

Patients' Preferences for Receiving Laboratory Test Results

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The main goal of healthcare systems is to improve the public's health, which can be attained by the delivery of appropriate and required health services. Evaluation of a health system can be done through an assessment of its services.^{1,2} Obtaining patients' opinions is a valid method for evaluating health services because patients are receiving healthcare and are a potential source of data; additionally, it is their right to have their opinions taken into consideration during processes of planning and evaluating.² Patient satisfaction with a health institution's services is among the most important tools for evaluation of system quality³; it can help staff and management to potentially revise their care methods.⁴

The laboratory, as a diagnostic department of a hospital, plays a significant role in the treatment and prevention of diseases. Heeding patients' opinions about lab services is important for improving provider-patient communication and enhancing the department's performance. Laboratory Information System, applied in this department, is a computer-based system that manages data on clinical chemistry, hematology, bacteriology, etc. The components of this system include hardware, software, data, and working processes that allow the professionals who are responsible for data collecting and processing and distributing test results to do so efficiently.⁵

Study results have shown that despite the existence of such systems in laboratories, patient dissatisfaction continues due to lack of system standardization and the systems' poor performance.^{6,7} The most dissatisfaction relates to delays in receiving test results, missing results, or misfiling/misreporting the results.⁸⁻¹² According to the findings of other studies, patients have great interest in using internet-based technology to communicate with their healthcare providers, to access their clinical records, and to obtain timely health information.¹³⁻¹⁸

Using internet-based technologies to receive test results contributes to decreasing the wait time, increasing patient satisfaction, reducing multiple visits to receive the results, and, to some degree, possibly decreasing urban traffic. Moreover, such a system can have advantages for hospitals, such as requiring less laboratory/

ABSTRACT

OBJECTIVES: The laboratory, as a diagnostic department in the hospital, plays an important role in the treatment and prevention of diseases. Paying attention to patients' preferences for communication of test results may provide a better and more responsive system for delivering these results. This study aimed to identify patient preferences regarding receiving their laboratory test results electronically and to identify the reasons behind their choice.

STUDY DESIGN: Descriptive-analytical study.

METHODS: This study was carried out in 2015 with 200 patients who had access to the internet and had been referred at least once previously to the hospital laboratory department to receive their test results. Data were collected through an expert-validated questionnaire, and its reliability was confirmed by test-retest ($P = .8$). Data were analyzed using χ^2 and marginal independence SPSS and R software.

RESULTS: Ninety-eight percent of participants preferred to be notified by short message service when their test results were ready. All participants preferred to receive their test results online, and 82.5% ($n = 165$) preferred to receive both normal and abnormal test results this way. The main reason for receiving results online was time savings, which was reported by 77% of participants, followed by lowering the chance of missing the results (31%). About 40% of participants thought e-mail notification was more secure than accessing the results through a hospital website.

CONCLUSIONS: Findings showed that although patients wanted to benefit from online services for receiving their test results, they were concerned about confidentiality and security. Before using online technologies, security measures necessary to protect patient privacy and to gain the trust of patients should be defined.

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TAKEAWAY POINTS

- ▶ Several problems in the communication of laboratory test results, such as prolonged wait time, erroneous results reported, and missing results, result in patient dissatisfaction.
- ▶ Online services were introduced as a way to improve the accuracy and timeliness of information communication; patients also show interest in using online technology to communicate with their healthcare providers.
- ▶ We asked those patients with internet access about their preferences regarding the possibility of receiving their laboratory test results electronically. We found that they prefer receiving online results if the confidentiality and security of their information are ensured.
- ▶ We recommend implementing the security measures necessary to protect patient privacy before deploying online patient-provider communication technologies.

administrative staff to deal with paperwork, freeing up waiting rooms for other purposes, and saving the costs of printing lab results. However, the lack of face-to-face interaction with laboratory staff, and of their personal encouragement, may result in the failure of patients with abnormal lab results to plan for their next treatment steps. Still, a previous study showed that more than 80% of patients prefer to receive lab results electronically, such as via the internet.¹⁸ In Iran, except in a few laboratories, online sending of test results is not widespread. Most patients still have to be present at laboratory departments to receive their test results.

To our knowledge, no study has addressed the preferences of Iranian patients regarding online delivery of laboratory test results. Our objective was to examine patient preferences, priorities, and recommendations for delivering laboratory test results electronically. This was a pre-implementation study conducted for the purpose of developing an online system for the delivery of test results. The findings can be of value for other organizations with similar goals as well.

METHODS**Study Setting and Sample**

This was a cross-sectional descriptive and analytic study carried out with the cooperation of patients visiting the laboratory department of a university hospital in Ferdows, Iran. A wide range of tests, including biochemistry, hematology, parasitology, bacteriology, serology, immunology, hormonology, pathology, and gasometry, is done in this department.

Patients were included in this study if they had 1) a previous history of receiving test results from this department, and 2) access to the internet. A sample of 195 patients was calculated using Cronbach's alpha sampling method; ultimately, 200 patients were invited to participate.

Data and Measures

A researcher-made data-collecting questionnaire was designed based on the review of literature.¹⁹⁻²² The validity of the question-

naire was confirmed by 4 medical informatics experts who have a background in medicine and health information management. Its reliability was examined using the test-retest method ($P = .8$).

The questionnaire consisted of 4 sections:

1) demographic data such as age, education, marital status, occupation, and residential address; 2) 2 questions about the time patients had spent to receive their test results in the previous encounter; 3) 12 questions about their use of information technology; and

4) 9 questions about the patients' preferences and priorities for receiving test results, including their reasons, and their preferred method of test-results delivery (by e-mail; on the patient portal of a website, with or without short message reminder concerning presence of the results on the portal). One of the authors distributed the questionnaire to each patient visiting the lab who met the qualifications and then collected them after completion. The patients were instructed to complete the questionnaire, and their consent was inferred from their agreement to fill out the questionnaire.

Statistical Analysis

Data analysis was done by SPSS software version 19 (IBM Corporation; Armonk, New York) and R software version 3.2.2 (R Foundation for Statistical Computing; Vienna, Austria) using descriptive and analytic statistics, including χ^2 and marginal independence.

RESULTS

Data analysis showed that about half of the participants ($n = 98$; 49%) were 30 years or younger. Less participants had a bachelor's degree ($n = 78$; 39%), most were married ($n = 156$; 78%), and almost half were employed ($n = 88$; 44%). The residential location of most participants ($n = 131$; 65.5%) was "city" (Table 1).

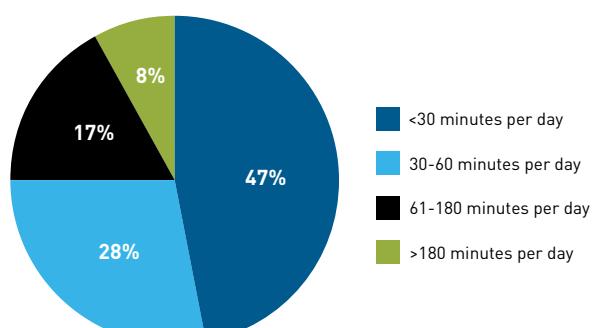
In their previous encounter getting laboratory test results, fewer than half of participants ($n = 83$; 41.5%) had spent less than half an hour; 35.5% ($n = 71$) spent between 30 and 60 minutes; 19% ($n = 38$), between 60 and 120 minutes; and 4% ($n = 8$), more than 2 hours to reach the hospital laboratory. In addition, 42% of participants ($n = 84$) said that once they arrived at the hospital, they had to spend 5 to 15 minutes waiting for their test results. The wait time for 32.5% ($n = 65$) of participants was about 15 to 30 minutes; for 12.5% ($n = 25$), more than 30 minutes. The rest (13%; $n = 26$) had to wait for less than 5 minutes.

Participants' Internet Use and Their Access to the Infrastructure

In this study, all participants had access to the internet. Almost half ($n = 94$; 47%) mentioned that they use the internet less than

TABLE 1. Demographic Information of the Participants

Variables	Frequency (%)
Age, years	
≤30	97 (48.5)
31-40	65 (32.5)
41-50	27 (13.5)
>50	11 (5.5)
Education	
High school diploma	53 (26.5)
Associate degree	48 (24.0)
Bachelor's degree	78 (39.0)
Post graduate	21 (10.5)
Marital status	
Married	156 (78)
Single	44 (22.0)
Occupation	
Employee	88 (44.0)
Housewife	60 (30)
Farmer	6 (3.0)
Pensioner	3 (1.5)
Other	43 (21.5)
Residential area	
Ferdows	131 (65.5)
Other cities	61 (30.5)
Village	8 (4.0)

FIGURE. Duration of Internet Use**TABLE 2.** Tasks Done Through the Internet by the Participants

Tasks Done Through the Internet ^a	Responses		Percent of Cases
	%	N	
Work related to job	20.5	89	44.5
Online purchase	14.0	61	30.5
Learning	23.2	101	50.5
Seeking health information	9.9	43	21.5
Social networks	30.1	131	65.5
Others	2.3	10	5.0
Total	100.0	435	217.5

^aThere was a possibility of selecting more than 1 task.

30 minutes daily, while 8% ($n = 16$) of participants used the internet more than 3 hours a day (Figure).

Most participants (65.5%; $n = 131$) used the internet often to access social networks (Table 2). Most accessed the internet from home ($n = 171$; 85%), and 35% ($n = 70$) accessed it from work; 22.5% ($n = 45$) from public internet centers, 21.5% ($n = 43$) from friends' homes, and 7% ($n = 14$) from their universities.

Of the participants, 74% ($n = 148$) had a personal e-mail address. The number of times they checked it included daily ($n = 51$; 34.5%), 1 to 2 times a week ($n = 31$; 20.9%), 3 to 4 times a week ($n = 28$; 18.9%), rarely (ie, less than once in a month) ($n = 22$; 14.9%), and 1 to 2 times a month ($n = 16$; 10.8%).

Forty-seven percent ($n = 94$) of the participants mentioned that they had already visited the hospital website. Among those, 84% ($n = 79$) reviewed the website to check the working schedule of the doctors, 13.8% ($n = 13$) to receive hygienic and health information, and 2.1% ($n = 2$) to do research.

All participants had cellphones and could receive and send text messages. They received 1 to 8 messages per day, but only about 10% ($n = 21$) of them received a maximum of 2 messages a day.

Participants' Preferences for Notification of Test Results

Notifying the participants that their results are in via text on the same day the laboratory received the results was favored by 98% ($n = 196$) of participants, and all participants preferred to receive their laboratory test results online. When exploring the possible modes of laboratory result notification (by e-mail or on the patient portal), 52.5% ($n = 105$) of participants preferred notification by e-mail and 47.5% ($n = 95$) through the hospital website. About half of the participants ($n = 101$; 50.55%) believed that viewing laboratory test results online is completely useful. The rest, except 1%, felt this method of notification is partially useful.

Most participants ($n = 154$; 77%) gave "saving time" as the main reason for receiving laboratory test results electronically. Thirty-one percent ($n = 62$) said their main reason was preventing the paperwork from becoming lost by the participants (Table 3). Regarding the nature of the results, 82.5% of participants ($n = 165$) preferred to receive both normal and abnormal test results online, while 14% ($n = 28$) wanted to receive only normal results online and 3.5% ($n = 7$) only abnormal test results online. Most participants also noted that they would want their online results to be

TABLE 3. Marginal Independence and χ^2 Tests for Factors Associated With Level of Education for Receiving the Laboratory Test Results Online

Variable	All Respondents N (%)	Education				P
		High school diploma, n (%)	Associate's degree, n (%)	Bachelor's degree, n (%)	Postgraduate, n (%)	
The reasons for getting the lab test results online ^a						
Reduction of the expenses and transportation issues	111 (55.5)	34 (64.2)	20 (41.7)	42 (53.8)	15 (71.4)	
Time saving	154 (77)	40 (75.5)	29 (60.4)	65 (83.3)	20 (95.2)	
Accessibility of electronic services	107 (53.5)	24 (45.3)	22 (45.8)	45 (57.7)	16 (76.2)	.0028
Prevention of missing the test results	62 (31)	13 (24.5)	15 (31.2)	23 (29.5)	11 (52.4)	
Other	1 (0.5)	0	0	1 (1.3)	0	
Selected features ^a						
Confidentiality of data	133 (66.5)	38 (71.1)	30 (62.5)	49 (62.8)	16 (76.2)	
Possibility of reprinting	71 (35.5)	17 (32.1)	16 (33.3)	26 (33.3)	12 (57.1)	.1291
Timeliness	143 (71.5)	37 (69.8)	33 (68.8)	53 (67.9)	20 (95.2)	
Preferable data for reporting along with the test result ^a						
Admission code	106 (53)	32 (60.4)	19 (39.6)	43 (55.1)	12 (57.1)	
Demographic data	109 (54.5)	37 (69.8)	30 (62.5)	32 (41)	10 (47.6)	
Doctor's name	72 (36)	19 (35.8)	15 (31.2)	24 (30.8)	14 (66.7)	.0175
ID number	123 (61.5)	33 (62.3)	26 (54.2)	50 (64.1)	14 (66.7)	
Other (eg, date of the test)	11 (5.5)	4 (7.5)	3 (6.2)	3 (3.8)	1 (4.8)	
The entrusted method for maintaining confidentiality ^b						
E-mail	82 (41)	22 (41.5)	17 (35.4)	34 (43.6)	8 (40)	
Website	41 (20.5)	13 (24.5)	13 (27.1)	11 (14.1)	4 (20)	
Both e-mail and website	45 (22.5)	9 (17)	10 (20.8)	20 (25.6)	6 (30)	
None	32 (16)	9 (17)	8 (16.7)	13 (16.7)	2 (10)	.846

^aThere was a possibility of selecting more than 1 option. Groups were compared using the Marginal independence test.

^bThere was a possibility of selecting 1 option. Groups were compared using the χ^2 test.

accompanied by such data as an identification number ($n = 123$; 61.5%) and name and age ($n = 109$; 54.5%) (Table 3).

Timeliness was the most important characteristic reported by 71.5% ($n = 143$) of the participants. There were significant relationships between level of education and the reasons given for wanting to receive test results online ($P = .0028$) and between education level and the data that participants preferred to be reported along with the test results ($P = .0175$) (Table 3). As noted in Table 3, there were no relationships between other demographic variables and variables.

Participants' Trust in the Confidentiality of the Online Delivery Methods

From the participants' perspective, the most reliable method to retain confidentiality was receiving the test results via e-mail ($n = 82$; 41%). However, about one-sixth of the participants ($n = 32$; 16%) believed that neither of the suggested methods—e-mail or website—for sending the test results electronically is secure enough to maintain confidentiality (Table 3).

A significant relationship existed between the frequency of internet use and the patients' trust in the confidentiality of the delivery methods ($P < .0001$); frequent internet users most mistrusted the confidentiality. Also, the relationship between the reasons for wishing to get lab test results through online services and participant trust in the confidential method was significant ($P = .0253$). There was no relationship between demographic variables and the participants' trust in the confidentiality of the delivery online methods (Table 4).

DISCUSSION

To our knowledge, there is no previous study in Iran that has investigated patient preferences regarding the delivery of test results. Most studies done in other countries have evaluated the perspective of special groups of patients, such as those with HIV^{20,23} or those with sexually transmitted diseases.^{19,21} Some other studies have evaluated security and confidentiality factors into preferences²⁴ and patient priorities for sending normal test results.²⁵

Our study investigated the preferences of a general population of patients who had been referred to a hospital laboratory, regarding the results of all tests.

The findings of our study show that the participants believed that the most useful method for communicating laboratory test results was providing the results to those with internet access through e-mail or website services. Frequent internet users had less confidence in the process of receiving test results via a website. However, although the result was not significant, patients expressed that sending the test results via e-mail was the most satisfactory and confidential notification method.

The findings of a study done by Platteau and colleagues²³ that questioned 898 men from Belgium who have sex with men showed a high level of satisfaction among the participants for receiving their HIV test results online. Findings by Shirts and colleagues²⁴ about 96 US participants (48 physicians and 48 nurse practitioners working in the nursing home setting) also indicated that they would be willing to try a Web-based system to get their patients' test results if they were convinced of its security and confidentiality. The results of another study done in South Carolina and Mississippi in 2009 and 2010 also indicated that this method of communicating test results would accelerate the treatment process.¹⁹

In other available research, the most important features of the communicating system for test results, from the perspective of the participants, were the timeliness and confidentiality of the data. The results of interviews with 20 Colorado patients, and of a study of 171 women from the United Kingdom with breast cancer who were asked about methods of receiving breast biopsy results, also show that when receiving test results electronically, their timely receipt is highly important to the patients.^{25,26}

In other studies, respondents noted that receiving detailed information along with test results online was important when receiving Pap smear results and for gastroenterologists who were communicating endoscopy findings.^{27,28} Providing identification information

TABLE 4. Marginal Independence and χ^2 Tests for Factors Associated With the Participants' Trust in Confidentiality of the Lab Results' Delivery Methods

Variable	Trust in Confidentiality of Lab Results' Delivery Methods				<i>P</i>
	E-mail, n (%)	Website, n (%)	Both e-mail and website, n (%)	None, n (%)	
Age, years					
≤30	37 [38.1]	17 [17.5]	26 [26.9]	17 [17.5]	.321
31-40	32 [49.2]	13 [20]	11 [16.9]	9 [13.9]	
41-50	8 [29.6]	8 [29.6]	5 [18.5]	6 [22.3]	
>50	5 [45.4]	3 [27.3]	3 [27.3]	0 [0]	
Education					
High school diploma	22 [41.5]	13 [24.5]	9 [17]	9 [17]	.779
Associate's degree	17 [35.4]	13 [27.1]	10 [20.8]	8 [16.7]	
Bachelor's degree	34 [43.6]	11 [14.1]	20 [25.6]	13 [16.7]	
Post graduate	9 [42.9]	4 [19]	6 [28.6]	2 [9.5]	
Marital status					
Married	64 [41]	30 [19.2]	40 [25.6]	22 [14.2]	.155
Single	18 [40.9]	11 [25]	5 [11.4]	10 [22.7]	
Occupation					
Employee	39 [44.3]	12 [13.6]	23 [26.2]	14 [15.9]	.145
Housewife	27 [45]	16 [26.7]	13 [21.7]	4 [6.6]	
Farmer	1 [16.7]	2 [33.3]	0 [0]	3 [50]	
Pensioner	2 [66.7]	1 [33.3]	0 [0]	0 [0]	
Other	13 [30.2]	10 [23.3]	9 [20.9]	11 [25.6]	
Residential area					
Ferdows	57 [43.5]	22 [16.8]	35 [26.7]	17 [13]	.242
Other cities	24 [39.3]	16 [26.2]	9 [14.8]	12 [19.7]	
Village	1 [12.5]	3 [37.5]	1 [12.5]	3 [37.5]	
Duration of internet use					
<30 minutes per day	16 [17]	41 [43.6]	25 [26.6]	12 [12.8]	<.0001
30-60 minutes per day	32 [57.1]	0 [0]	13 [23.2]	11 [19.7]	
60-180 minutes per day	25 [73.5]	0 [0]	3 [8.8]	6 [17.7]	
>180 minutes per day	9 [56.2]	0 [0]	4 [25]	3 [18.8]	
Reasons for getting lab results online ^b					
Reduction of expenses and transportation issues	47 [57.3]	20 [48.8]	34 [75.6]	10 [31.2]	.0253
Saving time	61 [74.4]	31 [75.6]	39 [86.7]	23 [71.9]	
Accessibility of electronic services	50 [61]	17 [41.5]	23 [51.1]	17 [53.1]	
Prevention of missing the test results	28 [34.1]	12 [29.3]	18 [40]	4 [12.5]	
Other	0 [0]	0 [0]	1 [2.2]	0 [0]	

^aThere was a possibility of selecting more than 1 option. Groups were compared using the Marginal independence test.

^bThere was a possibility of selecting more than 1 option. Groups were compared by using the Marginal independence test.

with their test results was also favored by our study participants, likely because they want assurance that they received the correct test results. This finding suggests that although patients worry about confidentiality, they also consider potential mishandling of the information.

Healthcare institutions should consider their patients' confidentiality concerns and be sure an effective and efficient identification plan is established and maintained in all patient communication systems. An admission code is also among the data that patients would request, perhaps because they believe that this code gives them the chance to track their results more effectively.

In the Colorado study by Baldwin and colleagues,²⁵ the 20 patients were less enthused about getting test results online because of security concerns. Only 10% of those patients chose e-mail for receiving their results, which is not in line with the current findings. This difference might be because in the current study, when patients asked about confidentiality issues, the researcher explained the details of the approach the laboratory department intended to use in e-mailing test results. The patients were told they would be issued an ID number when initially taking the test and that individualized number would need to be entered to see the test results. With such an approach, unauthorized persons cannot easily access the data. However, the acceptability and feasibility of this approach should be studied.

The findings of Siedner and colleagues²⁰ on 50 HIV-infected patients from rural Uganda showed that although communication of information about HIV laboratory test results via text messages would be acceptable, a few patients also expressed concerns about confidentiality, mentioning they might be more comfortable with both coded messages and PIN codes to protect confidentiality.

The results of our study confirmed the results of others that indicated patients' tendency to wish to receive their normal and abnormal test results through different technologies.^{19,25,29,30}

In our study, the main reason given by patients for wanting to receiving test results online was to save time; this is not in line with the findings of the study of Sieder et al,²⁰ in which patients were most interested in decreases in transportation costs. This difference can be explained by the significance of the research location. Since the city of Ferdows is relatively small, its roads are close together, and city travel is easily accomplished; transportation cost reductions got less attention from participants. Results of 2 other studies that used text messaging for communicating positive *Chlamydia trachomatis* test results in London and New Zealand indicated that the most significant achievement of sending laboratory results electronically was cost-effectiveness.^{31,32}

Receiving a text message reminder via cellphone on the date of receipt of laboratory results was selected by 98% of the participants. The results of a study by Lester and colleagues³³ of 111 patients at 2 primary HIV care clinics in Kenya also showed that the widespread availability of mobile phones and their ease and speed of use were

the reasons this technology drew the attention of the majority of participants. The results of Siedner and colleagues²⁰ showed that all participants desired to receive their test results through text message.

Most (almost 75%) of our participants mentioned that in their previous encounter, when they arrived at laboratory department, they had to wait either 5 to 15 minutes or 15 to 30 minutes to receive their test results. In the results of the study by Zare Mehrjerdi and colleagues, this time was about 106 minutes for 150 patients referred to the emergency department in an Iranian public hospital.¹¹ The time difference might be related to the allocation of personnel at Ferdows' hospital and how the test results are delivered in 2 working shifts there. The results of a controlled before-and-after study regarding implementation of a computerized pathology order-entry system in an inpatient setting, and the results of a randomized trial in outpatient offices both showed that using information technology in the laboratory department can facilitate the working process and reduce the time it takes to deliver test results to patients.^{34,35}

Recent studies evaluating laboratory information systems in hospitals of 2 large medical universities in Iran showed that using such technologies could provide better patient-provider communication, especially when the recommended standards are applied during the design and implementation of the system.^{7,36}

Limitations

One limitation is that this research was done in a small, easy-to-navigate city, so patients had not spent a lot of money and time in their previous encounter to get their test results manually. Another limitation is that although using technology for sending the results was acceptable to most of them, they did mention that when printing was required, lack of access to a printer to print their test results was a barrier.

CONCLUSIONS

This study showed the positive attitudes of patients toward receiving their laboratory test results electronically. However, patients are concerned about the confidentiality of their data. Therefore, obtaining their consent should be considered before using such technology, and security measures should be defined to protect privacy and to gain the trust of patients.

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