

The evaluation of pharmaceutical pictograms in a low-literate South African population

Ros Dowse and Martina S. Ehlers

Faculty of Pharmacy, Rhodes University, Grahamstown 6140, South Africa

Abstract

An inability to read and understand written medication instructions may be a major contributory factor to non-compliance in certain patient populations, particularly in countries with a high illiteracy rate such as South Africa. Twenty three pictograms from the USP-DI and a corresponding set of 23 locally developed, culturally sensitive pictograms for conveying medication instructions were evaluated in 46 Xhosa respondents who had attended school for a maximum of 7 years. Respondents were tested for their interpretation of all 46 pictograms at the first interview and again 3 weeks later. The correct meaning of each pictogram was explained at the end of the first interview. Preference for either the Local or USP pictograms was determined. At the follow-up interview, 20 of the Local pictograms complied with the ANSI criterion of $\geq 85\%$ comprehension, compared with 11 of the USP pictograms. Respondents indicated an overwhelming preference for the Local pictograms.

Author Keywords: Pictograms; Low literacy; Interpretation; Recall

1. Introduction

Pharmaceutical care is a philosophy of practice that is being adopted by many pharmacists world-wide and is described as a practice in which the pharmacist takes responsibility for a patient's drug-related needs and is held accountable for this commitment [1]. An integral part of this process involves educating and counselling patients in order to prepare and motivate them to adhere to their medication regimens [2]. The quality and form of this information must, however, be appropriate to the patient's level of education and must also take into account his culture, beliefs, attitudes and expectations [3 and 4].

In many parts of the developed world, literacy is taken for granted and health care professionals assume that they are dealing with a reading patient population [4, 5, 6 and 7]. However, this assumption has been shown to be seriously misleading, as is illustrated by a number of studies and anecdotal reports in which non-adherence to medication regimens was found to be due to an inability to read and understand the medication directions [8, 9, 10, 11, 12 and 13]. Health care systems generally require that patients possess a wide range of literacy skills in order to function effectively within a health care environment [4, 14 and 15] and a distinct link between poor reading skills and poor health has been reported [4, 16, 17, 18 and 19].

In considering literacy within the health care system, Williams et al. [5] have defined functional health literacy as a range of basic skills necessary to function in the health care environment. Several studies conducted in developed countries have shown that the mean reading ability of patients was far below the readability level of most of the written materials tested, and these studies identified a high prevalence of inadequate functional health literacy [5, 14, 20, 21, 22, 23, 24, 25 and 26]. This problem is exacerbated in

developing countries where the illiteracy rates are significantly higher. In South Africa it is estimated that only 30% of the black adult population is literate, with 25% being semi-literate and 45% illiterate [27].

This presents an enormous challenge to health care professionals all over the world to identify patients with inadequate literacy skills, to tailor any written information according to the estimated reading ability of the patient, and to investigate additional methods of facilitating the provision of information if the patient is illiterate. One way of communicating medication information to illiterate patients is to use visual aids such as pictograms which stimulate the imagination and offer an alternative means of recalling instructions without involving the written word. However, the success of using pictograms as a communication aid depends on a comprehensive design and testing process in order to produce clear, culturally acceptable pictograms, after which their value depends largely on their appropriate use by the health care professional who must provide verbal reinforcement in conjunction with the pictograms [28].

Visual images or symbols are a ubiquitous part of modern life and are often successful at communicating information to an international population, but their success is determined to a large extent by constant exposure to this type of graphic material which stimulates the learning process. Its accurate interpretation requires learning the conventions of representing three-dimensional reality on a two-dimensional surface [29]. In the absence of this learning process, visual images that effectively communicate a message to one population may prove meaningless to another.

Research indicates that the environment, both ecological and cultural, can exert a significant influence on the ability of the individual to perceive, as well as on what he perceives [29]. Although graphic material is often considered to be part of a universal language which can easily be recognised by all and can convey meaning with little or no dependence on language or cultural background [30], cross-cultural testing has consistently found otherwise [29, 31, 32 and 33]. This material is often designed by highly trained professionals who unfortunately lack insight into the target culture and who tend to make assumptions about what can be communicated using graphic material. This emphasises the importance of designing and evaluating pictograms in collaboration with the target population [28, 29, 31, 34, 35, 36, 37, 38, 39 and 40].

The use of visual aids such as pictograms in communicating health information to low-literate populations has been receiving increased attention over the past few years and this is accompanied by a growing body of literature on the subject. Although a detailed discussion is beyond the scope of this article, a review on the topic is available [28]. The review also examines the role of pictograms as an aid to compliance with medication regimens by various patient populations including illiterate patients, the elderly, the visually impaired and people unfamiliar with the native language such as tourists and immigrants.

The design and evaluation of pictograms is a complex, multistage, iterative process. One of the main strategies to minimise problems when designing pictograms is to identify the target population and to involve that population in all stages of the design and evaluation process. The pictograms should firstly be tested in healthy respondents from the target population and only after the completion of this stage, should the successful designs be tested in practice in a patient population to monitor for the effect of pictograms on the understanding of instructions and on compliance.

In deciding on the acceptability of a pictogram, researchers are guided by international standards which have been established for evaluating the comprehensibility of pictorial symbols. The American National Standard's Institute (ANSI Z535.3) [41] and the International Standards Organisation's (ISO 3864) [42] advise that, in a comprehension test, pictorial symbols must reach at least a criterion of 85 or 67% correct, respectively. These standards may be considered arbitrary, but given the importance of understanding the correct medication instructions in order to use a medicine safely, comprehension should be above the 85% level if possible.

The practical application of pictograms in a low-literate population would entail explaining the meaning of the pictogram to the patient after which the subsequent role of the pictogram is to act as a stimulus to recall that information. The evaluation process should therefore incorporate a follow-up stage to test for the effectiveness of pictograms in aiding recall of information [28]. This follow-up test should not be conducted during the same encounter as the initial testing as this would not simulate the real-life situation, but should rather be conducted after a suitable period of time has elapsed [37].

The most significant international initiative for developing a set of standard pharmaceutical pictograms was co-ordinated by the staff of the United States Pharmacopeia (USP), who began working with USP advisory panels in 1987. This resulted in 29 pictograms being published in the 1989 issue of the USP dispensing information [43] and this number increased to 91 pictograms in the 2000 issue [44]. However these were developed for application in a sophisticated, technologically advanced society, reflecting the essentially westernised base of its culture. The pictograms contain many symbols we felt would be unfamiliar to the majority of functionally illiterate people in South Africa who are found mainly in the black population. This population group has a vastly different cultural and socio-economic background from that of the average North American.

The objectives of this study were to evaluate and compare locally developed, culturally appropriate pharmaceutical pictograms with pictograms appearing in the 1991 edition of the USP-DI in a black, low-literate population. A further objective was to investigate the effectiveness of pictograms in stimulating recall of medication instructions.

2. Methods

2.1. Study site and sample

There are eight black ethnic groups in South Africa, each with its own language and ethnic culture. This study was conducted in the Eastern Cape, one of nine provinces in South Africa incorporating a large rural area which is mainly underdeveloped and economically poor, and which has an extremely high unemployment rate. The majority of the Local black population belongs to the Xhosa ethnic group and all our respondents were drawn from this group.

2.2. Preparation of Local and USP pictogram sets

Details of the multistage, iterative design process of the pictograms is described elsewhere [45]. At the end of this process, a final set of 23 modified pictograms was designed (hereafter referred to as Local pictograms). Pictograms were printed with black ink onto white card (11.5 cm×11.5 cm) and each pictogram was numbered. The USP pictograms were printed in exactly the same way.

2.3. Collection of test data during first and follow-up interviews

A questionnaire to collect data was designed and validated. Forty-six adult black Xhosa respondents, all of whom had less than 7 years' schooling, were interviewed. They were drawn from various sectors of the community, e.g. domestic workers, cleaners, road workers or were unemployed. All interviews were conducted by the two authors, each of whom was assisted by an interpreter.

At the beginning of the first interview with each respondent, the concept of using pictograms to convey medication instructions to patients who could not read was explained. The interviewers attempted to put the respondents at ease and to make the process as non-threatening as possible by emphasising that this was not a

test of each respondent's 'cleverness', but a test of the pictograms to see how good each pictogram was at communicating its meaning.

Selected demographic information was collected (gender, age, educational level). The ability to tell the time from a clock face was determined. A short literacy test was used to assess reading ability. Respondents were given a sample medication label and a short paragraph of supplementary information to read, both of which were printed in English. They were then asked four questions to determine their understanding of the label. On the basis of these answers, respondents were categorised as follows: (1) did not understand; (2) partly understood and (3) completely understood.

The respondents were then shown all 46 pictograms (two sets of 23 each) one at a time, in random order with no previous explanation of the meaning of individual pictograms. It was explained that the same answer could be given more than once. The respondent was asked to give his/her interpretation of each pictogram and responses were recorded. Thereafter, each Local pictogram with the corresponding USP counterpart was shown to the respondent and the correct meaning was explained. Respondents were asked to indicate which pictogram of each matched pair was preferred and preference was recorded.

To conclude the interview, respondents were asked if they thought pictograms would help in reminding them how to take their medicine, and if they would like to have pictograms on all their medicines. The same pictogram printed in four different colours (black, green, blue and red) was shown and respondents were asked for their colour preference and any reasons for liking or disliking a particular colour. This question was intended to identify any colours which could be of cultural significance and which would therefore be inappropriate to use.

The follow-up interview was conducted 3 weeks later, when respondents were again asked to give their interpretation of all 46 pictograms which were shown to them in a randomised manner. Respondents were remunerated at the end of the follow-up interview.

2.4. Data analysis

Chi-square tests were used to test for significant differences in interpretation between the Local and USP pictograms, and to test for significant differences in preference. Chi-square tests were also used to assess the effect of the demographic variables on the interpretation of pictograms. Level of significance was set at 5% level.

3. Results

3.1. Demographic data

Demographic data are displayed in Table 1. Females constituted the majority (76%) of our respondents. One of the reasons for the low number of males is that the interviews were conducted during working hours and males were more likely to have employment. We felt that this was acceptable for our assessment as it reflects the actual situation commonly found at the outpatient clinics where the majority of attendees are females, as paediatric patients are usually brought in either by their mothers or by other women acting as caregivers for extended families. Most respondents (57%) were between the ages of 41 and 65 years old. Just over half the respondents (55%) had completed between 5 and 7 years of schooling, with the remaining half being split between having completed either no schooling (20%) or 1–4 years' schooling (26%). Only five respondents (11%) were unable to tell the time and none of these had attended school. The time taken for each initial interview varied between 35 and 60 min.

Table 1
Demographic data of study respondents

	Number (%)
Gender	
Male	11 (23.9)
Female	35 (76.1)
Age (years)	
< 21	0 (0.0)
21 to 40	17 (37.0)
41 to 65	26 (56.5)
> 65	3 (6.5)
Education (years)	
No schooling	9 (19.6)
1-4	12 (26.1)
5-7	25 (55.3)

3.2. Literacy test results

Results from the literacy test (Table 2) revealed that more than half the respondents (57%) were either unable to read the label at all, or had clearly not understood what they were reading. Only three of the 46 respondents (7%) had completely understood the written instructions, whereas about a third (37%) had read but only partially comprehended the label. In the group of 25 respondents who had completed between 5 and 7 years of schooling, a quarter (five respondents) were categorised as having had no understanding of the label at all, with the majority (17 of the 25 respondents) partly understanding the label. These findings imply that even after having completed between 5 and 7 years of schooling, there is a strong likelihood that comprehension of written instructions will be incomplete. This could be a reflection of the legacy of the inconsistent and inadequate standard of education which was often endured by the black population in South Africa.

Table 2
Number (%) of respondents qualifying for each category of the literacy test according to years of education

Education	No understanding ^a	Partly understood	Understood completely
No education	9 (19.5)	0 (0.0)	0 (0.0)
1-4 years	12 (26.1)	0 (0.0)	0 (0.0)
5-7 years	5 (10.9)	17 (37.0)	3 (6.5)
Total	26 (56.5)	17 (37.0)	3 (6.5)

^aThis includes respondents who could not read as well as those who attempted to read but were unable to answer the questions.

3.3. Interpretation of pictograms

All 46 pictograms used in this study are illustrated in the Appendix A. Table 3 shows the number (%) of respondents who gave the correct interpretation of the individual pictograms. The percentage of respondents

giving the correct interpretation at the first interview for both sets ranged from 2 to 96%. Generally, the Local pictograms were more successful and in 16 cases yielded a higher number of correct interpretations, with the difference being significant in seven of these cases ($P < 0.05$). In no case was a USP pictogram significantly better interpreted than a Local one.

Table 3
Number (%) of respondents who correctly interpreted the pictograms

	Number and meaning of pictograms	First interview		Follow-up interview	
		Local	USP	Local	USP
1	This medicine may make you drowsy	2 (4.3)	1 (2.2)	8 (17.4)	10 (21.7)
2	Do not break or crush capsules or tablets	6 (13.0)	7 (15.2)	20 (43.5)	22 (47.8)
3	Do not store near heat or in sunlight	14 (30.4) ^a	3 (6.5)	22 (47.8) ^b	8 (17.4)
4	Complete the course	21 (45.7)	24 (52.2)	41 (89.1)	40 (87.0)
5	Insert into the vagina	24 (52.2) ^a	12 (26.1)	40 (87.0)	33 (71.7)
6	Insert into the rectum	26 (56.5)	23 (50.0)	41 (89.1)	35 (76.1)
7	Store in the refrigerator	27 (58.7)	26 (56.5)	42 (91.3)	38 (82.6)
8	Shake the bottle before use	27 (58.7)	28 (60.9)	41 (89.1)	44 (95.7)
9	Do not drink alcohol while on this medicine	29 (63.0) ^a	18 (39.1)	41 (89.1) ^b	27 (58.7)
10	Do not take this medicine if breastfeeding	29 (63.0)	25 (55.3)	40 (87.0)	35 (76.1)
11	Do not take with meals	30 (65.2)	26 (56.5)	40 (87.0)	33 (71.7)
12	Do not take with milk or other dairy products	32 (69.6) ^a	19 (41.3)	43 (93.5) ^b	35 (76.1)
13	Take with a glass of water	35 (76.1)	37 (80.4)	46 (100.0)	45 (97.8)
14	Take at night	35 (76.1)	39 (84.8)	39 (84.8)	39 (84.8)
15	Take one hour before meals	36 (78.3)	37 (80.4)	43 (93.5)	42 (91.3)
16	Do not take this medicine if pregnant	37 (80.4)	35 (76.1)	43 (93.5)	43 (93.5)
17	Take two hours after meals	39 (84.8) ^a	30 (65.2)	44 (95.7) ^b	36 (78.3)
18	Take with meals	39 (84.8)	35 (76.1)	42 (91.3)	39 (84.8)
19	Place drops in the nose	42 (91.3)	43 (93.5)	45 (97.8)	44 (95.7)
20	Take three times a day with meals and at night	43 (93.5) ^a	34 (73.9)	45 (97.8)	41 (89.1)
21	Take four times a day	43 (93.5)	37 (80.4)	45 (97.8)	43 (93.5)
22	Place drops in the ear	44 (95.7) ^a	15 (32.6)	46 (100.0) ^b	37 (80.4)
23	Place drops in the eye	44 (95.7)	37 (80.4)	42 (91.3)	41 (89.1)

^a Significant improvement in interpretation of local compared with USP pictograms during first interview ($P < 0.05$).

^b Significant improvement in interpretation of local compared with USP pictograms during follow-up interview ($P < 0.05$).

At the first interview, seven (30.0%) of the Local pictograms and only two (8.7%) of the USP pictograms complied with the ANSI criterion of $\geq 85\%$ comprehension. This improved substantially in the follow-up interview, in which 20 of the Local pictograms performed at or above 85% comprehension, compared with 11 USP pictograms. Interpretation improved markedly in the recall phase which was conducted 3 weeks after the first interview, and this improvement was particularly notable for those pictograms which were poorly interpreted initially. An example which illustrates this is Pictogram 5: “insert into the vagina”. Only 24 respondents (52.2%) correctly interpreted the Local pictogram at the first interview, and this increased significantly to 40 (87.0%) at the follow-up interview. The USP version also showed a significant increase in interpretation, increasing from 26.1 to 71.7%, although it still did not fulfil the ANSI 85% criterion on recall.

3.4. Preference results

When questioned on preference (Table 4), respondents were found to prefer the Local pictograms over the USP pictograms in 21 out of 23 cases and this difference was significant in 17 cases ($P < 0.05$), e.g. 41 (89.1%) respondents preferred the Local version of Pictogram 3: “do not store near heat or in sunlight”. The USP version contains abstract symbolism and graphic conventions depicting heat which were not apparent to our respondents. Most did not even attempt an explanation, and admitted to being totally confused. The container and the R_x convention were not linked to the concept of medicines, and the container was often mistaken for a

‘rubbish-bin’. In the Local version, we used familiar sources of heat such as the sun and a fire. Even then, the sun was sometimes mistaken for a watch face and the fire was not recognised. However, the majority of respondents preferred this version. Further work on this pictogram is in progress.

Table 4
Number (%) of respondents indicating preference for either local or USP pictograms at first interview

	Number and meaning of pictograms	Preference	
		Local	USP
1	This medicine may make you drowsy	28 (60.9) ^a	18 (39.1)
2	Do not break or crush capsules or tablets	32 (69.6) ^a	14 (30.4)
3	Do not store near heat or in sunlight	41 (89.1) ^a	5 (10.9)
4	Complete the course	21 (45.7)	25 (54.3)
5	Insert into the vagina	27 (58.7) ^a	19 (41.3)
6	Insert into the rectum	25 (54.3)	21 (45.7)
7	Store in the refrigerator	39 (84.8) ^a	7 (15.2)
8	Shake the bottle before use	25 (54.3)	21 (45.7)
9	Do not drink alcohol while on this medicine	33 (71.7) ^a	13 (28.3)
10	Do not take this medicine if breastfeeding	34 (73.9) ^a	12 (26.1)
11	Do not take with meals	33 (71.7) ^a	13 (28.3)
12	Do not take with milk or other dairy products	37 (80.4) ^a	9 (19.6)
13	Take with a glass of water	30 (65.2) ^a	16 (34.8)
14	Take at night	25 (54.3)	21 (45.7)
15	Take one hour before meals	30 (65.2) ^a	16 (34.8)
16	Do not take this medicine if pregnant	30 (65.2) ^a	16 (34.8)
17	Take two hours after meals	31 (67.4) ^a	15 (32.6)
18	Take with meals	29 (63.0) ^a	17 (37.0)
19	Place drops in the nose	18 (39.1)	28 (60.9) ^b
20	Take three times a day with meals and at night	31 (67.4) ^a	15 (32.6)
21	Take four times a day	29 (63.0) ^a	17 (37.0)
22	Place drops in the ear	36 (78.3) ^a	10 (21.7)
23	Place drops in the eye	24 (52.2)	22 (47.8)

^a Significant preference for local pictogram ($p < 0.05$)

^b Significant preference for USP pictogram ($p < 0.05$)

3.5. Effect of variables on literacy assessment and on interpretation of pictograms

The standard of education correlated significantly with the results of the literacy test. Every single respondent with less than 5 years’ schooling displayed an extremely poor comprehension of the medication information; they all fell into the first category of “did not understand”. Even those respondents who had between 5 and 7 years’ schooling had difficulty with comprehending the literacy test; within this group 68% ($n=17$) were categorised as having only “partly understood”, whereas only 12% ($n=3$) “completely understood” the information.

Standard of education had a significant influence on the initial interpretation of individual pictograms in only three cases; Pictograms 15 and 17 in the USP set, and Pictogram 9 in the Local set. Interestingly, both of the former pictograms attempt to convey the passage of time, an abstract concept which is difficult to depict. Significantly more respondents with between 5 and 7 years of schooling were able to grasp this concept, suggesting that formal education up to this level renders this idea more accessible to the viewer. This educational group were also significantly more successful at reading and understanding the word ‘beer’, recognising that the bottles and the carton in Local Pictogram 9 contained alcohol, and that this should not be drunk while taking the medication.

When considering the pictograms collectively, an increasing trend could be observed in the successful interpretation of all 46 pictograms as educational level increased. Those respondents with no schooling interpreted 56.8% of the pictograms correctly and this increased to 59.4 and 63.7% in the groups with 1–4 and 5–7 years of schooling, respectively. However, these differences were not statistically significant.

3.6. Acceptability of pictograms

Every single respondent reacted positively to the idea of having pictograms on their medicine and they all felt that pictograms could play a valuable role in helping them remember how to take their medicine. No significant colour preferences were identified, nor were we able to ascertain any negative connotations of the displayed colours within the Xhosa culture.

4. Discussion

There has been a recent increase in the number of papers reporting the development and testing of pharmaceutical pictograms [9, 38, 39, 40, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63 and 64]. These vary in usefulness, with some being of little value due to a variety of reasons such as lack of information on the design process, use of a population other than the target population to test the pictograms, not showing the pictograms tested and inadequate reporting of the results. Little benefit is gained from studies which merely present results of the evaluation process and do not give any indication of either an intention to use the data as feedback for improving future designs or to evaluate their practical implementation. A number of these studies either tested the USP-DI pictograms or used them as a basis for pictogram design.

In this study, the same two researchers who developed the Local pictograms also conducted the interviews in which both sets of pictograms were evaluated. This introduces a potential weakness in the research procedure as the researchers could have influenced the evaluation process. However, each interview was conducted by one researcher, each working with an interpreter and during discussions about the results, it became clear that both researchers had similar findings and experiences. As all communication with the respondents was through an interpreter, direct communication between the researcher and the respondent was minimal. The interpreter was therefore the person responsible for communicating the interpretation of the pictogram, a process which obviated any possible influence the researcher may have unwittingly exerted over the respondent. In a subsequent stage of this project, a large number of senior pharmacy students were trained and used as research assistants for data collection. They were asked to annotate every answer as well as assess correctness of interpretation. Generally, their results were similar to the findings of the authors, but it was also apparent that a number of the students lacked the insight and the interviewing skills to collect and evaluate the responses appropriately. This experience highlighted the need to have an experienced researcher, preferably a qualified pharmacist involved in the data collection process. Limited funding was available for this study, which prevented us from appointing and training a qualified research assistant to conduct the interviews.

South Africa is a multicultural, multilingual society with 11 official languages. There are eight major black ethnic groups each with its own language, culture and traditions. This study was conducted only in the Xhosa ethnic group, but we have subsequently tested the pictograms in the other seven major ethnic groups to investigate possible cultural differences in interpretation [65]. The results from this study in the Xhosa cultural group clearly illustrate the importance of collaborating with the target culture when designing pictograms. Even then, we found that we had to proceed one step further and focus on the specific sector within the target culture for which the pictograms were mainly intended, i.e. those people with limited or no schooling.

In testing literate Xhosa respondents with higher levels of education, and questioning them about their opinions of the pictograms intended for the lower-literate person [66], many respondents expressed perceptions about the lack of ability of the low-literate person to interpret pictograms which was not substantiated by our results, e.g. many educated Xhosas stated that we should not use clock faces on the pictograms as most low-literate people could not tell the time. Contrary to this, only 11% were unable to tell the time, and those pictograms on which clock faces appeared (Pictograms 15, 17, 20 and 21) were generally well interpreted.

Tests on visual perception have revealed that training in how to read images greatly enhances the performance of test subjects [29]. Other researchers have suggested that images which are not immediately recognised may, however, be rapidly learned [37] implying that the most appropriate set of visual images may not be one containing a high proportion of symbols which are recognised on first encounter, but rather one containing symbols which can be easily learned and subsequently recalled. In this study, respondents were shown a total of 46 pictograms in a relatively short space of time, a process which was potentially tiring and confusing, particularly for those respondents with underdeveloped visual literacy skills. These respondents were exposed to a large number of new images which required learning. This process was an intensive explaining/learning one, with much information being offered and processed and it called for a sustained high degree of concentration from the respondent.

During the follow-up interview conducted three weeks later, a significant improvement in interpretation was noted, with all but three of the Local pictograms complying with the ANSI 85% criterion. This supports findings from studies of picture memory which have suggested a large capacity for visual information and good retention of pictures over time [67]. It also reinforces the importance of incorporating a follow-up phase in the testing process and serves as testimony to the success of the pictograms as being easily learned and subsequently recalled over a prolonged time. In practice, a patient would only be required to learn the meaning of a limited number of pictograms directly pertaining to his medicine. He would then be required to recall this information within a short period of time, up to a maximum of 24 h depending on the dosage interval. The demands on our respondents were obviously far greater, and provided us with a rigorous method of assessing the ease with which pictograms could be learnt and their effectiveness in stimulating recall of information.

Research indicates that pictograms should rarely be used as the sole communication source as they do not convey the level of detail needed for proper comprehension of pharmaceutical information [9, 38, 46, 48 and 60]. However, they have been shown to be an effective aid to comprehension and recall if combined with text [46, 51, 60, 68 and 69]. The problem in low-literate patients is their inability to read the text, so in this population pictograms should always be used in conjunction with verbal counselling although pharmacists have commented that extra time is required to explain the pictogram labels [38]. Clearly, the patients who would derive the most benefit from pictogram labels are, by definition, going to be those patients who will require additional counselling. In such cases, pictogram labels should expedite this responsibility.

The success of this method of communicating information to low-literate patients was highlighted by our respondents, who unanimously stated that it was a good idea to have pictograms on their medication and they felt pictograms would be valuable in assisting them to remember their medication instructions.

5. Practical implications







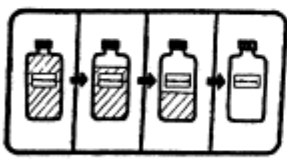
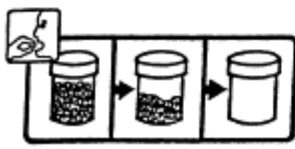




Low-literate patients comprise a patient population with special needs who are at a higher risk of experiencing poor health. This study has shown that pictograms can be successful in communicating medication information to such a population, particularly if they are developed in collaboration with the target community and cultural influences are acknowledged. When used appropriately, with time being taken by the health care provider to explain their meaning, they have been proven to be most successful in stimulating recall of medication information. A limited number of studies have also shown their positive influence on patient education and compliance. The challenge lying ahead is to influence and convince health authorities of the need for this type of intervention, introduce pictograms into routine practice and monitor the outcomes of such an initiative. This research will form the next stage of our project on pictograms.

Acknowledgements

The authors would like to acknowledge Rhodes University for financial assistance, Professor Sarah Radloff for statistical assistance, Miss Nontutuzelo Faku for acting as our interpreter and all the respondents who willingly participated and offered their opinions.

Appendix A

Local and USP pictograms used in the study

<p>1. This medicine may make you drowsy</p> <p>Local</p>  <p>USP</p> 	<p>2. Do not break or crush capsules or tablets</p> <p>Local</p>  <p>USP</p> 	<p>3. Do not store near heat or in sunlight</p> <p>Local</p>  <p>USP</p> 
<p>4. Complete the course</p> <p>Local</p>  <p>USP</p> 	<p>5. Insert into the vagina</p> <p>Local</p>  <p>USP</p> 	<p>6. Insert into the rectum</p> <p>Local</p>  <p>USP</p> 

7. Store in the refrigerator

Local



USP



8. Shake the bottle before use

Local



USP



9. Do not drink alcohol while on this medicine

Local



USP



10. Do not take this medicine if breastfeeding

Local



USP



11. Do not take with meals

Local



USP



12. Do not take with milk or other dairy products

Local



USP



13. Take with a glass of water

Local



USP



14. Take at night

Local

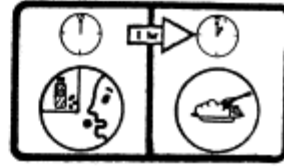


USP

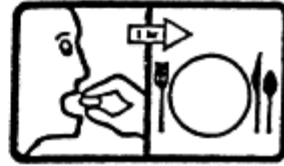


15. Take one hour before meals

Local



USP



16. Do not take this medicine if pregnant

Local

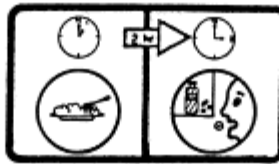


USP

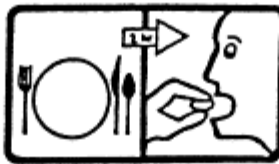


17. Take two hours after meals

Local



USP






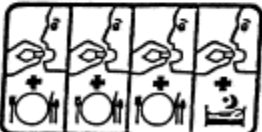






18. Take with meals

Local



USP



<p>19. Place drops in the nose</p> <p>Local</p>  <p>USP</p> 	<p>20. Take three times a day with meals and at night</p> <p>Local</p>  <p>USP</p> 	<p>21. Take four times a day</p> <p>Local</p>  <p>USP</p> 
<p>22. Place drops in the ear</p> <p>Local</p>  <p>USP</p> 	<p>23. Place drops in the eye</p> <p>Local</p>  <p>USP</p> 	

References

1. Strand, L. **Report on the Hoechst Marion Roussel lecture: Building a practice in pharmaceutical care** (1998), *Pharm J*, 260, pp. 874-876.
2. ASHP guidelines on pharmacist-conducted patient education and counseling. *Am J Health-Syst Pharm* 1997; 54:431-4.
3. Bruce, O.A.C., The crucial role of the pharmacist. *Int. Pharm. J.* **12** (1998), pp. 14-15.
4. Doak, C.C., Doak, L.G., Root, J.H. *Teaching patients with low literacy skills*. Philadelphia (JB): Lippincott Co., 1996.

5. Williams, M.V., Parker, R.M., Baker, D.W., Parikh, N.S., Pitkin, K., Coates, W.C., Nurss, J.R., Inadequate functional health literacy among patients at two public hospitals. *J. Am. Med. Assoc.* **274** (1995), pp. 1677–1682.
6. McCormick, K., Dealing with illiterate patients. *NARD J.* **110** (1988), pp. 41–44.
7. Report of the National Work Group on literacy and health, USA. Communicating with patients who have limited literacy skills. *J Fam Pract* 1998;46:168–76.
8. Mayeaux Jr., E.J., Murphy, P.W., Arnold, C., Davis, T.C., Jackson, R.H., Sentell, T., Improving patient education for patients with low literacy skills. *Am. Fam. Phys.* **53** (1996), pp. 205–211.
9. Rymes-Barley C. A secret inability to comply. The price of illiteracy. *Can Pharm J* 1989;86–94.
10. Frankel, D.H., Think horses, not zebras. *Lancet* **2** (1987), pp. 1515–1516.
11. Holt, G.A., Hollon, J.D., Hughes, S.E., Coyle, R., OTC labels: can consumers read and understand them. *Am. Pharm.* **30** (1990), pp. 51–54.
12. Hussey, L.C., Gilliland, K., Compliance, low literacy and locus of control. *Nurs. Clin. N. Am.* **24** (1989), pp. 605–611.
13. Morgan, P.P., Illiteracy can have major impact on patients' understanding of health care information. *Can. Med. Assoc. J.* **148** (1993), pp. 1196–1197.
14. Gazmararian, J.A., Baker, D.W., Williams, M.V., Parker, R.M., Scott, T.L., Green, D.C., Fehrenbach, S.N., Ren, J., Koplan, J.P., Health literacy among medicare enrollees in a managed care organization. *J. Am. Med. Assoc.* **281** (1999), pp. 545–551.
15. Miles, S., Davis, T., Patients who cannot read. Implications for the health care system. *J. Am. Med. Assoc.* **274** (1995), pp. 1719–1720.
16. Weiss, B.D., Coyne, C., Communicating with patients who cannot read. *New Engl. J. Med.* **337** (1997), pp. 272–274.
17. Weiss, B.D., Hart, G., Pust, R.E., The relationship between literacy and health. *J. Health Care Poor Underserved* **1** (1991), pp. 351–363.
18. Weiss, B.D., Hart, G., McGee, D.L., D'Estelle, S., Health status of illiterate adults: relation between literacy and health status among persons with low literacy skills. *J. Am. Board Fam. Pract.* **5** (1992), pp. 257–264.
19. Report of the Council on Scientific Affairs, American Medical Association. Health literacy. *J Am Med Assoc* 1999;281:552–7.
20. Jackson, R.H., Davis, T.C., Bairnsfather, L.E., George, R.B., Crouch, M.A., Gault, H., Patient reading ability: an overlooked problem in health care. *South Med. J.* **84** (1991), pp. 1172–1175.
21. Bradley, B., Singleton, M., Po, A.L.W., Readability of patient information leaflets on over-the-counter (OTC) medicines. *J. Clin. Pharm. Ther.* **19** (1994), pp. 7–15.

22. Powers, R.D., Emergency department patient literacy and the readability of patient-directed materials. *Ann. Emerg. Med.* **17** (1988), pp. 124–126.
23. Larson, I., Schumacher, H.R., Comparison of literacy level of patients in a VA arthritis center with the reading level required by educational materials. *Arthritis Care Res.* **5** (1992), pp. 13–16.
24. Davis, T.C., Mayeaux, E.J., Fredrickson, D., Bocchini Jr., J.A., Jackson, R.H., Murphy, P.W., Reading ability of parents compared with reading level of pediatric patient education materials. *Pediatrics* **93** (1994), pp. 460–468.
25. Davis, T.C., Bocchini Jr., J.A., Fredrickson, D., Arnold, C., Mayeaux, E.J., Murphy, P.W., Jackson, R.H., Hanna, N., Paterson, M., Parent comprehension of polio vaccine information pamphlets. *Pediatrics* **97** (1996), pp. 804–810.
26. Jolly, B.T., Scott, J.L., Feied, C.F., Sanford, S.M., Functional illiteracy among emergency department patients: a preliminary study. *Ann. Emerg. Med.* **22** (1993), pp. 573–578.
27. French E. Adult literacy in South Africa: past to present. In: Hutton B, editor. Adult basic education in South Africa: literacy, English as a second language and numeracy. Cape Town (SA): Oxford University Press, 1992. pp. 48–55.
28. Dowse, R., Ehlers, M.S., Pictograms in pharmacy. *Int. J. Pharm. Pract.* **6** (1998), pp. 109–118.
29. Mangan, J., Cultural conventions of pictorial representation: iconic literacy and education. *Edu. Commun. Tech. J.* **26** (1978), pp. 245–267.
30. Kolers, P.A., Some formal characteristics of pictograms. *Am. Scient.* **57** (1969), pp. 348–363.
31. Walker DA. Understanding pictures: a study in the design of appropriate visuals for education in developing countries. Center for International Education, University of Massachusetts, 1978.
32. Hudson, W., The study of the problem of pictorial perception among unacculturated groups. *Int. J. Psychol.* **2** (1967), pp. 89–107.
33. Louw, D.A., Plug, C., Sensation and perception. In: Louw DA, Edwards DJA, editors. Psychology. An introduction for students in Southern Africa. Johannesburg: Heinemann, 1998. pp. 160–5.
34. Colle, R., Glass, S., Pictorial conventions in development communication in developing countries. *Media Edu. Dev.* **19** (1986), pp. 159–162.
35. Davies, S., Haines, H., Norris, B., Wilson, J.R., Safety pictograms: are they getting the message across?. *Appl. Ergon.* **29** (1998), pp. 15–23.
36. Rohret, L., Ferguson, K.J., Effective use of patient education illustrations. *Patient Edu. Couns.* **15** (1990), pp. 73–75.
37. Cairney, P., Sless, D., Communication effectiveness of symbolic safety signs with different user groups. *Appl. Ergon.* **13** (1982), pp. 91–97.

38. Hanson, E.C., Hartzema, A., Evaluating pictograms as an aid for counseling elderly and low-literate patients. *J. Pharm. Market Manage.* **9** (1995), pp. 41–54.
39. Magurno, A.B., Wogalter, M.S., Kohake, J.R., Wolff, J.S., Iterative test and development of pharmaceutical pictorials. In: Proceedings of the 12th Triennial Congress of the International Ergonomics Association 1994; 4:360–2.
40. Wolff J.S., Wogalter M.S., Test and development of pharmaceutical pictorials. In: Proceedings of Interface '93. Santa Monica: Human Factors Society. pp. 187–92.
41. American National Standard Institute. Accredited standard on safety colours, signs, symbols, labels, and tags, vol. Z535. Washington (DC): National Electrical Manufacturers Association, 1991. pp. 1–5.
42. International standard for safety colours and safety signs, ISO 3864. Switzerland: International Standards Organization, 1984.
43. United States Pharmacopeia dispensing information, vol. II. Rockville (MD): United States Pharmacopeial Convention Inc., 1989.
44. United States Pharmacopeia dispensing information, vol. II. Englewood: Micromedex Inc., 2000.
45. Ehlers M.S, Dowse R., Guidelines for the design of culture-specific pharmaceutical pictograms for use in a South African population. *Int J Pharm Pract*, in press.
46. Hanson, E.C., Evaluating cognitive services for non-literate and visually impaired patients in community pharmacy rotation sites. *Am. J. Pharm. Edu.* **59** (1995), pp. 48–55.
47. Wolff, J.S., Wogalter, M.S., Comprehension of pictorial symbols: effects of context and test method. *Hum. Factors* **40** (1998), pp. 173–186.
48. Hardie, N.R., Gagnon, J.P., Eckel, F.M., Feasibility of symbolic directions on prescription labels. *Drug Intell. Clin. Pharm.* **13** (1979), pp. 588–595.
49. Kalsher, M.J., Wogalter, M.S., Racicot, B.M., Pharmaceutical container labels: enhancing preference perceptions with alternative designs and pictorials. *Int. J. Ind. Ergon.* **18** (1996), pp. 83–90.
50. Sojourner, R.J., Wogalter, M.S., The influence of pictorials on evaluations of prescription medication instructions. *Drug Inform. J.* **31** (1997), pp. 963–972.
51. Morrell, R.W., Park, D.C., Poon, L.W., Effects of labeling techniques on memory and comprehension of prescription information in young and old adults. *J. Gerontol.* **45** (1990), pp. 166–172.
52. Loughrey, L. Dealing with the illiterate patient. You cannot read him like a book. *Nursing* 1983;29–31.
53. Lenderink, A.W., Reducing mistakes in administration of medicines by means of pictographs. *Pharm. Weekblad.* **119** (1984), pp. 520–523.
54. Van Hattum, A.J.S., Apituley, A., Paes, A.H.P., Geneesmiddeleninstructie met behulp van beelden (developing visuals for drug information). Tussenrapportage BOP-project: Begrijpelijke geneesmiddeleninstructies voor Turkse en Marokkaanse migranten. *Pharm. Weekblad.* **126** (1991), pp. 137–140.

55. Eustace, C.A., Johnson, G.J., Gault, M.H., Improvements in drug prescription labels for patients with limited education or vision. *Can. Med. Assoc. J.* **127** (1982), pp. 301–302.
56. Van Hattum, A.J.S., Paes, A.H.P., Geneesmiddeleninstructies met behulp van beelden (developing visuals for drug information). Tweede tussenrapportage BOP-project: Begrijpelijke genees-middeleninstructies voor Turkse en Marokkaanse migranten. *Pharm. Weekblad.* **126** (1991), pp. 1008–1012.
57. Houts, P.S., Bachrach, R., Witmer, J.T., Tringali, C.A., Bucher, J.A., Localio, R.A., Using pictographs to enhance recall of spoken medical instructions. *Patient Edu. Couns.* **35** (1998), pp. 83–88.
58. Liberman, P., Swartz, A.J., Prescription dispensing to the problem patient. *Am. J. Hosp. Pharm.* **29** (1972), pp. 163–166.
59. Ringseis E.L, Caird J.K., The comprehensibility and legibility of 20 pharmaceutical warning pictograms. In: Proceedings of the 39th Annual Meeting of Human Factors and Ergonomics Society, 1995. pp. 974–8.
60. Sojourner, R.J., Wogalter, M.S., The influence of pictorials on the comprehension and recall of pharmaceutical safety and warning information. *Int. J. Cognitive Ergon.* **2** (1998), pp. 93–106.
61. Ngoh, L.N., Shepherd, M.D., Design, development, and evaluation of visual aids for communicating prescription drug instructions to nonliterate patients in rural Cameroon. *Patient Edu. Couns.* **30** (1997), pp. 257–270.
62. Adams, L., Communication between the hospital pharmacist and other cultural groups in the Southern African context. *S.A. Pharm. J.* **58** (1991), pp. 168–171.
63. Dowse, R, Ehlers, M.S., The development and evaluation of pharmaceutical pictograms. In: Scott PA, Bridger RS, Charteris J, editors. Global ergonomics. Proceedings of the Ergonomics Conference, Cape Town, 1998. Amsterdam: Elsevier, 1998. pp. 565–70.
64. Ehlers, M.S., Dowse, R., Pharmaceutical pictograms for antibiotic therapy: do they work? In: Scott PA, Bridger RS, Charteris J, editors. Global ergonomics. Proceedings of the Ergonomics Conference, Cape Town, 1998. Amsterdam: Elsevier, 1998. pp. 575–80.
65. Dowse, R., Ehlers, M.S., Pictograms: are they part of a universal language? In: Proceedings of the 59th Annual Congress of FIP, Barcelona, Spain, 1999.
66. Ehlers, M.S., Dowse, R., The understanding of medication instructions via pictograms by Xhosa-speaking people of different education levels. In: Proceedings of the 14th Annual Congress of the Academy of Pharmaceutical Sciences, Durban, South Africa, 1993.
67. Standing, L., Conezio, J., Haber, R.N., Perception and memory for pictures: single-trial learning of 2500 visual stimuli. *Psychon. Sci.* **19** (1970), pp. 73–74.
68. Austin, P.E., Matlack II, R., Dunn, K.A., Kesler, C., Brown, C.K., Discharge instructions: do illustrations help our patients understand them. *Ann. Emerg. Med.* **25** (1995), pp. 317–320.
69. Moll, J.M.H., Doctor–patient communication in rheumatology: studies of visual and verbal perception using educational booklets and other graphic material. *Ann. Rheum. Dis.* **45** (1986), pp. 198–209.