ORIGINAL ARTICLE

Comprehensibility of selected United States Pharmacopeia pictograms by illiterate and literate Farsi speakers: The first experience in Iran – Part II

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Background: Conveying information to patients on how to use medications at the dispensing sessions and retention of this information by the patients is essential to the good pharmaceutical care. The aim of our study was to examine the comprehensibility of the selected three potentially usable pictograms by five groups of subjects who had different levels of literacy in both before and after mini educational sessions. **Materials and Methods:** Nine experienced pharmacists selected three potentially usable pictograms in Isfahan pharmacies: Pictograms D through F representing respectively: "do not take medication during pregnancy," "keep medication in the refrigerator," and "take medication with plenty of water." Then, graduate students of two major universities (Groups 1 and 2), low-literate and illiterate individuals (Groups 3 and 4), and walk – in patients in the pharmacies affiliated to the Isfahan School of Pharmacy (Group 5) were asked about the comprehensibility of these pictograms before and after mini-education sessions. The American National Standard Institute and International Organization for Standardization standards were used for comparisons. **Results:** In the pre-follow-up period, D and E pictograms were most understandable (87.4%, 87.2%). In the post-follow-up, E and D pictograms were understood most (98.0%, 95.3%), followed by F (92.9%). Among the improvements measured in post-follow-up, pictogram F showed the biggest improvement ($P = 0.0$). **Conclusion:** Pictograms depicting the use of medications during pregnancy (D) and storing medication in the refrigerator (E) was easier to understand by our study population. The groups with the high level of literacy interpreted the pictograms better than those with lower levels of literacy.

Key words: Comprehensibility, pharmacy, pictograms

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INTRODUCTION

Utilizing images incorporated into pharmacy labels, named as pictograms, have been observed in various countries for the past few decades.[1-5] In places where physicians and pharmacists do not spend sufficient time with patients to explain about their illness and treatment, the use of pictograms can become even more useful.[6,7] These pictograms can be incorporated onto auxiliary labels and leaflets to improve understanding of medication instructions and adherence.[8-11]

There are vulnerable groups such as illiterate or low literate, elderly and cognitive or visually impaired patients that require more careful medication counseling when prescriptions are filled in the pharmacies. Pictograms have been shown to improve comprehension in these populations.[4,12-14]

In Iran, for the first time, we studied the understandability of three pictograms by people with various levels of literacy.[15] Since there is not much information about pictograms in Iran, we decided to evaluate the level of understanding of the same group of Iranians on three other selected United States Pharmacopeia (USP)

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pictograms and investigate the role of mini educational sessions on their recall.

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MATERIALS AND METHODS

This 11-month study took place in Isfahan, the third most populous city of Iran. This study like our previous study took part in two phases. Determination of the three most potentially usable pictograms and test of comprehensibility of these pictograms by literate and illiterate groups of Isfahanis. The demographic information on these participants was reported in our earlier study.[15] Participants' responses were categorized based on correct, incorrect, do not know, and reverse interpretation. Furthermore, as in the Part I of this article, the same 5 descriptive questions were asked to provide an opportunity for participants to qualify their answers and give suggestions on how to improve the design of the pictograms.

Phase I (selection of three pictograms)

As like our previous article seventy USP pictograms, 1–70, were presented to nine pharmacists working in Isfahan whom were interviewed to determine another 3 most prevalent instructions which auxiliary labels could be used for in the community pharmacies of Isfahan. Pictograms' size and color were exactly the same as ones used in the previous article.[15] The three most commonly chosen pictograms in this study were "D-do not take medication during pregnancy," "E-keep medication in the refrigerator," and "F-take medication with plenty of water."

Phase II (subject selection and interviews)

Each pictogram was pasted in its actual size matching the USP, on a piece of 11.5 cm × 11.5 cm paper without any texts, and shuffled before each interview to ensure random sequence. Their answers were recorded both by writing and an MP3 player in case the notes were not clear enough. Same calculations for sample size were done. The groups and their selection process selected were exactly the same as the ones in the previous study.[15]

Both parametric statistical tests such as Student's *t*-test and ANOVA and nonparametric tests such as Chi-square and Mann–Whitney test were utilized depending on whether the categories (parameters) assumed normal distribution or having equal interval scale.

RESULTS

A total of 358 participants were studied of whom 41% were males. Elderly comprised 2% of participants. Sixty-six percent fully literate based on National Security Agency definition.

Figure 1 depicts each pictogram and its designation. In the pre-follow-up period, D and E pictograms were understood most by the subjects (87.4%, 87.2%), and pictogram F was somewhat challenging (75.4%).

In the post-follow-up period, twenty (14.3%) subjects from the Groups 1 and 2, 9 (8.0%) subjects from the Groups 3 and 4, and 77 (71.2%) subjects who were walk-in patients were not reachable. The fallout from the Group 5 was predictable as the subjects were patients who had come to the pharmacies for having theirs or someone else's prescriptions filled and finding them again in 1 week time was not easy. In the post-follow-up, an improvement was seen in understanding of all three pictograms: D and E pictograms were understood most (95.3%, 98.0%), followed by F (92.9%). Pictogram F showed the biggest improvement in the post-follow-up ($P = 0.0$).

Standards of American National Standard Institute and International Organization for Standardization

Like our previous article, if 85% or more of subjects interpreted a pictogram correctly and 5% or less of subjects interpreted the pictogram opposite to what should be, the pictograms were considered acceptable based on the American National Standard Institute (ANSI) standards. According to the International Organization for Standardization (ISO), 67% or more of the subjects should interpret the pictograms correctly, to be considered acceptable. Tables 1 and 2 show the acceptability of the three pictograms based on the two standards before and after the follow-up.

Results for each pictogram

Following sections contain 3 tables, 1 for each pictogram showing pre- and post-follow-up data.

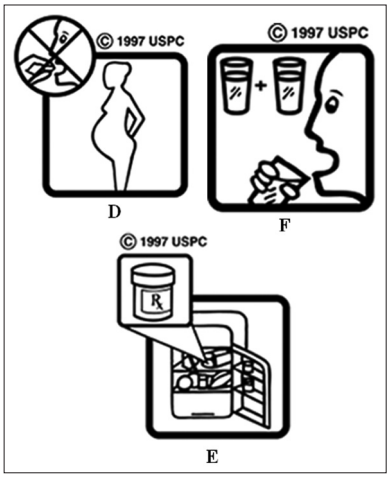

Figure 1: Selected pictograms

Table 1: Acceptability of pictograms according to the American National Standard Institute and International Organization for Standardization before follow-up

	Group 1	Group 2	Group 3	Group 4	Group 5
Pictogram D					
ANSI	Yes	Yes	No	No	Yes
ISO	Yes	Yes	Yes	No	Yes
Pictogram E					
ANSI	Yes	Yes	No	No	Yes
ISO	Yes	Yes	Yes	No	Yes
Pictogram F					
ANSI	Yes	Yes	No	No	No
ISO	Yes	Yes	No	No	Yes

Group 1 = Medical university graduate students; Group 2 = Nonmedical university graduate students; Group 3 = Low literates; Group 4 = Illiterates; Group 5 = Walk-in patients; ANSI = American National Standard Institute; ISO = International Organization for Standardization

Table 2: Acceptability of pictograms according to the American National Standard Institute and International Organization for Standardization after follow-up

	Group 1	Group 2	Group 3	Group 4	Group 5
Pictogram D					
ANSI	Yes	Yes	Yes	No	Yes
ISO	Yes	Yes	Yes	Yes	Yes
Pictogram E					
ANSI	Yes	Yes	Yes	Yes	Yes
ISO	Yes	Yes	Yes	Yes	Yes
Pictogram F					
ANSI	Yes	Yes	No	No	Yes
ISO	Yes	Yes	Yes	Yes	Yes

Group 1 = Medical university graduate students; Group 2 = Nonmedical university graduate students; Group 3 = Low literates; Group 4 = Illiterates; Group 5 = Walk-in patients; ANSI = American National Standard Institute; ISO = International Organization for Standardization

Pictograms D, E, and F

Pictogram D and E seem to be more comprehensible as Groups 1, 2, and 5 passed the ANSI threshold and Group 3 passed the ISO limit in the pre-follow-up period. In the post-follow-up, all 5 groups performed well with a slight difference between D and E. In the pre-follow-up period, Groups 1 and 2 surpassed ANSI threshold and Group 5 passed the ISO limit for F [Tables 3-5]. In the post-follow-up period, F met ANSI criteria in Groups 1, 2, and 5.

Results of groups

As shown in Table 6, in the post-follow-up, all five groups improved significantly with all three pictograms ($P = 0.0$), the biggest difference was in low literate and illiterate subjects ($P = 0.0$). No significant impact was detected from age or sex on the comprehensibility of the pictograms ($P = 0.371$ and $P = 0.381$, respectively).

Among the four groups of university students in the medically related fields of pharmacy, dentistry, medicine and nursing, the pharmacy group performed slightly better but not significantly ($P = 0.797$).

Answers to descriptive questions

Five qualitative questions as in the Part I article were repeated for the three pictograms in this article. Again, 84.1% believed that pictograms had a positive impact on the correct use of medications and timing of administration.

Close to 70% stated that they would see the images when placed on the packaging. Only 44.4% stated that pictograms would impact positively on adherence and 12.6% did not respond to this question. Regarding the possibility of unwanted impact of pictograms on the use of medications, 29.3% felt the pictograms might cause misunderstanding in use of medications or they may attract children's attention toward medications causing accidental ingestion when no text accompanies the images.

More than two-thirds of participants (76.8%) stated that they had not noticed the pictograms on the packaging of medications. Their comments and ideas on tips to improve the understandability of pictograms are shown in Table 7.

DISCUSSION

According to our results, the level of literacy has an impact on the interpretation of the pictograms. The highly educated groups interpreted the three pictograms more correctly than the rest. In the subgroup analysis, as expected, Isfahan University of Medical Sciences students performed slightly better than their counterparts, however, not statistically significant. Other reports are in congruence with our results. Rajesh *et al*. showed that literacy had a positive role on the interpretation of pictograms regarding the adverse drug reaction of antiretroviral therapy.[16] Dowse and Eehlers also showed that in the South African population, the more literate subjects interpreted the pictograms more correctly.[17] Knapp *et al*. also found a positive role of literacy on the interpretation of 10 pictograms they studied.[18] In our study, females and males were almost equal in their interpretability of the pictograms. Rajesh *et al*., also, did not find a difference among the genders in their ability to interpret the pictograms.[16] In the recall phase, all groups ranging between 18% and 95% improved in their ability to interpret the pictograms, the biggest difference was seen in low-literate and illiterate groups. In Knapp *et al*. and Dowse studies, they also showed similar results after 1–3 weeks recalls. Knapp *et al*. showed that after 1 week, most pictograms were interpreted correctly almost twice than the first interview.[18] Dowse and Eehlers showed after 3 weeks recall period that the participants interpreted the pictograms 3–5 times more correctly.[17] Therefore, mini educational sessions during which meanings of the pictograms are told to the participants

Table 3: Interpretation of pictogram D before and after follow-up

	Correct, *n* (%)		Incorrect, *n* (%)		Do not know, *n* (%)		Reverse, *n* (%)	
	Before	After	Before	After	Before	After	Before	After
1	60 (100)	52 (100)	0	0	0	0	0	0
2	76 (96.2)	67 (100)	3 (3.8)	0	0	0	0	0
3	68 (72.3)	82 (91.1)	18 (19.1)	4 (4.4)	8 (8.5)	2 (2.2)	0	2 (2.2)
4	10 (58.8)	10 (71.4)	5 (29.4)	3 (21.4)	2 (11.8)	1 (7.1)	0	0
5	99 (91.7)	31 (100)	6 (5.6)	0	2 (1.9)	0	1 (0.9)	0
Total	313 (87.4)	242 (95.3)	32 (8.9)	7 (2.8)	12 (3.4)	3 (1.2)	1 (0.3)	2 (0.8)

Group 1 = Medical university graduate students; Group 2 = Nonmedical university graduate students; Group 3 = Low literates; Group 4 = Illiterates; Group 5 = Walk-in patients

Table 4: Interpretation of pictogram E before and after follow-up

Groups	Correct, *n* (%)		Incorrect, *n* (%)		Do not know, *n* (%)		Reverse, *n* (%)	
	Before	After	Before	After	Before	After	Before	After
1	54 (90)	52 (100)	1 (1.7)	0	4 (6.7)	0	1 (1.7)	0
2	75 (94.9)	66 (98.5)	2 (2.5)	0	1 (1.3)	0	1 (1.3)	1 (1.5)
3	75 (79.8)	87 (96.7)	6 (6.4)	0	6 (6.4)	2 (2.2)	7 (7.4)	1 (1.1)
4	10 (58.8)	13 (92.9)	1 (5.9)	1 (7.1)	6 (35.3)	0	0	0
5	98 (90.7)	31 (100)	4 (3.7)	0	4 (3.7)	0	2 (1.9)	0
Total	312 (87.2)	249 (98)	14 (3.9)	1 (0.4)	21 (5.9)	2 (0.8)	11 (3.1)	2 (0.8)

Group 1 = Medical university graduate students; Group 2 = Nonmedical university graduate students; Group 3 = Low literates; Group 4 = Illiterates; Group 5 = Walk-in patients

Table 5: Interpretation of pictogram F before and after follow-up

Groups	Correct, *n* (%)		Incorrect, *n* (%)		Do not know, *n* (%)		Reverse, *n* (%)	
	Before	After	Before	After	Before	After	Before	After
1	55 (91.7)	52 (100)	4 (6.7)	0	1 (1.7)	0	0	0
2	68 (86.1)	66 (98.5)	10 (12.7)	1 (1.5)	1 (1.3)	0	0	0
3	55 (58.5)	76 (84.4)	33 (35.1)	13 (14.4)	5 (5.3)	1 (1.1)	1 (1.1)	0
4	8 (47.1)	11 (78.6)	8 (47.1)	3 (21.4)	1 (5.9)	0		0
5	84 (77.8)	31 (100)	20 (18.5)	0	4 (3.7)	0	0	0
Total	270 (75.4)	236 (92.9)	75 (20.9)	17 (6.7)	12 (3.4)	1 (0.4)	1 (0.3)	0

Group 1 = Medical university graduate students; Group 2 = Nonmedical university graduate students; Group 3 = Low literates; Group 4 = Illiterates; Group 5 = Walk-in patients

Table 6: Comparison of groups with regard to their correct answers on pictograms

Groups	Mean±SD		*P*
	Before follow-up	After follow-up	
1	5.0±0.88	5.88±0.32	0.0
2	4.81±1.01	5.64±0.59	0.0
3	3.04±1.33	4.77±1.13	0.0
4	2.0±1.11	3.84±1.21	0.0
5	4.17±1.25	5.61±0.66	0.0
Total	4.12±1.46	5.26±1.05	0.0

SD = Standard deviation

Table 7: Suggestions or ideas on improvement of pictograms comprehensibility

Pictogram type	Patients' comments on improvement
Pictogram D	Use triangle instead of square, use text in addition to the picture
Pictogram E	Write the word "daru" in Farsi as opposed to Rx, add text to the picture, show temperature of 2°–8° centigrade, use a clearer design for the refrigerator making shelves less crowded
Pictogram F	Show the picture of the medication, a large glass full of water, or a mineral water bottle should be added, show the subject while taking the medication

are effective in increasing the understandability of patients. Knapp *et al*. in his article, argues that "giving the meaning of pictograms to subjects is effective in improving their understanding of pictograms."[18] Although the factor of age was not part of our main objectives to measure, in our small population of elderly, we did not see any significant difference in their interpretations of the pictograms in comparison to the younger participants. However, published studies show conflicting results. Knapp *et al*. showed in his study that with an increase in age, the correct interpretability reducesedd among his research subjects.[18] On the contrary, Barros *et al*. showed in their Brazilian subjects that, overall, older age interpreted the pictograms more correctly than the younger age.[19]

Regarding the qualitative questions, as seen in the results section, the majority of our subjects felt pictograms would attract the attention of subjects while having a positive impact on time and use of administration of medications. Less than third believed that pictograms may cause reverse understanding of what was meant by the pictogram. The percentage of people who thought reverse understanding

could be problematic is high enough that deserves further investigation. Similarly, there are published reports that show either the pictograms may cause confusion even in the highly literate societies,[5,18,20,21] or are deficient in showing detailed necessary information, or they may not be internationally understood uniformly, or even some may cause reverse understanding in some subjects.[22,23] However, we believe in our setting we could alleviate this misunderstanding by adding a text to each pictogram and conducting mini educational sessions to clarify the meaning of each pictogram.

Among our participants, a minority felt that pictograms could enhance adherence to medications. This is in line with the findings that adherence is a complex phenomenon and multiple factors such as patient characteristics and socioeconomic status, type of therapy, nature of disease, and the healthcare system in place simultaneously affect adherence to medications. Therefore, pictograms may play only a small role in improving adherence. Dowse *et al*. in his study showed that every single subject reacted positively to the idea of pictograms and felt that the pictograms helped him or her remember how to take their medications.[8] The majority of our subjects had not had any previous experience with pictograms. In the Iranian market, experience with the use of pictograms is very limited. Only two pharmaceutical manufacturers, SohaHelal and AlborzDaru, have been using simplistic pictograms resembling "morning," "noon," and "evening" on the packaging of their pharmaceuticals. It is not surprising, therefore, that majority of our subjects had not seen such drawings.

Although there are controversies in the role of pictograms, in our setting, we feel that pictograms may act as an effective complement to the oral instructions of pharmacists. In this study, we have shown that some of the USP pictograms may not be understood well by some groups of subjects and redesign of these pictograms to make them culturally suitable is warranted. We intend to modify these pictograms and field test them before final implementation.

CONCLUSION

Pictograms depicting the use of medications during pregnancy (D) and storing medication in the refrigerator (E) were easier to understand by our participants. Moe literate individuals interpreted the pictograms better than those with lower levels of literacy. The impact of mini-education sessions in increasing the comprehensibility of the pictograms is quite clear. No difference between the sexes was detected in the interpretability of the pictograms.

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Conflicts of interest

There are no conflicts of interest.

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