

The pharmacists' knowledge, attitude, and practice toward the application of radio-frequency identification in Iranian pharmacies

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Abstract

Background: Health care is a vitally sensitive area, in which the smallest medication error may lead to patient's loss that cannot be compensated. In this area, information technology is a useful tool for practical improvement of health-care units such as hospital and community pharmacies. The aim of this study was to investigate the pharmacists' knowledge, attitude, and practice in applying radio-frequency identification (RFID).

Methods: This is a cross-sectional research carried out in 2016. Research population and sample included 196 pharmacists in Shiraz city, the largest metropolitan in the South of Iran. The data were collected using the researcher-made questionnaire, and its validity and reliability were confirmed. Data were analyzed using descriptive indices and Pearson's correlation in SPSS 23.

Results: The results showed that the means of practice, knowledge, and attitude of the participants were 1.64 ± 0.5 , 1.82 ± 0.61 , and 3.62 ± 0.62 (out of 5), respectively, showing weak practice and knowledge but good attitude toward RFID technology. In addition, the majority of the pharmacists' attitude toward applying RFID technology was evaluated as positive. There was a significant relationship between the items of pharmacists' knowledge and attitude toward RFID technology ($P = 0.03$, $r = 0.36$).

Conclusion: Considering the fact that the concept of technology was newly developed in health area, we concluded that the studied pharmacists were not familiar with RFID technology and its advantages and they doubted its application. Therefore, it is suggested that required instructions should be taken into consideration by health authorities for introducing and applying the technology.

Keywords: Attitude, knowledge, pharmacy, practice, radio-frequency identification

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INTRODUCTION

Radio-frequency identification (RFID) is an automatic wireless technology for identification and collection of

data.^[1] It is of rapidly developing technologies, which uses radio waves for collecting, transmitting, and recording

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important and effective data automatically and without human participation.^[2] RFID technology can identify each item without direct vision limitations and allows the instant collection of data and target identification. It also detects physical objects during their life cycle directly and without human participation.^[3]

Structurally, a common RFID system contains a unified collection of components including tag, antenna, data reader, and software. The system detective tag would be incorporated into the object that should be detected and identified using antenna; the related information of the object of interest is transmitted to the reader of RFID technology. Then, the saved information is read by the reader and is transmitted to the software which is launched on a computer using suitable communication cables such as local network.^[4] In recent years, the use of detective technology systems for the identification of patients in hospital and the access of some employees to the patients' file has been investigated.^[5] This technology is among the tools which were specially taken into consideration, and use of it for the improvement of efficiency and effectiveness has been increasingly commenced.^[6]

Regarding the abilities of RFID, the most important application of this technology in health-care industry is detecting and tracing of patients, equipment, and pharmaceuticals.^[7] Pharmaceuticals, as strategic good for all countries, form a large part of health expense, thus including 20%–50% of health budget in many developing countries.^[8] On the one hand, these products are the fastest growing component of health-care expenses.^[9] Based on a study performed in 44 states of the USA, drug expenses were one of the three effective factors in Medicaid expenses in 2002.^[10]

Pharmaceutical mistakes are the 8th mortality factor in the world causing the increasing growth of medicine expenses. Thus, the factor causes >2 million dollar expense in the USA. In addition, pharmaceuticals also face the drafting problem in which different causes are involved; for instance, approximately 15% of hospital drug draft is due to expiration rather than sufficient usage.^[11]

Furthermore, what is important for both government and pharmacists is drug safety. In this case, each side should accept different levels of responsibility according to which the patients would be avoided from using fake drugs.^[12] Evidence shows that nearly 10% of the world drug market is facing the problem; in 2010, it charged nearly 75 million dollars, and in 2005, this amount was increased up to 95%.^[11]

Therefore, regarding the challenges such as appropriate medication management^[13] in the field of pharmaceuticals, it seems that application of RFID technology for the identification of fake drugs would improve drug system and consequently would provide drug safety and decreased draft and its expense.^[14]

Moreover than what was said, the results of Decker et al. indicate that the RFID-enabled hand hygiene station and monitoring system was feasible in the classroom setting and students reported positive effects on their motivation to perform hand hygiene applying this technology.^[15]

Regarding the novelty of the concept of RFID technology in drug area of developing countries, also considering the fact that the knowledge related to this technology in drug area from production to consumption is small, it seems that providing a more proper context for applying the technology in drug area aiming at reduction of expenses related to fake and contraband drugs is required. Therefore, this research was conducted with the aim of investigating the knowledge, attitude, and practice level of pharmacists of Shiraz as the largest Iranian metropolitan in applying the RFID technology in hospital and community pharmacies in 2016.

METHODS

This is a cross-sectional research carried out in the hospital and community pharmacies in Shiraz including all the pharmacies of state hospitals (13 pharmacies), private hospitals (12 pharmacies), state nonuniversity pharmacies (6 pharmacies), and private community pharmacies (165 pharmacies) in Shiraz. The participants of this research included the hospital pharmacists of the aforementioned places, which included through census. Considering 10% attrition rate, totally 196 individuals were included to the study.

Data collection tool was a researcher-made questionnaire which included four parts: demographic information with 8 questions, pharmacists' practice part with 8 questions, the part of pharmacists' knowledge level about RFID with 9 questions, and the part of pharmacists' attitude toward RFID with 11 questions, and finally, the survey part about substructures required for the application of RFID technology in the opinion of pharmacists included 5 questions. To answer the questions related to practice and knowledge, Likert 5-point rating scale (very low = 1, mediate = 3, high = 4, and very high = 5) was used. The mean of 1-2 shows weak knowledge, attitude and practice, and the means of 2-3 and 3-4 stand for moderate and good levels of pharmacists' knowledge, attitude and

practice respectively and finally the mean of 4-5 represents the very good level of the above variables.

To confirm the face and content validity, the questionnaire was reviewed and approved by six health-care management experts. To assay the reliability of the questionnaire, we used Cronbach's alpha method. To this end, a primary sample including 40 questionnaires were preassayed, and then using the data from these questionnaires, the amount of reliance ratio was calculated as 0.821, applying Cronbach's alpha method. The participations of individuals in the research and filling out the questionnaire were done completely voluntarily. After clarifying the aims of the survey for the volunteers, confidentiality of the answers was emphasized and their oral agreement was achieved. Then, questionnaire sheets without identification headings were distributed among the volunteers.

Next, the questionnaires were completed in a self-administrated way, and completed questionnaires were subjected to data collection and data transfer into (Version 16.0. Chicago, SPSS Inc.), using descriptive (mean, variance, and percentage) and analytic (Pearson's correlation) indices at the significance level of $\alpha = 5\%$.

RESULTS

In this research, 52.05% of the participants (102 individuals) were male and 47.95% (94 individuals) were female, and also 46.9% of the participants (92 individuals) were in the age group of 20–30 years and 55.6% of them (109 individuals) had <10-year job experience. About 93.9% of the participants (184 individuals) were pharm doctors and 82.7% (162 individuals) were employed as the pharmacy's technical supervisors. In addition, RFID technology was not applied in 90.8% of the hospital pharmacies.

The results of this research showed that the means of practice and knowledge of pharmacists from hospital pharmacies were 1.64 ± 0.5 and 1.82 ± 0.61 , respectively. "Skill in pharmaceutical control according to the applied methods" with the mean of 2.14 ± 1.24 had the highest amount in Practice area, furthermore, in Knowledge scope, "the existence of proper substructures for information and communication technology (ICT)" had the highest amount (2.22 ± 1.08) [Table 1].

Other results indicated that the mean of participants' attitude toward RFID technology was 3.62 ± 0.62 . Among "attitude" determinants, "RFID technology" determinants cause error, and with the mean of 3.82 ± 0.74 , it showed the highest value [Table 2].

In general, 82.14% of the pharmacists (161 individuals) involved in the study had positive viewpoints toward the application of RFID technology in their pharmacies, in contrast, 3.58% of the pharmacists (7 individuals) had negative viewpoint and the others (14.28%/28 individuals) had no opinion in this regard.

In addition, in the case of substructures required for RFID technology, the item of "no resistance of employees" with the mean of 3.72 ± 1.04 had the largest value [Table 3]. On the other hand, the results achieved in this part were due to the weak substructures in the test centers.

Furthermore, the findings shown in Table 4 revealed that the item of knowledge toward RFID technology in the opinion of the participants in the research had a statistically positive and significant relationship ($P = 0.03$, $r = 0.36$). Moreover, the results of Table 4 indicate that there was no significant relationship between the items of pharmacists' skill and attitude toward RFID technology ($P = 0.25$, $r = 0.201$).

DISCUSSION

Based on the findings, the practice of pharmacists toward the application of RFID technology was evaluated to be at a weak level. In this case, the results showed that the items of International conference on digital libraries skills, primary skills of working with RFID, working skills of HIS software, drug barcoding skills, practical skills of working with RFID, skills in practical areas of RFID, and the skill of access to RFID system as the items indicating the "practice" were found to be weak. Ebrahimi *et al.* mentioned that readiness level for the applications of RFID technology in Shiraz Medical University Hospitals was not suitable and one of the reasons was the lack of managers' and individuals' skill for applying RFID technology in their centers.^[16] In addition to this item, skill in drug control using the ongoing center method was evaluated as moderate.

On the other hand, the "knowledge" of participants of the research about applying RFID technology was also at a weak level. Thus, in the case of participants' knowledge in this study about RFID technology, the items of informing on RFID technology, suitable perspective of RFID technology, center structural changes for application of RFID, applying hardware and software of RFID, proper culture, and imposing environmental changes for the application of RFID system were found to be weak. This indicates the lack of concern about the role of information technology in health industry. Sharifian *et al.* stated that the lack of knowledge about RFID technology in drug industry causes annual loss of millions of dollars to this industry.^[14]

Table 1: The practice and knowledge of pharmacists toward radio-frequency identification technology

Area	Items	Very low	Low	Mediate	High	Very high	Mean±SD
Practice	ICDL skills	199	44	17	0	0	1.43±0.66
	Primary skills in working with RFID	133	39	7	2	1	1.35±0.66
	Skills in working with HIS software	88	40	36	13	2	1.89±1.03
	Drug barcoding skill	73	47	32	20	2	1.98±1.14
	Practical skill in working with RFID	102	54	22	5	1	1.64±0.83
	Skills in applicable areas of RFID	114	51	14	2	1	1.49±0.73
	Skills in access to RFID	143	28	10	2	0	1.30±0.62
Knowledge	Skills in drug control by center ongoing method	83	25	34	31	4	2.14±1.24
	Informing on RFID technology	128	41	17	0	0	1.40±0.65
	Proper perspective of RFID technology	63	49	57	10	3	1.96±1.10
	Center structural changes for RFID application	94	42	37	5	2	1.77±0.94
	Application of RFID software and hardware	101	39	35	9	0	1.74±0.93
	Availability of employee's facilitating systems	86	38	37	15	4	2.13±1.00
	Availability of suitable substructures for ICT	60	43	56	14	5	2.22±1.80
	Proper culture	88	42	44	8	0	1.58±0.93
	Applying environmental changes for launching RFID system	97	46	33	7	0	1.73±0.89
	Affordability of RFID system	95	42	31	5	2	1.73±0.939

RFID: Radio-frequency identification, ICT: Information and communication technology, HIS: Hospital information systems, ICDL: International computer Driving License, SD: Standard deviation

Table 2: The attitude of pharmacists towards radio-frequency identification technology

Item	Completely disagreed	Disagreed	No opinion	Agreed	Completely agreed	Mean±SD
Improvement of healthcare using RFID	1	5	49	198	24	3.80±0.71
Continuous healthcare using RFID	1	5	51	100	30	3.67±0.89
RFID technology leads to accelerated service	2	10	40	101	30	3.80±0.81
RFID technology encourages the employees for working in sampling room	2	33	66	68	16	3.34±0.90
Application of RFID technology with rapid access to information leads to continuous health of society	2	2	56	102	26	3.79±0.72
RFID technology results in reduced healthcare expenses	4	39	59	69	17	3.30±0.96
RFID technology reduces data recording time	2	20	49	93	24	3.62±0.87
RFID technology reduces the mistakes	6	9	52	92	27	3.82±0.74
RFID technology increases the employee's satisfactory	6	23	70	64	25	3.42±0.97
RFID technology increases the patient's satisfactory	3	13	17	74	20	3.51±0.83
RFID technology benefits the patients	3	21	51	86	25	3.79±2.95

SD: Standard deviation, RFID: Radio-frequency identification

Table 3: The mean of substructures required for the application of radio-frequency identification technology

Item	Frequency (%)		Mean±SD
	Yes	No	
Sufficient budget	187 (95.40)	9 (4.59)	3.61±1.38
No resistance of employees in accepting RFID technology	189 (96.42)	7 (3.57)	3.72±1.04
Support of high-ranking managers	186 (94.89)	10 (5.10)	3.23±1.39
Required instructions	187 (95.40)	9 (4.59)	3.14±1.23
Suitable equipment	185 (94.38)	11 (5.62)	3.13±0.88

SD: Standard deviation

Table 4: The relationship between knowledge and practice of the individuals with their attitudes on radio-frequency identification technology

	r	P	Mean±SD
Practice	0.201	0.25	1.64±0.5
Knowledge	0.36	0.03	1.82±0.61

SD: Standard deviation

Therefore, a serious concern of the authorities is required about this case. On the one hand, most of the managers in health area are not aware of the role of information

technology in improving the quality of services and increasing efficiency.^[17] Thus, operating instructional courses by Medical University and Educational Assistance of Hygiene Ministry can raise the knowledge on the role of technology. After that, the authorities of health-care system are recommended to provide prerequisites for proper application of RFID technology by increasing the pharmacists' knowledge about it in a way that RFID technology is not considered as a complicated technology.

Furthermore, the items of facilitating employee systems and availability of suitable substructures for ICT were evaluated at a moderate level. Therefore, these items should be improved using instruction and application of an ICT-consistent technology in the centers.

The results demonstrated that the "attitudes" of pharmacists toward RFID technology are generally positive, showing that they tend to apply information technology in drug industry. In this case, the majority of

pharmacists participating in the survey believed that the application of RFID could reduce the medical mistakes.

The results also showed that in the opinion of pharmacists, providing a condition for the acceptance of RFID by the employees is more important than other substructures required for the application of this technology. It seems that one of the possible reasons of resistance against this technology is the lack of employees' awareness about it. Based on the effective indices in the application of RFID in hospitals, Sepehri and Mollabagher found that there was a close relationship between the resistance of employees and low level of reliability in RFID technology.^[18]

Moreover, Tzeng *et al.* mentioned that one of the barriers in the application of RFID technology was the personnel's concern about being fired following the development of this technology.^[19] Scarr *et al.* emphasized the readiness of organizations and hospitals for the application of successful RFID technology.^[20] They also introduced the lack of substructures required for the application of this technology as a challenge for using RFID technology.^[20]

Peris-Lopez *et al.* showed that although RFID technology has increased the efficiency of drug distribution, has made the work condition comfortable for nurses, medicines, and personnel of pharmacy, and also has provided a more precise filing system in hospitals, primary expensive investment for the application of this technology and long-time instruction for using RFID technology are the challenges which highlight the importance of the required substructures.^[21] Furthermore, Fisher and Monahan stated that the improper technological and physical substructures were one of the basic problems for the application of RFID technology.^[22]

The findings of this research showed that there was no significant relationship between practice and attitude of the participants toward RFID technology which might be due to the lack of suitable skills in working with this technology. However, there was a positively significant relationship between the knowledge and the attitude of participants toward RFID technology; thus, increased knowledge would change the attitude leading to increased tendency toward the application of this technology. Therefore, individuals' attitude toward RFID technology can be improved using precise programming, required instructions, and raising the knowledge.

Regarding the results of this study, it can be concluded that generally the attitudes and viewpoints of the present pharmacists toward RFID technology were positive.

However, since this technology is newly developed in the health area, it can be concluded that the personnel are not that familiar with this technology and its advantages and they are skeptical of using it. Regarding the lack of knowledge and support of high-rank managers, the employees are not interested in using this technology. Thus, to move along with world technology, drug industry has no other way, but using the information technology and neglecting this issue can cause remarkable losses to the health industry of the country which cannot be compensated. Therefore, it is recommended that the managers and personnel of pharmacies should be aware of the information technology and its advantages by taking online instructional courses and/or scientific workshops and confers. This would result in raised knowledge and subsequently makes them interested in applying RFID technology. Other tools for raising the knowledge such as pamphlet and instructional brochure can also be used. In addition, it can be mentioned that one of the reasons that employees of hospitals have no skill in applying RFID is the adopted policy in these centers, in which the application of information technology is not included or is less regarded.

Among the study limitations, we can consider the restricted study population to Shiraz pharmacists, using self-assessment approach to evaluate the pharmacists' performance, unwillingness of some of the studied pharmacists to fill the questionnaires and lack of previous local studies to compare the results.

CONCLUSION

Considering the fact that the concept of technology was newly developed in health area, we concluded that the studied pharmacists were not familiar with RFID technology and its advantages and they doubted its application. Therefore, it is suggested that required instructions should be taken into consideration by health authorities for introducing and applying the technology.

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Conflicts of interest

There are no conflicts of interest.

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