

Evaluating Physicians and Nurses' Satisfaction with Computerized Physician Order Entry System in Iran

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Abstract

Background: An important application in health care system is computerized physician order entry system (CPOE) which improves the quality of patient's care. Given that the users' satisfaction is necessary in predicting the success of a system, this study aimed to evaluate the satisfaction of CPOE users in Namazi Hospital.

Methods: This cross-sectional study was conducted as a descriptive-analytical research three months after CPOE implementation in Namazi Hospital. The study population consisted of all physicians and nurses in General Intensive care Unit (ICU), which included 14 physicians and 26 nurses who had been working with CPOE system. A standard questionnaire was applied for data gathering; its validity and reliability was confirmed in the study ($\alpha=0.84$). The data were processed by SPSS 21 software and appropriate statistical tests including T test, One-way Anova and Chi-square tests were used.

Results: Overall, the satisfaction of physicians and nurses about the CPOE systems was moderate (4.83 ± 1.99). Although the physician's satisfaction score was 5.30 ± 1.54 , which was greater than that of nurses (4.56 ± 2.19), this differences was not significant ($P>0.05$). Results also showed a significant relationship between the user satisfaction score and age and gender of the participants ($P=0.001$, $P=0.006$) respectively. A significant relationship was found between the CPOE user friendliness and age ($P=0.05$).

Conclusion: Overall, there is a relative satisfaction among the physicians and nurses about CPOE in Namazi hospital. Hospital managers could accelerate the use of CPOE in hospitals. It is suggested that the challenges of the system should be examined in future studies.

Keywords: Evaluation, CPOE, Satisfaction, Hospital

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Introduction

Computerized physician order entry (CPOE) system is a tool for improving the quality and safety of patient care and an important application in health care system (1). With CPOE, orders related to patient care process are electronically processed and are legible for health care providers who log in to the patient's records. Additionally, health care professionals can easily review medication orders to prevent drug interactions, dose errors, side effects and allergic reactions (2). Henceforth, this system improves the quality of patient care by reducing medication errors

and adverse drug events and supports the physicians in clinical decision making by alerting them about medication interactions, allergies and wrong dosing (3). Medication errors are one of the most common threats to patients' safety and approximately 200,000 people die every year in the United States as the result of preventable medical errors (4, 5). This can occur in different parts of a hospital, especially in intensive care units, due to severity, complexity and frequency of daily change in medication orders (6). CPOE system have the potential to be an effective solution for limiting hospital medical errors (7) and this system is able to reduce errors by as much as 80

to 90 percent. Medical errors can lead to increased mortality, longer hospital stay, costs, stress in health care workers, and can potentially ruin the credibility of an institution (8). Moreover, a goal in any health care organizations is to reduce medical errors (9). Despite potential benefits of CPOE, for various reasons implementing CPOE has failed; a reason for this has been the lack of satisfaction (10). End-user satisfaction is people's perspective towards a particular application with which they are in direct contact (11). Fumis et al. in 2014 reported that health care professionals were neither completely unsatisfied nor satisfied with CPOE, and physicians had reported the lowest level of satisfaction amongst all the health care workers (3). In a study by Husseini et al. in 2013, it was stated that 57% of physicians were confident that if the system was implemented properly, it would be easy to work with CPOE (12). If the users are unsatisfied with a computer program, they do not like to use it and look for other means in order to perform their duties. According to Davis, the concept of perceived usefulness and perceived ease are important for acceptance of a technology. Perceived usefulness is defined as a degree to which people believe using a particular system can enhance their performance. Ease of use is perceived as the degree to which a user expects a system to be user-friendly (13). Based on Technology Acceptance Model (TAM), an individual's understanding of the usefulness of a system is influenced by the fact that he perceives using this system is easy (14, 15). Other studies have shown that the participants' evaluation and users' feedback can ensure proper utilization of these systems (16-18). In addition, the users' satisfaction is necessary in predicting the success of a system (19).

For the first time, CPOE system has been executed in Iran in one of the largest educational hospitals (Namazi Hospital). Hence, this study aimed to evaluate the degree of physicians and nurses' satisfaction with CPOE in Nemazi Intensive Care Unit general hospital.

Methods

This cross-sectional descriptive-analytical study was conducted in 2016 at Namazi hospital. This study was performed three months after CPOE implementation in General Intensive Care Unit with 10 beds in the hospital. The study population consisted of all physicians and nurses in this unit, which included 14 physicians and 26 nurses who had been working there since October 2015 and had used CPOE system. All the study population was included in the study. A standard questionnaire designed by Hoonakker in

2009 was used to gather the data. For validity of the questionnaire, we used expert opinions (seven experts in health services management and health informatics technology) and the questionnaire's validity was confirmed by them. About 10 questionnaires were distributed among the participant and the reliability of the instrument was confirmed by Cronbach's alpha ($\alpha=0.84$). It included 16 questions, the score for each question ranged from 1 (never) to 7 (always), and 4 was considered as the midpoint (20, 21). For each question, mean and standard deviation of physicians and nurses were reported separately. It is worth mentioning that questions 3, 6 and 10 were negative questions; therefore, if they scored above 4, it meant that the level of satisfaction was low.

Since hospital staff work according to their shifts, in order for the researchers to have access to all of them, they distributed the questionnaires at three different times, i.e. morning, evening and night; the purpose of the study was to increase the staff participation. For the questionnaires to be filed correctly, the researchers provided adequate information. After completing the questionnaires, data were processed by SPSS 21 software and descriptive and analytical statistics were used for their analysis. One Way ANOVA and Chi-square test were used to determine the relationship between age, gender and CPOE's overall satisfaction as well as the relationship between user friendliness of CPOE and satisfaction with the CPOE system.

The study was approved by Ethics Committee of SUMS.

Results

Among the participants, 23 were female and 27 of them were 20 to 30 years old. Our results from the overall physicians and nurses' satisfaction indicated that the users had moderate satisfaction about the CPOE systems with the mean and standard deviation of 4.83 ± 1.99 . Although the physician's satisfaction score was 5.30 ± 1.54 , which was greater than that of nurses (4.56 ± 2.19), this difference was not significant ($P > 0.05$).

The relationships between age, gender and CPOE and participants' satisfaction are shown in Table 1.

As shown in Table 1. There was a significant relationship between overall satisfaction score of CPOE system with age and gender of participants ($P=0.001$, $P=0.006$), respectively; those in the age range of 20-30 were more satisfied with the CPOE system. Furthermore, men were more satisfied than women.

The relationship between the user friendliness of the system and users' satisfaction is shown in Table 2.

Table1: The relationship between demographic data and overall satisfaction with CPOE

Variables	Dimension; n (%)		Overall satisfaction with CPOE			P value
			High	Moderate	Low	
Age category, n(%)	(20-30)	27 (75%)	18 (66%)	3 (11%)	6(22%)	0.001
	(31-40)	8 (22%)	2 (25%)	1 (12%)	5(62%)	
	(40>)	1 (2%)	0 (0%)	0 (0%)	100%)1	
Gender	Male	13 (36%)	13 (100%)	0 (0%)	0%)0	0.006
	Female (%)	23 (63%)	11 (47%)	4 (17%)	8(34%)	

P values were results from chi-square test

Table2: The relationship between age categories, overall satisfaction with user friendliness of the CPOE in Nemazi Hospital

Variables		User friendliness of the CPOE (Mean± SD)	P value
Age category	20-30	(5±1)	0.05
	31-40	(3±2)	
	40>	(3±0)	
Overall satisfaction with CPOE	High	(5±1)	0.006
	Moderate	(4±1)	
	Low	(3±1)	

P values were results from One Way ANOVA test

Also, a significant relationship was found between the user friendliness of the CPOE and age ($P=0.05$); as a matter of fact, the users in the age range of 20-30 were more satisfied than the others. There was a relationship between the user friendliness of the system and satisfaction ($P=0.006$) in a way that the users who were satisfied with the system believed that it was user friendly.

The results of the CPOE system and the overall satisfaction of physicians and nurses are shown in Table 3. As to the improvement of the patients' safety by the CPOE system (question 14: overall, order entry system improves the safety of care I provide), we found that overall this system can moderately improve the care safety (4.33 ± 1.87), which is provided by of physicians and nurses; again the mean score was higher amongst physician than nurses (3.91 ± 2.2), (5.07 ± 1.38), respectively.

Furthermore, in terms of saving time using the CPOE (Question 15: overall, order entry saves me time.), results showed that the overall mean score of physicians and nurses for this item was 3.75 ± 1.90 , which was low. However, again the mean and standard deviation of the nurses was (4.21 ± 2.04) greater than that of physicians (2.92 ± 1.33).

Discussion

The results of this study showed that the physicians and nurses in Nemazi hospital were generally satisfied with the CPOE system. The result of this study was in line with those of Hoonakker et al.'s studies, (20, 21) in 2009 and 2012, which were conducted in four large

ICUs, in an American hospital. Their results indicated that physicians and nurses as the end users of the CPOE system had a moderate level of satisfaction. Moreover, our results are consistent with the study of Fumis et al., (3), which was done in 2014 in Brazil, and reviewed the degree of physicians and nurses' satisfaction after six months of its implementation. In their study, they reported that health care professionals were not totally unhappy and fully satisfied with the CPOE system. Our results are also consistent with those of the study conducted by Wilson et al. (22) in 2000 in two American army health care centers; the average satisfaction rate was 5.07, not showing a high level of satisfaction. In addition, our results showed that the physicians' satisfaction with CPOE was more than that of nurses, which was consistent with Hoonakker et al.'s study results (21). Nonetheless, this result was not compatible with the findings of Fumis et al., (4), showing that physicians were less satisfied in comparison with nurses.

The study showed that in 6 out of 16 items, physicians were more satisfied than nurses; this was due to the reliability of the CPOE system, increased user productivity with CPOE, reduced errors related to the care using CPOE, improved quality of care, improved care, improved safety, and system assistance when dealing with a problem; this result was also compatible with Hoonakker and Lee et al.'s (20, 21, 23) studies.

The results showed that the CPOE system was moderately user-friendly and the results were consistent with those of Hosseini et al., (12); in their

Table 3: Comparison of the physicians and nurses' mean score of the CPOE system and evaluation of the level of satisfaction

No.	Questions	Total (N=36) Mean±SD	The total number of physicians (N=13) Mean±SD	The total number of Nurses (N=23) Mean±SD
1	The order entry system is reliable – it does its job consistently.	4.1±1.72	4.5±1.26	3.9±1.92
2	Order entry improves my productivity.	4.38±2	5±1.68	4.04±2.11
3	Order entry has a negative impact on patient care.	2.22±1.56	1.84±1.06	2.43±1.77
4	Order entry reduces patient care errors.	4.18±1.06	4.07±1	4.01±1.01
5	The order entry system is easy to use.	4.83±1.74	4.69±1.54	4.91±1.88
6	Compared to paper ordering, order entry slows me down	5.17±1.91	5.07±1.44	3.62±1.97
7	Order entry gives me the information I need to write better orders.	4.42 ±1.60	4.30±1.37	4.39±1.75
8	I feel I had adequate training on order entry	4.20 ±1.36	4.51±1.33	5.08±1.23
9	Order entry improves the quality of patient care.	4.52±1.68	4.38±1.26	3.86±1.89
10	System response time on order entry is slow.	3.61±1.82	3.15±1.57	3.86±1.93
11	When I have a problem with order entry, I just ask someone for help	4.83±1.46	4.61±1.75	4.95±1.29
12	I feel that I can benefit from refresher classes on order entry.	4.11±1.66	4.00±1.77	4.00±1.56
13	When I need help on order entry, I can find it.	4.52±1.96	5.38±1.75	4.04±1.94
14	Overall, order entry improves the safety of care I provide	4.33±1.87	5.07±1.38	3.91±2.2
15	Overall, order entry saves me time.	3.75±1.90	2.92±1.32	4.21±2.04
16	Overall, I am satisfied with the order entry system.	4.83±1.99	5.30±1.54	4.56±2.19

study, they suggested that half of the physicians believe that working with CPOE system was easy. However, our results were not compatible with those of Niazkhani et al. (24); in their study, it was reported that the nurses believed that working with CPOE system was difficult.

The result of this study showed that physicians and nurses believed that the order entry system did not have a negative effect on the patient care and moderately increased the users' productivity. The results of our study is consistent with those of Khajouei et al.'s study (4) which was conducted in 2010 in the Netherlands; in his study, they stated that the physicians and nurses used this system efficiently and had a great impact on their work.

As to question 8 (I feel that I had adequate training on order entry) a moderate satisfaction rate of the users was shown; this was not compatible with the results of Honaker et al.'s study (23) done in 2012, where the end users (physicians and nurses) had little satisfaction with this item.

With regards to question 15 (overall, order entry system saves me time), the results was consistent with Hoonakker et al.'s study (21). As the results of their study suggests, physicians and nurses did not believe that this system would save time, and their study was also consistent with our results, suggesting that nurses had a more positive view to this question.

Results of age and user friendliness of the system were not in the same line with those of Hosseini et al.'s

study (12). The present study showed that there was no significant relationship between age and ease of use, while Hosseini et al.'s study showed that the age group 20-30 had significantly more positive attitude in comparison with the 41-year-old group towards the user friendliness of the system (question 5).

There was also a significant relationship between the overall satisfaction of CPOE users and age of the participants ($p<.05$); this result was consistent with that of Fumis et al.'s study (3). Consequently, the results of our study showed that people who were in the age range of 20-30 years were more satisfied with the CPOE system, and Fumis's study results showed that there was an inverse relationship between age and satisfaction, which means that the satisfaction and rate of technology acceptance were reduced with age.

Limitation of the Study

The low number of participants was the main limitation of the study although the researchers tried to involve all persons who used the CPOE system. Implementation of the study in one ward was another limitation of the study because the system was only run in one ward.

Conclusion

Overall, there was a relative satisfaction among the physicians and nurses about the CPOE system in Nemazi hospital. Hospital managers could accelerate

the use of CPOE in hospitals. It is suggested that the challenges of the system should be examined in future studies. It is suggested that a study should be done one year after the implementation of the CPOE systems in the wards to identify its strengths and weaknesses.

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Conflict of Interest: None declared.

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