

EDUCATION

Effectiveness of Educational Interventions on Asthma Self-Management in Punjabi and Chinese Asthma Patients: A Randomized Controlled Trial

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Background. Asthma tends to be less well controlled among ethnic minority groups, and its prevalence in new immigrants increases significantly the longer they are in Canada; mainly due to their lack of familiarity with English and difficulty understanding information regarding the disease, health literacy, cultural issues, housing conditions, and lack of access to appropriate care services. **Objective.** To explore the effectiveness of different formats of culturally relevant information and its impact on asthma patients' self-management within the Punjabi, Mandarin, and Cantonese communities. **Methods.** Using a participatory approach, we developed and tested knowledge and community educational videos (with similar information, but used a different approach, i.e., scientific vs. colloquial) and a pictorial pamphlet. A total of 92 physician-diagnosed adult asthma patients (47 Chinese and 45 Punjabi) were assigned at random to three experimental groups (watched one or both videos) and one comparison group (read pictorial pamphlet) and participated in three in-person interviews and one telephone interview within a 9-month period. Patients received education on asthma self-management via videos and pamphlet and outcomes, including their knowledge of asthma triggers (environmental-related and behavioral-related triggers) and symptoms; inhaler use skills and patient-reported medication adherence were measured. **Results.** Knowledge of asthma symptoms, inhaler use, and understanding of physician's instructions improved significantly from pretest to 3 months post-intervention follow-up among all participants. **Conclusions.** Participants performed significantly better at follow-up than they did at baseline assessment, with the most notable improvements observed in the group that watched both community and knowledge videos. The results suggest that short, simple, culturally, and linguistically appropriate interventions can promote knowledge gain about asthma and improve inhaler use that can be sustained over the short term. Such interventions that provide authentic learning materials that draw on patients' life experiences and sociocultural context can overcome certain limitations of conventional patient education approaches.

Keywords asthma, cultural background, educational materials, instructional video, patient education handout

INTRODUCTION

According to the World Health Organization, asthma is a serious public health problem with over 235 million people suffering from asthma worldwide (1, 2). In Canada, asthma affects about 2.2 million adults and 0.8 million children (3–6). Although it is highly prevalent in the general population, asthma tends to be less well controlled among individuals of lower socioeconomic status and new immigrants (7–11), and constitutes a disproportionate burden of disease compared to Canadian-born individuals (8, 12, 13). According to the 2006 Canadian Census, 27% of British Columbia's (BC) population identified themselves as immigrants, of which two-thirds are from East, South, and Southeast Asia (14). More than 40% of immigrants in BC communicate in a mother tongue other than English or French (14, 15). The societal and personal burden related to asthma in immigrant

groups presents significant challenges to the Canadian health-care system (16, 17).

One such challenge is that in spite of an overall decrease in asthma-related hospitalizations and mortality rates during the past two decades, new immigrant communities in Canada may have less controlled asthma due to socio-cultural and systemic barriers in accessing health-care services (18, 19). Other factors may also play a role, such as level of education, health literacy, competing cultural traditions, and housing conditions (20–22). Cultural, linguistic, and systemic barriers have been shown to be related to a lack of adequate access to crucial information, as well as to delays in seeking care for asthma symptoms (19, 21, 23). Another challenge is that research-based interventions for immigrant groups are usually developed without input from the end users (e.g., patients and community members) (16).

Educational information, in the form of translated handouts, is often available to patients in physicians' offices (24–26). In general, the aim is to help the patients to better understand their disease and to promote regular use of anti-inflammatory therapy (24–26). However, many of these

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handouts have been developed originally in English and then translated to the community's language, without involving community members in the process, nor considering their cultural beliefs and practices (7, 8, 16, 17, 23, 27). As a result, existing information created for different cultural and language communities is not geared toward the real needs of diverse ethno-cultural groups (27–29). In addition, research elsewhere has suggested that education via videos may overcome some of these challenges (10, 20, 30–33). However, in previously developed videos, they have been developed either in English with subtitles in the community's language or in a documentary video format with voice over from the target community's language. Alternatively, the participatory approach to developing patient educational materials has been promoted as a more novel and practical method to educate patients about how to manage their chronic diseases, including asthma (31–33). Drawing on the social and cultural realities of patients, our study aligns with the principal concepts of adult education theory that highlights the interconnected relationship between the way people process and use information and their social and cultural context (34, 35). It is unclear whether these types of educational interventions can improve asthma knowledge and management skills among diverse ethnic communities in Canada. Our previous research and systematic review (16, 17, 23) suggested that educational videos—while developed in a community's language and applying relevant cultural beliefs and practices—would be more effective in improving asthma knowledge and proper inhaler technique. Our findings suggest that the issues summarized above have not previously been studied among ethno-cultural communities in Canada. Therefore, our reasons for developing and implementing culturally and linguistically relevant asthma educational materials (including video clips and pictorial pamphlet) were as follows: (1) many asthma patients from minority and ethnic communities lack access to relevant educational materials (8, 9, 13); (2) health-care providers rarely have the opportunity to teach patients about self-management of asthma, and in particular the correct use of inhalers (11, 36); and (3) there is a paucity of Canadian-based literature about the effects of instruction given via educational materials on asthma self-management and inhaler technique among new immigrants in Canada (16, 23).

The *purpose* of this study was to conduct a community-based research project to develop a culturally and linguistically appropriate educational intervention focusing on the correct use of inhalers, medication adherence, and asthma knowledge. We investigated whether these aspects of asthma management could be improved after instruction given in the form of videos (presented to experimental groups) or a written pamphlet (presented to a comparison group). A special feature of this study is that it was a randomized controlled trial and that it was designed with direct involvement of the community (including patients, their family members, and key informants) to include community and professionals' opinion on study design, material development, and implementation. In most other studies, the materials and interventions have been developed solely by health-care providers or by agencies without community

engagement (37–39). We believe the findings of this study will add to the literature the importance of involving the community in the research process, as well as patient engagement in self-management of their asthma in ethno-cultural communities.

MATERIALS AND METHODS

The study was conducted at a university-based pulmonary medicine clinic. It was approved by The University of British Columbia Office of Research Ethics and was registered at ClinicalTrials.gov. All subjects signed a written consent form in their native language prior to the study. For those subjects who could not read the consent form, the research facilitators explained the nature and aim of the study as well as the rights of participants and asked them to sign the form if they understood and agreed to participate.

Study Subject

We applied a convenience sampling method and recruited 167 asthmatic adults; of whom 92 participated in the interventions, 35 participated in the development of the educational videos and pamphlets, and 40 participated in focus group sessions to review and comment on the educational videos and pamphlets, and the study design and procedures (Figure 1). Physicians identified participants from the community, who had a physician diagnosis of asthma, used asthma medications daily, were at least 21 years of age, immigrated to Canada within the past 20 years, resided in the Greater Vancouver Area (GVA) during the study period, and spoke Mandarin, Cantonese, or Punjabi. For the intervention, we enrolled 92 adult asthma patients to our educational interventions, of whom 85 completed the study (including 42 Chinese and 43 Punjabi aged 21–87 years, 42 males and 43 females—Table 1).

Education Materials Development

Our community participatory approach (16, 17) commenced with four patient-oriented focus group sessions that were conducted in 2008. The results of these preliminary activities have been published, as well as an earlier systematic review with regard to health literacy and ethnicity in asthma (16, 23). A manuscript that details how to develop patient educational materials from the elicitation study is currently in press (17). Based on this study and through a participatory approach (40–49) we developed two sets of educational videos (knowledge and community videos) and pictorial pamphlets. The educational materials (videos and pamphlets) were developed through direct involvement of patients, their family members, community key informants, and practitioners. As a result, the videos were culturally and linguistically appropriate because they included people's views and perceptions about health.

In the *knowledge video*, we provided scientific information in terms of asthma symptoms, how to avoid asthma environmental-related and behavioral-related triggers (e.g., exposure to chemicals, dust, pollution, foam, as well

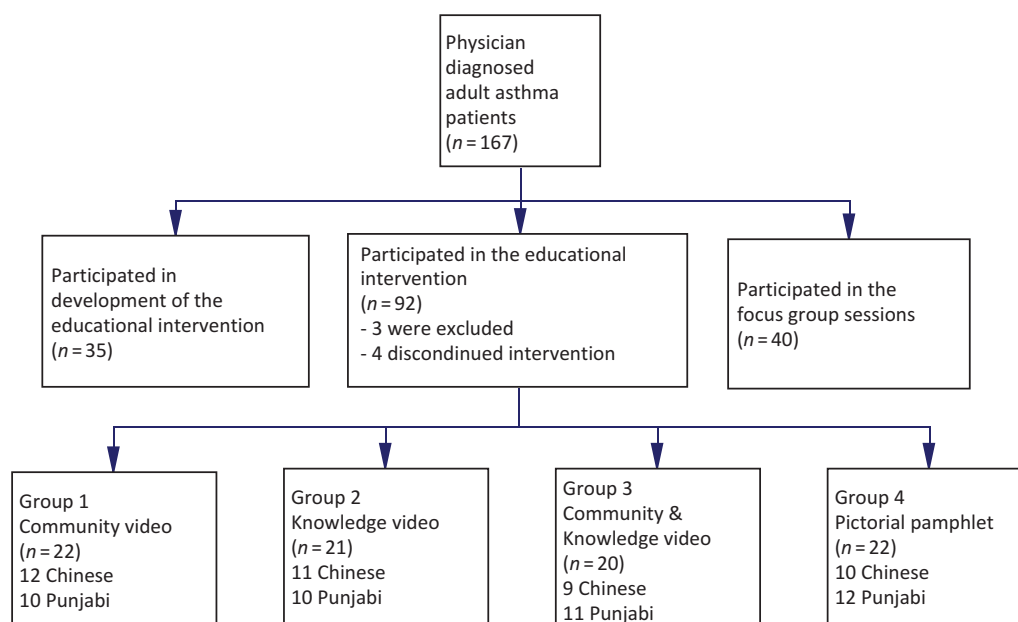


FIGURE 1.—Patient enrollment and attrition.

as smoking, a sedentary lifestyle, and diet behaviors), and how to manage an asthma attack. Smoking cessation, proper diet, and appropriate exercise for adult asthma patients were also emphasized in the knowledge video. In the *community video*, we used community opinions and narratives, and covered the community members' cultural beliefs and practices about asthma and its management using social interactive communication styles. In this patient-generated community video, a key informant (an educated elder) addressed the potential misconceptions about asthma management. For instance, some of the participants in the elicitation study believed that traditional remedies should be used to prevent and treat chronic diseases, including asthma. In addition, most participants emphasized that people from their community often think that taking medication is only necessary when patients are symptomatic. In the community video, the educated elder challenged these beliefs and practices and provided the patients with correct information on how to manage their asthma and to intervene early to prevent an asthma exacerbation. More information can be found in our other published papers that detail how the videos were developed and promoted in the community (16, 17, 50). The *pamphlet* was reverse engineered from the instructional knowledge video, while the content of the information remained the same. The aim was to use similar content with a different presentation format. A methodology manuscript describing the development aspects of the educational materials has been developed and is under review for publication in another journal. The educational materials were pilot tested with patients from the target ethno-cultural communities for clarity, cultural relevance, and acceptability (16, 17, 51).

Measurement

The study questionnaire was delivered orally by the community facilitators, and the patient's response was recorded

on a checklist. The questionnaire included 20 practical outcome items concerning patient's self-reported medication adherence and asthma management (to assess patients' health practice and knowledge). These questions also assessed patients' functional knowledge of environmental-related and behavioral-related triggers of asthma symptoms, and actions they needed to prevent or treat an asthma exacerbation. For instance, the following are some sample questions we asked the participants while showing some relevant illustrations: "Imagine a family member has been recently diagnosed with asthma and asks you to tell her about asthma symptoms—use the following list to pick asthma symptoms," "People have different ideas about what actually causes their asthma to worsen, some of which are listed below. Please pick the causes that may make your asthma worse from the following list," and "Imagine your doctor has instructed you to take two inhalations twice daily in the morning and evening (approximately 12 hours apart). Also, continue to use your reliever inhaler on an as-needed basis to relieve or breakthrough your symptoms. Can you explain in your own words what this instruction means to you?" The functional knowledge questions were assessed using a 5-point Likert scale. We also added a few questions to capture patients' self-reported adherence practices. Examples of these questions were "If you use a RELIEVER/CONTROLLER inhaler, can you tell me what would you use this inhaler for?," "When would you use your RELIEVER/CONTROLLER inhaler?," and "What do you expect your RELIEVER/CONTROLLER inhaler will do for your asthma?." In addition, we added some questions to assess patients' health literacy (e.g., ability to access, understand, and use asthma-related information). Scoring for these questions was 0 or 1; with a score of "0" meaning the patient incorrectly answered the questions, while a score of "1" means the patient correctly answered the questions. The questionnaire also comprised a standardized

TABLE 1.—Characteristics of the patients.

Characteristics	Value: n (%)
Sex	
Male	42 (49.4%)
Female	43 (50.6%)
Experimental and comparison groups	
Group 1 (watched community video)	22 (25.9%)
Chinese	12 (54.6%)
Punjabi	10 (45.4%)
Group 2 (watched knowledge video)	21 (24.7%)
Chinese	11 (52.4%)
Punjabi	10 (47.6%)
Group 3 (watched both community and knowledge videos)	20 (23.5%)
Chinese	9 (45%)
Punjabi	11 (55%)
Group 4 (read pamphlet only)	22 (25.9%)
Chinese	10 (45.5%)
Punjabi	12 (54.5%)
Education	
Never attended formal school	15 (17.6%)
Completed elementary school	21 (24.7%)
Completed high school	29 (34.1%)
Post high school education	20 (23.5%)
Language	
Chinese	42 (49%)
Punjabi	43 (51%)
Age	Mean: 62.9 years SD: 15.3 years
Current employment status	
Employed	18 (21.2%)
Unemployed	25 (29.4%)
Retired	37 (43.5%)
Volunteer job	5 (5.9%)
Medications taken	
Anti-inflammatory therapy	23 (27%)
Combination medications	46 (54%)
Long-acting bronchodilators	7 (8%)
Short-acting bronchodilators	48 (56%)
Asthma action plan	
Never received a written action plan from doctor	59 (69.4 %)
Have received verbal information from doctor	7 (8.2%)
Have received written action plan from doctor	3 (3.5%)
No response (no data)	16 (18.8%)
Regular use of prescribed medications	
No	15 (18%)
Can distinguish reliever and controller inhaler	
Yes	27 (32%)

Note: Data indicate the patients who completed the interventions ($n = 85$).

nine-step observational checklist, which was used by the facilitator to record proper use of different inhalers (e.g., Metered-Dose Inhaler (MDI) TurboHaler, Diskus, HandiHaler) (52, 53). Scoring for the checklist was from 0 to 9; with a “0” score meaning the patient missed all the necessary steps for inhaler use, and a “9” score meaning the patient used all the nine steps of the inhaler technique appropriately. Patients who used more than one inhaler were asked in which order they used them. Patients who used an inhaled corticosteroid were asked whether they rinsed their mouth after inhaling. In addition, during the post-test interview we included a few qualitative open-ended questions to capture patients’ overall beliefs and

concerns about asthma and its management. The qualitative questions were transcribed, translated, and coded to ensure cultural and linguistic appropriateness.

Intervention Procedures

Eligible subjects were randomly assigned to one of the three experimental groups (Group 1 viewed a physician-led knowledge video, Group 2 viewed the patient-generated community video, and Group 3 viewed both the knowledge and community videos) and one comparison group (Group 4), which read an educational pamphlet only. The intervention lasted for 9 months. This process included an initial pretest assessment, followed by a 1-month educational intervention (the patient watched the videos or read the pamphlet based on the study group they belonged to), and was then followed by a 3-month follow-up post-test assessment. Identical assessment tools were used in the three different interviews (pretest, immediate post-test, follow-up post-test), with the exception of adding a few open-ended qualitative questions to the post-test interview (as explained below). Six months after the follow-up post-test assessment, we called the patients to assess their self-management practices using a shorter version of the study questionnaire. The interventions took place in a convenient place for the patient—either at their home or in our clinic. Immediately after reviewing the educational materials, the participants were asked a series of qualitative questions about asthma covering topics that were included in the videos or pamphlet; in addition, they were asked to respond to a study questionnaire. We interviewed each patient alone in their native language to ensure confidentiality. The interviews were facilitated by bilingual and bicultural experienced moderators from the same community who were not aware of the study hypothesis. The facilitators signed an agreement to keep the information confidential. We assessed patients’ functional knowledge, health literacy, and health practices (as explained in the section “Measurement”) related to asthma at the baseline interview (pretest). We then conducted our intervention 1 month immediately after the pretest, and then had a further follow-up 3 months post-intervention. Furthermore, 6 months after the post-intervention, the patients were invited to participate in a telephone follow-up survey to assess their self-reported use of the peak flow meter, whether they followed their action plans, and whether they used their prescribed medications regularly.

Sample Size Calculation

With a total sample size of 92 subjects for the educational intervention, we estimated that we could identify mean differences between the four experimental groups and two ethnic groups with an effect size of 0.45 in asthma self-management and inhaler techniques with 80% statistical power and a two-sided significant level of 5%.

Analysis

Analyses were completed using SAS (Statistical Analysis System, SAS Institute Inc., version 17, 2011). The outcomes of interest, which were compared in pretest, post-

test, and 3-month follow-up post-test, were “participants’ knowledge about asthma triggers and symptoms (assessed during the interview),” “the ability to use inhalers (assessed through observation),” and self-reported “medication adherence (assessed during the interview).” The outcomes of interest were calculated as the percentage of items to which participants correctly responded out of the total possible number of correct responses. Because participants in the video and print groups responded to the same pictorial questionnaire during the in-person interviews (and only differed in what materials they viewed or read during the post-test interview), participants in these four groups were combined for analyses examining their immediate performance related to the knowledge and skills measured in this study. Initially, we ran analysis of variance (ANOVA) for the outcomes of this intervention across the four groups, and then to examine the effect of the different interventions on immediate and long-term information recall for each outcome as described previously, analysis of covariance (ANCOVA) was applied, comparing the print and video methods. Covariates of interest were intervention type, age, gender, ethnic group, and educational level. The reason for using ANCOVA was to adjust the outcomes for age, gender, educational level, and ethnic groups. Then interaction terms were added to see if the effect of the interventions differed across time, educational level, age, ethnic group, and gender group. Finally, we assessed the longer term impact of the interventions on behavioral intention after the in-person session and during the phone interviews. In patients using two or more inhalers the mean number of mistakes was used in the analysis (36).

RESULTS

The initial pretest analyses showed no statistically significant differences among the four study groups and also between gender and ethnic groups in relation to the outcomes of interest. This article summarizes the analyses from pretest and 3-month post-intervention follow-up data. We observed significant improvements across all experimental groups from pretest to post-intervention test in terms of inhaler use skills, asthma knowledge, and patients’ intentions to properly manage their asthma. In addition, these differences were observed between gender and age groups and different educational levels. The major findings of this study are as follows.

Inhaler Use Technique

Proper use of inhalers improved significantly among all experimental groups over time (confidence interval (CI) = -1.79 ± 0.52 , F -statistics = 45.60, df = 1 and 71, p < .001) (Tables 2 and 3); with females showing greater improvements compared to male patients (CI = 0.77 ± 0.72 , F -statistics = 4.45, df = 1 and 71, p = .04). The mean summary score of proper inhaler use among the four study groups from pretest to 3-month post-intervention follow-up test can be found in Table 4. In addition, Chinese patients

showed significantly greater improvements compared to Punjabi patients (CI = -1.40 ± 0.75 , F -statistics = 13.13, df = 1 and 76, p < .001) in the correct use of inhalers (Table 2). Furthermore, we observed that the education provided in the videos had a significant effect on mouth rinsing and the order in which the medications were used in all three experimental groups (data are not shown).

Knowledge of Asthma Symptoms and Asthma

Environmental-Related and Behavioral-Related Triggers

Participants’ knowledge of asthma symptoms improved over time in all four study groups (CI = -0.83 ± 0.53 , F -statistics = 9.44, df = 1 and 72, p < .01) (Tables 2 and 3), with the largest improvements identified in Group 3 who watched both community and knowledge videos (CI = 1.47 ± 1.08 , F -statistics = 3.02, df = 3 and 72, p = .009). In addition, patients with a high school diploma or more education and patients younger than 60 years of age showed significant improvements over time in their knowledge of asthma symptoms (CI = 0.73 ± 0.64 , F -statistics = 5.07, df = 1 and 72, p = .03, and CI = 0.04 ± 0.0238 , F -statistics = 11.11, df = 1 and 72, p < .01, respectively). In addition, Chinese patients showed significant improvement over time in their knowledge of asthma symptoms compared to Punjabi patients (CI = -1.47 ± 0.804 , F -statistics = 12.79, df = 1 and 76, p < .001). Moreover, all four groups showed improvement in knowledge of asthma triggers over time (CI = -0.83 ± 0.53 , F -statistics = 11.63, df = 1 and 72, p < .001), with the largest improvements identified in Group 2 who watched the knowledge video only (CI = 1.40 ± 0.73 , F -statistics = 7.01, df = 3 and 72, p = .040) (Tables 2 and 3).

Knowledge About Factors That Could Make Asthma Worse

As shown in Tables 2 and 3, while there were no statistically significant differences across the four study groups in terms of improvement of participants’ knowledge about factors (e.g., triggers) that could make asthma worse (CI = -0.40 ± 0.80 , F -statistics = 1.56, df = 3 and 72, p = .21), when we stratified the analyses based on ethnic group, Punjabi patients’ knowledge about factors that could make asthma worse improved significantly during the intervention period compared to Chinese patients (CI = 1.81 ± 1.162 , F -statistics = 9.34, df = 1 and 76, p < .01) (Table 2). Furthermore, Punjabi males showed greater improvements in asthma knowledge compared to Punjabi females (p = .02) (data are not shown). In addition, patients younger than 60 years of age showed significant improvements over time in their knowledge of factors that could worsen asthma relative to patients older than 60 (p = .003) (data are not shown).

Understanding a Physician’s Instructions

Patients’ understanding of physicians’ instructions on how to follow their treatment regimen and regular use of inhalers (self-reported inhaler adherence) improved significantly in all participants over time (CI = -0.37 ± 0.2193 , F -statistics = 11.12, df = 1 and 71, p < .01)

TABLE 2.—Subgroup analyses of asthma knowledge, self-management, and proper use of an inhaler.

Outcomes of interest	Confidence interval (CI)	F-statistics	df	p-Value
Proper use of inhaler (according to standard checklist)				
Time	−1.79 ± 0.52	45.60	1,71	<.001
Study group				
Ethnicity	−1.40 ± 0.75	13.13	1,76	<.001
Age				
Gender	0.77 ± 0.72	4.45	1,71	.04
Education level				
Knowledge of asthma symptoms				
Time	−0.83 ± 0.53	9.44	1,72	<.01
Study group	1.47 ± 1.08	3.02	3,72	.009
Ethnicity	−1.47 ± 0.804	12.79	1,76	<.001
Age	0.04 ± 0.024	11.11	1,72	<.01
Gender				
Education level	0.73 ± 0.64	5.07	1,72	.03
Knowledge of asthma triggers				
Time	−0.83 ± 0.53	11.63	1,72	<.001
Study group	1.40 ± 0.73	7.01	3,72	.040
Ethnicity				
Age				
Gender				
Education level				
Knowledge of factors that could make asthma worse				
Time				
Study group	−0.40 ± 0.80	1.56	3,72	.21
Ethnicity	1.81 ± 1.162	9.34	1,76	<.01
Age				
Gender				
Education level				
Understanding physician instruction on medication use				
Time	−0.37 ± 0.22	11.12	1,71	<.01
Study group	0.61 ± 0.4524	2.77	3,71	<.05
Ethnicity				
Age				
Gender	0.61 ± 0.34	4.04	1,71	<.05
Education level				

Notes: Difference in mean scores for both ethnic groups ($n = 85$) (pretest to 3-month post-intervention follow-up test) (95% CI). Time (pretest vs. follow-up post-test) for study groups (1, 2, and 3 vs. 4). Ethnicity (Punjabi vs. Chinese); Age (under 60 years vs. 60 years plus); Gender (female vs. male). Educational level (high school diploma and higher education vs. under high school diploma).

(Tables 2 and 3) with only Group 1 who watched the community video showing the most improvement compared to the other three groups (CI = 0.61 ± 0.4524 , F -statistics = 2.77, $df = 3$ and 71, $p < .05$). In addition,

TABLE 3.—Subgroup analyses of asthma knowledge, self-management, and proper use of an inhaler.

Study group	Proper use of an inhaler ^a	Knowledge of asthma symptoms	Knowledge of asthma triggers	Knowledge of triggers that could make asthma worse	Understanding physician instructions on medication use ^b
	$p = .0001^*$	$p = .0004$	$p = .003$	$p = .173$	$p = .0014$
Group 1	2.71 (1.35 to 4.06)	−0.19 (−0.78 to 0.40)	0.50 (−0.62 to 1.62)	−0.18 (−2.37 to 2.01)	0.53 (0.12 to 0.94)
Group 2	1.95 (0.99 to 2.91)	0.33 (−0.30 to 0.97)	1.29 (0.03 to 2.54)	0.86 (−0.51 to 2.22)	0.38 (−0.06 to 0.82)
Group 3	1.53 (0.66 to 2.40)	0.88 (−0.02 to 1.79)	0.29 (−0.99 to 1.58)	0.35 (−1.12 to 1.94)	0.24 (−0.19 to 0.66)
Group 4	1.05 (−0.10 to 2.20)	0.17 (−0.62 to 0.95)	1.22 (0.38 to 2.07)	0.45 (−1.41 to 2.31)	0.35 (−0.22 to 0.92)

Notes: Group 1: Watched community video; Group 2: Watched knowledge video; Group 3: Watched both community and knowledge videos; Group 4: Read pamphlet only. Data presented in boldface represent largest changes observed between pretest and 3-month post-intervention follow-up test.

^aSee also Table 4.

^bSee also Table 5.

*Differences observed in study groups after the intervention (both ethnic groups $n = 85$).

TABLE 4.—Mean summary score—proper use of an inhaler.

Study group	Pretest		Follow-up		All patients	
	Mean	SD	Mean	SD	Mean	SD
Group 1	4.0	2.1	5.9	2.0	4.9	2.2
Group 2	4.5	2.0	6.8	2.0	5.6	2.3
Group 3	3.9	2.1	6.8	1.6	5.4	2.3
Group 4	4.8	2.3	6.6	1.4	5.9	1.7
All patients	4.4	2.0	6.5	1.8	5.5	2.2

Notes: Includes both ethnic groups ($n = 85$). Observational checklist using a score of 0–9.

TABLE 5.—Mean summary score—understanding physician instructions on medication use.

Study group	Pretest		Follow-up		All patients	
	Mean	SD	Mean	SD	Mean	SD
Group 1	0.8	0.6	1.4	0.8	1.1	0.8
Group 2	1.2	0.9	1.7	0.9	1.5	0.9
Group 3	1.7	0.8	1.8	0.6	1.8	0.7
Group 4	1.6	1.1	1.9	0.9	1.8	1.0
All patients	1.3	0.9	1.7	0.8	1.5	0.9

Notes: Includes both ethnic groups $n = 85$. Score of 0–3.

female patients showed significant improvements over time in their understanding of physicians' instructions (CI = 0.61 ± 0.34 , F -statistics = 4.04, $df = 1$ and 71, $p < .05$). The mean summary score of patients' understanding of physicians' instructions among the four study groups from pretest to 3-month post-intervention follow-up test can be found in Table 5.

Patient Concerns Regarding Asthma Medications

Language and cultural barriers were identified by almost all patients as major problems when trying to communicate with care providers in Canada. Tables 6 and 7 summarize the content of qualitative data reported by the patients during the post-test interview about following their doctor's instructions. Finally, in common with the general asthma population in Canada (8, 11, 16), patients in this study had universal challenges and concerns regarding asthma medications and treatment, which are summarized in Table 7.

TABLE 6.—Patients more likely to follow a physician's instructions.

1. If they liked and trusted the physician (a doctor who communicated in their mother tongue)
2. If the physician was honest with them to explain the side effects of the medications
3. If the physician had taken the time to listen to them and respond to their questions
4. If the physician understood the challenges the patient has with asthma

Note: Data from posttest interviews and includes both ethnic groups.

TABLE 7.—Patients' concerns and comments about asthma and its management.

Factor	Patients statements
Access issues	"If we can have access to sources in our own language, we will be better able to get more and relevant information, especially those of us who don't know English very well."
Communication issues	"I have never received any verbal or written explanation from my doctor and I have never heard about asthma action plan." "I do not know how to properly use my inhaler. My doctor never showed me how to use it."
Language and culture issues	"My primary source of health information is my family doctor. I am satisfied with my doctor because we speak the same language and I trust him." "A lot of people in my community believe that asthma is a communicable disease." "I am an elder and many people in my age group need relevant and trusted resources for their health concerns and questions; something is needed to be changed in Canadian health system in regard to culture and language issues."
General concerns	"Asthma medications are too expensive. I cannot afford them. They should be cheaper." "What are the side effects from the medications?" "When we first arrived in Canada we did not have the Medical Services Plan (MSP) card and it was the first barrier to services; I had to bring the medicine in my luggage"

Note: Data from post-test interviews and includes both ethnic groups.

DISCUSSION

Studies in Canada and elsewhere have attempted to increase public awareness and action to manage both indoor and outdoor asthma triggers as part of comprehensive asthma management, applying educational materials to identify and manage triggers, home visits, and barrier assessments (27–29, 44, 45). We applied all these approaches through community-based research using a multi-method prospective research design and found remarkable improvements in participants' self-management practices. Knowledge of asthma symptoms and triggers, as well as participants' understanding of physician instructions and proper use of inhalers improved significantly across all three experimental groups and the comparison group after the respective educational interventions. The most notable improvements were observed in the video intervention groups, who watched either or both community and knowledge videos. This indicates that when patients received information from different sources (in particular audiovisual format) their knowledge

of asthma and understanding of physicians' instructions improved significantly over time. Similar findings have been reported by other researchers (46, 47) and this suggests that information drawn from community knowledge, when combined with scientific information from clinicians, can complement each other in terms of encouraging patients to engage in self-management of their asthma. We observed that community-based and physician-led educational video clips can overcome certain limitations of conventional patient education approaches, in that they provide authentic learning materials that draw on the patients' life experiences and sociocultural context (48, 49).

The assessment of the inhaler techniques during the face-to-face interviews was judged by two observers (the interviewer and the research coordinator), a new approach that has rarely been used before. This method had the advantage of measuring the patient's proper use of an inhaler by two independent observers; in which, in addition to the research staff, community facilitators were involved in the evaluation of the inhaler technique performed by the participants. Our findings support key concepts of adult education theory (34) by adding to the literature that involvement of the community can facilitate development of relevant and practical educational interventions about asthma management for patients from different ethno-cultural communities.

In terms of medication adherence, this study confirms that most patients did not use their asthma inhaler correctly at the pretest interview. Furthermore, it was shown that the inhaler technique of patients can be significantly improved after instruction through educational videos or a written pamphlet. Interestingly, we observed significant improvements over time among the Chinese patients compared to the Punjabi patients, in terms of acquiring the skill set for correctly using inhalers. Two important factors may have been at play. The first could be related to the age of the participants (51); the Punjabi participants were relatively older than the Chinese participants. The second factor could be related to educational level (46, 47, 51); the Punjabi patients had lower levels of formal education than the Chinese patients. Our data showed that the younger participants who have higher levels of formal education manifested significant improvements in their asthma knowledge compared to older and less-educated participants. We also found it notable that Punjabi males showed significant improvements in asthma knowledge compared to Punjabi females. In our study Punjabi males had higher levels of education than Punjabi females. This finding suggests that the interaction of age, level of education, gender, and knowledge may influence one's correct use of an inhaler to prevent loss of control of asthma. In addition, further studies should explore the role of aging and cognitive decline on the learning styles of different ethno-cultural groups. Further investigation with larger samples could also explore the role of gender in medically related skill-based learning.

We highlight the importance of patients' understanding of information and their adherence with physicians' instructions to manage their asthma while receiving educational materials that are culturally and linguistically

relevant. According to the literature, educational handouts (e.g., pamphlets) are readily available in physicians' offices, with little instruction normally given by the caregivers on how to use the information (24–26). In addition, the information materials are normally developed in the respective mainstream culture and language (16). Although the pamphlets in our study were written in the patients' own language and were reverse engineered from the knowledge video, we could not integrate the cultural aspect of information (i.e., gestures, humor, storytelling, and other social interaction styles) that are featured in the videos. Literature reveals that people normally trust visual information that is presented to them by a trustworthy individual (e.g., a physician) who speaks their language, and is from their cultural community (30–33). Our aim was to assess the effectiveness of presenting scientific information (via a knowledge video) compared to community opinions and stories about asthma (via a community video) in three experimental groups, and then compare the results with those of the comparison group who received only written material (a pamphlet) on patient asthma self-management. The goal was to translate the gathered information from patients and key informants into educational materials that are beneficial and meaningful to the patients (16). We discovered that when the patients obtained relevant educational information, which is provided by trusted people (including their community members and physicians who speak the same language), their knowledge and recall of asthma symptoms and self-management practices improved significantly.

The findings of this study suggest that health materials developed in the community's language, and integrated with the community's most common cultural beliefs and practices, are highly effective in promoting self-management and intentions to change behavior. This is related to ways of avoiding asthma triggers as well as techniques for proper inhaler usage among ethno-cultural communities. Participants in all four groups performed significantly better in the post-intervention follow-up test compared to pretest assessment, indicating not only an initial learning experience, but also one that was associated with significant retention of knowledge 4 months later. These results suggest that succinct culturally and linguistically appropriate educational interventions, involving print or video materials can effectively improve patients' understanding and recall of information about asthma.

Limitations

Health knowledge increased and health practices improved within each ethnic community in this study. However, we believe that our sample size does not have the breadth to generalize certain ethno-cultural communities' cultural norms and health behavior. It is not clear to what extent the patients studied are representative of all patients in the target communities using asthma medication. However, these results may well hold for those patients who are inclined to participate in such an educational intervention. Furthermore, while a proportion of patient self-reports of adherence and behavioral intention may represent a “social

desirability” response; psychometric analyses indicated a strong measurement of behavioral impact in this study. Participation of 92% of the enrolled patients to complete the study confirms that adults with asthma from Punjabi, Cantonese, and Mandarin communities are interested in taking an active role in their self-management and in participating in a health education program that is integrated into routine asthma care. While the methods and results reported here and elsewhere were encouraging (28, 27), future research is required to evaluate the impact of our educational intervention on health service utilization; for example, outpatient care, emergency care, hospitalization, and clinical outcomes.

In conclusion, the way in which information is developed and presented may affect immediate understanding and use of information in the self-management of asthma. This can be promoted through either print or video-based materials and by patient consultation given by a range of caregivers. Regardless of the initial intervention format chosen, benefits to modifying behavioral intentions and health practices may occur if patients are able to perceive information as being relevant. Other benefits also emerge if useful information is presented by trusted caregivers, and if health materials are developed with direct involvement of patients and community caregivers.

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DECLARATION OF INTEREST

We declare that there is no conflict of interest in terms of ownership of shares, consultancy, speaker's honoraria, or research grants from commercial companies or professional or governmental organizations with an interest in the topic of the paper (the International Committee of Medical Journal Editors (ICMJE) form for Disclosure of Potential Conflicts of Interest from the corresponding author and the coauthors will be also sent to the journal separately).

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