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Using pictographs to enhance recall of spoken medical instructions II

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Abstract

The first study in this series [Houts PS, Bachrach R, Witmer JT, Tringali CA, Bucher JA, Localio RA. Patient Educ. Couns. 1998;35:83–8] found that recall of spoken medical instructions averaged 14% but that, when pictographs (drawings representing the instructions) accompanied the spoken instructions and were present during recall, 85% of medical instructions were remembered correctly. Those findings suggested that spoken instructions plus pictographs may be a way to give people with low literacy skills access to medical information that is normally available only in written form. However, there were three important limitations to that study: (1) the subjects were literate and perhaps literate people remember pictograph meanings better than people with low literacy skills; (2) only short term recall was tested and, for medical information to be useful clinically, it must be remembered for significant periods of time and (3) a maximum of 50 instructions were shown in pictographs, whereas managing complex illnesses may require remembering several hundred instructions. This study addresses those limitations by investigating 4-week recall of 236 medical instructions accompanied by pictographs by people with low literacy skills. Subjects were 21 adult clients of an inner city job training program who had less than fifth grade reading skills. Results showed 85% mean correct recall of pictograph meanings immediately after training (range from 63 to 99%) and 71% after 4 weeks (range from 33 to 94%). These results indicate that people with low literacy skills can, with the help of pictographs, recall large amounts of medical information for significant periods of time. The impact of pictographs on symptom management and patient quality of life remains to be studied.

Keywords: Patient education; Low literacy; Recall

1. Introduction

As reliance on outpatient care increases and hospital stays shorten, patients and families are taking on larger and larger roles in managing illness. If they are to fulfill their roles adequately, patients and families must have information and guidance on how to manage symptoms and when to call for professional help. Written patient education materials are the traditional way to provide this kind of information. But, for people who cannot read, written materials are not useful.

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1.1. Prevalence of low literacy skills

Having low literacy skills is a widespread problem that has important implications for people's ability to understand and manage symptoms related to serious illnesses. The United Nations reports that there are significant numbers of people with low literacy skills even among industrialized countries including the UK (21.8%), the USA (20.7%), Canada (16.6%), Japan (16.8%), The Netherlands (10.5%) and Sweden (7.5%) [2]. A recent study by Gazmararian et al. [3] of 3260 enrollees in a national managed care organization in the United States found that 23% of English-speaking and 34% of Spanish-speaking respondents had inadequate ability to read and comprehend medical information in their spoken languages. Furthermore, of those with low ability to read medical information, only 55% reported having someone in their households who could read for them [4].

Low health-literacy skills are especially prevalent among minority, low income, and low education populations. Gazmararian et al. [3] reported inadequate health literacy levels of 52% for African Americans, 30% for English-speaking Hispanics, and 34% for Spanish-speaking Hispanics (tested in Spanish) as compared to 19% for whites. Rates changed with income too, with 42% of those with incomes less than US$ 10,000 having inadequate health literacy as compared to only 8% of those with incomes greater than US$ 35,000. Education showed similar patterns with 58% of those with grade school or less education with inadequate health literacy compared to 10% of those with more than a high school education. Another important predictor is age, with 58% of Medicare enrollees 85 years of age or older having inadequate health literacy as compared to 15% of those who are 65–69 years of age.

1.2. Effects of health illiteracy

Low literacy skills can make it difficult for health professionals to inform patients about their illnesses and their treatment options and to insure meaningful informed consent. People with low literacy skills may also have difficulty understanding wellness promotion and reminders for preventive services, and be unable to use patient education materials for managing care at home and for communicating medical information to health professionals. These limitations can affect both patient morbidity and health care costs. Fried land [5] estimated the costs of health illiteracy in the United States at between US$ 30 and 70 billion dollars per year based on data obtained from the 1992 National Adult Literacy Survey and from the 1993 Survey of Income and Program Participation.

1.3. Recognition of the problem

Communicating health information to people with low literacy skills has received increasing attention in recent years [6–8]. In 1998 The American Medical Association Council on Scientific Affairs adopted, as AMA policy, that "The AMA recognizes that limited patient literacy is a barrier to effective medical diagnosis and treatment," that "The AMA will work... to make the health care community aware that approximately one-fourth of the adult population has limited literacy and difficulty understanding both oral and written health information", and "The AMA encourages the allocation of federal and private funds for research on health literacy" [6].

1.4. Communicating medical information to people with low literacy skills

Simplification of language has been the principal technique used by health educators to make written materials understandable and useful for people with low literacy skills. Illustrations have also been used to increase interest and meaningfulness of written information. These are important and useful techniques, but they assume some ability to read and, therefore, cannot help those with no or very limited reading skills. Video and audio tapes are effective in communicating information to people with very low literacy skills, but listeners must remember the messages, if they are to be used. This limits their usefulness to simple, important ideas. Where the problems to be dealt with are complex, such as managing symptoms from chemotherapy, multiple actions are needed to manage multiple symptoms. Here health professionals could explain in person or on video or audio tapes, what should be done, but the non-reading listener must remember what was said and there is a substantial

body of literature showing that recall of oral medical instructions is often poor. Ley [9] in a review of this literature reported recall rates ranging from 29 to 72% and that, the more medical information given orally, the poorer the total recall. Houts et al. [1] reported an average recall rate of 14% (range from 5 to 32%) for orally presented lists of 38 actions to manage fever and 50 actions to manage mouth sores due to cancer treatments.

Combining oral instructions with drawings or photos that illustrate the oral message results in increased recall over oral instructions alone [10–13]. For example, the effects of visual aids in health education for non-literate women in rural Cameroon was studied by Ngoh and Shepherd [13], who found that including visual aids in the education phase improved both comprehension and compliance when compared to a control group that did not have visual aids during training.

Combining oral instructions with illustrations of actions to be taken (pictographs) which serve as cues to facilitate recall has also been studied. This work goes beyond using illustrations in teaching and gives patients copies of the illustrations to take with them and to use as reminders of what they heard. Pharmacists have reported programs where patients took pictographs home to remind them of what the pharmacists told them [14,15]. Harper and Van Riper [16] gave pictographs to non-literate patients to remind them how to manage their implantable cardioverter defibrillators. Unfortunately, these reports did not include data on whether patients' recall was improved by having the pictographs.

Houts et al. did study the effects of pictographs on recall of medical instructions by 21 junior college students and found a marked improvement over oral instructions alone [1]. Their subjects listened to lists of 38 actions for managing fever and 50 actions for managing sore mouth. One of the action lists was accompanied by pictographs for each action during both listening and recall while the other was not. Presentations were counterbalanced so that half of the subjects had pictographs with the sore mouth instructions and the other half with the fever instructions. Subjects did not see any written words during the intervention and, therefore, relied entirely on memory of what they heard. The results showed a very large mean difference without any overlap between the conditions. Mean correct recall was 85% with pictographs and 14% without ($P < 0.0001$).

1.5. Purpose of this research

There were three important limitations to the Houts et al. research: (1) the subjects were literate junior college students (even though there was no writing on the pictographs, it could be argued that literate people understand and remember pictograph meanings better than non-literate people); (2) only immediate recall was tested whereas medical instructions must be remembered for long periods to be useful and (3) the number of pictographs was limited to one symptom, leaving open the question of whether people could remember the meanings of several 100 pictographs needed to manage multiple symptoms — as are commonly experienced by patients with serious illnesses. This research project addresses these questions.

2. Study design

This is a descriptive study intended to answer three questions raised by the Houts et al. earlier research [1]: (1) can people with low literacy skills (less than 50 grade reading level) (2) remember large numbers of actions (236) for managing symptoms (3) for long periods of time (4 weeks). To answer these questions 193 pictographs representing 236 actions were created and 21 subjects with less than fifth grade reading scores were taught the pictograph meanings followed by testing their recall immediately after learning and 4 weeks later. There is no control group because the earlier research [1] had already shown that pictographs improve recall over spoken instructions alone. The question to be addressed in this study was how much information could be recalled by people with low literacy skills and for how long?

2.1. Pictograph development

First, 193 pictographs were created. The actions depicted in the pictographs were taken from the American College of Physicians Home Care Guide for Cancer [17] and the American College of Physicians Home Care Guide for HIV and AIDS [18]. These

books include chapters for how to manage illness-related symptoms and problems. Chapter topics include when to call the doctor immediately, when to call during office hours, what the family caregiver can do to deal with the problem, and what can be done to prevent the problem. Within topics there are lists of actions the patient or the family caregiver should take in managing symptoms. Pictographs were drawn to represent the actions listed for six problems: fever and sore mouth from the cancer book and nausea, depression, fatigue, and how to control the spread of infections to and from the person with HIV/AIDS from the HIV/AIDS book. Two of the topics, fever and sore mouth, were the same as used in the earlier pictograph study [1]. The pictographs were refined based on reviews by five health professionals and field tests with 15 low literacy people. Some pictographs consisted of one drawing while others, representing more complex instructions, required several drawings. Fig. 1 shows four examples of pictographs used in this study with their definitions. Stick figures were used because their simplicity helps to focus attention on the actions being performed and because they are equally appropriate for different ethnic, age, and gender groups. A professional illustrator was employed to maximize the drawings' effectiveness in communicating important actions and emotions.

2.2. Subjects

Twenty-nine subjects were recruited from clients of an inner-city program for adults that teaches skills needed to obtain and maintain employment. Subjects had a tested reading level of less than fifth grade as measured by the Test of Adult Basic Education (TABE) [19] and had volunteered for the program. The study population included people who had performed well in the program as well as many who had difficulties or had dropped out. As a result, the study population included people who, according to reports from the staff of the training program, had problems often correlated with low literacy including drug use, short attention spans, negative attitudes toward authority, and limited mental abilities.

Three experienced high school English teachers plus the principal investigator conducted the training and recall testing. The teachers were trained to follow a detailed protocol prepared by the principal investigator based on experience with the pilot subjects. Informed consent, training, and testing procedures

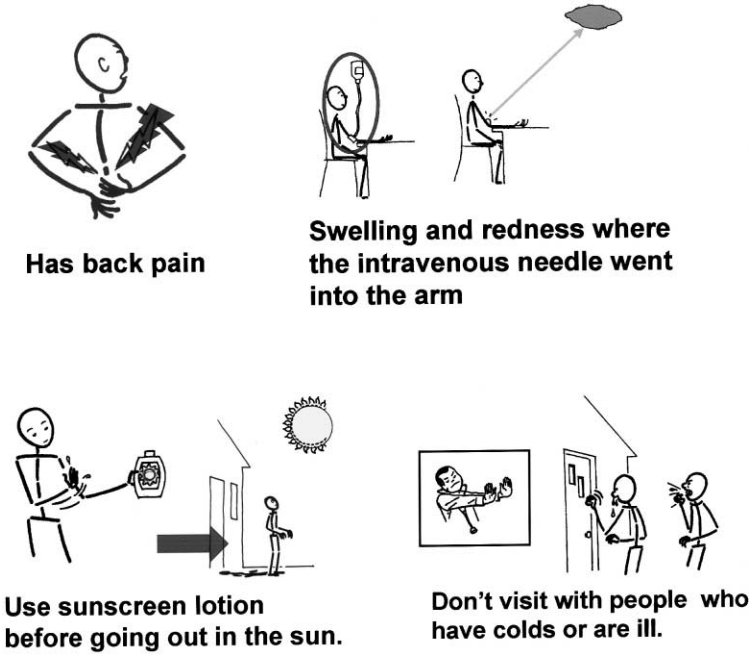

Fig. 1. Example pictographs.

were approved by the Clinical Research Review and Monitoring Committee of the Johns Hopkins Cancer Center. Subjects were paid US$ 40 for participating in the 1.5 h training session. Four weeks later, subjects who participated in the follow-up session received US$ 50 and five cents for every pictograph correctly recalled.

2.3. Teaching and testing procedures

Before seeing pictographs, subjects were taught the meanings of 29 ''conventions'' standardized parts of pictographs that always have the same meanings. Examples include that a blue arrow indicates time passing, that a red lightning bolt indicates pain, that a day is represented by the sun rising and setting and that 24 h is depicted by the sun rising and setting plus a moon.

Next, subjects were shown the pictographs grouped by problem. After showing a pictograph, the instructor gave its meaning, and waited for recognition that the subject understood — usually a nod of the head — before moving to the next pictograph. At the end of each problem group, the instructor showed the pictographs again and the subject stated their meanings. A record was kept off the accuracy of the responses. Errors were corrected so the recall test was also a learning experience. Subjects were then paid US$ 40 for attending and were reminded that they would be paid US$ 50 and five cents for each correct answer when they returned for recall testing.

After 4 weeks the initial training, subjects returned for a test of their recall of pictograph meanings. Testers were the same people who had done the instructions 4 weeks earlier, but subjects were not necessarily tested by the same person who had taught them. Subjects were shown the ''conventions'' and pictographs in the same order that they had been taught. Subjects were asked to state the meanings of the conventions and pictographs. If the response was incorrect because it did not include an important part of the definition (for example, saying the person had a headache without adding that it was severe), the tester asked if there was ''anything else'' and this was noted on the scoring sheet. If the response was incorrect because it only described what the characters in the pictograph were doing without stating a general rule (for example, he is eating, he is drinking, he is eating without stating the general meaning ''drink liquids with meals''), the tester asked ''what does that mean?'' and this was noted on the scoring sheet. At the end of the session subjects were thanked and paid US$ 50 for attending and five cents for each correct answer (including correct answers after questioning).

3. Results

Twenty-nine subjects were recruited for the initial training session. Twenty-one of those trained returned for the follow-up testing 4 weeks later. Characteristics of those who did and did not return for testing are shown in Table 1. There were no statistically significant differences between the groups in their demographic characteristics or in their reading scores. In general, subjects were people with many problems coping with life. The reasons for subjects not returning show this. They include that one subject was reported

Table 1
Subject characteristics

Characteristic	Subjects who provided both immediate and 4-week recall data	Subjects with incomplete data
Number of subjects	21	8
Mean age	38.8 (Range 17–65)	29.8 (Range 18–59)
Percent male	33%	38%
Ethnicity	African American 67%	63%
	Hispanic 24%	37%
	Caucasian 9%	0%
Mean years of formal schooling	9.2 (Range 3–12)	9.1 (Range 5–12)
Grade reading level	3.4 (Range 1.6–4.6)	3.0 (Range 2.0–3.9)

to be incarcerated, one moved without leaving a forwarding address, one said she was ''bored'' during the initial session and so would not come back, and one could not be located. An unfortunate coincidence was that several subjects had just received pay or government checks just before the follow-up testing and so did not feel an immediate need for the honorarium. Those who did return received reminders, and in some cases, transportation as well.

A response was scored as correct if the subject stated its meaning correctly either before or after being asked ''is there anything more'' or ''what does that mean?'' At the 4-week testing, records were kept of questions asked so that a scoring of correct answers without questioning was also available. During both immediate and 4-week recall testing, subjects were asked to define the 29 conventions as well as the pictographs. Several pictographs included multiple actions. An example is the pictograph that directs the caregiver to serve fruits, pasta, bread, and potatoes to the person with fever. The four actions shown in this pictograph were scored separately. The total number of actions plus conventions was 236.

Immediate recall of the 236 pictograph meanings (including conventions) averaged 85% with a range from 63 to 99%. Recall 4 weeks later averaged 71% with a range from 33 to 94%. Mean recall at 4-weeks counting only first responses (without answers to ''is

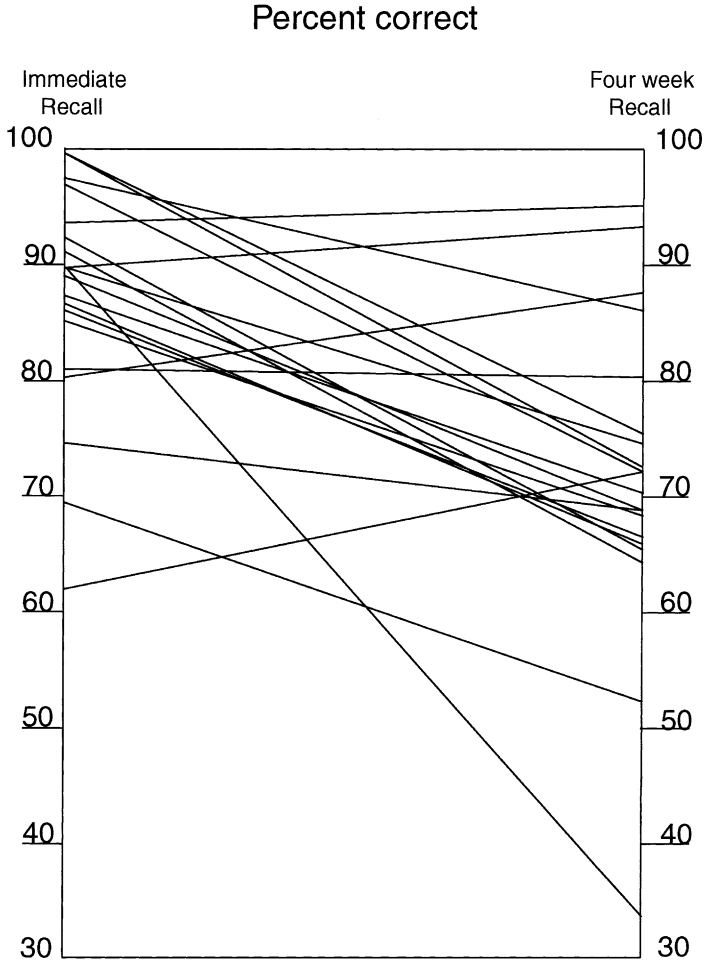

Fig. 2. Change in recall of pictograph meanings over a 4-week period.

there was anything more'' or ''what does that mean?'') was 64% with a range from 33 to 91%. Fig. 2 shows the distribution of recall scores for immediate and 4-week testings with connecting lines showing, how each subject changed. The fact that some subjects' scores improved from immediate to 4-week testing is probably because errors were corrected during the initial testing so that it served as a learning as well as a testing session. The Spearman correlation between immediate and 4-week recall was not statistically significant ($r = 0.23$ and 0.33).

Table 2 shows the number of pictographed actions with zero to 20 errors during initial testing and at the 4-week follow-up. Only 20 of the 21 subjects had complete data on items missed because of a miscommunication with one of the testers. Therefore, the maximum number of errors for each action was 20. Immediate recall results showed that 57% of the pictographs were correctly identified by 90% of the subjects and 86% were correctly identified by 75% of the subjects. At 4 weeks, the recall rate dropped with 27% of the pictographs correctly identified by 90% of the subjects and 51% correctly identified by 75% of the subjects. Also shown is the error rate if only the subject's first statement was accepted for scoring without counting responses to instructors' questions. With this scoring, only 17% of the pictographs were correctly identified by 90% of the subjects at 4 weeks and 33 by 75% of the subjects.

Table 2
Actions recognized correctly immediately after training and 4 weeks later

Percent of correct responses (%)[a]	Number of actions		
	Immediate recall	Four-week recall	Four-week recall first response only
100	43[b]	22	12
95	49	22	14
90	42	19	15
85	23	24	10
80	28	21	13
75	19	14	23
70	9	18	20
65	7	6	15
60	6	13	14
55	4	12	20
50	3	15	9
45	2	13	12
40	0	7	11
35	0	11	16
30	1	4	8
25	0	5	5
20	0	2	3
15	0	3	3
10	0	3	4
5	0	2	0
0	0	0	3
Total	236	236	236

[a] Data on responses to individual pictographs was not available for one subject. Therefore, percentages are based on an N of 20.

[b] For example, 43 of the 236 actions shown in the pictographs were correctly identified by 100% of the subjects during immediate recall.

Comparing the pictographs with few errors with those with a large number of errors suggested that those with few errors tend to be simple, meaning that there was a direct relationship between the pictograph and its meaning, while pictographs with a large number of errors appeared to be complex and to require an inference from what is happening in the picture to the general meaning of the pictograph. To test this observation, we asked a panel of six people who did not know the pictograph recall scores to divide the pictographs into three groups: (1) simple, (2) intermediate, and (3) complex. Simple was defined as having a direct relationship between the drawing and its meaning while complex was defined as requiring an inference from the action shown in the picture to its meaning (see examples of complex and simple pictographs in Fig. 3). Forty pictographs were rated by all six reviewers as being simple. However, no pictographs were rated by all six reviewers as complex. In order to create a comparison group of reasonable size, we combined the complex and intermediate categories. Thirty-two pictographs were rated by at least four of the six reviewers as being complex or intermediate (the remaining 121 pictogaphs had fewer than four ratings of complex or intermediate). Mean recall of the 32 complex/intermediate pictographs immediately after instruction was 87% as compared to 95% for simple pictographs ($t = 3.9$ and 70 d.f., $P < 0.001$). After 4 weeks, the mean recall of complex/intermediate pictographs was 71 and 87% for simple pictographs ($t = 3.7$ and 70 d.f., $P < 0.001$).

In order to compare these results with those in the earlier pictograph study [1], 40 pictographs were selected which appeared in both studies and which represented the same instructions for managing the

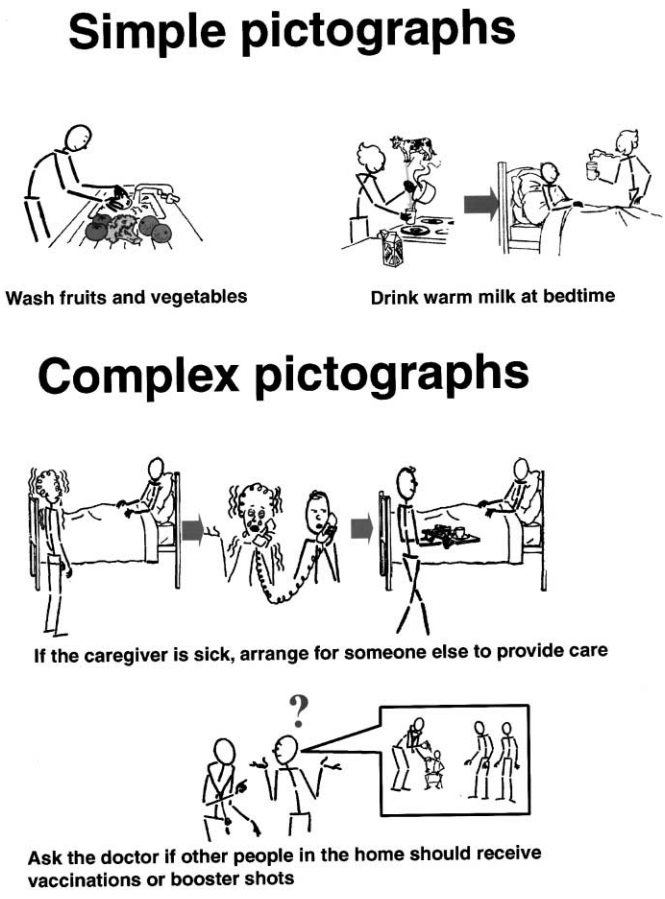

Fig. 3. Examples of simple and complex pictographs

same symptoms (fever and sore mouth). Both sets of pictographs used stick figures (though there were differences in the drawings due to using a professional illustrator for the second study) and the scoring criteria were the same for both groups. Mean accurate recall immediately after instruction was 87% for the junior college students in the first study and 91% for people with low literacy skills in the second study.

No predictions were made in advance for how subject characteristics shown in Table 2 might relate to recall. Therefore, these analyses were exploratory. The Hispanic group was of special interest because, for many Hispanics, English is a second language and so low literacy may have a different meaning for them. We, therefore, created a Hispanic/non-Hispanic score for these analyses. No subject characteristics correlated significantly with immediate recall, but there was a significant relationship between the Hispanic variable and 4-week recall (Hispanic mean recall = 84% and non-Hispanic mean recall = 66%, $t = 2.99$ and 19 d.f., $P < 0.001$). Interestingly, TABE reading scores were not significantly related to either immediate or 4-week recall scores.

Exploratory investigations also included interviews about each subject with staff of the vocational program from which subjects were recruited. Staff were asked to describe each of the participants. There was no consistent pattern between perceptions and experiences of staff and subjects' recall scores — with two interesting exceptions. The subject who had only 33% correct recall after 4 weeks also had difficulty recalling what she had learned from one class to the next and the subject with 93% correct recall after 4 weeks had received treatments for colon cancer.

4. Discussion

These findings address the three questions raised by the earlier Houts et al. [1] pictograph study with junior college students: can the findings be replicated with low literacy people and can they be extended to large numbers of actions for long periods of time? The results show that (1) low literacy people's immediate recall rates are similar to those of literate people (91% for low literacy subjects and 87% for junior college students for matched sets of pictographs — using similar stick figures and the same scoring method), (2) increasing the number of pictographs to 236 yields an 85% immediate recall rate, and (3) while there is some decrement with time, an average of 71% of the instructions were, with the help of pictographs, recalled correctly after 4 weeks.

There are important limitations to this study that should be noted. First, the findings are limited to the actions for which the pictographs were drawn. Second, results are not necessarily indicative of what will happen in a clinical setting where the incentives and stress levels will be different. In this study, financial incentives were used because, without them, many subjects would not agree to participate in the study and would not give their maximum attention to the tasks. In a clinical setting, the incentive would be to help management of difficult symptoms. What this study does establish is that people with low literacy skills (and many of the problems associated with low literacy) are capable of recalling a large percentage of instructions with the help of pictographs and, therefore, that pictographs may significantly improve recall of medical instructions in a clinical setting. Research in clinical settings is needed to determine, if these results can be replicated and if pictographs affect symptom management, morbidity, and quality of life.

It should be noted that these results were obtained with people who, according to staff reports as well as our own observations, exhibited many problems, in addition to low literacy, which could affect their performance including limited ability to abstract, unfriendly attitudes toward authority, short attention spans, and drug use. The cumulative effect of these life problems would be expected to inhibit their ability to process new information — and yet they were able to understand and remember considerable amounts of medical information. Furthermore, these recall rates were achieved under less than optimal teaching conditions. Subjects' exposure to each pictograph during training was quite short — usually less than a minute. Also, learning was largely passive since subjects just listened to the pictograph explanations without any opportunity to discuss what it meant to them or how they could use the information. This procedure maximized speed and simulated the conditions under which training would be likely to occur in a busy medical clinic. But it also minimized many educational techniques known to improve recall including active participation in the learning process, repetition, and a close, personal relationship to the instructor. In addition, these people did not have the motivation of a life threatening illness.

The findings also suggest that complex meanings are especially vulnerable to memory lapses. This could be because, if even a part is forgotten, the rest does not make sense. Another factor may be that the drawings do not directly suggest the pictograph's meaning and, as a result, recall depends on memory without cues. This points to the importance of memory skills in pictograph recall. The subject with the highest recall at 4 weeks (94%) said that "I have always had a good memory," while the subject with the lowest recall (33%) had difficulty remembering what was taught from one class session to the next. It also suggests that techniques known to improve recall — such as repetition, motivation, and meaningfulness of content — may improve pictograph recall as well. The importance of meaningfulness is illustrated by the second highest scorer (93%) at 4 weeks, who had received treatments for colon cancer, and therefore, could give personal meaning to the information represented by the pictographs.

The fact that recall rates were highest for "simple" pictographs (where there is a direct link between the picture and its meaning) raises the question of whether subjects would have guessed the pictograph meanings without being told what they meant. If so, then memory was not a factor in their scores. We cannot answer this question with the data available in this study but it is likely that several factors entered into subjects' responses. These include remembering the explanation given by the instructor, understanding the context (when to call the doctor or how to prevent an illness), cues from pictographs that preceded the one

being tested, previous knowledge of what should be done in caring for a sick person, and associations from their current thought patterns. From a practical standpoint it does not matter how subjects arrived at correct meanings since the end result was the same and the information was then available for the person to use. Furthermore, it will always be necessary to explain even simple pictograph meanings to minimize the chances of misinterpretation and to insure that they are understood in the correct context. Whatever the reasons for high recall of simple pictographs, they are clearly to be preferred over complex ones. This points to the importance of simplification and clarity in formulating the instructions to be represented by the pictographs since simple pictographs require simple, clear instructions.

Another important question is how well the subjects with low literacy skills understood the more abstract pictograph meanings, when they were first presented. Literacy is more than word recognition. It also includes making inferences from how the words are organized and using generalizations and abstractions. People with low literacy skills may, therefore, not initially understand the meanings of the more complex or abstract pictographs. While some subjects did have difficulty generalizing from what they saw in the pictures, most did not. The data from the immediate testing shows high recall rates for most pictographs including the more complex or abstract ones. However, the 8% difference in immediate recall for complex and simple pictographs may, in part, be due to lack of initial understanding.

The role of literacy skills in pictograph recall was also studied in the correlations between reading level and recall scores. None was statistically significant. Also, the fact that immediate recall rates in this study are similar to immediate recall rates in the pictograph study with junior college students [1] suggests that literacy skills may not play a large role in short term recall of pictograph meanings. An important question for future research is to better understand the role that limited language skills play in understanding and remembering pictograph meanings. The statistically significant relationship between being Hispanic and 4-week recall suggests that pictographs may be especially useful with people for whom English is a second language. This an important question for future research.

4.1. Practice implications

This study's findings show that most people with low literacy skills, even those experiencing problems associated with low literacy, can remember most pictograph meanings for at least 4 weeks. This suggests that pictographs could significantly increase the information available to low literacy people for managing symptoms and problems related to illness.

There are two important differences between how pictographs would be used in a clinical setting and this study, both of which should increase the likelihood that pictograph meanings are remembered and used. First, written definitions would be incorporated into the pictographs. This would allow patients and families to make use of whatever literacy skills they have. For people with high literacy skills, the pictographs would be illustrations of what they read and, for people with low literacy skills, the pictographs would be cues to help them remember what they heard. For both groups, pictographs would attract the attention, which could increase the likelihood of adherence to medical instructions. A second important difference is the motivation to learn and use the information. People who are likely to experience problems because of an illness, and their family caregivers, have strong, compelling reasons to learn the information represented by the pictographs. This is in contrast to the subjects in this study whose motivation was to please an instructor that they barely knew and to earn a monetary bonus. A third difference is that staff at the treatment site can support the use of the pictograph materials at every visit, thereby giving endorsement and continuous support for utilizing the pictographs.

The study findings also indicate that pictographs which represent simple actions are more likely to be remembered for a longer period than pictographs which represent complex or abstract ideas. Twenty-seven percent of the ideas represented in the pictographs used in this study were recalled correctly by at least 90% of the subjects at the 4-week testing. These pictographs were largely for simple actions that could be directly represented in the drawings. Therefore, one of the first steps in creating pictographs for use in medical settings should be to clarify and simplify the information to be conveyed. The strategies for simplifying patient education materials advocated in Teaching Patients with Low Literacy Skills by Doak

et al. [8] apply to preparing information for pictographs. Good pictograph design, therefore, builds on their pioneering work to extend access to health information to people with limited literacy skills.

Another important early step in pictograph design is to prioritize the information and to create pictographs for only the most important information. This is because of the time and effort required to teach pictograph meanings. It took over an hour to teach 236 pieces of information in the 193 pictographs. With the present cost-consciousness in health care, it will be difficult to find funds and staff time to conduct the training and, from the patient and family perspective, it will be difficult to give time in the midst of demands of treatment and negotiating the health care system.

Whether health care institutions are willing to provide the resources to teach pictograph meanings depends on whether benefits are greater than the costs. Benefits can be maximized in several ways. Since immediate recall was quite high, immediate use of the information will maximize recall and the potential for the information being used. Thus, teaching pictograph meanings for symptoms or problems that the patient is currently experiencing or about to experience will maximize their recall and usefulness. Furthermore, teaching about how to manage current symptoms will maximize patient and family motivation to learn the pictograph meanings. Another way to maximize benefits is to use pictographs in situations where good home care is critical to the patient's survival. An example is patients receiving bone marrow transplants where the patient's survival depends on careful monitoring of his or her condition after discharge. Here the importance of educating patients and families makes the expense worth the costs.

Another way to maximize the impact of time taken to teach pictograph meanings would be to spend less time teaching simple pictographs and more time on pictographs known to be difficult to recall, such as complex or abstract ideas. Many of the simple pictographs used in this study could be explained very quickly leaving more time to use repetition, personal involvement, and personal encouragement to maximize recall of complex pictographs.

The other side of the cost-benefit equation is costs, which can be minimized in several ways. One would be to use interactive computer-based programs to teach pictograph meanings. Such programs could use animation and other devices to maintain interest while explaining how to manage medical problems that are illustrated with pictographs. Participants would take copies of the pictographs home with them to remind them of what they saw and heard. Time required of staff would be minimal — only to endorse the program and to show patients and families how to use the equipment. Another way to minimize costs would be to use volunteers to teach pictograph meanings. Costs can also be minimized by teaching the meanings of only those pictographs that are most important for the patient's health.

Other techniques that may increase recall and thereby effectiveness of pictographs should also be explored. These include creating stories about pictographs, having subjects guess meanings before being told, or even having patients or caregivers teach each other.

5. Conclusion

The two studies in this series have shown that people with low literacy skills can remember large amounts of medical information for a significant period of time when pictographs are present during both learning and recall. However, the fact that people with low literacy skills can remember the information does not necessarily mean they will use it. Therefore, the next step should be to study pictographs in medical practices serving low literacy populations and to refine both pictographs and teaching methods to maximize their feasibility and effectiveness for those settings.

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