety has been accentuated because it has been identified that a weak safety culture can contribute to adverse events and harm patients (Danielsson, Nilsen, Rutberg, & Arestedt, 2019). Danielsson et al., (2019) further states that the organizational culture which refers to how safety is viewed and perceived by the members of the organization is an aspect of safety culture.

Organizational cultures impact the outcomes for patient safety. Organizational culture is defined as “how things are handled day to day with shared beliefs and attitudes (Machen, Jani, Turner, Marshall, & Fulop, 2019). It has been argued that organizational sub-cultures inside health care organization can be a challenge preventing error reporting, as voluntary reporting will occur only if the HCPs feel supported and held accountable to report the incidences (Marra, Algwizani, Alzunitan, Brennan, & Edmond, 2020; Machen, Jani, Turner, Marshall, & Fulop, 2019).

Factors that contribute to Patient Safety Culture

Patient Safety Culture is affected by several factors such as communication, leadership, teamwork, infrastructure, poor usability of EHR, discrimination and dismissal of suggestions (Rodzeiwicz & Hipskind, 2020). Patient safety is one of the main challenges faced in health care organizations, due to increase in adverse events as a result of EHR systems (more than 50%) fails to support patient care, poor organizational strategies such as choosing the compatible EHRs and also due to nurses’ attitudes towards EHRs such as demographic factors including age, level of education, work environment as well as training on computer systems (Gracia, et al., 2019; Abdulai & Adam, 2020). In a review of literature to find out the factors affecting patient safety and the roles played by these factors in a healthcare setting by Alqattan, Marrison and Cleland (2019) it was observed that technology (such as EHR), was one of the factors which was of importance for safe and quality care. Hilario (2019) reveals that patient safety is the responsibility of all HCPs working in the healthcare organizations but creating an environment that can reduce incidences.

Literature has also revealed that even though EHRs is implemented and established in the developing countries sustainability is low due to the cost and lack of healthcare funding for

shifting to electronic documentation, lack of technical expertise and knowledge on computer skills and inadequate availability of technology (Afrizal, Hidayanto, Handayani, Budiharsana, & Eryando, 2019). Afrizal et al., (2019) further explains that up to date many research studies have been done in various countries such as Canada, United States and even in United Kingdom to review EHRs adoption and find out what are the factors which are contributing to the adoption of EHRs, and the findings were related to how individuals and health care organizations accept it depending on the knowledge attitude and skills. When seen from another angle, according to Wienert (2019), the Institute of Medicine has stated that even though when technology such as EHRs is well designed, implemented and used accordingly to enhance the delivery of quality care, when it is designed and not applied properly, there are high chances that it may lead to inadvertent adverse consequences such as failure to detect fatal illnesses, and delayed treatment due to poor computer knowledge and usage, as well as loss of data.

Relationship between EHRs and Patient Safety Culture

Pfaehler (2020) reveals that in history, documenting a patient's medical records originated in the Egyptian inscriptions and papyri from 16,00-3,000 BC, that is even before the modern medicine was in place. In the 19th century the healthcare has faced many challenges due to epidemiological transitions, causing a major shift in managing chronic illnesses and to find a way to increase efficiency in providing solutions, thus recent technological innovation of EHRs has proved to help in attaining this (Pfaehler, 2020). However, the successful adoption of EHRs is solely associated with how the technology is integrated into the provider practices and the suitability of it in the existing health care system (Carbone, et al., 2020).

In a study done by Menacheni, (2011) Electronic Health Record is defined as "a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting, which includes the demographic data, progress notes, problems, past medical history, immunization, laboratory and radiology data with vital signs". (Pfaehler, 2020). When trying to understand the importance of EHRs for a patient safety culture it is better to investigate the barriers of implementing EHRs in health care settings (Kiri & Ojule, 2020; Dutta & Hwang, 2020). The way physicians treat patients may change due to Electronic Health Records (EHRs), so it is the responsibility of healthcare organizations to establish a culture where EHRs is adopted for quality and safe care for patients (Dutta & Hwang, 2020). The findings from a literature review done by Feldman et al., (2019) explains that to sustain a culture of quality and safety for patients, healthcare organizations need to embrace the EHR systems before the implementation process. Vassel-Webb (2019) noted implementing EHRs is a complex phenomenon and requires a change in the organizational culture and transforming the culture needs a positive approach towards implementation.

A literature review done by Feldman et al., (2019) stated that EHRs, if it helps to identify an adverse event when it is about to occur, is more benefitting for health care delivery and patient

care improvement. Thus, indicating that ineffective implementation and monitoring may lead to failure in the delivery of safe and quality care (Wienert, 2019). Wienert further explains that implementation failure is defined when a program fails and may lead to adverse events such as medication dose errors, failure to detect fatal illness, delayed treatment due to poor interactions with the systems in place, poor data management or even loss of data. Evidence have shown that researchers have done a lot of work to find out the use of technology systems to detect adverse events and the most important finding is the lack of generalizability (Zeiler & Hardy, 2019). Furthermore, Galt, Fuji and Shah (2019) express that if we look upon the pharmacy practice setting when using technology systems is their daily tactics as many technologies are integrated into the use of medication preparation processes, dispensing or administration and pharmacist must identify the causes which may arise and lead to an adverse event and should be integrated with EHRS.

Evidence based literature has revealed that EHRS, with regard to prevention of adverse events and delivery of safe care, provides essential support such as reminders and alerts in the EHR which can be of help to clinicians and it has shown improvement in areas like effective medication where medication alerts have had a 22% decrease in medication prescription errors after implementation of EHRs (Feldman, Buchalter, & Hayes, 2019). About 52% of adverse drug reactions were preventable according to research by Marraet al., (2020). And also, by using barcode for medication administration a reduction of 43.5% medication administration errors were reported, resulting a reduction of 55.4% adverse events by combining barcode technology with EHRS (Marra, Algwizani, Alzunitan, Brennan, & Edmond, 2020). According to an observational study done by Carbone et al., (2020) integrating EHRS and replacing handwritten note and paperwork improves the efficiency of documentation thus, minimizing adverse events as nurses spent less time charting on EHRS than on paper, which enables them to spend more time on patient care.

There is lack of ways of reporting the incidences to the HER developers and this becomes a challenge to fully understand the patient safety related events which occur due to the limitations of EHR software. On the other hand, several barriers to nurses' use of EHRS have been reported by researchers who emphasizes that in the EHRS systems, there are limitations such as EHRS usability (how easy is the EHRS system to use, its functionality, ease of navigation and how to incorporate it into the working context and the impact on workload), these limitations may be due to software designs that can reduce efficient workflow for the nurses' in delivering safe care for the patients (Strudwick, Hall, Nagle, & Trbovich, 2018; Graber, Siegal, Riah, Johnston, & Kenyon, 2019). Hence, the currently established EHRs system developers should adopt and promote EHRs implementation thorough an organizational change management model with interventions such as system integration interoperability, which is practical to the end users, if not healthcare professionals are reluctant to adopt EHRS as they find that the existing systems does not meet their requirements (Vassell-Webb, 2019; Dutta & Hwang, 2020). Thus, indicating

that researchers should take responsibility in researching more about safety events that occur with technologies to bring it out in order to rectify these problems (Galt, Fuji, & Shah, 2019). This shows that EHRs plays a role in maintaining a Patient Safety Culture.

METHODOLOGY

A cross sectional institutions-based study was conducted among nurses working in different departments of two tertiary care hospitals in Central Male 'area, in the Maldives, namely ADK Hospital (private hospital) and Indira Gandhi Memorial Hospital (public hospital). The two selected hospitals are largest and the oldest serving hospitals in Maldives providing tertiary care services to the residents of Maldives. IGMH is serving for 72 years and is the only govt owned multi- specialty tertiary care referral hospital in the Central Male' Region with a bed capacity of 380 beds and ADK hospital, 34 years of service with a bed capacity of 245 beds. Each hospital uses their own software systems which is interfaced at different levels within the hospital departments. Some use shared folders within the departments so that patient records can be accessible at the time of need such as if need to check for allergy or any other critical condition or the diagnosis of a patient. A simple random sampling method was used to select nurses from a total of 971 nurses. The required sample for this study was 278 according to Krejci and Morgan (1970). 363 nurses were invited to participate in this study; however, 292 data sets were used after data cleaning with a response rate of 80.4%.

The National Health Research Council (NHRC/2020/007) of Ministry of Health, Maldives approved the study prior to the research conduction and approval was obtained from the National Health Academy (B(NHA)/MISC/2019/136) of IGMH and from ADK Hospital (ADK/ADM/MISC/19/269). Additionally, approval was obtained from the Research Management Centre, Management and Science University, Malaysia (MSU-RMC-02/FR01/12/L1/001). Participation was voluntary and participants were informed about the purpose of the study. All of the data were placed in a locked cabinet to ensure that data confidentiality was maintained.

A survey questionnaire was used to measure nurses' perceptions about the role of using EHRs for PSC. This study was carried out using the adapted version of the questionnaire for EHRs and Patient Safety Culture. Electronic Medical Record System Questionnaire by Shaker, Farooq and Dhafar (2015) for quality and safe care of patients and the Hospital survey on Patient Safety Culture (HSo PSC) which is a tool established by Agency for Healthcare Research and Quality, U.S in 2016 to assess the culture of safety in hospitals. The items in the survey questionnaire are measured using a five-point Likert scale.

Statistical Package for Social Sciences (SPSS Version :25) program was used for data analysis. Descriptive analysis was done for the demographic characteristics. Data were analysed for

frequencies, and percentage. A linear regression test was used to determine the statistical significance among the variables EHRs and Patient safety culture. The Cronbach's total alpha for EHRs was 0.869 and for Patient Safety Culture 0.634. Literature on the HSOPC survey tool used for Patient Safety Culture had shown the reliability (Cronbach's Alpha) value of 0.6 (Kumbi, Hussien, Lette, & Nuriye, 2019; Akologo, Abuosi, & Anoba, 2019).

RESULTS

Demographics of the survey respondents

The demographic characteristics of the participants as shown in (Table 1) showed a predominance of females, since nursing population in the two hospitals were 85% females. Most of the participants were aged range of 26 to 35 years (61%).

Majority of the participants (58%) had completed an undergraduate degree in nursing and were working as Registered nurses (77%). Most of the nurses worked for weekly 40 to 59 hours (85%). All of the nurses worked in different individual clinical areas of the hospital, many of whom worked in multidisciplinary nursing units (20%).

Table 1: Demographic data of the participants

Survey response rate		
Total Participants invited		n= 363
	n(samples)	Percent
Total eligible response received	306	84.3%
Total eligible data for analysis	292	80.4%
Frequency		
Percent		
Gender		
Female	248	84.9
Male	44	15.1
Total	292	100.0
Age		
Under 25 years	28	9.6
26 - 35 years	179	61.3
36 - 45 years	69	23.6
46 - 55 years	16	5.5
Total	292	100.0
Education		
Advance Certificate	2	0.7
Diploma level	96	32.9

Bachelor's Degree level	170	58.2
Post Graduate Diploma level	9	3.1
Masters level	15	5.1
Total	292	100.0
Designation		
Enrolled nurse	10	3.4
Registered nurse	225	77.1
Clinical nurse	19	6.5
Clinical head nurse	22	7.5
Other	16	5.5
Total	292	100.0
Work hours/week		
Less than 20 hours per week	3	1.0
20 to 39 hours per week	27	9.2
40 to 59 hours per week	249	85.3
60 to 79 hours per week	12	4.1
100 hours per week or more	1	0.3
Total	292	100.0
Work area		
Many different hospitals units/No specific unit	59	20.2
Medicine (non-surgical)	9	3.1
Surgery	45	15.4
Obstetrics	46	15.8
Pediatrics	3	1.0
Emergency department	26	8.9
Intensive care unit (any type)	51	17.5
Other	53	18.2
Total	292	100.0

Inferential data analysis

According to the results in Table 2, most of the nurses agreed that there is a relationship between EHRs ($M = 3.83$, $SD = 0.701$) and Patient Safety Culture ($M = 3.50$, $SD = 0.492$).

Table 2: Summary statistics for standard deviation and mean

Variable	N	Mean		SD
		Valid	Missing	
EHR	292	0	3.83	0.701

PSC	292	0	3.50	0.492
-----	-----	---	------	-------

Note:EHR= Electronic Health Record; PSC= Patient Safety Culture; SD= Standard deviation.

The relationship between Electronic Health Record Systems and Patient Safety Culture (Table 3) was investigated using Pearson product-moment correlation coefficient. The results indicated that there was a statistically significant positive correlation between the two variables ($r = .151$, $n = 292$, $p \leq .005$). According to Cohen (1988), the strength of this correlation is small(Brydges, 2019).

Table 3: Pearson correlation done for EHR and PSC (n=292)

Correlations			
		PSC	
Pearson Correlation	PSC	1.000	
	EHR	0.151	
Sig. (1-tailed)	PSC		
	EHR	0.005	

Note:EHR (Electronic Health Record System); PSC= Patient Safety Culture: $P < 0.05$.

A linear regression analysis was carried out to calculate and predict the impact of EHR on Patient Safety Culture as shown in (Table 3). Using The model of EHR, to predict patient safety culture (Model 1), the derived values were statistically significant, $R^2 = .023$, $F(1, 290) = 6.789$, ($p < 0.0001$).

Table 4: A simple linear regression was carried out to find the significance for the study.

Model Selection								
Model	R	R ²	F	df1	Unstandardized Coefficients		Standardized Coefficients	Sig.
					B	Std .Error	Beta	
1	.151 ^a	.023	6.789	1	Constant	3.094	.158	.000
Residual =290					Tech	.106	.041	.151

- a. Predictors: (Constant), EHR(Electronic Health Record System)
- b. Dependent Variable: Patient Safety Culture

The statistical hypothesis test for the p-value is:

H₀: There is no relationship between EHR and Patient Safety Culture

H₁: There is a relationship between EHR and Patient Safety Culture

H₀: A work culture where EHR is used has an impact on Patient Safety Culture

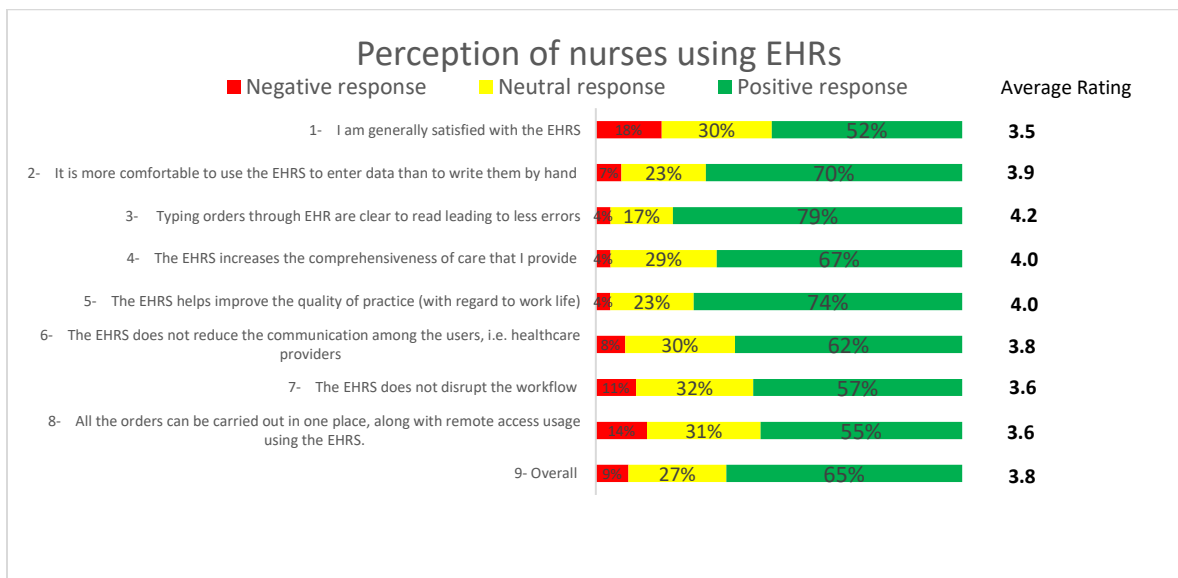
H₂: A work culture where EHR is not used has an impact on Patient Safety Culture

The statistical hypothesis test for this p-value is: H₀: There is no significant relationship between Technology and Patient Safety Culture. H₁: There is a statistically significant relationship between Technology and Patient Safety Culture. Because $p < 0.05$ it rejects the null of relationship and conclude that the relationship is statistically significant.

According to the findings the value of $p < 0.05$, so the null hypothesis is rejected. Even though the results show that the hypothesis is accepted, the significance in the variance explained is extremely low for EHR contributing to Patient Safety Culture.

EHR explained 2.3% of the variance in the Patient Safety Culture as the main variable.

Figure1: Bar chart of nurses’ perception on EHRs and how it contributes to a patient safety culture in Maldives



Regarding the perception, three stems, that is Q2, Q3 and Q5 were appreciated by the majority. However, Q1 “I am generally satisfied with the EHRS” (52%) with an average rating (AR) of 3.5 was rated the lowest.

Overall perception on EHRS was 65% with an average rating (AR) of 3.8.

DISCUSSION

The findings from this study identified that only 52% of the nurses from the two tertiary care hospitals are satisfied with the existing Electronic Health Record System which they use in the hospitals. Nurses’ do perceive that EHRs is important for Patient Safety Culture, but it is controversial whether existing EHRs contributes much to it. Previous studies also support these findings, and the belief that introducing EHRs can minimize harm to patients, is embraced abundantly in many countries still there are gaps for improvement. (Wienert, 2019; Alanazi, Butler-Henderson, & Alanazi, 2019; Medani, et al., 2020). Alanazi, Butler-Henderson and Alanazi (2019) further enlightened that factor such as workflow and communication interruptions, lack of training cost of the system as well as privacy and security can be challenges faced by the nurses to adopt EHRs in the health care setting. The above statement supports the findings from this study as nurses emphasized that even though, majority of the nurses believe EHRs increases the care quality, the existing EHR systems does not reduce the communication process. Therefore, it can be deduced that their perceptions are influenced by various factors that can be individual, organizational, or based on the systems used and the knowledge and attitude towards the using of EHR.

However, most of the nurses who participated in this research are in contact with patients and they do use a system for patient records, but it is not a well-established or an international EHR system. Nurses emphasized that with the existing systems used as EHR, the work load is not reduced and also very limited access they have to patient records and most of the time as they have to write in the nurses notes it gives less time to be present by the bedside of the patient. One of the very important factors highlighted by most of the nurses are that they have very little access to patient data such as Laboratory reports so in their opinion a better EHRs system is needed for safe care delivery of patients. Nurses did point out the existing EHR system is helpful when it comes to finding records of patients where the need arises such as if a past allergy was recorded or any other critical information. This is mostly in the shared folders within the hospital departments and accessibility is limited to such records.

According to El-Sherbiny Ibrahim, and Abdel-Wahed the Ministry of Health should play a vital role in the regular assessment of the safety culture in health care organizations with a standardized tool to assess and understand the patient safety related issues and perceptions of the HCPs evaluating the effectiveness of patient safety related issues and interventions. Suggestions were given for the strengthening of the integrated health information systems such as EHRs to be linked to patient information to evaluate how adverse events may occur (El-Shaerbiny , Ibrahim,

& Abdel-Wahed, 2020). Tsai et al., (2020) states that when failed to include key functions in the EHRs system nurses had perceived that their efficiency decreases, and also poor integration failed due to lack of templates and reuse of existing records has affected negatively in patient care. This supports the findings for the study done in the Maldives context as nurses' do perceive that when a proper EHRs is established it will enhance the efficiency of their contribution to build a PSC.

Even though there are lots of advantages in using EHRs, there are some limitations such as access to technological support, ease of use variability, HCPs acceptance, implementation and costs, need to continued training, integration of software into existing facility systems, and external suppliers, standardization across systems, errors increasing after implementation, and its ability to address only a subset of potential medical errors (Mueller, Neuspiel, & Fisher, 2019).

Due to limited number of studies on nurses' perceptions regarding the role of EHR on Patient Safety Culture in Maldives, some conclusions are difficult to draw. Thus, this opens a pathway to find the gaps and implement on researching more to find the role played by the EHRs on helping to minimize patient related adverse events and provide safe and quality care by encouraging voluntary error reporting and mitigating a blame culture.

Other limitations of this study were that the research was conducted in two hospitals in Maldives from the central Male' region, therefore, the findings may not be applicable to hospitals in other settings. Future research is needed, to explore into the other hospital settings of Maldives in regard to the EHR systems used.

CONCLUSION

A good Electronic Health Record System is important for a PSC, but the existing EHRs systems need to be evaluated for better understanding of how to improve in lieu of patient safety such as electronic error reporting, alerts and reduce paperwork. Thus, the researcher finds that nurses perceive EHR to be useful but needs to be established in a user-friendly way where its usage can be maximized for patient safety and quality care.

The findings from this study provides a basis for future research to be done on the existing EHRs systems implemented in the healthcare organizations and find ways to enlighten on the importance of EHR and how well it can contribute to the care of patients by incorporating different types of alerts concerning with the safety of patients and minimizing the workload of HCPs, especially nurses in Maldives. Thus, highlighting the necessity to further understand whether EHRs is crucial for safety of patients as well as for a culture of safety and how to improve and sustain the delivery of safe and quality care for patients using EHRs.

Also, evaluating whether the systems are well established in the health care facilities and implementing policies and regulations with up to date EHRs systems, along with trainings to be introduced within healthcare facilities could change their perception in favor of EHRs.

IMPLICATIONS:

A well-designed context based EHR system will help in coordination and communication among HCPs for better patient outcomes. It also will help nurses in attending to patients need more efficiently and spending less time on nurses' notes and documentation.

RECOMMENDATIONS

Knowledge and attitude towards the use of EHRs in the existing culture in an organization needs to be assessed to minimize adverse events and this can be academically encouraged among HCPs especially nurses as they are the. These factors can be taken as limitations that prevent technology from giving much contribution to reducing harm during everyday nursing care.

REFERENCES

- Abbasi, R., Khajouei, R., & Mirzaee, M. (2019). Evaluating the demographic and clinical minimum data sets of Iranian National Electronic Health Record. *BMC Health Services Research* , 1-10.
- Abu-El-Noor, N. I., Abu-El-Noor, M. K., Abuowda, Y. Z., Alfaqawi, M., & Bottcher, B. (2019). Patient safety culture among nurses working in Palestinian governmental hospital: a pathway to a new policy. *BMC Health Services Research* , 19(550), 1-11.
- Afrizal, S. H., Hidayanto, A. N., Handayani, P. W., Budiharsana, M., & Eryando, T. (2019). Narrative Review for Exploring Barriers to Readiness of Electronic Health Record Implementation in Primary Health Care. *Healthcare Informatics Research* , 25(3), 141-152.
- Akologo, A., Abuosi, A. A., & Anoba, A. (2019). A cross-sectional survey on patient safety culture among healthcare providers in the Upper East region of Ghana. *PloS ONE*, 14(8), 1-13.
- Alanazi, B., Butler-Henderson, K., & Alanazi, M. (2019). Perceptions of healthcare professionals about the adoption and use of EHR in Gulf Cooperation Council countries: a systematic review. *BMJ Health and Care Informatics*, 1-10.
- Alqattan, H., Marrison, Z., & Cleland, J. (2019). A Narrative Synthesis of Qualitative Studies Conducted to Assess Patient Safety Culture in Hospital Settings. *Sultan Qaboos University Med J*, 19(2), 91-98.
- Alsahafi, Y. A., Gay, V., & Khwaji, A. A. (2020). The Acceptance of National Electronic Health Records in Saudi Arabia: Healthcare Consumers' Perspective. *Australasian Conference on Information Systems*, 1-12.
- Bartman, T., Bertoni, C. B., Merandi, J., Brady, M., & Bode, K. S. (2019). Patient Safety: What Is Working and Why? *Curr Treat Options Peds*, 5, 131-144.
- Behrens, A., Noteboom, C., & Bishop , D. (2019). How can Health Technology Project Communications be Improved in a Hospital. *Association for Information Systems*, 1-4.

- Brydges, C. R. (2019). Effect Size Guidelines, Sample Size Calculations, and Statistical Power in Gerontology. *Innovation in aging* , 3(4), 1-8.
- Campione, J. R., Mardon, R. E., & McDonald, K. M. (2018). Patient Safety Culture, Health Information Technology Implementation, and Medical Office Problems That Could Lead to Diagnostic Error. *Journal of Patient Safety*, 1-7.
- Carbone, S., Kurdina, A., King, M., Peckham, A., Bhatia, D., Ng, D., . . . Marchildon, G. (2020). Adopting EMRs and Information Technology in Primary Care A Rapid Review Prepared for the Yukon Government. *Rapid Review*, 1-94.
- Colicchio , T. K., Cimino, J. J., & Fiol, G. D. (2019). Unintended Consequences of Nationwide Electronic Health Record Adoption: Challenges and Opportunities in the Post-Meaningful Use Era. *Journal of Medical Internet Research* , 1-9.
- Danielsson, M., Nilsen, P., Rutberg, H., & Arestedt, K. (2019). A National Study of Patient Safety Culture in Hospitals in Sweden. *J Patient Saf*, 15, 328-333.
- Dhabbari, F. A. (2018). Nurses' Perceptions of Patient Safety Culture in Oman. *University of glassgow*, 1-347.
- Dutta, B., & Hwang, H. (2020). The adoption of electronic medical record by physicians A PRISMA-compliant systematic review. *Medicine*, 1-7.
- Dr. Aarushi Kataria, Dr. Naveen Nandal and Dr. Ritika Malik, Shahnaz Husain -A Successful Indian Woman Entrepreneur, *International Journal of Disaster Recovery and Business Continuity* Vol.11, No. 2, (2020), pp. 88–93
- Kumar, S. (2020). Relevance of Buddhist Philosophy in Modern Management Theory. *Psychology and Education*, Vol. 58, no.2, pp. 2104–2111.
- El-Shaerbiny , N. A., Ibrahim, E. H., & Abdel-Wahed, W. Y. (2020). Assessment of patient safety culture among paramedical personnel at general and district hospitals, Fayoum Governorate, Egypt. *Journal of the Egyptian Public Health Association* , 95(4), 1-8.
- Feldman, S. S., Buchalter, S., & Hayes, L. W. (2019). Health Information Technology in Healthcare Quality and Patient Safety: Literature Review. *JMIR Medical Informatics*, 7(1), e11320.
- Galt, K. A., Fuji, T. K., & Shah, S. R. (2019). Health Information Technology Use and Patient Safety: Study of Pharmacists in Nebraska. *Pharmacy*, 7(1), 1-14.
- Graber, M. L., Siegal, D., Riah, H., Johnston, D., & Kenyon, K. (2019). 2020 Electronic Health Record–Related Events in Medical Malpractice Claims. *J pateint saf*, 15(2), 77-85.
- Gracia, C., Abreu, L., Ramos, J., Castro, C., Smiderle, F., Santos, J., & Bezerra, I. (2019). Influence of Burnout on Patient Safety: Systematic Review and Meta-Analysis. *Medicina*, 55(553), 1-13.
- Hilario, G. (2019). Patient Safety Problems, Procedures, and Systems Associated With Safety Reporting and Turnover. *Walden University*, 1-77.
- Jang, H., Song, Y., & Kang, H. (2017). Nurses' Perception of Patient Safety Culture and Safety Control in Patient Safety Management Activities. *J Korean Acad Nurs Adm*, 23(4), 450-459.

- Karademirler, Y., & Manav, G. (2020). Perceptions and Factors Affecting Patient Safety Culture of Employees in Pediatric Services. *The Journal of Pediatric Research*, 17(4), 301-308.
- Khoshakhlagh, A. H., Khatooni, E., Akbarzadeh, I., Yazdanirad, S., & Sheidaei, A. (2019). Analysis of affecting factors on patientsafety culture in public and privatehospitals in Iran. *BMC Health Services Research* , 19(1009), 1-14.
- Kiri, V. A., & Ojule, A. C. (2020). Electronic medical record systems: A pathway to sustainable public health insurance schemes in sub-Saharan Africa. *Nigerian postgraduate Medical Journal*, 27(1), 1-7.
- Kumbi, M., Hussien, A., Lette, A., & Nuriye, S. (2019). Patient Safety Culture and Associated Factors Among Health Care Providers in Bale Zone Hospitals, Southeast Ethiopia: An Institutional Based Cross-Sectional Study. *Dovepress*, 2020(12), 1-14.
- Machen, S., Jani, Y., Turner, S., Marshall, M., & Fulop, N. J. (2019). The role of organizational and professional cultures in medication safety: a scoping review of the literature. *International Journal for Quality in Helath Care*, 31(10), G146- G157.
- Marra, A. R., Algwizani, A., Alzunitan, M., Brennan, T. M., & Edmond, M. B. (2020). Descriptive Epidemiology of Safety Events at an Academic Medical Center. *International Journal of Environmental Research and Public Health* , 353, 1-11.
- Medani, K., Ahmed, S. M., Sami, W., Mohamed, E. Y., Abdalla, S. M., & Abdelrahman, H. H. (2020). Use of electronic health records among Saudi and Non – Saudi health providers – a comparative study at a secondary hospital, Saudi Arabia. *Journal of Pakistan Medical Association*, 70(9), 1591-1595.
- Ministry of Health. (2016). National Child Health Strategy and Action Plan for the Republic of Maldives 2016-2020. Male': Ministry of Health.
- Mohammed, A., Mehrez, A., & Aladel, L. (2020). Investigating the impact of electronic health record on healthcare professionals. *International Journal of Data and Network Science*, 1-23.
- Mueller, B. U., Neuspiel, D. R., & Fisher, E. s. (2019). Principles of Pediatric Patient Safety: Reducing Harm Due to Medical Care. *American Academy of Pediatrics*, 143(2), 1-15.
- Naderi, S., Zaboli, R., Khalesi, N., & Nasiripour, A. A. (2019). Factors affecting patient safety: a qualitative content analysis. *Ethiop.J.Helath.Dev*, 33(2), 73-80.
- Pfaehler, C. D. (2020). Electronic Health Records and Health Information Exchange and Their Impact on International Healthcare System Efficiency . Oxford, Mississippi, 1-94.
- Rodzeiwicz, T. L., & Hipskind, J. E. (2020). Medical Error Prevention. In T. L. Rodzeiwicz, & J. E. Hipskind, *Medical Error Prevention*. RockVile Pike, USA: StatPearls Publishishing LLC .
- Shaker, H. A., Farooq, M. U., & Dhafar, K. O. (2015). Physicians' perception about electronic medical record system in Makkah Region, Saudi Arabia. *Avicenna Journal of Medicine* , 5(1), 1-5.
- Strudwick, G., Hall, L. M., Nagle, L., & Trbovich, P. (2018). Acute care nurses' perceptions of electronic health record use: A mixed method study. *Nursing Open* , 491-500.

- Tavares, J., & Oliveira, T. (2016). Electronic Health Record Patient Portal Adoption by Health Care Consumers: An Acceptance Model and Survey. *Journal of Medical Internet Research*, 1-19.
- Tsai, C. H., Eghdam, A., Davoody, N., Wright, G., Flowerday, S., & Koch, S. (2020). Effects of Electronic Health Record Implementation and Barriers to Adoption and Use: A Scoping Review and Qualitative Analysis of the Content. *Life*, 1-41.
- Vaismoradi, M., Tella, S., Logan, P., Khakurel, J., & Vizcaya-Moreno, F. (2020). Nurses' Adherence to Patient Safety Principles: A Systematic Review. *International Journal of Environmental Research and Public Health*, 1-15.
- Vassell-Webb, C. (2019). *Strategies for Implementation of Electronic Health Records*. Walden University Scholar Works, 1-187.
- Wienert, J. (2019). Understanding Health Information Technologies as Complex Interventions With the Need for Thorough Implementation and Monitoring to Sustain Patient Safety. *Frontiers in Information and Communication Technology*, 6, 1-5.
- Zeiler, K., & Hardy, G. (2019). Law, Technology and Patient Safety . *DePaul L. Rev.*, 68(2), 459-480.