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Pictograms for Medication Intake Instructions: Validation, Comprehension and Recall in Populations with Different Education Levels

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The information presented herein is confidential. A manuscript is in preparation and will be submitted for publication.

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OBJECTIVES OF THE STUDY

Good understanding of medication instructions is essential for effective patient treatment. Utilization of pictograms was found to simplify medication instructions and consequently, to improve medication safety, compliance and health outcomes in different groups of population.

The objectives of this study were first, to validate pictograms in a population with a low level of formal education. Secondly, to compare the recall of pictograms' meaning in different groups of population with low, medium and high levels of formal education based on years of schooling completed.

The participants participated to 2 interviews:

The purpose of the first one was to validate and evaluate the pictograms. Several tests were applied; a Guessability test, a Translucency test and a Semiotic analysis. The "education part" took place in this first interview.

The goal of the second one was to evaluate the recall of the pictogram's meaning for each participant. Only a guessability test of recall was done during this interview.

INTRODUCTION

Good understanding of medication instructions is essential for effective patient treatment. However, patients often do not fully understand and may even forget medication instructions given by their healthcare provider once the consultation is over (Bayldon *et al.*, 2013; Yin *et al.*, 2011), and as a consequence, their condition may worsen instead of improve. Misunderstandings may be caused by age, language, low health literacy, low education, stress, lack of experience in receiving a particular medication, and even fear or shame to ask the doctor to repeat their indications, among other factors (Health literacy connection, 2012).

Misunderstanding of treatment indications may lead to increased drug-drug interactions and adverse effects (Kashler *et al.*, 2008), hospitalization rates and mortality (Sudore *et al.*, 2006) which in turn will also impact health care costs (Eichler *et al.*, 2009; Howard *et al.*, 2005). Solving this situation is essential for patients and healthcare staff; and is an important public health issue.

Health literacy and education level

Health literacy is defined as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Selden *et al*., 2000). In Canada, 60% of adults do not have an adequate health literacy to manage their health as appropriate (Health Literacy in Canada, 2008). This correlates in part with the level of literacy, which depends on the education grade, but not exclusively on it; Health care information can be difficult to understand even in people with more years of formal education (Kashler *et al*., 2008). Most health instructions are written for a 10^{th} grade level or higher, while the majority of adults are estimated to read at an eighth or ninth grade level (Davis, Wolf, Bass, Middlebrooks, *et al*., 2006; Moon *et al*., 2005; Safeer and Keenan, 2005).

Indeed, formal education provides literacy skills; but health literacy skills likely depend on other factors as well. While 48% of Canadians have less than high school education, it is estimated that 60% of Canadians have low levels of health literacy, which interferes with proper healthcare

communication, as reported by the Canadian Council of Learning in 2008 (Health Literacy in Canada, 2008).

Patients with low health literacy could, for example, take their medications at inappropriate times, incorrect dosages, or even by the wrong route of administration. Moreover, older patients with less years of formal education are more likely to not understand and to not remember their medical instructions (Baker *et al*., 2008; Bostock and Steptoe, 2012).

Communication, pictograms and recall

Proper communication between healthcare providers and patients is important, especially for patients with chronic diseases such as diabetes or hypertension (Williams *et al.*, 1998) and as mentioned above, is particularly important in patients with low literacy (Villaire and Mayer, 2007; Davis, Wolf, Bass, Thompson, *et al.*, 2006). Many patients complain they did not understand what the physician explained them about their medical condition or prescription direction because they used words that they could not understand. Indeed, healthcare providers often do not know if patients have low literacy or low health literacy, believe they are higher than it is and think that they understand everything they say (Safeer and Keenan, 2005). Like mentioned above, misunderstandings between healthcare providers and their patients may impact patients' health and may harm the patients if medications are not taken properly.

The use of pictograms simplifies medication instructions and consequently improves medication safety, compliance and health outcomes in different populations (Dowse and Ehlers, 2001; Houts, Witmer et al., 2001; Kripalini et al., 2008; Dowse and Ehlers, 2005). Indeed, humans have a cognitive preference for picture-based rather than text-based information (Katz *et al*., 2006; Mbuagbaw and Ndongmanji, 2012). Pictures linked to written or spoken text can markedly increase comprehension, attention to and recall of medications instruction (Dowse and Ehlers, 2005; Houts, Doak et al., 2006) and health education information since pictograms can enhance memory of spoken medical instructions (Houts, Bachrach et al., 1998). In addition, pictorial aids have been found to improve patients' satisfaction with medication instructions (Dowse and Ehlers, 2001; Katz *et al.*, 2006; Kripalini et al., 2007). However, contrary to the first assumption, that the images could serve as a universal language, understood by all; research has shown that various

factors such as age, origin, habits, level of health literacy, level of education and other, can influence the interpretation of pictograms (Chan and Chan, 2013; Vredenburgh, 2009). These factors also influence healthcare communication in general, as mentioned above.

Previous studies (Montagne, 2013; Houts, Doak *et al.*, 2006) have shown that the meaning of pictograms are understood at low or moderate levels the first time that they were shown to the general population, and the people with low levels of education interpret pictograms less accurately than those with higher levels of education. However, after educating the participants about what each pictogram is representing, the recall of the pictogram's meaning can improve (Dowse and Ehlers, 2003). In practice, patients take their medications during few weeks and need to remember the intake instructions during this time. Pictograms are also an aid in recall of information. To date, no studies have compared the mid-term recall in populations with different levels of formal education.

Like mentioned above, the comprehension of the meaning of pictograms depends of different factors. Therefore, to evaluate and validate pictograms, this is very important to choose the population and test this target population.

The aim of this study was first, to evaluate and validate pictograms in a population with a low level of schooling's education. Then, based on the results obtained and the sample tested, the study took a different turn to finally evaluate and compare the medium-term recall of medications intake instructions after training in a population with different levels of formal education.

MATERIALS AND METHODS

Population and Sample

Participants were adults who attended one of three adult education programs in Ottawa, Canada. A total of 111 consecutive participants were recruited from 3 different schools in Ottawa, Ontario, Canada: *"Moi J'apprends"*, a literacy center, *"La Cite Collegiale"* – from FBO, "*Formation de Base de l'Ontario"* (Base training of Ontario for adults) and CLIC, "*Cours de Langues pour Immigrants au Canada"* (Language courses for new Canadian immigrants) programs –, and *"Le Carrefour"*, a school who provides literacy courses. Participants' recruitment took place during the fall of 2013.

Participants were considered eligible for the study if they were 19 years of age or older, and were considered ineligible if they were not willing to participate, were visually impaired, with hearing problems or were not able to communicate in French or English. All participants provided informed consent and the study was approved by CHEO's Research Ethics Board. A total of 111 individuals participated in the first test, 90 of whom took part in the recall tests.

Schooling Level Stratification

Students at the participating sites present an entrance exam and a literacy exam and based on the results, they are placed at their level and grade for their courses. La Cité Collégiale, CLIC and FBO programs and Le Carrefour's test is called "*Batterie de tests de classement aux Niveaux de Compétence Linguistique Canadiens"* (BTC-NCLC), evaluates "NCLC" levels 1 to 8 in listening, speaking, reading and writing. It provides language assessors, French second language teachers, counselors and program coordinators with a valid, reliable, standardized tool to place adult learners in federally and provincially funded programs (CCLB, 2009). The School "Moi j'Apprends" uses the test from PEFA*, "Partenaire en Education et Formation des Adultes",* developed few years ago and which is based on skill levels of NCLC (Niveaux de Compétence Linguistique Canadiens), AFB (Formation de Base de l'Ontario) and TPCL (Test Provincial de Compétences Linguistiques de l'Ontario).

Participants were identified as having “low”, “medium” or “high” schooling levels based on the number of years of formal education. People with between 0 and 6 years of formal education were placed in the group “Low Schooling Level”. Those who had between 6 and 12 years of schooling were placed in the group “Medium Level of Education”; and individuals with more than 12 years of schooling were in the “High Level of Education” group.

Study design

The research was conducted between October and December 2013. One-on-one structured interviews were performed by only one research assistant, to reduce variability of results. Two different concepts were examined to determine pictogram comprehension: transparency and translucency. ***Transparency*** is “the guessability of the meaning” of a picture or image when the signification is unknown by participants. ***Translucency*** refers to the relationship between the pictogram or image and its signification or referent, in other words, it is the degree to which participant believes that the image represents what it is supposed to portray after being told the meaning of the pictogram (Bloomberg, 1990; Bellugi and Klima, 1976; Roberts *et al.*, 2009) Semiotic analysis was performed. Participants provided feedback and informed what components of each pictogram made it easy or difficult to convey its meaning.

Validation of pictograms

International standards have been established to evaluate and validate the comprehensibility of pictograms. The meaning of the image must be understood and guessed by at least 85% of the population tested for the American National Standard’s Institute (ANSI Z535.3, 1991) and by at least 67% for the International Standards Organization’s (ISO 3864, 1984). The instructions to take a medication adequately are very important and that is why, even if these standards may be considered arbitrary, the comprehension should be above 85% to decide to use a pictogram safely.

Materials

A total of 71 pictograms from the International Pharmaceutical Federation (FIP, 2009) were tested. These pictograms have been validated in different populations (Korenevsky *et al*., 2013; Richler *et al*., 2012). These symbols represented 5 categories of medication instructions: Doses and Routes, Frequencies, Indications, Precautions and Side Effects. Pictograms within each of these 5 categories were mixed randomly and separated in 2 sets of pictograms: set A which contained 35 pictograms and set B with the remaining 36, for a total of 71 pictograms. They were printed in black and white and presented on white cards (A6 format, 10.5 cm x 14.8 cm). Each pictogram was numbered and the sets were shown in the same order to the participants.

Recruitment

To recruit participants, initially, the project and the concept of pictograms were explained to the students from FBO programs in La Cité Collégiale by teachers and the research assistant through a power point presentation. However, this way of presenting the project seemed too daunting and formal for the students, so in the other two participating schools, the teachers helped recruit the students by explaining the project in their different classes.

Phase I - Interview and Data Collection

The one-on-one interviews were held in a separate and private place at the three participating schools. Before showing the pictograms, the concept of using pictograms for instructions of medication intake was explained to each participant by the trained research assistant, as well as different categories of instruction they would encounter (Doses and Routes, Frequencies, Indications, Precautions and Side effects). The participants were asked if they had any questions or concerns regarding the study and were then invited to sign the consent form if they could read and write, or were asked for their verbal consent, with the signature of a witness if they could not read and write (see appendix I). After this, demographic data was collected, including age, gender,

origin, highest level of schooling achieved, number of years of no training before entering the program and approximate number of medications the participant was taking at the time. Names of participants were recorded and an identifier number was given. The name of participants was not entered into the database, and was kept in a locked cabinet.

Following this, a pictogram survey was randomly assigned to the participant and the guessability test was performed with a structured interview format. Each pictogram was shown one at a time to the participants, and they were asked for the meaning of it. All the 35 or 36 pictograms of the set were shown. As each pictogram was presented the responses obtained from each participant were written on the data collection paper (see appendix II). No feedback was provided on their meaning until all 35 or 36 pictograms were presented. The answers were scored as "correct" if the meaning of the pictogram was exactly the real signification, and only if all of the elements of the pictogram were correctly identified; responses were "partially correct" if the guessed meaning missed some details, but nothing to really interfere with the medication intake or to make it unsafe. Responses were classified as "incorrect" if the guessed meaning was totally incorrect, if they were inaccurate or did not contain all aspect of the instructions or if it could make dangerous the administration of drug. These scores were recorded on the data collection tool. During the test, due to the high number of pictograms, the notion of pictograms as help aids for medication intake instructions was repeated again to all participants.

The next part of the study was undertaken. Participants were informed about the meaning of each pictogram and the details of each picture were explained to educate them. The length of time of the interview was adapted to each participant. When needed, interview times were extended to ensure individual participants' comprehension of significance of the pictograms. Interviews lasted between 25 and 90 minutes.

Subsequently, the translucency test was performed. Participants were asked to assess with a scale of 1 to 7, how well each pictogram communicates what it supposed to represent. A rating of 1 indicates that there is no relationship between the pictogram and its meaning, whereas, a rating of 7 indicates a very strong relationship. A score of 2 to 6 indicates there is some relationship between the image and its meaning. However, due to low numeracy and low literacy levels of several participants, the scale had to be converting in very simple words (1 = very very bad, 2 = very bad, 3 = bad, 4 = not bad, 5 = good, 6 = very good, 7 = very very good) for these participants. After giving this guidance, each participant was asked to comment on each pictogram's specific

elements that they believed make it easy or hard to understand the message it is supposed to depict and then were asked to suggest modifications to help improve the comprehension of each pictogram. These scores and these qualitative descriptions were recorded on the data collection sheet. During Phase I of the study, participants were not told they would be invited to take part in Phase II of the study.

After each first interview, a candy was provided to each participant in appreciation for their participation.

Phase II – Second Interview

Participants were evaluated for the recall of the meaning of the pictograms they had been shown 2-3 weeks before. The same set of pictograms was shown to them and they were asked to tell their meaning, which is a second guessability test, in this case, a recall test. Again, the answers were recorded as correct, incorrect or partially correct, according to the same classifications defined above.

Statistical Analysis

Data from each participant were recorded using a data collection sheet and entered into a SPSS version 21 database (Statistical Package for the Social Sciences). For each participant in phase I and phase II, a percentage score was computed for pictogram meanings identified correctly or partially correctly. Statistical analyses were performed using SPSS. Descriptive statistics (mean, standard deviations, range, frequencies) were calculated for each variable.

A linear model was used to compare percentage scores between participants with “low”, “medium” or “high” schooling levels, adjusting for potential confounding variables sex and country of origin. Post hoc Tukey tests were used to adjust for multiple comparisons. Mean percentage scores by schooling level, adjusted for gender and country of origin, were also computed together with 95% confidence intervals.

RESULTS

Demographics

A total of 111 adults participated in this study. All participants were taking French alphabetization courses. The demographic data are summarized in Table 1.

The mean age for all the participants was 41.4 years (SD, 15.1; range, 19 to 79 years). Seventy percent of the population was female. Three predominant origins were observed; Haitian (40.5%), African (25.2%) and North American (20.7%). Thirteen percent had different origins and were grouped as "Other", which included Middle East (5.4%), Asia (3.6%), European (2.7%) and South American (1.8%). Almost the half (42.3%) had no primary grade, one third (33.3%) had at least the primary grade completed and quarter (24.3%) had over 12 years of formal education. The mean number of medications regularly taken was 0.95 (SD, 1.6; range, 0 to 7 medications).

One-hundred and eleven participants took part in the initial interview that included the guessability and translucency tests. The recall test was performed on 90 participants between 11 and 56 days (mean, 24.21; SD, 12.29 days) after the initial guessability test. The remainder twenty-one participants could not be followed-up for a second test. The reasons were varied: 5 were sick, 3 were pregnant, 2 found a job, 2 had young children and were irregular, 2 had finished their courses, 2 declined to do the recall and 5 were absent for unknown reasons.

Forty seven of the participants had less than 6 years of formal education; 37 between 6 and 12; and 27 over 12 years of formal education. Of the group with low education levels, 16 individuals had never received formal schooling, and, the median was 2 years of schooling. For the group with an education level between 6 and 12 years, the median was 10 years of schooling.

Table 1. Participants Demographic Information

Groups	N1[1]	N2[1]	Questionnaire		Age Mean (Range)	Gender			% Origin				Number of medications regularly taken Mean (Range)	Number of days before recall Mean (Range)
			A[2]	B[2]		M[2]	F[2]	Ratio F:M	NA[3]	A[3]	H[3]	O[3]		
Overall	111	90	54	57	41.44 (19-79)	33	78	2.4	20.7	25.2	40.5	13.5	0.95 (0-7)	24.21 (11-56)
Low (1-6 years)	47	43	24	23	49.13 (20-79)	13	34	2.6	12.8	21.2	66.0	0	1.32 (0-7)	18.98 (12-33)
Medium (7-12)	37	28	20	17	34.43 (19-59)	13	24	1.8	37.8	24.3	32.4	5.4	0.89 (0-5)	27.32 (11-56)
High (over 12 years)	27	19	10	17	37.67 (22-64)	7	20	2.9	11.1	33.3	7.4	48.1	0.37 (0-5)	31.47 (19-52)

[1]Number of participants for N1=the first test, N2=during the recall

[2]Number of participants for A=Questionnaire A, B=Questionnaire B, M=Male, F=Female

[3]% of participants from NA=North America, A=Africa, H=Haiti, O=Other, including Middle East, Asia, Europe, South America

Validation of each Pictograms in Low Educated People

The results for the guessability, translucency and recall tests for each pictogram are depicted on the Tables 2, 3, 4 and 5. Of the 71 pictograms studied, only 7 reached 85% of guessability (ANSI Z535.3, 1991) after the first interview in the lower formal education group (6 or less year of formal education) and 7 additional pictograms reached the 85% guessability after the second test. Thus, 14 pictograms were validated at recall in this group. A total of twelve pictograms achieved 67% of guessability (ISO 3864, 1984) the first time and 16 additional ones were correctly guessed at recall after the second interview.

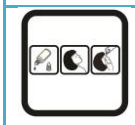
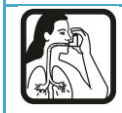
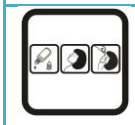
In the group of participants that had received between 6 and 12 years of formal education, there were 21 and 35 of pictograms initially guessed correctly for the ANSI and ISO respectively, and during recall this number increased to 36 and 55 respectively.

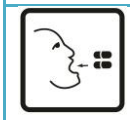
For the people with highest education levels, out of a total of 71 pictograms, 35 and 55 were validated with more than 85% and 67% respectively during the first interview and 62 and 68 during the recall, with the same standard values.

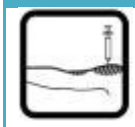
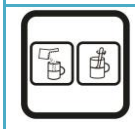
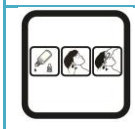
Translucency

The scores for translucency and the comparison with the results of guessability after recall showed no correlation. In general, the translucency scores were very high in all groups. Participants expressed their satisfaction with pictograms and were not critical at this point.

Table 2. Guessability, translucency and recall for doses and routes' pictograms

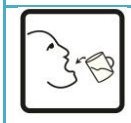
Picto	Groups	Guess 1	Trans	Guess Recall	Picto	Groups	Guess 1	Trans	Guess Recall
	<6	95.7 (n=23)	100	100 (n=21)		<6	43.5 (n=23)	100	85.7 (n=21)
	6-12	94.1 (n=17)	100	100 (n=12)		6-12	70.6 (n=17)	94.1	75 (n=12)
	>12	100 (n=17)	100	100 (n=11)		>12	94.1 (n=17)	94.1	100 (n=11)
	Overall	96.5 (n=57)	100	100 (n=44)		Overall	66.7 (n=57)	96.5	86.4 (n=44)
	<6	91.7 (n=24)	100	100 (n=22)		<6	21.7 (n=23)	91.3	81 (n=21)
	6-12	95 (n=20)	95	100 (n=16)		6-12	52.9 (n=17)	100	83.3 (n=12)
	>12	100 (n=10)	80	100 (n=8)		>12	64.7 (n=17)	94.1	100 (n=11)
	Overall	94.4 (n=54)	94.4	100 (n=46)		Overall	43.9 (n=57)	94.7	86.4 (n=44)
	<6	87.5 (n=24)	100	100 (n=22)		<6	75 (n=24)	95.8	86.4 (n=22)
	6-12	75 (n=20)	100	93.8 (n=16)		6-12	85 (n=20)	85	81.3 (n=16)
	>12	80 (n=10)	100	100 (n=8)		>12	90 (n=10)	90	87.5 (n=8)
	Overall	81.5 (n=54)	100	97.9 (n=46)		Overall	81.5 (n=54)	90.7	84.8 (n=46)
	<6	91.7 (n=24)	95.8	95.5 (n=22)		<6	43.5 (n=23)	91.3	66.7 (n=21)
	6-12	95 (n=20)	85	100 (n=16)		6-12	88.2 (n=17)	94.1	100 (n=12)
	>12	90 (n=10)	70	100 (n=8)		>12	100 (n=17)	100	100 (n=11)
	Overall	92.6 (n=54)	87	97.8 (n=46)		Overall	73.7 (n=57)	94.7	84.1 (n=44)

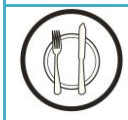
	<6	60.9 (n=23)	95.7	90.5 (n=21)		<6	47.8 (n=23)	100	66.7 (n=21)
	6-12	100 (n=17)	100	100 (n=12)		6-12	88.2 (n=17)	94.1	91.7 (n=12)
	>12	94.1 (n=17)	100	100 (n=11)		>12	100 (n=17)	100	100 (n=11)
	Overall	82.5 (n=57)	98.2	95.5 (n=44)		Overall	75.4 (n=57)	98.2	81.8 (n=44)
	<6	50 (n=24)	91.7	86.4 (n=22)		<6	34.8 (n=23)	91.3	71.4 (n=21)
	6-12	70 (n=20)	90	100 (n=16)		6-12	58.8 (n=17)	88.2	83.3 (n=12)
	>12	100 (n=10)	90	100 (n=8)		>12	88.2 (n=17)	94.1	100 (n=11)
	Overall	66.7 (n=54)	90.7	93.5 (n=46)		Overall	57.9 (n=57)	91.2	81.8 (n=44)
	<6	87.5 (n=24)	100	86.4 (n=22)		<6	34.8 (n=23)	87	61.9 (n=21)
	6-12	95 (n=20)	90	100 (n=16)		6-12	88.2 (n=17)	94.1	91.7 (n=12)
	>12	100 (n=10)	90	100 (n=8)		>12	94.1 (n=17)	100	100 (n=11)
	Overall	92.6 (n=54)	94.4	93.5 (n=46)		Overall	68.4 (n=57)	93	79.5 (n=44)
	<6	60.9 (n=23)	100	90.5 (n=21)		<6	21.7 (n=23)	95.7	71.4 (n=21)
	6-12	88.2 (n=17)	100	91.7 (n=12)		6-12	58.8 (n=17)	76.5	75 (n=12)
	>12	82.4 (n=17)	100	100 (n=11)		>12	76.5 (n=17)	82.4	100 (n=11)
	Overall	75.4 (n=57)	100	93.2 (n=44)		Overall	49.1 (n=57)	86	79.5 (n=44)

	<6	79.2 (n=24)	100	95.5 (n=22)		<6	58.3 (n=24)	95.8	63.6 (n=22)
	6-12	90 (n=20)	95	81.3 (n=16)		6-12	70 (n=20)	90	87.5 (n=16)
	>12	80 (n=10)	90	100 (n=8)		>12	70 (n=10)	70	100 (n=8)
	Overall	83.3 (n=54)	96.3	91.3 (n=46)		Overall	64.8 (n=54)	88.9	78.3 (n=46)
	<6	41.7 (n=24)	87.5	77.3 (n=22)		<6	20.8 (n=24)	83.3	50 (n=22)
	6-12	65 (n=20)	85	93.8 (n=16)		6-12	45 (n=20)	85	87.5 (n=16)
	>12	90 (n=10)	90	100 (n=8)		>12	90 (n=10)	80	100 (n=8)
	Overall	59.3 (n=54)	87	87 (n=46)		Overall	42.6 (n=54)	83.3	71.7 (n=46)
	<6	75 (n=24)	100	77.3 (n=22)		<6	26.1 (n=23)	73.9	42.9 (n=21)
	6-12	85 (n=20)	100	93.8 (n=16)		6-12	47.1 (n=17)	88.2	66.7 (n=12)
	>12	100 (n=10)	100	100 (n=8)		>12	88.2 (n=17)	88.2	100 (n=11)
	Overall	83.3 (n=54)	100	87 (n=46)		Overall	50.9 (n=57)	82.5	63.6 (n=44)
	<6	69.6 (n=23)	95.7	81 (n=21)		<6	34.8 (n=23)	95.7	81 (n=21)
	6-12	94.1 (n=17)	94.1	91.7 (n=12)		6-12	64.7 (n=17)	76.5	83.3 (n=12)
	>12	88.2 (n=17)	94.1	90.9 (n=11)		>12	100 (n=17)	94.1	100 (n=11)
	Overall	82.5 (n=57)	94.7	86.4 (n=44)		Overall	63.2 (n=57)	89.5	86.4 (n=44)

Picto, Pictograms; Groups, Number of years of formal education; Guess1, Guessability during the first interview, % of correct; Trans, % of translucency's score higher or equal 5; Guess Recall, Guessability during the recall, % of correct.

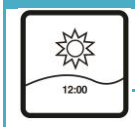
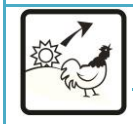
Table 3. Guessability, translucency and recall for precautions' pictograms

Picto	Groups	Guess 1	Trans	Guess Recall	Picto	Groups	Guess 1	Trans	Guess Recall
	<6	52.2 (n=23)	100	81 (n=21)		<6	25 (n=24)	95.8	54.5 (n=22)
	6-12	94.1 (n=17)	100	100 (n=12)		6-12	85 (n=20)	100	93.8 (n=16)
	>12	100 (n=17)	100	100 (n=11)		>12	90 (n=10)	100	100 (n=8)
	Overall	78.9 (n=57)	100	90.9 (n=44)		Overall	59.3 (n=54)	98.1	76.1 (n=46)
	<6	43.5 (n=23)	95.7	81 (n=21)		<6	37.5 (n=24)	95.8	59.1 (n=22)
	6-12	70.6 (n=17)	94.1	100 (n=12)		6-12	65 (n=20)	100	85 (n=16)
	>12	82.4 (n=17)	82.4	100 (n=11)		>12	90 (n=10)	100	100 (n=8)
	Overall	63.2 (n=57)	91.2	90.9 (n=44)		Overall	57.4 (n=54)	98.1	73.9 (n=46)
	<6	70.8 (n=24)	87.5	86.4 (n=22)		<6	29.2 (n=24)	91.7	50 (n=22)
	6-12	85 (n=20)	95	87.5 (n=16)		6-12	50 (n=20)	80	81.3 (n=16)
	>12	100 (n=10)	100	100 (n=8)		>12	100 (n=10)	100	100 (n=8)
	Overall	81.5 (n=54)	92.6	89.1 (n=46)		Overall	50 (n=54)	88.9	69.6 (n=46)
	<6	39.1 (n=23)	95.7	76.2 (n=21)		<6	8.7 (n=23)	95.7	28.6 (n=21)
	6-12	58.8 (n=17)	88.2	100 (n=12)		6-12	47.1 (n=17)	94.1	100 (n=12)
	>12	70.6 (n=17)	100	100 (n=11)		>12	94.1 (n=17)	100	100 (n=11)
	Overall	54.4 (n=57)	94.7	88.6 (n=44)		Overall	45.6 (n=57)	96.5	65.9 (n=44)

	<6	50 (n=23)	91.3	66.7 (n=21)		<6	29.2 (n=24)	100	36.3 (n=10)
	6-12	82.4 (n=17)	94.1	100 (n=12)		6-12	45 (n=20)	90	81.3 (n=16)
	>12	88.2 (n=17)	100	100 (n=11)		>12	70 (n=10)	90	100 (n=8)
	Overall	71.4 (n=57)	94.7	84.1 (n=44)		Overall	42.6 (n=54)	94.4	63 (n=46)
	<6	52.2 (n=23)	91.3	61.9 (n=21)		<6	0 (n=23)	82.6	28.6 (n=21)
	6-12	76.5 (n=17)	94.1	100 (n=12)		6-12	41.2 (n=17)	88.2	66.7 (n=12)
	>12	94.1 (n=17)	94.1	100 (n=11)		>12	70.6 (n=17)	64.7	90.9 (n=11)
	Overall	71.9 (n=57)	93	81.8 (n=44)		Overall	33.3 (n=57)	78.9	54.5 (n=44)
	<6	37.5 (n=24)	95.8	68.2 (n=22)		<6	0 (n=23)	100	23.8 (n=21)
	6-12	95 (n=20)	85	87.5 (n=16)		6-12	23.5 (n=17)	94.1	41.7 (n=12)
	>12	90 (n=10)	80	87.5 (n=8)		>12	58.8 (n=17)	82.4	90.9 (n=11)
	Overall	68.5 (n=54)	88.9	78.3 (n=46)		Overall	24.6 (n=57)	93	45.5 (n=44)
	<6	16.7 (n=24)	100	54.5 (n=22)		<6	0 (n=24)	87.5	27.3 (n=22)
	6-12	75 (n=20)	90	93.8 (n=16)		6-12	5 (n=20)	75	37.5 (n=16)
	>12	90 (n=10)	90	100 (n=8)		>12	10 (n=10)	70	75 (n=8)
	Overall	51.9 (n=54)	94.4	76.1 (n=46)		Overall	3.7 (n=54)	79.6	39.1 (n=46)

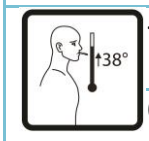
Picto, Pictograms; Groups, Number of years of formal education; Guess1, Guessability during the first interview, % of correct; Trans, % of translucency's score higher or equal 5; Guess Recall, Guessability during the recall, % of correct.

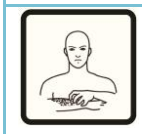
Table 4. Guessability, translucency and recall for frequencies' pictograms

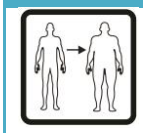
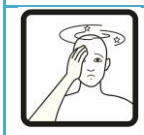
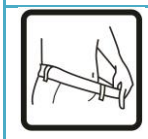
Picto	Groups	Guess 1	Trans	Guess Recall	Picto	Groups	Guess 1	Trans	Guess Recall
	<6	41.7 (n=24)	91.7	77.3 (n=22)		<6	34.8 (n=23)	91.3	47.6 (n=21)
	6-12	85 (n=20)	100	100 (n=16)		6-12	58.8 (n=17)	100	58.3 (n=12)
	>12	60 (n=10)	100	100 (n=8)		>12	76.5 (n=17)	82.4	100 (n=11)
	Overall	61.1 (n=54)	96.3	89.1 (n=46)		Overall	54.4 (n=57)	91.2	63.6 (n=44)
	<6	26.1 (n=23)	95.7	66.7 (n=21)		<6	16.7 (n=24)	87.5	40.9 (n=22)
	6-12	58.8 (n=17)	88.2	83.3 (n=12)		6-12	40 (n=20)	95	75 (n=16)
	>12	100 (n=17)	100	100 (n=11)		>12	50 (n=10)	70	100 (n=8)
	Overall	57.9 (n=57)	94.7	79.5 (n=44)		Overall	31.5 (n=54)	87	63 (n=46)
	<6	29.2 (n=24)	91.7	54.5 (n=22)		<6	0 (n=24)	91.7	4.5 (n=22)
	6-12	75 (n=20)	95	93.8 (n=16)		6-12	5 (n=20)	45	31.3 (n=16)
	>12	80 (n=10)	90	100 (n=8)		>12	50 (n=10)	50	75 (n=8)
	Overall	55.6 (n=54)	92.6	76.1 (n=46)		Overall	11.1 (n=54)	66.7	26.1 (n=46)

Picto, Pictograms; Groups, Number of years of formal education; Guess1, Guessability during the first interview, % of correct; Trans, % of translucency's score higher or equal 5; Guess Recall, Guessability during the recall, % of correct.

Table 5. Guessability, translucency and recall for indications and side effects' pictograms

Picto	Groups	Guess 1	Trans	Guess Recall	Picto	Groups	Guess 1	Trans	Guess Recall
	<6	100 (n=24)	100	100 (n=22)		<6	43.5 (n=23)	91.3	33.3 (n=21)
	6-12	95 (n=20)	90	100 (n=16)		6-12	76.5 (n=17)	100	91.7 (n=12)
	>12	100 (n=10)	100	100 (n=8)		>12	88.2 (n=17)	100	90.9 (n=11)
	Overall	98.1 (n=54)	96.3	100 (n=46)		Overall	66.7 (n=57)	96.5	63.6 (n=44)
	<6	91.7 (n=24)	100	95.5 (n=22)		<6	8.7 (n=23)	73.9	23.8 (n=21)
	6-12	100 (n=20)	100	100 (n=16)		6-12	43.8 (n=16)	93.3	100 (n=11)
	>12	100 (n=10)	100	100 (n=8)		>12	93.8 (n=16)	100	100 (n=7)
	Overall	96.3 (n=54)	100	97.8 (n=46)		Overall	43.6 (n=55)	86	59 (n=39)
	<6	33.3 (n=24)	87.5	63.6 (n=22)		<6	4.3 (n=23)	73.9	33.3 (n=21)
	6-12	90 (n=20)	95	100 (n=16)		6-12	18.8 (n=16)	86.7	81.8 (n=11)
	>12	80 (n=10)	90	100 (n=8)		>12	43.8 (n=16)	58.3	100 (n=7)
	Overall	63 (n=54)	90.7	82.6 (n=46)		Overall	20 (n=55)	74	59 (n=39)
	<6	34.8 (n=23)	87	61.9 (n=21)		<6	16.7 (n=24)	79.2	31.8 (n=22)
	6-12	82.4 (n=17)	88.2	91.7 (n=12)		6-12	35.3 (n=17)	71.4	63.6 (n=11)
	>12	82.4 (n=17)	100	100 (n=11)		>12	71.4 (n=7)	100	100 (n=5)
	Overall	63.2 (n=57)	91.2	79.5 (n=44)		Overall	31.3 (n=48)	80	50 (n=38)

	<6	45.8 (n=24)	95.8	68.2 (n=22)		<6	4.2 (n=24)	83.3	45.5 (n=22)
	6-12	80 (n=20)	95	81.3 (n=16)		6-12	25 (n=20)	65	37.5 (n=16)
	>12	60 (n=10)	80	100 (n=8)		>12	36.4 (n=10)	60	75 (n=8)
	Overall	61.1 (n=54)	92.6	78.3 (n=46)		Overall	18.2 (n=54)	72.2	47.8 (n=46)
	<6	34.8 (n=23)	91.3	61.9 (n=21)		<6	13 (n=23)	82.6	28.6 (n=21)
	6-12	82.4 (n=17)	94.1	83.3 (n=12)		6-12	47.1 (n=17)	76.5	50 (n=12)
	>12	94.1 (n=17)	100	100 (n=11)		>12	58.8 (n=17)	82.4	81.8 (n=11)
	Overall	66.7 (n=57)	94.7	77.3 (n=44)		Overall	36.8 (n=57)	80.7	47.7 (n=44)
	<6	13 (n=23)	87	71.4 (n=21)		<6	12.5 (n=24)	83.3	23.8 (n=21)
	6-12	52.9 (n=17)	94.1	75 (n=12)		6-12	41.2 (n=17)	85.7	63.6 (n=11)
	>12	58.8 (n=17)	82.4	90.9 (n=11)		>12	71.4 (n=7)	28.6	100 (n=5)
	Overall	38.6 (n=57)	87.7	77.3 (n=44)		Overall	31.3 (n=48)	100	45.9 (n=37)
	<6	43.5 (n=23)	91.3	66.7 (n=21)		<6	4.3 (n=23)	73.9	9.5 (n=21)
	6-12	47.1 (n=17)	64.7	75 (n=12)		6-12	52.9 (n=17)	88.2	66.7 (n=12)
	>12	76.5 (n=17)	70.6	90.9 (n=11)		>12	82.4 (n=17)	88.2	81.8 (n=11)
	Overall	54.4 (n=57)	77.2	75 (n=44)		Overall	42.1 (n=57)	82.5	43.2 (n=44)

	<6	16.7 (n=24)	91.7	45.5 (n=22)		<6	13 (n=23)	69.6	19 (n=21)
	6-12	70 (n=20)	95	93.8 (n=16)		6-12	17.6 (n=17)	70.6	50 (n=12)
	>12	70 (n=10)	100	100 (n=8)		>12	41.2 (n=17)	64.7	72.7 (n=11)
	Overall	46.3 (n=54)	94.3	71.7 (n=46)		Overall	22.8 (n=57)	68.4	40.9 (n=44)
	<6	52.2 (n=23)	87	47.6 (n=21)		<6	8.3 (n=24)	87.5	27.3 (n=22)
	6-12	58.8 (n=17)	88.2	83.3 (n=12)		6-12	10 (n=20)	60	43.7 (n=16)
	>12	82.4 (n=17)	100	100 (n=11)		>12	20 (n=10)	50	62.5 (n=8)
	Overall	63.2 (n=57)	91.2	70.5 (n=44)		Overall	11.1 (n=54)	70.4	39.1 (n=46)
	<6	26.1 (n=23)	78.3	47.6 (n=21)		<6	13 (n=23)	82.6	28.6 (n=21)
	6-12	52.9 (n=17)	88.2	83.3 (n=12)		6-12	41.2 (n=17)	88.2	41.7 (n=12)
	>12	82.4 (n=17)	82.4	90.9 (n=11)		>12	29.4 (n=17)	52.9	36.4 (n=11)
	Overall	50.9 (n=57)	82.5	68.2 (n=44)		Overall	26.3 (n=57)	75.4	34.1 (n=44)
	<6	37.5 (n=24)	87.5	50 (n=22)		<6	4.2 (n=24)	87.5	9.1 (n=22)
	6-12	60 (n=20)	90	75 (n=16)		6-12	20 (n=20)	65	43.8 (n=16)
	>12	80 (n=10)	90	100 (n=8)		>12	60 (n=10)	70	62.5 (n=8)
	Overall	53.7 (n=54)	88.9	67.4 (n=46)		Overall	20.4 (n=54)	75.9	30.4 (n=46)

Picto, Pictograms; Groups, Number of years of formal education; Guess1, Guessability during the first interview, % of correct; Trans, % of translucency's score higher or equal 5; Guess Recall, Guessability during the recall, % of correct.

Pictogram Validation in Each Education Level Group

The percent of correct guessability tests for all pictograms from either group A (35 pictograms) or Group B (36 pictograms) was calculated for each participant. To get insight into the level of comprehension of pictograms as a whole, the average percent of correct guessability tests was calculated for each of the 3 groups of education level studied. The results are depicted in Table 6. On average, individuals with lowest education levels guessed the meaning of the pictograms correctly for 38.0% of the pictograms. Participants with formal education levels between 6 and 12 years guessed correctly 63.7% of the pictograms shown. Participants with more than 12 years of formal education guessed 78.7% of pictograms correctly. The differences between these groups were statistically significant.

To investigate if the differences in correct guessability rates in the three groups were due to factors not related to education levels, other variables were tested for their influence on the capacity to understand the meaning of the pictograms shown. Number of medications taken, age and gender did not have a statistically significant influence on the participants' capacity to understand the meaning of medication instruction pictograms. Having Haiti as country of origin was found to be a factor that influenced the capacity to understand pictograms, and this was independent of level of education.

Marginal means were calculated to better elucidate if level of education influences pictogram comprehension, irrespective of other potential influencing factors. Marginal means were calculated for pictogram comprehension in each education level group, taking into account potential cofactors "origin" and "gender". The marginal mean values are presented in Table 7. The guessability during the first interview for participants with low, medium and high schooling level were respectively 45.8%, 65.3% and 76.2%. Multivariate analyses identified level of schooling as significant independent predictors of misunderstanding the pictograms ($p<0.001$).

Table 6. Pictogram comprehension for low, medium and high education levels - Normal means

Groups	N1	Guessability (% of correct)	N2	Recall (% of correct)
<6	47	38.0	43	59.1
6-12	37	63.7	28	80.8
>12	27	78.7	19	92.6

Groups, Number of years of formal education; N1, N2, Number of participants during the first interview and during the recall.

Table 7. Pictogram comprehension for low, medium and high education levels - Marginal means, adjusted for gender and country of origin

Groups	N1	Guessability (% of correct)	N2	Recall (% of correct)
<6	47	45.8	43	66.8
6-12	37	65.3	28	84.1
>12	27	76.2	19	90.6

Groups, Number of years of formal education; N1, N2, Number of participants during the first interview and during the recall.

Pictogram Recall

After educating each participant after the first guessability test interview, the guessability was re-tested at an average of 24.21 days after. That is, mid-term recall was tested in each of the participants. After education, mid-term recall improved to 66.8%, 84.1% and 90.6% in the low, middle and high education level groups, respectively (Table 7). Again, for the three groups tested, no statistically significant interactions were found between age, gender, number of medications taken and number of days between the first interview and mid-term recall.

For mid-term recall, individuals with lower education had a lower understanding than individuals with between 6 and 12 years of formal education and these than those with higher education levels. These differences were independent from the country of origin and of gender, and were statistically significant ($p < 0.001$). As with initial pictogram guessability, mid-term pictogram recall was associated with education ($p < 0.001$), origin ($p < 0.001$) and not with gender ($p = 0.610$).

Pictogram Comprehension and Recall by Country of Origin

Table 8 depicts the comprehension and recall of pictograms according to participants' country of origin. People coming from Haiti had lower pictogram comprehension and recall at all education levels, but in particular for the low and middle levels of education. Being from Africa also lowered the levels of pictogram comprehension and recall, but this did not reach statistical significance.

Pictogram Category's Comprehension and Recall by Level of Education Group

Medication instructions can be categorized into four classes: doses and routes, precautions, frequencies, and indications and side effects. A test was carried out in order to highlight a potential preference for one of these categories in the different levels of education considered in this study. Table 9 and 10 depict the results obtained for pictogram comprehension and recall by categories. It can be seen that in the set of pictograms tested, pictogram comprehension and recall was better for those indicating doses and routes with a mean of 70.6% of pictograms guessed correctly in this category. The least understood pictograms were those related to frequencies with a mean of 50% guessed, and the worst, indications and side effects with 46.5% of guessability for these pictograms. This was the case across all levels of formal education.

Table 8. Pictogram comprehension and recall by education level and country of origin

Groups	N1	Guessability (% of correct)	Translucency (%>or=5)	N2	Recall (% of correct)
Low Education (0-6 years of formal education)					
North America	6	57.4	90.6	6	73.7
Africa	10	43.6	96.9	8	73.0
Haiti	31	32.4	89.2	29	52.2
Other	0	-	-	0	-
6-12 years of formal education					
North America	14	68.4	89.9	11	83.8
Africa	9	67.2	84.8	6	88.8
Haiti	12	54.4	90.0	11	76.2
Other	2	71.4	83.8	0	-
>12 years of formal education					
North America	3	85.1	81.9	1	94.4
Africa	9	75.8	86.5	8	94.2
Haiti	2	56.9	91.2	2	86.8
Other	13	82.5	90.7	8	96.8

N1, N2; Number of participants during the first interview and during the recall

Table 9. Pictogram categories guessability by level of education groups

Categories of pictograms	GUESSABILITY (% of correct)			
	0-6 years of formal education	6-12 years of formal education	>12 years of formal education	Overall
Doses and routes (n=25)	55.4	76.6	88.8	70.6
Precautions (n=16)	30.6	62.5	81.5	53.6
Frequencies (n=6)	28.7	54.7	77.8	50
Indication and side effects (n=24)	26.1	53.9	67.4	46.5

Table 10. Pictogram categories guessability during recall by level of education groups

Categories of pictograms	RECALL (% of correct)			
	0-6 years of formal education	6-12 years of formal education	>12 years of formal education	Overall
Doses and routes (n=25)	78.1	88.8	99.1	83.8
Precautions (n=16)	55.3	84.8	96.5	73.0
Frequencies (n=6)	48.6	73.6	95.8	66.2
Indication and side effects (n=24)	45.5	74.0	89.0	62.8

DISCUSSION

Validation of pictograms displaying medication instructions was not optimal in individuals with low levels and mid-levels of formal education. Few pictograms reached at least 85% of correct guessability, both in the first guessability test as well as during recall. The number was especially very low in the group with the lowest level of formal education. This may be explained partly by their low levels of formal education and low levels of literacy, which correlates to low health literacy (Health Literacy in Canada, 2008). Indeed, these participants were observed to have very poor skills related to health, medications and instructions of medication intake. As a consequence, it was decided to focus on recall of pictogram's meaning after explanations and training.

This study is the first that compares mid-term recall of pictogram after thorough one-on-one verbal explanations on pictogram meaning in individuals that have different levels of formal schooling. It shows that training on pictogram's meaning helps increase understanding and mid-term recall on medication intake instructions in all education level groups tested herein.

Previous studies have found that pictograms can help people with low literacy skills to have a higher recall of the medical instructions, but none have compared pictogram recall in people with different levels of formal education (Houts, Witmer et al., 2001; Wilby *et al*., 2011; Lesch, 2003; Braich *et al*., 2011). Other studies have shown that pictogram recall test is not enhanced in short-term recall, or depends of the age (King *et al*., 2012; Morrell et al., 1990; Thompson *et al*., 2010). Here, the age was not found to be an influencing factor, but level of formal education or the origin was found to influence pictogram comprehension. In the different populations and different levels of schooling, individual explanation on the meaning of pictograms was found to enhance recall.

Similar to other studies, the origin and culture as factors that influence pictogram's understanding were verified by this study (Dowse and Ehlers, 2001; Grenier *et al*., 2011). Because the first aim was to focus the study on lower educated individuals, and that the recruitment took place at alphabetization classes in French and in Ottawa, the population studied was mostly composed of immigrants, and interestingly most were from Haiti. In the statistical analysis, Haiti was found to be correlated with very low guessability and recall; perhaps this can be explained by the type of medicine used in this country, where non-allopathic medicine is still used (Benoît, 1997; Muula *et*

al., 2009). To account for the Haiti origin, marginal means took into account "origin" as a potential confounding factor.

Importance of culture was highlighted by the manner in which several pictograms were interpreted. For example, the pictogram "headache" was often interpreted as "pray to heal". Pictogram "vomit" was mistook for "eat a banana" and nausea for "put your finger in the mouth to vomit if you are full after your meal". All these interpretations can be explained by cultural difference and different habits of the study participants.

During the interviews, several points proved very interesting. Having children seemed to be a factor that helped better understand the pictograms and recall their meaning. This may be explained by previous experiences with medication intake in children or because being a parent can make them more sensitive. Although having children was not recorded in the data collection, future studies should take this into account.

Pictograms like "headache" or "inhale" were better understood and remembered than other pictograms, probably because of the familiarity of the population with these issues. Indeed, asthma has a high prevalence in Ottawa, Ontario, Canada (Gershon *et al*., 2010), and probably many participants of this study have inhaled asthma medications with a spacer and everybody knows at least one relative who has asthma and takes inhalers. Headache is one of the most common symptom that people have experienced and for which over-the-counter medications are sold (Mehuys *et al.*, 2012; Dyb *et al.*, 2006). Taking medications for headaches is also a common habit.

The "G-tube" pictogram, which shows a child with a tube inserted in the abdomen to provide food, shocked some participants and they mentioned they felt sad for the child. The increase of guessability during the recall for this pictogram was particularly high, most likely due to the emotional component identified during the education part (Bennion *et al*., 2013)

In the low educated participants, particular low capacities in guessing the pictograms' meaning were observed. First, it was difficult for them to step back and imagine the pictograms related medications. The pictogram "gain weight" became "go to the gym to lose weight". More, difficulties in telling time were observed. Another study found similar results for the difficulty of perception of pictograms with low educated groups but the clock pictograms seemed to work better with them (Dowse and Ehlers, 2003). The clocks tested in the set of pictograms were maybe

too complex with several needles and the numbers were missing. Furthermore, most participants in the 0 to 6th grade of formal education did not receive more than 2 years of formal education and 16 did not receive any.

Moreover, for all tested groups, various parameters must be taken into consideration. One of them is the fact that a large number of pictograms were shown in a short time, the concentration might decrease as a measure of the interview. Having started the testing with the guessability assessment can also mislead the recall because they remember more what they said that the signification learned. And finally, it is possible that some people were ashamed to tell they did not understand the meaning of the pictograms presented to them (Safeer and Keenan, 2005).

Future studies should take in consideration the number of children, don't show too many pictograms and find the best manner by which participants will understand the meaning of the pictograms. Moreover, they should use very simple pictograms. Indeed, like it is showed in this study, simple pictograms like "take one pill" or "headache" are better guessed than pictograms more complex like by example "every 2 hours". The best pictograms may be symbols designed by the population tested. In this case, test the same pictograms in three groups with different levels of education and different origins, implies that pictograms should be as simple as possible to increase the understanding in each group (Chan and Chan, 2013).

Use of symbols in low educated population enhances the recall but not enough to validate pictograms with the general standards in this population. Perhaps participants are less familiar with evidence-based medicine. Their knowledge of western medicine and drugs might be very low and this can be even worse if they have been raised in places from certain origins. Association of pictograms, education and verbal, one-to-one explanatory sessions helps increase pictogram comprehension but is not enough for low educated participants. With increasing immigration, it will be important to further investigate how to better help those individuals with low levels of formal education (Health literacy connection, 2012; Health Literacy in Canada, 2008). To heal them properly, they need to understand the medication intake instructions. Furthermore, this is also important because of the impact of immigration on integration and public health. Research should be expanded to develop tools to help patients with low health literacy skills will benefit for everybody who needs health care.

CONCLUSION

Pictograms are tools that can help patients from the general population to remember their medication intake indications. Pictograms can particularly help patients that do not speak perfectly the language of the instructions or if they have reading difficulties. Symbols' comprehension depends on different factors like origin because of the link with habits and culture. To account of this, it is important to use pictograms designed by somebody of the same culture or at least, pictograms validated in an equivalent group. In future studies, it would be interesting to try to understand why being from Haiti was a risk factor to not understand the meaning of the medication symbols.

Validating pictograms in a group of low educated people is difficult to achieve with the standards of validation, ANSI or ISO. Low skills in health and health literacy unfortunately cannot simply be filled with pictures. These patients require adequate monitoring, with a period of education, and recall of information supported by tools developed specifically by them and for them.

Future studies should compare recall in different groups after doing first the education part before the guessability test, choose the most common and useful pictograms and take in consideration the number of children and the country of origin.

Further studies should be undertaken to compare actual medication adherence in patients with different level of educations when medication instructions are supported or not with pictograms, to show if in the practice, pictograms enhance or not the recall of information and the patient adherence.

In conclusion, pictograms are effective tools that help patients to understand and recall medication instructions and information and help educate patients. Using pictograms and educating each patient about their meaning in hospital or pharmacy when the medications are provided have the potential of increasing the understanding of treatment instructions, of increasing patient adherence and thus, bettering health outcomes. Patients with lower levels of formal education and patients from different cultural origins should be given special attention, more education and close monitoring and follow-up.

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APPENDIX

- **APPENDIX I**

Oral Consent

- **APPENDIX II**

Data Collection Sheet

CONSENTEMENT ORAL

VALIDATION DE PICTOGRAMMES CHEZ LES APPRENANTS

Principal investigateur: Régis Vaillancourt
Service de pharmacie
Centre hospitalier pour enfants de l'est de l'Ontario
613 737-7600, poste 2231

But de cette étude de recherche:

La communication entre un patient et un professionnel de santé est fondamentale. En effet, grâce à une bonne communication, les patients peuvent comprendre leurs maladies et comment prendre leurs traitements efficacement. Cependant, ces informations ne sont pas toujours bien comprises à cause de la différence de langue parlée, du nombre d'années d'études et du temps écoulé depuis la dernière formation, ainsi que les effets de la santé. Ces barrières conduisent à des erreurs de médications et diminuent la compliance. Pourtant, chaque patient devrait être capable de participer à la prise en charge de sa maladie. Utiliser des images en complément d'informations écrites et orales peut améliorer la compréhension des patients et aider à mieux gérer leurs maladies.

Cette étude consiste à déterminer quels sont les pictogrammes les mieux compris concernant l'indication, la voie d'administration, la fréquence, les précautions et les effets secondaires des médicaments utilisés chez les personnes à faible éducation. En participant à cette étude vous allez nous aider à créer des illustrations afin d'améliorer la communication et de faciliter la compréhension des instructions médicales.

Votre participation est volontaire :

Votre participation est entièrement volontaire. Votre décision de participer ou de ne pas participer n'aura aucun effet sur les soins que vous recevrez au CHEO. Vous êtes libre de vous retirer de l'étude n'importe quand et il y aura aucun impact négatif sur vous ni sur les soins reçus.

Procédure:

Si vous acceptez de participer à cette étude, nous vous demanderons de répondre à quelques informations démographiques tels que l'âge, le sexe, le dernier niveau d'étude, etc. Nous vous demanderons ensuite de nous dire ce que certaines images représentent pour vous. Chaque image sera montrée une fois. Après avoir deviné le sens de l'image, nous allons vous dire ce qu'elle représente réellement. Nous vous demanderons alors d'évaluer sur une échelle de 1 à 7 combien l'image et sa signification sont concordantes.

Description des participants de l'étude:

Seules les personnes âgées de 19 à 65 ans étudiant à :

1) La Cité Collégiale, dans le programme FBO (Formation de Base de l'Ontario), à Ottawa, Ontario;

2) La Cité Collégiale, dans le programme CLIC (Cours de Langues pour Immigrants au Canada), à Ottawa, Ontario;

3) Centre « Moi, j'apprends », sur Donald Street, à Ottawa, Ontario;

4) L'Ecole des adultes « Le Carrefour », Saint-Laurent Boulevard, à Ottawa, Ontario

peuvent participer. Les personnes pour qui participer à l'étude provoque du stress ne participeront pas.

Risques et avantages liés à l'étude:

Il n'y a pas de risques associés à la participation à cette étude. À long terme, ces informations aideront à développer un outil de communication avec illustrations pour améliorer la compréhension des instructions médicales.

Retrait de l'étude:

Vous pouvez vous retirer de l'étude n'importe quand et il n'y aura pas de pénalité pour vous. Par contre, nous conserverons toutes les données recueillies à votre sujet pendant la réalisation de l'étude pour l'analyse.

Confidentialité:

Vos renseignements personnels seront gardés strictement confidentiels sauf ce qui est autorisé ou exigé par la loi. Vous ne serez identifié dans aucune publication ou présentation liée à cette étude. Tous les renseignements personnels à votre sujet qui quitteront l'hôpital seront codés à l'aide d'un numéro afin qu'il soit impossible de vous identifier par votre nom. Seuls les chercheurs principaux et la personne qui recueillera vos réponses auront accès aux noms des participants. Les listes des participants seront gardées sous clé dans un lieu à accès restreint et sera protégée par un mot de passe que seuls les chercheurs connaîtront. Les résultats finaux de cette étude seront publiés dans des revues scientifiques ou à des présentations sous forme de synthèse pour éviter qu'on puisse identifier les sujets. Si vous le désirez, vous pourrez demander un exemplaire des résultats de l'étude à la fin de celle-ci. Les représentants du Comité d'éthique pour la recherche du CHEO auront le droit de consulter vos renseignements personnels.

Pour plus d'information:

L'étude est sous la direction de Régis Vaillancourt. On vous encourage à poser vos questions en tout temps pendant l'étude. Si vous avez des questions concernant l'étude, veuillez contacter Régis Vaillancourt, directeur de la pharmacie, au (613) 737 7600, poste 2231.

Le Comité d'éthique de la recherche du CHEO est un comité de l'hôpital qui comprend des personnes venant de professions différentes. Le Comité examine toutes les recherches qui se déroulent à l'hôpital. Son but est de protéger les droits et le bien-être des personnes qui participent à un projet de recherche. Le travail du Comité n'a pas pour but de remplacer votre jugement sur les meilleurs choix et décisions pour lui. Vous pouvez appeler le président du Comité au 613 737-7600, poste 3272, si vous voulez de l'information sur les droits des personnes qui participent à une étude de recherche. Le président du Comité n'est pas en mesure toutefois de répondre à vos questions médicales au sujet de l'étude.

Une copie du consentement éclairé vous sera donnée. Nous vous rappelons que si vous décidez de participer à l'étude, vous êtes libre de vous retirer à n'importe quel moment et sans donner de raisons concernant votre décision.

Je suis satisfait que les informations contenues dans ce document m'aient été expliquées d'une façon très compréhensible et d'avoir eu les réponses à mes questions.

Je consens, par la présente, à la participation à cette étude. Je reconnais avoir reçu un exemplaire de ce formulaire de consentement.

Accord et signature de l'assistant de recherche:

En tant qu'assistant de recherche, je reconnais avoir lu le consentement éclairé au participant et avoir expliqué clairement le projet de recherche et le déroulement de l'entretien. Le participant et l'assistant de recherche sont satisfaits par l'information donnée verbalement, celui-ci a compris l'information et l'ensemble de ces questions ont été répondue et le participant donne son accord verbal pour sa participation à l'étude.

_____	**_____**
Nom de l'assistant de recherche (en caractères d'imprimerie)	**Nom du témoin (en caractères d'imprimerie)**
_____	**_____**
Signature de l'assistant de recherche	**Signature du temoin**
Date _____	**Date_____**

DATA COLLECTION

Study #: _____ Questionnaire version: _A _B

Age of participant: _____ Gender: M F

Origin: _____

Highest level of schooling completed: _____

Number of years of no training: _____

# of medications regularly taken (excluding vitamins): _____

Pictogram Number:	**Guessability:** C= CORRECT, X= INCORRECT, PC= PARTIALLY CORRECT	**Translucency:** Indicate numeric score from 1 to 7 (1= no relationship, 2 to 6= some relationship, 7= very strong relationship)	**Semiotic Input:** (free text)
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