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A Randomized Controlled Trial Comparing Two Self-Administered Educational Strategies for Patients With Knee Osteoarthritis

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Objective. The objective of this study was to assess the efficacy of self-administered patient educational tools in improving knowledge and behaviors for the management of knee osteoarthritis.

Methods. We conducted a randomized clinical trial in patients with knee osteoarthritis to assess the efficacy of providing a video for entertainment education, in combination with two booklets, compared with providing the booklets alone. We evaluated changes in scores on a patient knowledge questionnaire, the Decisional Conflict Scale, the Arthritis Self-Efficacy Scale, and the Effective Consumer Scale between baseline and same day, 3 months, and 6 months post intervention. We used linear regression models to explore associations between demographic characteristics and outcomes, testing for interactions.

Results. Two hundred nineteen participants were randomly assigned to receive the video + booklets (n = 109) or the booklets alone (n = 110). The mean age of participants was 64.6 (±8.3) years. At 6 months, statistically significant improvements were observed in knowledge and decisional conflict scores for both groups, and statistically significant improvements in the behavior to participate in their health care were observed in the video + booklets group. The video + booklets group was more knowledgeable immediately post intervention than the booklet group (mean difference 0.39 [95% confidence interval 0.02-0.76]). No other significant changes in outcomes were observed at 6 months between the two groups. The video + booklets combination was associated with decreased decisional conflict in Spanish speakers and increased self-efficacy in those with less than a high school education.

Conclusion. Although both education strategies were associated with improved knowledge and reduced decisional conflict at 6 months, receiving the video + booklets in combination, compared with receiving the booklets alone, proved to be more effective in changing behaviors and appeared to have some advantages for Spanish speakers and those who were less educated.

INTRODUCTION

Education is an essential component in self-management of chronic diseases (1). Nonpharmacologic interventions for arthritis recommended by the American College of Rheumatology (ACR) include patient education and participation in self-management programs (2). Health education has the potential to influence

patient-provider communication by empowering patients to ask the right questions (3). It has been postulated that patients' behaviors are associated with the exchanges and perceived interaction with their providers (4). Furthermore, effective communication has been shown to increase patients' trust, satisfaction, and understanding of the condition, which may lead to changes in health behaviors (5). In cancer, one study showed that perceived

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SIGNIFICANCES & INNOVATIONS

- Providing education about knee osteoarthritis and its treatment improves knowledge and decrease decisional conflict.
- Combining a video using entertainment as an education tool with booklets was more effective at improving knowledge compared with providing the booklets alone.
- The use of the video plus booklets was more beneficial among some patient groups, especially those who were Spanish speakers and less educated.

self-efficacy varies according to exposure to health information. Participants exposed to health information were more likely to have higher levels of behaviors to manage their health effectively and higher levels of self-efficacy compared with participants who were not exposed to health information (6). Studies evaluating patient education for self-management of knee osteoarthritis have reported mixed results (7-10). Some variation may be due to differences in factors, such as methods of information delivery, the population studied, duration of instruction, methods of evaluation, and use of language above the reading level of participants (8,11).

Using entertainment as an education tool (also known as edutainment) has been demonstrated to improve disease awareness or intentions towards prevention (12-14). This type of education, in which storytelling is a key component, can use different formats, including a combination of video and pictures. Using videos can offer different advantages, such as attracting attention and emphasis on content; videos can be used at the individual's own pace at any location (ie, home or waiting areas) and on device (ie, computer, or personal devices), can be made available for patients to watch repeatedly (ie, using a digital video disc [DVD] or uploading to the web), and can be made to reach larger audiences; and minimal resources are expended on staff training (15-18). Videos may be particularly effective in low-literacy populations and non-English speakers (19).

The efficacy of using this type of educational format in improving outcomes in patients with knee osteoarthritis is yet to be demonstrated. Therefore, we conducted a randomized controlled trial to determine if providing educational entertainment in this population increased patients' understanding of their condition, enhancing the process of decision-making and leading to improvements in health behaviors.

The objective of our study was to compare the efficacy of two self-administered educational strategies in improving disease knowledge in patients with knee osteoarthritis: a patient education tool employing video together with two educational booklets and the educational booklets alone. We hypothesized that delivering information with a video plus booklets would result in greater knowledge scores compared with delivering information with booklets alone. We also evaluated the effects of the educational

strategies on decisional conflict, self-efficacy, Effective Consumer Scale (ECS) scores, and acceptability.

PATIENTS AND METHODS

This study was approved by our institutional review board and the review boards of all participating institutions (protocol 2012-0172). In reporting our study, we followed the outline as recommended by the Consolidated Standards of Reporting Trials (CONSORT) statement for nonpharmacological treatment interventions (20).

Design. We conducted an open-label, parallel, two-arm randomized controlled trial to assess the efficacy of two self-administered educational strategies in providing disease management information to patients diagnosed with knee osteoarthritis (ClinicalTrials.gov Identifier: NCT01698762).

Participants. Potential participants were identified either through medical records in five Houston area health facilities or by responding to our adverts placed in local newspapers. All potential participants were screened over the phone by a research coordinator. Inclusion criteria were as follows: 1) age 50 years or older, 2) prior diagnosis of knee osteoarthritis by a physician with a radiograph (self-report and confirmed by medical records, when possible), 4) ability to communicate in either English or Spanish, and 5) reachable by telephone.

Study settings. Our research personnel met eligible participants at locations in any of the five health facilities. The potential participants were taken through the details of the study and given the opportunity to seek clarifications. Those willing to take part in the study signed informed consent forms and were enrolled. Participants then completed a baseline assessment questionnaire, after which they were randomly assigned to the video + booklets arm or booklets alone arm of the study.

Randomization. Randomization was implemented on the Clinical Trial Conduct website maintained by the Department of Biostatistics at The University of Texas MD Anderson Cancer Center (online at https://biostatistics.mdanderson.org/ClinicalTrialConduct/). Eligible participants were stratified by study site and their preferred language and randomly assigned in a 1:1 ratio with unequal block sizes within each stratum.

Interventions. Patients in the intervention group received an educational tool in DVD format that used video modeling to provide information about knee osteoarthritis and its management (The University of Texas MD Anderson Cancer Center; English-language version online at https://youtu.be/kuNOkijTh1E and Spanish-language version online at https://mediaplayer.mdanderson.org/video-full/67142A0F-34F9-40C6-ADD6-FCE18AE108FA). The development and pilot testing of the tool has been

reported elsewhere (21). Briefly, the educational tool consisted of a series of dramatized episodes recorded on video, each between 3 and 7 minutes, showing a main character with osteoarthritis and a narrator. The episodes, linked to learning modules and using the patient actor or actress and the narrator, provided facts about osteoarthritis and its management, including pain medications and their side effects as well as treatments that help and those that do not. It also provided information on physical activity and weight loss. Participants in the video group also received the copies of the educational booklets.

The control group received only the educational booklets, two consumer guides produced by the Agency for Healthcare Research and Quality (AHRQ) (also available in English and in Spanish) (22,23). One booklet provided information on osteoarthritis; the other, about its management. The information provided by both the booklets and the video was similar in scope, content, and topics addressed.

Procedures. All participants initially completed a questionnaire on demographic characteristics, health literacy, role preference in disease management decision-making, and baseline measures of the outcomes to be assessed. After randomization, participants were given the appropriate educational material to go over at their own pace in quiet rooms at the health facilities. We allowed patients to review materials until completed, regardless of the time they took to complete. Research staff monitored patients, and patients were allowed to pause and ask questions. Patients could select the materials in their language of preference and could request them in both languages if that was their preference. Then outcomes were assessed again, immediately after review of the educational material. Questionnaires were available in English and Spanish. After completing the day's session, participants were allowed to keep the educational material.

Follow-up. Three and six months after the initial assessment, participants completed questionnaires to assess outcomes. The questionnaires were sent by mail along with stamped addressed envelopes. Phone reminders were used to encourage participants to complete the questionnaires. Those who had not returned their questionnaires within 2 weeks were contacted and given the option of completing them with research staff assistance, either over the phone or by scheduling homes visits.

After receiving the completed questionnaires for the final evaluation at 6 months, participants who were randomly assigned to the control arm of the study were also sent copies of the video to keep.

Outcomes. The primary outcome, disease knowledge, was assessed by using the Patient Knowledge Questionnaire–Osteoarthritis (24). This tool has 16 multiple-choice questions and a reliability coefficient of 0.75; for the study, we used a modified version with 11 questions that were relevant to the content of our educational materials. Each item consisted of a statement followed by five or six response options. Each question answered correctly was given 1 point, with a possible total score ranging between 0 and 11 (higher scores indicating better knowledge).

Secondary outcome measures assessed decisional conflict about treatment options, self-efficacy, and skills and behaviors for self-management. Decisional conflict was assessed using the low-literacy version of the Decisional Conflict Scale (DCS). The DCS is designed to evaluate consumers' uncertainty in making a health care decision (25). It consists of 10 items with 3 response categories. It has five subscales: Informed, Values Clarity, Support, Uncertainty, and Effective Decision. It has a reliability coefficient of between 0.78 and 0.92 (25). For this study, we used five items evaluating two subscales: Informed and Values Clarity, which were deemed relevant to our study. Each item is scored on a scale of 0 (for extremely well informed or clear) to 100 (for extremely uninformed or unclear). A total score is found by taking the average of scores on all items. In this study, we calculated a combined DCS score by averaging the sum of the Informed and Values Clarity subscales. Higher scores indicate high decisional conflict for each particular scale.

Self-efficacy was assessed by using the eight-item short form of the Arthritis Self-Efficacy Scale. Each item is scored on a visual analog scale, with 0 being not confident all and 100 being very confident. A total score is derived by adding the scores of all items and dividing by 8 (26,27). It had a Cronbach's α of 0.92 (26). Higher scores indicate high self-confidence in dealing with disease.

We used the ECS to evaluate skills and behaviors needed to effectively manage one's health care (eg, appropriate use of health information, understanding of priorities, and knowing how to communicate with others, negotiate role, and take control and action). It is a 17-item Likert-type questionnaire. Each statement is followed by five response options, namely "never," "rarely," "sometimes," "usually," and "always," and scored 0 to 4, respectively. The scores of all responses are summed up for a highest of 68, which is then converted to a score out of 100. The scale demonstrates a high internal consistency, with a Cronbach's α of greater than 0.90 (28). Higher scores indicate greater effectiveness in dealing with a condition and making decisions about health care (29,30).

We also evaluated the acceptability of the educational materials in both groups by using the Ottawa Acceptability Scale immediately after participants had reviewed the educational tools. Respondents rated the components of the educational materials in various ways depending on the options offered: some parts are rated as either "poor," "fair," "good," or "excellent," whereas other sections allowed respondents to state their opinions by selecting "yes" or "no" or expressing a favorable or unfavorable opinion. Responses are reported descriptively in terms of proportions of respondents having a favorable or unfavorable opinion about the various aspects of the tool (31).

Sample size. We determined a sample size of 220, with 110 participants in each of the study arms, based on 80% power to detect a mean difference (MD) in knowledge of 0.46 points on a scale of 0 to 10 (Cohen's d = 0.33) in a design with three repeated measures. We decided on this MD on the basis of the pooled estimate reported in a Cochrane systematic review of decision aids for people facing health treatment or screening decisions (32). The sample size and power calculations were based on a two-sided test with an α level of 0.05.

Statistical analysis. A descriptive analysis was performed for the demographic and baseline measures. Continuous variables are expressed as means and SDs, whereas categorical variables are expressed as frequencies and percentages. Differences in the demographic and baseline measures between the treatment and control arms were assessed by using t-tests for continuous variables and χ^2 tests for categorical variables.

All analyses were done on an intent-to-treat basis (ie, all patients who were randomly assigned were accounted for in the analysis according to the intervention they were scheduled to receive). Questionnaires received 3 months after the study ended were considered missing. Missing data for an outcome measure at a time point were imputed by the mean of the observed data at the corresponding time point. This method was chosen to preserve the mean of the observed data and to keep the full sample size for analysis.

Given the longitudinal nature of the outcome measures, linear mixed-effect models were used to study the changes of the outcome measures over time to take the intrapatient correlation into account and to compare the changes in the outcome scores (follow-up period – prerandomization) between the video + booklets and booklets alone groups (33). MDs of change from baseline (intervention – control) and their 95% confidence intervals (CIs) were also calculated.

Linear regression models were used to assess the relationship between the intervention and changes in outcome scores and the effect of covariates of interest. Analyses were conducted for differences before and immediately after reviewing the educational materials and before and after 6 months. Subgroup analyses were performed by level of independent variable in the presence of interaction (ie, between independent variable and group allocation). For all analyses, a two-sided P value <0.05 was considered statistically significant. Statistical Analysis System software (SAS Institute, Inc.) was used to perform the analyses.

RESULTS

A total of 3637 potential participants were screened, of whom 502 met the inclusion criteria. However, 283 declined participation. Two hundred nineteen participants were randomly assigned, with 109 in the video + booklets arm and 110 in the booklets alone arm. Figure 1 shows the depiction of the study.
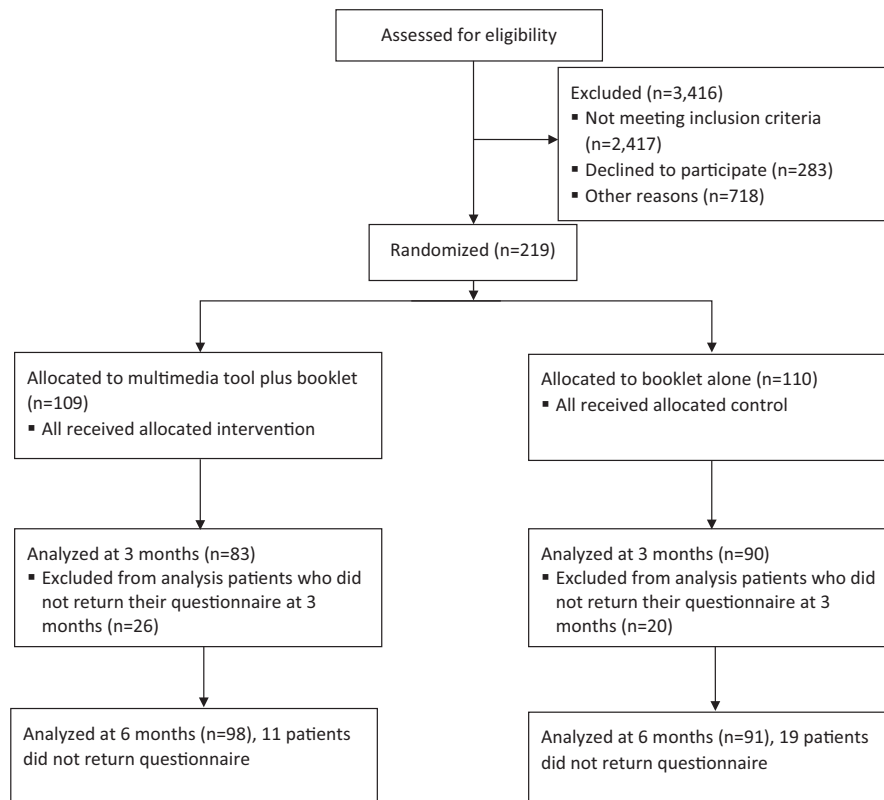

Figure 1.   Consolidated Standards of Reporting Trials (CONSORT) 2010 flow diagram.

The response rate at 3 months' follow-up was 79% (173 participants; 83 and 90 from the video + booklets and booklets alone arms, respectively). At 6 months' follow-up, the response rate was 86.3% (189 participants; 98 and 91 from the video + booklets and booklets alone arms, respectively).

Baseline data. Table 1 presents the characteristics of participants at baseline. The mean age (±SD) of participants was 64.6 (±8.3) years; 76% of participants were women, 82% had adequate health literacy, and 89% selected English as their preferred language. The mean duration of disease was 10.2 (±8.5) years.

Differences between groups. Table 2 shows the outcome measures at baseline, immediately post intervention (as applicable), and at 3 and 6 months' follow-up for the video + booklets and booklets alone groups.

Knowledge. Within each group, knowledge increased from baseline to each evaluation time point. A comparison of the mean increase in knowledge scores from baseline showed that the video + booklets group performed better than the booklets alone group immediately post intervention (mean: 9.4 vs 9.0; MD 0.39 [95% CI 0.02–0.76]), but no significant differences were observed at 3 and 6 months' follow-up. The increase in knowledge was maintained at 6 months.

Decisional conflict. In both the video + booklets and booklets alone groups, DCS scores significantly decreased at follow-up, compared with baseline, on the combined DCS as well as the individual Informed and Values Clarity subscales. The changes from baseline to post intervention in DCS scores were not significantly different between groups, but a trend was observed for lower conflict in the video + booklets group, compared with the booklets alone group, for the combined DCS and the Informed subscale (MD −9.1 [95% CI −18.9 to 0.68] and MD −9.9 [95% CI −20.5 to 0.60], respectively). Similar trends were observed at 6 months for the combined DCS and the Values Clarity subscale, also not reaching statistical significance (MD −8.7 [95% CI −18.5 to 1.1] and MD −9.3 [95% CI −19.7 to 1.1], respectively). The highest improvement was observed immediately after intervention, with some losses over time.

Self-efficacy. Self-efficacy was not assessed immediately post intervention. At 3 and 6 months' follow-up, no statistically significant changes from baseline were observed within or between the video + booklets and booklets alone groups.

ECS. This outcome was not assessed immediately post intervention. No statistically significant improvements in scores were observed at 3 months' follow-up within the video + booklets and booklets alone arms. At 6 months' follow-up, a significant

Table 1. Baseline characteristics

Characteristics	Total (N = 219), n (%)	Intervention (n = 109), n (%)	Control (n = 110), n (%)
Age, mean (SD), years	64.6 (8.3)	64.8 (8.2)	64.5 (8.4)
Sex			
Male	53 (24.2)	27 (24.8)	26 (23.6)
Female	166 (75.8)	82 (75.2)	84 (76.4)
Race			
White	87 (39.7)	45 (41.3)	42 (38.2)
Black or African American	78 (35.6)	39 (35.8)	39 (35.5)
Hispanic	42 (19.2)	23 (21.1)	19 (17.3)
Other	12 (5.5)	2 (1.8)	10 (9.1)
Marital status			
Married, living together	103 (47.0)	45 (41.3)	58 (52.7)
Not married, living together	116 (53.0)	64 (58.7)	52 (47.3)
Educational attainment			
Less than high school diploma or equivalent	34 (15.5)	18 (16.5)	16 (14.5)
High school diploma or equivalent, associate degree	106 (48.4)	53 (48.6)	53 (48.2)
Bachelor's degree or higher	79 (36.1)	38 (34.9)	41 (37.3)
Language of questionnaire			
English	195 (89.0)	96 (88.1)	99 (90.0)
Spanish	24 (11.0)	13 (11.9)	11 (10.0)
Employment			
No	147 (67.1)	77 (70.6)	70 (63.6)
Yes	72 (32.9)	32 (29.4)	40 (36.4)
Health literacy			
Adequate health literacy	179 (81.7)	90 (82.6)	89 (80.9)
Inadequate health literacy	40 (18.3)	19 (17.4)	21 (19.1)
Disease duration, mean (SD), years	10.2 (8.5)	10.2 (8.8)	10.2 (8.2)
Role in decision-making			
Active/shared	197 (90.0)	100 (91.7)	97 (88.2)
Passive	21 (9.6)	8 (7.3)	13 (11.8)

Table 2. Outcomes at baseline and follow-up assessments in intervention and control groups

Outcome measure	Baseline	Post intervention	3 months	6 months	P^a
Knowledge					
Intervention	8.1 (1.9)	9.4 (1.3)	8.9 (1.5)	9.1 (1.4)	<0.001
Control	8.1 (1.9)	9.0 (1.6)	8.9 (1.5)	9.1 (1.3)	<0.001
Difference of change from baseline (intervention – control) (95% CI)	...	0.39 (0.02 to 0.76)	0.05 (−0.38 to 0.47)	0.03 (−0.41 to 0.46)	...
P^b	...	0.04	0.82	0.91	...
Combined decisional conflict[c]					
Intervention	52.0 (36.6)	11.7 (23.9)	25.7 (26.9)	19.1 (25.8)	<0.001
Control	49.6 (36.5)	18.4 (27.7)	30.6 (31.7)	25.4 (27.3)	<0.001
Difference (intervention – control) (95% CI)	...	−9.1 (−18.9 to 0.68)	−7.4 (−17.7 to 2.93)	−8.7 (−18.5 to 1.1)	...
P^b	...	0.07	0.16	0.08	...
Decisional conflict, informed subscale					
Intervention	54.6 (38.6)	12.4 (26.2)	26.3 (28.0)	20.0 (27.7)	<0.001
Control	51.1 (37.7)	18.8 (29.7)	32.0 (33.3)	24.9 (28.3)	<0.001
Difference of change from baseline (intervention – control) (95% CI)	...	−9.9 (−20.5 to 0.60)	−9.2 (−19.9 to 1.5)	−8.4 (−18.9 to 2.2)	...
P^b	...	0.07	0.09	0.12	...
Decisional conflict, clarity subscale					
Intervention	48.2 (39.0)	10.8 (23.7)	24.7 (28.4)	17.7 (24.8)	<0.001
Control	47.3 (40.1)	17.7 (28.6)	28.5 (33.5)	26.1 (28.8)	<0.001
Difference of change from baseline (intervention – control) (95% CI)	...	−7.8 (−18.4 to 2.8)	−4.7 (−16.2 to 6.9)	−9.3 (−19.7 to 1.1)	...
P^b	...	0.15	0.43	0.08	...
Self-efficacy[d]					
Intervention	53.9 (25.6)	...	52.1 (21.9)	56.7 (21.6)	<0.001
Control	53.3 (24.7)	...	49.9 (24.8)	55.9 (20.6)	<0.001
Difference of change from baseline (intervention – control) (95% CI)	...	...	1.5 (−4.6 to 7.7)	0.22 (−6.5 to 6.9)	...
P^b	...	...	0.63	0.95	...
Effective consumer scale[d]					
Intervention	78.0 (13.9)	...	79.2 (11.4)	80.7 (12.3)	<0.001
Control	77.9 (15.3)	...	77.5 (13.5)	79.9 (11.7)	<0.001
Difference of change from baseline (intervention – control) (95% CI)	...	...	1.7 (−1.7 to 5.1)	0.79 (−2.7 to 4.3)	...
P^b	...	...	0.32	0.65	...

Note. The analysis is based on the intention-to-treat population.
Abbreviation: CI, confidence interval.
[a] Statistically significant. Within groups, the *P* value from *t*-tests comparing baseline with follow-up scores in the PROC MIXED procedure in SAS was significant for all outcomes except self-efficacy (both at 3 and 6 months) and the Effective Consumer Scale (at 3 months for the intervention groups; at 3 and 6 months for the control group).
[b] *P* values were from two-sample *t*-tests comparing the groups in terms of change in outcome between the follow-up period and baseline using the ESTIMATE statement in the PROC MIXED procedure in SAS unless stated otherwise.
[c] Only two decisional conflict subscales were used.
[d] Self-efficacy and the Effective Consumer Scale were not assessed immediate post intervention.

change was observed within the video + booklets arm but not in the booklets alone arm. There were no significant differences between the video + booklets and booklets alone groups at 3 or 6 months' follow-up.

Acceptability of educational strategies. Participants described both the video with the booklets and the booklets alone as good/excellent in explaining the side effects and self-care options. They also described the amount of information and length of material as "just right" and the information presented as balanced. There was no difference in the level of acceptability of the educational materials. Figure 2 shows the percentages of participants reporting favorable or positive comments on either educational strategy.

Determinants of improvement at 6 months. Table 3 shows demographic factors associated with changes in outcomes from baseline to 6 months. Several significant interactions were found between the intervention groups and covariates on the changes in outcomes from baseline. Therefore, we compared the change of the outcome scores from baseline to 6 months after review of the educational materials by intervention group and within language group and education level or vice versa. Spanish-speaking participants receiving the video + booklets had a larger decrease in outcome scores than those receiving the booklets alone on the total DCS (−43.76 vs −4.24 [*P* = 0.009], respectively) and on the Informed and Values Clarity subscales, whereas no differences were observed for English-speaking participants (Supplementary Figure 1). Participants in the lowest educational tier

(less than high school education) who received the video + booklets gained more in self-efficacy than those receiving the booklets only (12.45 vs −7.84 [$P = 0.02$], respectively); no differences were observed for patients in the higher educational strata (Supplementary Figure 2).

DISCUSSION

In this study, we assessed the efficacy of two strategies in providing disease management information to patients with knee osteoarthritis. We observed improvements from baseline in knowledge, decisional conflict, self-efficacy, and the ECS score within each group, but these improvements were more prominent for the video + booklets group. The observed effects were maintained in both groups across time. No statistically significant differences were observed between groups, except in knowledge scores immediately after the intervention that favored use of the video + booklets over the booklets alone. However, the difference observed may not be clinically relevant given that it was small.

In our study, the observed effects in the DCS decreased over time, suggesting that educational interventions need to be maintained. Employing a series of patient repetitive education sessions during follow-up or other strategies to continuously reinforce health information have been associated with better outcomes and even physicians' adherence to guideline-recommended therapy (34-36). We also found benefits in self-efficacy and the ECS. These findings may be related to the content of the educational material, which included possible questions to discuss during the medical encounter and elements to get most out of the visit (such as asking and clarifying questions and discussing personal priorities, things that patients can do to alleviate pain, or how to get more information). However, our educational materials were developed to primarily provide information on the disease and the treatment, not to increase

self-efficacy or health care behaviors. Generally, educational interventions show positive impacts on knowledge and decisional conflict but varying impacts on self-efficacy and health behaviors (37,38). Self-efficacy and behavior may not easily change with educational interventions because these changes require not only knowledge but also experiences (39).

In our exploratory subgroup analysis, the combination of video + booklets was more effective in Spanish-speaking patients or in those with lower education levels. At 6 months, the video + booklets appeared to be more beneficial than the booklets alone for those who were least educated in improving knowledge and self-efficacy. The video + booklets was also associated with decreased decisional conflict among Spanish-speaking participants at 6 months. Although these findings derived from a post hoc analysis and should be interpreted cautiously, they could be a reflection of subtle cultural and/or sociodemographic differences, such as in educational levels and health literacy among various subpopulations, or a preference for the videos by some populations. For example, in subpopulations with lower educational levels, reading the material might be more challenging than listening to and/or watching a DVD. Although, we adjusted for some demographic variables in our analysis, residual confounding could still exist. The differences seen between subpopulations may also support the notion that educational needs differ according to patient characteristics (40).

It was also noticed that participants in both arms expressed a high level of satisfaction and acceptability for the educational material. This is also consistent with other studies (7,41) and indicates that patients are generally willing and eager to participate in educational programs. When developing educational material, the needs of various subpopulations should be considered. This is supported by our observation of various beneficial effects of different formats in certain specific participant subgroups. Factors such as the patient preference for presentation format and
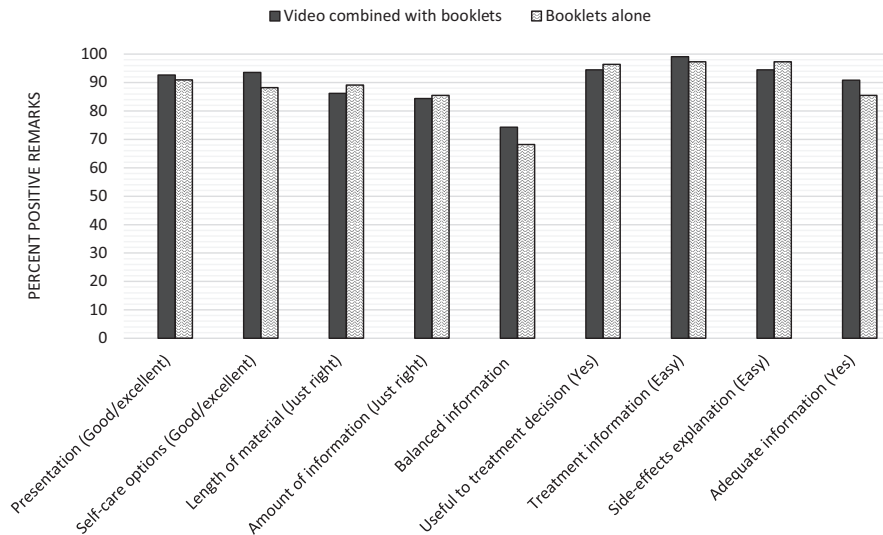

Figure 2. Acceptability of educational tools.

Table 3. Demographic factors associated with changes in outcomes from baseline to 6 months

Covariate	Knowledge		Total decisional conflict		Informed decisional conflict		Values clarity decisional conflict		Self-efficacy	
	B (SE)	Pa	B (SE)	Pa	B (SE)	Pa	B (SE)	Pa	B (SE)	Pa
Group										
Intervention vs control	3.86 (1.67)	0.02a	−39.52 (15.0)	0.01a	−124.76 (45.8)	0.01a	−41.8 (15.9)	0.01a	−20.3 (8.54)	0.02a
Age										
Per-year increase	0.03 (0.02)	0.10	...	...	−0.35 (0.45)	0.43	...	...	...	...
Age*group										
Intervention	−0.06 (0.03)	0.02a	...	...	1.3 (0.64)	0.04a	...	...	...	...
Language										
English vs Spanish	...	...	−22.18 (11.6)	0.06	−23.2 (12.5)	0.06	−21.7 (12.4)	0.08	...	...
Group*language										
Intervention: English vs Spanish	...	...	34.5 (15.9)	0.03a	36.1 (17.1)	0.04a	36.5 (16.9)	0.03a	...	...
Educational level										
Bachelor's degree or higher vs less than high school	−1.34 (0.32)	<0.001a	...	...	...	...	...	...	15.3 (7.32)	0.04a
High school or equivalent vs less than high school	−0.99 (0.31)	<0.001a	...	...	...	...	...	...	9.81 (7.09)	0.17
Group*educational level										
Intervention: bachelor's degree or higher vs less than high school	...	...	...	...	...	...	...	...	−29.1 (10.2)	<0.001a
Intervention: high school or equivalent vs less than high school	...	...	...	...	...	...	...	...	−19.8 (9.81)	0.05a

a Statistically significant, P values ≤0.05.

their motivation to learn about their condition may be as important as the format itself.

To our knowledge, this is the first study to evaluate the efficacy of two self-administered educational strategies. Other studies have compared other methods or approaches to delivering education to patients with osteoarthritis that require more resources. Our results compare favorably with those studies. One randomized trial involving patients with osteoarthritis, rheumatoid arthritis, and fibromyalgia who received a 6-week course in the Arthritis Self-Management Program (ASMP) together with the ASMP booklet and a control group who only received the ASMP booklet found no significant change from baseline in both groups after 4 weeks of follow-up (41). Another study assessing the efficacy of a nurse-led education program in patients with knee osteoarthritis found no differences in outcome measures (depression, osteoarthritis knowledge, pain, and physical ability) at 1 month and 1 year between the video + booklets and booklets alone groups (8). Fries et al (10) compared patients with arthritis who were recruited into a mail-delivered ASMP with controls who were not and found significant improvement in outcomes at 6 months in the video + booklets group. In our study, effects were more prominent immediately after the intervention and tended to fade over time. One randomized trial compared providing educational sessions together with an educational booklet in self-management with providing an educational booklet alone and found a decrease in anxiety and an increase in self-efficacy in the intervention group at 12 months, but there were no differences in service use also at 12 months (9). Two studies have evaluated the use of multimedia tools in different platforms via mobile applications or websites on the Internet. Allen et al (7) compared a video versus the Internet as methods of presenting information to aid in decision-making in patients with hip and knee osteoarthritis. They observed that both groups improved in knowledge and decisional conflict, but there were no major differences between the groups (7). Timmers et al (42) also found that using mobile application with interactive features (push notifications on a daily basis with pertinent information about the disease), compared with standard care, in patients with knee osteoarthritis increased knowledge scores.

Our study has limitations. Although we randomly assigned our study participants to the study arms, the groups consisted largely of willing participants interested in learning more about their condition. This could have biased the differences towards the null. Willing patients may likely be a more motivated group already wanting to learn more about their disease condition. Taking this into account, the format of the presentation of educational material might not show as much of a difference. Additionally, our study respectively showed attrition of 10% and 17% in the video + booklets and booklets alone groups at 6 months, and missing values were imputed for these patients, which could have a small impact on findings. However, a per-completers analysis showed similar results; no significant differences in the score changes from baseline to 6 months were observed between the video + booklets

and booklets alone groups, and the video + booklets arm was associated with decreased decisional conflict and increased self-efficacy in Spanish speakers. Finally, with the rapid advent of technology and the growing popularity of nonphysical media, the use of DVDs may not be optimal or a viable option in the near future. Therefore, other delivery formats (eg, media files or streaming via the Internet) and settings (eg, home) may need to be further evaluated.

Our videos (English and Spanish versions) are publicly available and can be recommended by providers as a self-administered education strategy. The combination of video with booklets proved to be more effective among some groups, especially those who were Spanish speakers and less educated. It may be advisable to provide educational material for disease self-management and patient decision-making in various formats to allow patients to select formats that best fit their learning styles and personal preferences. Although providing education about the disease and its treatment improved knowledge and decrease decisional conflict, on its own, education was not sufficient to change self-efficacy or participation in health care. Future studies should evaluate interventions that more specifically target these constructs.

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REFERENCES

1. Zhang W, Moskowitz RW, Nuki G, Abramson S, Altman RD, Arden N, et al. OARSI recommendations for the management of hip and knee osteoarthritis. Part II. OARSI evidence-based, expert consensus guidelines. Osteoarthritis Cartilage 2008;16:137–62.

2. American College of Rheumatology Subcommittee on Osteoarthritis Guidelines. Recommendations for the medical management of osteoarthritis of the hip and knee: 2000 update. Arthritis Rheum 2000;43:1905–15.

3. Jotterand F, Amodio A, Elger BS. Patient education as empowerment and self-rebiasing. Med Health Care Philos 2016;19:553–61.

4. Glanz K, Rimer BK, Viswanath K. Health behavior and health education: theory, research, and practice. 4th ed. San Francisco: Jossey-Bass; 2008.

5. Stewart MA. Effective physician-patient communication and health outcomes: a review. CMAJ 1995;152:1423–33.

6. Bass SB, Ruzek SB, Gordon TF, Fleisher L, McKeown-Conn N, Moore D. Relationship of Internet health information use with patient behavior and self-efficacy: experiences of newly diagnosed cancer patients who contact the National Cancer Institute's Cancer Information Service. J Health Commun 2006;11:219–36.

7. Allen KD, Sanders LL, Olsen MK, Bowlby L, Katz JN, Mather RC III, et al. Internet versus DVD decision aids for hip and knee osteoarthritis. Musculoskeletal Care 2016;14:87–97.

8. Victor CR, Triggs E, Ross F, Lord J, Axford JS. Lack of benefit of a primary care-based nurse-led education programme for people with osteoarthritis of the knee. Clin Rheumatol 2005;24:358–64.

9. Buszewicz M, Rait G, Griffin M, Nazareth I, Patel A, Atkinson A, et al. Self management of arthritis in primary care: randomised controlled trial. BMJ 2006;333:879.

10. Fries JF, Carey C, McShane DJ. Patient education in arthritis: randomized controlled trial of a mail-delivered program. J Rheumatol 1997;24:1378–83.

11. Ackerman IN, Bucknill A, Page RS, Broughton NS, Roberts C, Cavka B, et al. Preferences for disease-related education and support among younger people with hip or knee osteoarthritis. Arthritis Care Res (Hoboken) 2017;69:499–508.

12. Hoffman AS, Lowenstein LM, Kamath GR, Housten AJ, Leal VB, Linder SK, et al. An entertainment-education colorectal cancer screening decision aid for African American patients: a randomized controlled trial. Cancer 2017;123:1401–8.

13. Jayne J. Incorporation of edutainment into intervention and evaluation: the Jump With Jill (JWJ) program. Front Public Health 2019;7:163.

14. Cox C. Edutainment: a creative solution for school-based preventive screening orientation in Missouri. Creat Nurs 2018;24:215–9.

15. Nickel F, Tapking C, Benner L, Schuler S, Ottawa GB, Krug K, et al. Video teaching leads to improved attitudes towards obesity: a randomized study with 949 participants. Obes Surg 2019;29:2078–86.

16. Esses SA, Small S, Rodemann A, Hartman ME. Post-intensive care syndrome: educational interventions for parents of hospitalized children. Am J Crit Care 2019;28:19–27.

17. Dahodwala M, Geransar R, Babion J, de Grood J, Sargious P. The impact of the use of video-based educational interventions on patient outcomes in hospital settings: a scoping review. Patient Educ Couns 2018;101:2116–24.

18. Munigala S, Gardner TB, O'Reilly EM, Castillo CF, Ko AH, Pleskow D, et al. Understanding pancreatic diseases using animated pancreas patient: informing patients for better health outcomes with visual formats of learning. Pancreas 2018;47:1256–61.

19. Poureslami I, Kwan S, Lam S, Khan NA, FitzGerald JM. Assessing the effect of culturally specific audiovisual educational interventions on attaining self-management skills for chronic obstructive pulmonary disease in Mandarin- and Cantonese-speaking patients: a randomized controlled trial. Int J Chron Obstruct Pulmon Dis 2016;11:1811–22.

20. Schulz KF, Altman DG, Moher D, CONSORT Group. CONSORT 2010 statement: updated guidelines for reporting parallel group randomised trials. J Clin Epidemiol 2010;2010(63):834–40.

21. Lopez-Olivo MA, Ingleshwar A, Volk RJ, Jibaja-Weiss M, Barbo A, Saag K, et al. Development and pilot testing of multimedia patient education tools for patients with knee osteoarthritis, osteoporosis, and rheumatoid arthritis. Arthritis Care Res (Hoboken) 2018;70:213–20.

22. Eisenberg Center at Oregon Health & Science University. Choosing pain medicine for asteoarthritis: a guide for consumers. In: Comparative effectiveness review summary guides for xonsumers. Rockville (MD): Agency for Healthcare Research and Quality; 2005.

23. Eisenberg Center at Oregon Health & Science University. Osteoarthritis of the knee: a guide for adults. In: Comparative effectiveness review summary guides for consumers. Rockville (MD): Agency for Healthcare Research and Quality; 2005.

24. Hill J, Bird H. Patient knowledge and misconceptions of osteoarthritis assessed by a validated self-completed knowledge questionnaire (PKQ-OA). Rheumatology (Oxford) 2007;46:796–800.

25. O'Connor AM. Validation of a decisional conflict scale. Med Decis Making 1995;15:25–30.

26. Mueller A, Hartmann M, Mueller K, Eich W. Validation of the arthritis self-efficacy short-form scale in German fibromyalgia patients. Eur J Pain 2003;7:163–71.

27. Lorig K, Chastain RL, Ung E, Shoor S, Holman HR. Development and evaluation of a scale to measure perceived self-efficacy in people with arthritis. Arthritis Rheum 1989;32:37–44.

28. Hamnes B, Garratt A, Kjeken I, Kristjansson E, Hagen KB. Translation, data quality, reliability, validity and responsiveness of the Norwegian version of the Effective Musculoskeletal Consumer Scale (EC-17). BMC Musculoskelet Disord 2010;11:21.

29. Kristjansson E, Tugwell PS, Wilson AJ, Brooks PM, Driedger SM, Gallois C, et al. Development of the effective musculoskeletal consumer scale. J Rheumatol 2007;34:1392–400.

30. Santesso N, Rader T, Wells GA, O'Connor AM, Brooks PM, Driedger M, et al. Responsiveness of the Effective Consumer Scale (EC-17). J Rheumatol 2009;36:2087–91.

31. O'Connor AM, Cranney A. User manual: acceptability. URL: http://decisionaid.ohri.ca/docs/develop/User_Manuals/UM_Acceptability.pdf. Ottawa Hospital Research Institute. 1996.

32. O'Connor AM, Bennett CL, Stacey D, Barry M, Col NF, Eden KB, et al. Decision aids for people facing health treatment or screening decisions. Cochrane Database Syst Rev 2009:CD001431.

33. Jiang J. Linear and generalized linear mixed models and their applications. New York: Springer-Verlag; 2007.

34. Ogunbanjo BO, Asuzu MC, Edet EE, Osoba AO. Reinforcement of health education and counselling by doctors in treatment and control of sexually transmitted disease. Genitourin Med 1986;62:53–5.

35. Haleem A, Khan MK, Sufia S, Chaudhry S, Siddiqui MI, Khan AA. The role of repetition and reinforcement in school-based oral health education-a cluster randomized controlled trial. BMC Public Health 2016;16:2.

36. Lee CK, Lai CL, Lee MH, Su FY, Yeh TS, Cheng LY, et al. Reinforcement of patient education improved physicians' adherence to guideline-recommended medical therapy after acute coronary syndrome. PLoS One 2019;14:e0217444.

37. Li LC, Adam PM, Backman CL, Lineker S, Jones CA, Lacaille D, et al. Proof-of-concept study of a Web-based methotrexate decision aid for patients with rheumatoid arthritis. Arthritis Care Res (Hoboken) 2014;66:1472–81.

38. Laslett LL, Lynch J, Sullivan TR, McNeil JD. Osteoporosis education improves osteoporosis knowledge and dietary calcium: comparison of a 4 week and a one-session education course. Int J Rheum Dis 2011;14:239–47.

39. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. Psychol Rev 1977;84:191–215.

40. Dragoi RG, Ndosi M, Sadlonova M, Hill J, Duer M, Graninger W, et al. Patient education, disease activity and physical function: can we be more targeted? A cross sectional study among people with rheumatoid arthritis, psoriatic arthritis and hand osteoarthritis. Arthritis Res Ther 2013;15:R156.

41. Solomon DH, Warsi A, Brown-Stevenson T, Farrell M, Gauthier S, Mikels D, et al. Does self-management education benefit all populations with arthritis? A randomized controlled trial in a primary care physician network. J Rheumatol 2002;29:362–8.

42. Timmers T, Janssen L, Pronk Y, van der Zwaard BC, Koeter S, van Oostveen D, et al. Assessing the efficacy of an educational smartphone or tablet app with subdivided and interactive content to increase patients' medical knowledge: randomized controlled trial. JMIR Mhealth Uhealth 2018;6:e10742.