Comprehensibility of selected USP pictograms by illiterate and literate Farsi speakers: The first experience in Iran - Part I

Amir H Zargarzadeh, Sahar Ahamdi[1]

Department of Clinical Pharmacy and Pharmacy Practice, School of Pharmacy and Pharmaceutical Sciences, Isfahan University of Medical Sciences, Isfahan, [1]Pharmaceuticals Division, Shahin Shahr Health Network, Shahin Shahr, Iran

Background: Good understanding of medication instructions is paramount to a good pharmaceutical care. The aim of our study was to examine the understandability of the selected three most applicable pictograms by participants and their recall after educational mini sessions. **Materials and Methods:** First, nine experienced pharmacists selected the three most potentially applicable pictograms. Pictograms A to C were determined, respectively, "A-take medication with food," "B-medication may cause drowsiness," and "C-take medication before sleep." In the second phase, we measured the comprehensibility of pictograms by three groups of participants (sample of 358): highly educated participants of two major universities of Isfahan (Groups 1 and 2), low-literate and illiterate individuals (Groups 3 and 4), and the rest were participants interviewed in three teaching pharmacies affiliated to the Isfahan School of Pharmacy (Group 5). The American National Standards Institute (ANSI) and International Organization for Standardization (ISO) were used to compare the comprehensibility of pictograms. Furthermore, five qualitative questions were asked about the impact of pictograms on several parameters. **Results:** In the pre-follow-up period, only Group 1 (75%) understood pictogram A while pictogram B did not pass the ANSI and ISO thresholds for acceptability in none of the groups. In the pre-follow-up period, Groups 1 and 2 surpassed the ANSI threshold and Group 5 passed the ISO limit for C. In the post-follow-up period, C passed the ISO limit in Group 3. Regarding the qualitative questions, 84.1% believed that pictograms had positive impact on the correct use of medications and timing of administration. **Conclusion:** The groups with high level of literacy interpreted the pictograms better than those with lower levels of literacy.

Key words: Comprehensibility, pharmacy, pictograms

INTRODUCTION

Good understanding of medication instructions is paramount to a good pharmaceutical care.[1] Lack of sufficient time spent by physicians, among various reasons, may lead to lack of understanding by patients or their caretakers on the appropriate usage of medications.[2,3] Symbols and drawings have been used historically by humans to communicate. In pharmacy, tools such as pictograms on auxiliary labels and leaflets have been used to improve understanding of medication instructions in different countries of the world.[4-7]

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 not only to improve comprehension but also adherence to medication usage.[8-10]

In Iran, as yet, we do not have any auxiliary labels or pictograms to complement the oral explanations given in the community pharmacies. Therefore, we decided to evaluate level of understanding of different groups of Iranians with different education levels of the selected

Address for correspondence: Prof. Amir H Zargarzadeh, Department of Clinical Pharmacy and Pharmacy Practice, School of Pharmacy and Pharmaceutical Sciences, Isfahan University of Medical Sciences, Hezar Jerib Ave., Isfahan, Iran.
E-mail: amirz1962@yahoo.com

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

MATERIALS AND METHODS

The permission was granted (No. 393276) by the Investigational Review Board of the Isfahan University of Medical Sciences to perform this study, and no major ethical considerations were cited.

This cross-sectional study (June–December 2014) consisted of two phases. The first phase of the study consisted of selecting the most potentially applicable pictograms in Iran. The second phase of the study comprised measuring the comprehensibility of pictograms by three groups of participants: highly educated participants who were graduate students of two major universities of Isfahan (Groups 1 and 2), low-literate or illiterate individuals (Groups 3 and 4), and the rest were participants interviewed in three teaching pharmacies affiliated to the Isfahan University of Medical Sciences, School of Pharmacy, who were waiting to receive their or someone else's filled prescription (Group 5). The data on name, age, gender, level of education, date of interview, follow-up date, university name and major of study (Group 1 only), and telephone contacts were collected. The disease characteristic was not an important factor affecting the comprehensibility of the pictograms. In our data collection form, we divided the answers of respondents into four categories: correct, incorrect, do not know, and reverse interpretation (i.e., if the pictogram indicated to use drug with food, but the respondent stated that it should be taken on an empty stomach). Furthermore, we designed five descriptive questions providing an opportunity for the respondents to qualify their answers. Farsi language was used throughout the project. The questions included: (1) Do pictograms help you in remembering correct time and appropriate way to use the medication? (2) Do pictograms attract your attention on when to use your medication? (3) Do pictograms help you become more adherent with your medications? (4) Can pictograms have potentially negative consequences? (5) Have you ever noticed similar designs on the medication packages you have used already? Furthermore, for each pictogram shown to the participants, we asked whether they have suggestions to improve the design in order to enhance comprehensibility.

Phase I (selection of three pictograms)
Seventy USP pictograms, 1–70, were presented to nine pharmacists working in Isfahan. The first three pharmacists were academic members of the Department of Clinical Pharmacy, Isfahan School of Pharmacy. The next three were members of the Executive Committee of the Iranian Society of Pharmacists - Isfahan Branch. The last three were selected

from the pharmacists in charge of teaching pharmacies affiliated to the Isfahan School of Pharmacy with minimum of 5 years of experience. An interview was used to determine the six most prevalent instructions which auxiliary labels could be used for in the community pharmacies of Isfahan. Pictograms were printed with the actual size of the USP in two columns of each three on each piece of A4 paper in black and white colors as found in the USP Handbook of Drug Evaluation for the Professionals. The three most commonly chosen pictograms were determined as "take medication with food," "medication may cause drowsiness," and "take medication before sleep" and assigned A to C to designate them for further study [Figure 1].

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 text, 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. The sample size was calculated as follows:

$$n = \frac{2S^2\left(Z_1 + Z_2\right)^2}{d^2}$$

The sample size comes to 98 which we rounded it to 100. Because there was a postinterview phase and we might have faced with lower number of participants to attend the second interview, higher numbers were used.

Graduate students of both universities of Isfahan University of Medical Sciences (four schools, mostly medical- and health-related fields) and Isfahan University (nine schools, mostly engineering and social science majors) comprised the first group of highly educated individuals. Lists of graduate students were obtained from Education Departments of both universities. The names were randomly selected. The top fifty names from each list were approached. If after three
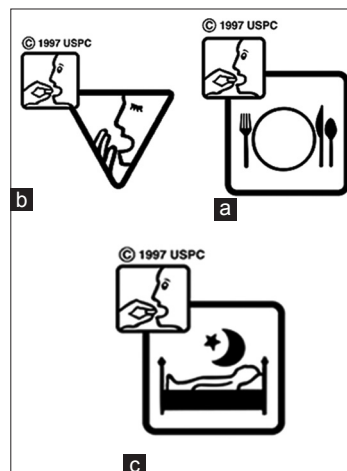

Figure 1: (a-c) Selected pictograms

unsuccessful attempts in reaching them, he or she would be substituted by another one in the list. The objectives of the study were explained and oral consent was obtained.

The second group of participants was chosen from the classes offered to illiterate or low literates by the Nehzat Savad Amuzi (NSA) or Literacy Movement Organization. A list of schools offering classes by NSA-Isfahan Branch was obtained. A total of 111 persons were recruited by convenient sampling from one only male school and eight only female schools, all in the low socioeconomic areas of the city of Isfahan. Each participant was interviewed alone after describing the project and receiving his or her consent. Randomly selected pictograms were shown to each individual one by one and asked about their understanding. The definition for the level of literacy was used based on the NSA definition. Illiterates attended grade one and low literates attended grades two and three.

The remainder was walk-in patients in the three teaching community pharmacies, Seyed o Shohada, Sajjad, and Montazeri Pharmacies. Upon obtaining oral consent (97.3% gave their consent), a brief description was provided and three pictograms were randomly shown and answers were recorded.

An appointment was made with each participant for 1 to 2 weeks for the follow-up interview. Telephone numbers or E-mail addresses were obtained from the Group 5 participants since finding them was more difficult. In the second interview, the procedure described above was repeated exactly and the answers were recorded.

Both parametric statistical tests such as Student's *t*-test and analysis of variance 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

In a total of 358 participants studied, 59% were females. Two percent of our study population were 65 years or older. Sixty-six percent of our participants were considered fully literate [Table 1].

Figure 1 depicts each pictogram and its designation. In the pre-follow-up period, C pictogram was understood most by the participants (71.8%) while A and B were the most problematic for the participants (47.7%, 35.8%).

Despite emphasizing the importance of availability for the second interview to all the participants, twenty (14.3%) participants from the Groups 1 and 2, 9 (8.0%) from the

Table 1: Demographic characteristics of subjects

	Groups 1 and 2 (%)	Groups 3 and 4 (%)	Group 5 (%)	Total (%)
Gender				
Female	70 (50.3)	86 (77)	55 (51)	211 (59)
Male	69 (49.7)	25 (23)	53 (49)	147 (41)
Age range (years)				
18-34	117 (84)	23 (21)	43 (40)	183 (51)
35-64	22 (26)	88 (79)	60 (55)	170 (47)
≥65	0 (0.0)	0 (0.0)	5 (5)	5 (2)
Level of education				
Literate	139 (100)	0 (0.0)	97 (90)	236 (66)
Illiterate/low literate	0 (0.0)	111 (100)	11 (10)	122 (34)

Note: Groups 1 and 2 consist of two groups of medical and non-medical graduate students. Group 3 and 4 consist of two groups of illiterate and low literate subjects. Group 5 consists of subjects interviewed at three teaching pharmacies

Groups 3 and 4, and 77 (71.2%) who were walk-in patients were not reachable. The fallout from the Group 5 was predictable as the participants 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. In this stage, again, C pictogram was understood most (86.8%), followed by B and A (78.3%, 73.6%). Among the improvements measured in this stage, pictogram B showed the biggest improvement in the post-follow-up ($P = 0.0$).

Standards of American National Standards Institute and International Organization for Standardization

Standardization of the pictograms was verified using two different standard criteria, the American National Standards Institute (ANSI), an American and the International Organization for Standardization (ISO), a European standard. According to the ANSI, if 85% or more of participants interpreted a pictogram correctly and 5% or less of participants interpreted the pictogram opposite to what should be, the pictograms would be considered as acceptable. According to the ISO, 67% or more of the participants should interpret the pictograms correctly, to be considered acceptable. Tables 2 and 3 show the acceptability of the three pictograms based on the two criteria before and after follow-up.

Results for each pictogram

In the following, a total of six tables [Tables 2-7] show pre and post follow up results for the three pictograms.

Pictograms A and B and C

Only Group 1 (75%) understood pictogram A in the pre-follow-up period, whereas in the post-follow-up period, Groups 1, 2, and 5 understood the pictogram well enough to pass the ISO standard. Pictogram B did not pass the ISO and ANSI thresholds for acceptability in the pre-follow-up period in none of the groups.

Table 2: Acceptability of pictograms according to ANSI and ISO before follow up

	Group 1	Group 2	Group 3	Group 4	Group 5
Pictogram A	ANSI NO	ANSI NO	ANSI NO	ANSI NO	ANSI NO
	ISO YES	ISO NO	ISO NO	ISO NO	ISO NO
Pictogram B	ANSI NO	ANSI NO	ANSI NO	ANSI NO	ANSI NO
	ISO NO	ISO NO	ISO NO	ISO NO	ISO NO
Pictogram C	ANSI YES	ANSI YES	ANSI NO	ANSI NO	ANSI NO
	ISO YES	ISO YES	ISO NO	ISO NO	ISO YES

Note: Group 1: Medical University graduate students; Group 2: Non-medical University graduate students; Group 3: Low literates; Group 4: Illiterates; Group 5: Walk-in patients

Table 3: Acceptability of pictograms according to ANSI and ISO after follow up

	Group 1	Group 2	Group 3	Group 4	Group 5
Pictogram A	ANSI YES	ANSI NO	ANSI NO	ANSI NO	ANSI NO
	ISO YES	ISO YES	ISO NO	ISO NO	ISO YES
Pictogram B	ANSI YES	ANSI YES	ANSI NO	ANSI NO	ANSI YES
	ISO YES	ISO YES	ISO NO	ISO NO	ISO YES
Pictogram C	ANSI YES	ANSI YES	ANSI NO	ANSI NO	ANSI YES
	ISO YES	ISO YES	ISO YES	ISO NO	ISO YES

In the post-follow-up, however, Groups 1, 2, and 5 reached the acceptability thresholds of both criteria. Pictogram C was better understood than A and B. In the pre-follow-up period, Groups 1 and 2 surpassed the ANSI threshold and Group 5 passed the ISO limit for C [Tables 4-6]; in the post-follow-up period, C passed the ISO limit in Group 3.

Answers to descriptive questions

Five qualitative questions were asked about the impact of pictograms on time and use of medications, their ability to attract participant attention when placed on the packaging of medications, impact on adherence, their ability to have an unwanted impact on general use of medications, perception of participants on the value of pictograms on the packaging of medications, and previous experience of participants with regard to these pictograms. Among the participants questioned, 84.1% believed that pictograms had positive impact on the correct use of medications and timing of administration.

Around 70% stated that they would pay attention to the pictograms when placed on the packaging. Regarding the impact of pictograms on adherence, only 44.4% stated that pictograms would impact positively on adherence and 12.6% did not know what to respond.

Regarding the possibility of unwanted impact of pictograms on the use of medications, only 29.3% felt that the pictograms might cause misunderstanding in the use of medications or they may attract children's attention toward medications causing accidental ingestion.

Our last question in this section was whether they had seen similar examples of these pictograms on the packaging of medications which are already available in the market? More than 2/3 (76.8%) of participants stated that they had not noticed the pictograms on the packaging of medications.

At the end of interview, we asked whether they have ideas or suggestions for the improvement of comprehensibility of these pictograms. Some comments made were shown in Table 7.

DISCUSSION

Given the results presented, level of literacy has an impact on the interpretation of the pictograms in our study. Published reports show positive impact of education on the comprehensibility of pictograms. Knapp *et al.* showed a positive role of literacy on the interpretation of ten pictograms they studied.[11] Dowse and Eehlers also showed that the more literate participants interpreted the pictograms more correctly.[12] Rajesh *et al.* also showed that literacy has a positive role on the interpretation of pictograms regarding the adverse drug reaction of antiretroviral therapy.[13] In our study, females were more than males, but we did not show any difference between the two genders in their interpretability of the pictograms. Rajesh *et al.* study also did not find a difference among the genders in their ability to interpret the pictograms.[13] In the recall phase, we saw improvement in the interpretability of all three pictograms by all groups ranging between 14.8% and 42.5%, the biggest difference in low-literate and illiterate groups. In two other studies, same results have been reported regarding the positive impact of educational mini sessions and interpretability of pictograms after 1–3 weeks' recalls. Knapp *et al.* used a 1-week recall period and showed that in the second interview, most pictograms were interpreted correctly almost twice than the first interview.[11] In Dowse and Ehlers article, they used a 3-week recall period and showed that participants interpreted the pictograms more correctly in the 2nd interview, and depending on whether they were local or USP pictograms, they observed a 3–5 time improvement.[8] These results show that a mini educational session explaining about the pictograms to those who have misinterpreted them can improve comprehensibility, in a 1 or even 3 weeks' period. Knapp *et al.* also argue that "giving the meaning of pictograms to participants is effective in improving their understanding of pictograms."[11] We cannot make any statement about the role of age on the interpretability of pictograms as this was not an objective of our study. Furthermore, the participants with 65 years of age or older were not enough in all groups to make any meaningful comparison. However, Knapp *et al.* showed in their study that with

Table 4: Interpretation of pictogram A before and after follow up

Groups	Correct n (%)		Incorrect n (%)		Don't know n (%)		Reverse n (%)	
	Before	After	Before	After	Before	After	Before	After
1	45 (75)	50 (96.2)	12 (20)	2 (3.8)	3 (5)	0 (0.0)	0 (0.0)	0 (0.0)
2	40 (50.6)	55 (82.1)	38 (48.1)	11 (16.4)	1 (1.3)	1 (1.5)	0 (0.0)	0 (0.0)
3	30 (31.9)	51 (56.7)	59 (62.8)	38 (42.2)	4 (4.3)	0 (0.0)	1 (1.1)	1 (1.1)
4	1 (5.9)	5 (35.7)	10 (58.8)	9 (64.3)	5 (29.4)	0 (0.0)	1 (5.9)	0 (0.0)
5	55 (50.9)	26 (83.9)	51 (47.2)	4 (12.9)	1 (0.9)	1 (3.2)	1 (0.9)	0 (0.0)
Total	171 (47.7)	187 (73.6)	170 (47.5)	64 (25.2)	14 (3.9)	2 (0.8)	3 (0.8)	1 (0.4)

Table 5: Interpretation of pictogram B before and after follow up

Groups	Correct n (%)		Incorrect n (%)		Don't know n (%)		Reverse n (%)	
	Before	After	Before	After	Before	After	Before	After
1	31 (51.7)	49 (94.2	20 (33.3)	3 (5.8)	9 (15)	0 (0.0	0 (0.0)	0 (0.0)
2	49 (62)	62 (92.5	22 (27.8)	5 (7.5)	8 (10.1)	0 (0.0)	0 (0.0)	0 (0.0)
3	11 (11.7)	56 (62.2	68 (72.3)	30 (33.3)	15 (16)	4 (4.4)	0 (0.0)	0 (0.0)
4	0 (0.0)	5 (35.7	14 (82.4	8 (57.1)	3 (17.6)	1 (7.1)	0 (0.0)	0 (0.0)
5	37 (34.3)	27 (87.1)	53 (49.1)	4 (12.9)	18 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)
Total	128 (35.8)	199 (78.3)	177 (49.4)	50 (19.7)	53 (14.8)	5 (2)	0 (0.0)	0 (0.0)

Table 6: Interpretation of pictogram C before and after follow up

Groups	Correct n (%)		Incorrect n (%)		Don't know n (%)		Reverse n (%)	
	Before	After	Before	After	Before	After	Before	After
1	55 (91.7)	51 (98.1)	4 (6.7)	1 (1.9)	1 (1.7)	0 (0.0)	0 (0.0)	0 (0.0)
2	72 (91.1)	62 (92.5)	6 (7.6)	4 (6)	0 (0.0)	1 (1.5)	1 (1.3)	0 (0.0)
3	47 (50)	73 (81.1)	37 (39.4)	17 (18.9)	6 (6.4)	0 (0.0)	4 (4.3)	0 (0.0)
4	5 (29.4)	6 (42.9)	11 (64.7)	7 (50)	0 (0.0)	0 (0.0)	1 (5.9)	1 (7.1)
5	78 (72.2)	28 (90.3)	26 (24.1)	3 (9.7)	3 (2.8)	0 (0.0)	1 (0.9)	0 (0.0)
Total	257 (71.8)	220 (86.6)	84 (23.5)	31 (12.6)	10 (2.8)	1 (0.4)	7 (2)	1 (0.4)

Table 7: Suggestions or ideas on improvement of pictograms comprehensibility

Pictogram A	Add some food to the plate, write the word food on the plate, show the subject while eating and taking the medication
Pictogram B	Show arrows causing sedation after taking the medication, show subject while driving, show a sedated driver behind the wheel, show yawning more clearly
Pictogram C	Show the subject while sitting on the bed, make it simpler, show a moon and several stars as opposed to only one star to avoid confusing with the Red Crescent Society symbol

increase in age, the correct interpretability reduced among their research participants.[11] On the contrary, Barros *et al.* showed in their Brazilian participants that, overall, older age interpreted the pictograms more correctly than the younger age.[14] Regarding the qualitative questions, as seen in the results section, the majority of our participants felt that pictograms had positive impact on time and use of administration of medications and would attract attention of participants. Less than third believed that pictograms may cause reverse understanding of what was meant, and the minority felt that adherence might improve as the result of pictograms. It is important to mention that adherence is a complex phenomenon and multiple factors simultaneously affect adherence to medications. Patient-, therapy-, and condition-related factors in addition to socioeconomic and health-care system factors are among such factors. Therefore, pictograms may play only a small role in improving adherence. Dowse and Ehlers in their study of 46 participants also showed that every single participant reacted positively to the idea of pictograms and felt that the pictograms helped them remember how to take their medications.[8] The majority of our participants had not had any previous experience with pictograms. In the Iranian market, only two pharmaceutical manufacturers, SohaHelal and AlborzDaru, have been using a very simplistic pictogram resembling "morning," "noon," and "evening" on the packaging of their pharmaceuticals. The last qualitative questions referred to any experience participant might have had with seeing such pictograms which majority stated that they had not seen such drawings. Since the use of pictograms is not prevalent among the packaging of pharmaceuticals in Iran, it is very likely that these participants had not come across the products of these two manufacturers. There are published reports, on the other hand, that show either the pictograms may cause

confusion in the highly literate societies[1,11,15,16] 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 participants.[17] Although there are controversies in the role of pictograms, in our study, 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 participants, and modifications of these pictograms may be necessary to make them more conducive to understanding by our local people. We intend to modify those pictograms that did not meet both the ANSI or ISO requirements and field test them again to examine whether the new versions might be more understandable by different groups and throughout a campaign introduce these pictograms with their meanings to our people.

CONCLUSION

The pictograms depicting use of medications before sleep (C) was easier to understand by our study population. The groups with high level of literacy interpreted the pictograms better than those with lower levels of literacy. The impact of education by the interviewer in increasing the comprehensibility of the pictograms in the postinterview phase is quite clear. No difference between the genders was detected in their ability to interpret the pictograms.

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Conflicts of interest
There are no conflicts of interest.

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