



Nurses' Satisfaction with the Use of Health Information System (HIS) in A Saudi Tertiary Care Medical Center

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Abstract: *The use of health information system is increasing and there is substantial evidence suggesting that the successful implementation of HIS in hospitals is significantly related to nurse's satisfaction and attitudes. In Saudi Arabia, no such studies -according to the author's knowledge- have addressed this topic.*

Key Words: *Nurses, Health Information System, Tertiary Care Centers, Saudi Arabia*

I. INTRODUCTION

There is a growing demand to use information technology in healthcare. The increased demand to access health data by consumers, third party payers, and regulatory accrediting bodies mandates the deployment of Health Information System (HIS) (Abdrbo et al., 2011). The Healthcare Information Management System Society (HIMSS) and other studies point to the impact of health Information Technology (IT) as a cornerstone in the healthcare transformation (HIMSS, 2008). The appropriate use of health IT can decrease preventable medical errors, save lives, improve healthcare outcomes, empower users, and reduce costs (HIMSS, 2008).

Healthcare organizations spend around 4.6% of their budget for IT use (HIMSS, 2000). Nowadays, there is an increase in the use of IT among nurses to improve their work (Oroviogioicoechea et al., 2008). Nurses are expected to use the deployed technology efficiently and effectively in their workflow to improve patient safety and quality care as reported by the American committee on quality of health care in 2001.

Nurses who constitute the largest category of HIS end users are expected to use the IT in their workflow to collect, manipulate, store, retrieve, display, and communicate health information for better patient care (Abdrbo et al., 2011). The adoption of information technology in healthcare demands, require the nursing staff to accept the use of the available technology to improve the workflow and to show a certain level of satisfaction with its usage.

Assessment of nurses' satisfaction with HIS use can offer exclusive advantages to managers, organizational development consultants, and researchers working in the healthcare field. Users' satisfaction is one of the most important factors involved in IT successful usage. Personal development can be attained with successful achievements at work. The benefits of the system include improvements in quality of care, communication, documentation, efficiency, and professional practice.

Saudi Arabia is a developing country, recently having highly equipped health facilities, including major tertiary care medical centers. One of these centers -is located in Riyadh- and has four hospitals. This facility implements health information system among its hospitals to facilitate work and provide a paper free environment. Nurses are using the HIS system to help physicians and patients. The HIS system also facilitates creating request orders by physicians or administration. In Saudi Arabia, the health care system has been given a very high priority by the Government (Almalki et al., 2011) and the Saudi health care system was ranked 26 among 190 health care systems around the world (World health report, 2000).

Research shows diverse effects of nursing satisfaction with the use of HIS in their daily practice. No such research in this area in Saudi Arabia was found according to the best of the author's knowledge.

This study aims to: 1- Explore nurses' attitudes and level of satisfaction in using the medical center's information system during their clinical practices. 2- Determine the importance of HIS satisfaction domains among nurses in a Saudi tertiary care medical center.

The use of HIS has introduced a significant change in the nursing workflow. It has decreased the amount of time required by the nurses to review medical orders, to check for allergies, and to clarify orders with unit protocol and pharmacy. Furthermore, the use of HIS helped in omitting redundancy and decreased the time needed for health data documentation

allowing nurses to become more effective and efficient in providing patients' care. With the use of HIS, nurses can allocate more time to spend in rendering bedside care rather than wasting a vast of time on documentation. This also ensures the safety of patient information and protects the confidentiality of health information (Sinha et al., 2012 and Chan et al., 2010).

II. METHODOLOGY

This study is cross sectional study about nurses' job satisfaction in a tertiary care medical center in Riyadh, Saudi Arabia. The study subjects were nurses working in that center which composes 4 hospitals; main, women, children and rehabilitation hospitals. Sample size estimation was based on the following assumptions: satisfaction rate is 50% among nurses and type I error is 0.05, Type II error is 0.2, the Power is 80%, and permissible error is 0.05, thus the required sample size was estimated to be equal or more than 570 nurses, the author decided to include 600 nurses in the study. A stratified random sample with proportional allocation from all nurses working in this facility was used. This sample was proportional according the nurses' job ranks, directors and managers, head nurses, charge nurses and staff nurses, .

A self-administered questionnaire about perceptions of nurses toward HIS was designed, validated and piloted. It had clear instructions and was distributed among the participated nurses in the study. The questionnaire contained: demographic variables, job rank and 11 statements on a 5-point Likert scale to measure the nurses' satisfaction on the use of HIS, besides an item related to the nurse's overall job satisfaction in his/her job. These items covered three important outcomes (domains) namely: work efficiency and effectiveness including five items, patient care including four items, and personal development including two items. The reliability of the questionnaire had been tested using Cronbach's alpha (α) (Tavakol and Dennick, 2011). It showed that the reliability for the used questionnaire equals 0.85. To assess the test- retest reliability of the questionnaire, a sub- sample of 40 nurses- not included in the final analysis- working in the center were selected randomly. The test retest result was 0.81. Five scholars in both public health and nursing have reviewed and agreed with this questionnaire assessment of nurses' job satisfaction. An Institutional Review Board (IRB) approval was obtained and a written consent form was signed by all participants.

The participated nurses were contacted by the investigator and via the medical center's postmaster twice to answer the questionnaire, the first time was one month after the distribution of the questionnaires and the second time was a month after the first contact.

III. STATISTICAL ANALYSIS

Data were collected and entered in SPSS version17 which was also used for data analysis. Descriptive statistics i.e. mean score \pm its standard deviation (sd) for each quantitative variable, and frequency for the qualitative variables were calculated. Bivariate analyses were used to test the possible relationship among different study variables. t-test or Mann-Whitney test, ANOVA or Kruskal-Wallis as appropriate after checking for normality to find if there were any significant relationship(s) between satisfaction scores and the predictor variables i.e. gender, nationality, and educational level etc. Correlation coefficient was used to find if there is any linear relationship between nurses' satisfaction with the use of HIS and its important domains. Multiple linear regression was used to predict the important variables affected nurses satisfaction with the use HIS, from demographic characteristics, and benefits of using HIS. The independent variable was satisfaction scores which is distributed normally. With respect to R^2 , Cohen (1988) explained the importance of its values, if the value is 0.02, it means that the effect is small, if the value is 0.13, it means that effect of the independent variable is moderate, while if the value is 0.26 or more, it means that the effect of the predictors is large in explaining the outcome of the model. Level of significance was set to be < 0.05 throughout the study.

IV. RESULTS

Questionnaires were distributed to 600 nurses working in the study center at the time of the study, only 445 had complete responses; with a response rate of 74.2% and only those answered questionnaires were used in the analysis. Job satisfaction among nurses was 70.13% (Bahnassy et al., 2014). Mean satisfaction scores of the use with HIS was 3.37 ± 0.5 (67.5%). Table 1 shows the participated nurses' characteristics. The majority of them were females 89.1%, non Saudis 93.6%, with BSc in nursing (69.7%, work as staff nurses 90.8%, married 71.5%, and working in the main hospital 64.5%). The table also shows that the nurses mean age was 34.7 ± 7.9 years, their mean total years of experience as nurses was 15.8 ± 6.9 years, mean years of experience within their recent job in this tertiary care medical center was 4.7 ± 3.9 years and their mean years of experience using computers was 7.8 ± 3.9 years.

Table 2 shows the correlation between total satisfaction scores with the use of HIS and some important variables. It shows that no statistical negative linear relationship with nurses age, years of experiences as a total or in recent work, while the total satisfaction scores with the use of HIS were significantly correlated with nurses' job satisfaction and each of the three HIS satisfaction domains (work work efficiency and effectiveness, patient care and personal development).

Table 3 shows the mean difference between the three domains scores by gender. Females were significantly scored higher in mean satisfaction than males with respect to patient care ($p=0.009$). With respect to personal development, males scored significant higher mean satisfaction scores than females ($p= 0.047$). No difference for work efficiency and effectiveness between males and females ($p=0.39$).

To determine the effect of nurses' demographics on the satisfaction of the use of HIS, multiple linear regression analysis was used. The model explained significantly the satisfaction with the usage of HIS among nurses ($p = 0.001$) with $R^2 = 0.29$. It means that about 29% of the variability in nurses' satisfaction with the use of HIS in their career can be explained by their demographic variables. It also shows that educational level for nurses is higher than diploma (BSc and above), and that their years of computer experiences were significant predictors to satisfaction with the use of HIS controlling the effect of other predictors (Table 4).

Regression analysis for satisfaction of the use of HIS and its benefits is shown in Table 5. The table shows that patient care, work efficiency and effectiveness and personal development domains besides nurses' overall job satisfaction significantly explain the nurses' satisfaction with the use of HIS in their work ($p < 0.0001$) with $R^2 = 0.54$. The predictor variables in both regression models in tables 4 and 5 are explaining a large effect on the outcome variable which is the nurses' satisfaction with the use of HIS in their work, according to Cohen's explanation of R^2 (Cohen, 1988).

V. DISCUSSION

In this study, the characteristics, education BSC, and computer experience were most significantly influential to the level of nurses' satisfaction with the use of HIS; whereas the age, gender, and nationality were not influential (Table 4). The above results contrast with the results of Marasovic et al (1997) and Sleutel and Guinn (1999) regarding that computer experience of nurses influences the degree of satisfaction in HIS use; whereas the results corresponds to their results regarding that the age of the nurses was not influential.

The results of this study revealed that the degree of nurses' satisfaction with the use of HIS is significantly high for its benefit regarding patient care, work efficiency and effectiveness, and when the overall job satisfaction is there (Table 5). It is obvious when nurses perceive the benefits of the HIS use in patient care to decrease medical errors and achieve quality care; this will positively influence their degree of satisfaction. The strength of the HIS in easing the flow of work, makes nurses work more efficiently and effectively, this would increase their degree of satisfaction with using the HIS. Furthermore, nurses who scored high in their overall job satisfaction would certainly have a high degree of satisfaction with the use of HIS at the workplace. A systematic review by Gruber found that the implementation of clinical information system in health facilities had increased the interests of nursing knowledge and profession which can be reflected on patients' care (Gruber et al., 2009).

In this respect, it is necessary to address nurses' computer skills and provide necessary teaching sessions on using computers in healthcare. It is also crucial to address the level of job satisfaction among nurses and omit any barriers that can lower the degree of their overall job satisfaction as it can negatively influence the degree of their satisfaction in using any tool or any information system at work including the HIS. Abdrbo et al. found similar results since education was not significantly related to information system but nursing education reflected a positive trend towards nursing informatics (Abdrbo et al., 2011).

The study results found no significant relation between age and satisfaction of nursing toward the use of HIS; the same results were found in different studies as well (Marasovic et al. 1997 and Kim, 2006).

VI. CONCLUSION

The study revealed a relation between nurses' satisfaction with the use of HIS and each of their job satisfaction, work output (efficiency and effectiveness) and personnel development. The regression analysis found that years of computer experience as well as obtaining a bachelor in nursing (and above) are the most significant predictors for the satisfaction with the use of HIS.

VII. RECOMMENDATIONS

Training courses on the use of HIS is recommended to newly nursing staff at the time of joining the center. Nurses should be encouraged to report any problems they may face upon using the HIS system, and any updates within the HIS should be based on meetings with the nurses who are using this system.

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REFERENCES

- [1] Abdrbo AA, Hudak CA, Anthony MK, Douglas SL. Information systems use, benefits, and satisfaction among Ohio RNs. *Computer informatics nursing* 2011; 29(1):59-65.
- [2] HIMSS. A Call for Action. Enabling healthcare reform using information technology. Recommendations for the Obama administration and the 11th congress. 2008. <http://himss.files.cms-plus.com/himssorg/2009calltoaction/himsscalltoactiondec2008.pdf> (Accessed November 15, 2014).
- [3] HIMSS. The 11th annual HIMSS Leadership Survey. Sponsored by IBM: trends in healthcare information and technology-final report, healthcare Information and Management systems Society. 2000. <http://www2.himss.org/survey/2000/survey2000.html> (Accessed March 17, 2014).

- [4] Committee on Quality of Health Care in America and Institute of Medicine. Crossing the quality chasm: a new health system of the 21st century. National Academy Press. Washington, D.C, USA. 2001.
- [5] Oroviogiochea C, Elliot B, Watson R. Review: evaluating information systems in nursing. Journal of clinical nursing 2008; 17(5): 567-575.
- [6] Almalki M, Fitzgerald G, Clark M. Health care system in Saudi Arabia: an overview. Eastern Mediterranean health journal 2011; 17(10):784-793.
- [7] The world health report 2000 - Health systems: improving performance. Geneva, World health Organization 2000.
- [8] Tavakol M, Dennick R. Making sense of Cronbach's alpha. International journal of medical education 2011; 2:53-55.
- [9] Bahnassy AA, AlKabba AF, Saeed AA, Al Ohaidib T. Job satisfaction of nurses in a tertiary medical care center: a cross sectional study, Riyadh, Saudi Arabia. Life science journal 2014; 11(1): 127-132.
- [10] Cohen J. Statistical power analysis for the behavioral sciences, second edition. Lawrence Erlbaum Associates. Hillsdale, New Jersey, USA. 1988.
- [11] Marasovic C, Kenny C, Elliot D, Sindhusake D. Attitudes of Australian nurses toward the implementation of a clinical information system. Computers in Nursing 1997; 15(2): 91-98.
- [12] Sleutel M, Guinn M. As Good as it gets? Going online with a clinical information system. Computers in Nursing 1999; 17(4):181-185.
- [13] Gruber D, Cummings GG, LeBlanc L, Smith DL. Factors influencing outcomes of clinical information systems implementation; a systematic review. Computers informatics nursing 2009; 27(3):151-163.
- [14] Kim S-Y. Factors affecting the degree of satisfaction for nursing information system. In: Park H-A, ed. Consumer-centered computer-supported care for healthy people. Proceedings of NI2006. IOS Press. Amsterdam, Netherlands. 2006: 523-526.
- [15] Sinha RK, Saha D, Shetty S. Perceptions of health information system. British journal of healthcare management 2012; 18(10):534-538.
- [16] Chan C, Ho P, Khoo L, Hong M. Nurses' perceptions on the impact of health information system usage in their workplace. Singapore nursing journal 2010; 37(2):19-24.

Table 1 Characteristics of the study sample

	Mean	sd	Median	Min	Max
Age (yrs)	34.7	7.9	33		59
Experience in Nursing (y)	15.8	6.9	15	1	35
Experience in Recent Job (y)	4.7	3.2	5	1	10
Computer Experience (y)	7.8	3.9	8	2	28
Sex	no.			%	
Male	47			10.5	
Female	398			89.5	
Nationality					
Saudi	29			6.4	
Non Saudi	416			93.6	
Education					
Diploma	130		29.2		
BSC (Nursing)	310		69.7		
M.Sc.+		5		1.1	
Occupation					
Nurse Manager	3		0.7		
Head Nurse		10		2.2	
Charge Nurse		28		6.3	
Staff Nurse		404		90.8	
Marital Status					
Single		127		28.5	

Married	318	71.5
Place of Work		
Main Hospital	286	64.2
Pediatric Hospital	48	10.8
Women Hospital	65	14.6
Rehabilitation Hospital	46	10.4

Table 2 Correlation between Nurses Satisfaction with Health Information System and Important Domains

Variable	Correlation coefficient (r)	p.value
Age	- 0.075	0.23
Years of Experience in recent job	- 0.082	0.187
Total Years of Experience	- 0.077	0.21
Nurses job satisfaction	0.72	<0.0001
Work efficiency and effectiveness	0.973	<0.0001
Patient Care	0.962	<0.0001
Personal Develop	0.93	<0.0001

Table 3 Differences between Mean Domains' satisfaction Scores with the use of HIS by Gender

HIS Domains	Gender		t*	p-value
	Male Mean \pm sd n = 35	Female Mean \pm sd n = 410		
Work efficiency and effectiveness (out of 25)	17.1 \pm 2.7	17.5 \pm 2.4	0.85	0.35
Patient Care (out of 20)	13.1 \pm 2.1	14.2 \pm 2.4	2.63	0.009
Personal Development (out of 10)	7.25 \pm 1.1	6.8 \pm 1.3	1.99	0.047

- t- test was used to compare between mean scores for males and females.

Table 4 Regression Analysis of Variables Explaining Variability in Satisfaction with HIS

Variable	B	SE B	p-value
Constant	42.5	5.4	<0.0001
Age (years)	0.18	0.74	0.81
Education			
Diploma	1.24	1.1	0.27
BSC	7.4	1.08	<0.0001
MSc and above	4.43	1.6	0.034
Gender			
Male	2.73	1.58	0.065
Female	0.06	2.3	0.96
Nationality			
Saudi	-8.96	5.27	0.09

Non Saudi	-6.38	4.54	0.16
Computer Experience (years)	1.76	0.41	<0.001

R² = 0.29

Table 5 Regression Analysis for Satisfaction of the use of HIS and its benefits

Variable	B	s.e B	P-value
Constant	0.229	0.087	0.01
Patient Care	0.162	0.015	<0.001
Work efficiency and effectiveness	0.17	0.023	<0.001
Personal Development	0.52	0.17	0.023
Nurses overall job Satisfaction	0.27	0.03	<0.001

R² = 0.54