



Development and evaluation of an online continuing education course to increase healthcare provider self-efficacy to make strong HPV vaccine recommendations to East African immigrant families

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ABSTRACT

Objective: To develop and evaluate an online continuing education (CE) course designed to improve healthcare provider self-efficacy to make strong adolescent HPV vaccine recommendations to East African immigrant families.

Methods: Focus groups with providers and East African immigrant mothers informed course development. Providers serving East African immigrant families were recruited to view the course and complete pre-/post-test and two-month follow-up surveys. Pre-/post differences were compared with paired t-tests.

Results: 202 providers completed the course and pre-/post-test; 158 (78%) completed two-month follow-up. Confidence to make strong HPV vaccine recommendations to East African families increased from 68% pre-test to 98% post-test. Confidence to address common parental concerns also increased: safety, 54% pre-test, 92% post-test; fertility, 55% pre-test, 90% post-test; child too young, 68% pre-test, 92% post-test; and pork gelatin in vaccine manufacturing, 38% pre-test, 90% post-test. Two-month follow-up scores remained high (97% for overall confidence, 94%–97% for addressing parental concerns). All pre-/post-test and pre-test/two-month follow-up comparisons were statistically significant ($p < 0.05$).

Conclusions: The online CE course focused on culturally appropriate strategies for making strong recommendations and addressing specific parental concerns was effective for increasing provider self-efficacy to recommend HPV vaccination to East African families. Similar courses could be tailored to other priority populations.

1. Introduction

Human papillomavirus (HPV) vaccination prevents infection with HPV types that cause most HPV-related cancers, and United States (U.S.) guidelines recommend routine vaccination for adolescents [1]. Despite

this, vaccine uptake remains low. In 2019, 72% of adolescents aged 13–17 years had initiated the HPV vaccine series, and only 54% had completed [2]. HPV vaccine uptake, as well as HPV-associated cancer incidence and mortality, vary based on geographical location, gender, health insurance status, education status, race and ethnicity, and

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nativity [3–9]. Some [10–12], but not all [13], studies evaluating the differences in HPV vaccine uptake by nativity indicate that children with foreign-born parents are less likely to be vaccinated than children with U.S.-born parents [13]. Among children with foreign-born parents, differences in years living in the U.S., parental birthplace, and other socioeconomic variables may contribute to variations in HPV vaccine uptake [10–12]. Additional universal barriers to HPV vaccine uptake include concerns about vaccine safety, concerns about encouraging sexual promiscuity, irregular access to care, and lack of provider recommendations [6,8,14–18].

Health care provider recommendations are one of the strongest predictors of adolescent HPV vaccination [14,19–22]. However, some providers view HPV vaccine recommendations as burdensome; when discussed in conjunction with other adolescent vaccines, they tend to recommend it last and less strongly [20,23–25]. This may be due to uncertainty in how to address parental concerns, which may be magnified in cross-cultural encounters. Additionally, primary care providers often see adolescent patients less frequently, reducing opportunities to educate parents about the HPV vaccine [26].

Various evidence-based interventions have been developed to improve provider recommendation of HPV vaccination, including continuing education (CE) courses [27–30]. CE courses are widely-used tools for keeping providers up-to-date on medical knowledge [31]. CE courses can be effective in providing HPV vaccination knowledge, but their effectiveness in increasing provider confidence to make high-quality recommendations (measured by strong endorsement, encouraging same-day vaccination, and discussing cancer prevention) [20] is unclear. There are additional gaps in provider education regarding communication about HPV vaccination with specific priority populations, including immigrant communities [27,29,32,33].

East African immigrant families are a priority population to improve HPV vaccine uptake. King County, Washington has a large East African population (28,571 or 1% of the county population in 2018) [34], and data suggest low HPV vaccine uptake [28]. As part of a multilevel communication intervention study to promote HPV vaccination among East African adolescents in King County, Washington, we developed an online CE course designed to address culturally-specific barriers and improve healthcare provider self-efficacy to make strong HPV vaccine recommendations to East African families. The course was evaluated by different types of healthcare providers (physicians, nurse practitioners, physician assistants, nurses, and medical assistants) involved in making adolescent vaccine recommendations.

2. Methods

2.1. Overview

We developed an online CE course that provided cultural context and concrete strategies that healthcare providers can implement to make strong HPV vaccine recommendations to their East African adolescent patients and their families. We then recruited healthcare providers to view the course, and complete immediate pre-/post-test surveys and a two-month follow-up survey to assess the impact on provider self-efficacy to make strong HPV vaccine recommendations. For this study, the term healthcare provider encompasses physicians, physician assistants, nurse practitioners, nurses, and medical assistants – recognizing that all these roles are involved in the vaccination process. This study was approved by the University of Washington Institutional Review Board.

2.2. Online CE course development

We used a multi-step process to develop the online CE course, including 1) review of the literature; 2) focus groups (three with East African mothers, one with providers); and 3) integration of literature review and focus group findings to develop the online CE course.

Step 1) Review of the Literature. In 2018, we reviewed the literature on 1) HPV vaccine uptake in East African immigrant and refugee communities, 2) provider HPV vaccine recommendations in immigrant and refugee communities, and 3) provider CE courses on HPV vaccination.

The literature search yielded little information about HPV vaccine uptake or attitudes and beliefs towards HPV vaccination in East African communities. A study conducted in 2012 surveyed Somali, Ethiopian, and Eritrean parents in Washington State [28]. Only 16% (8 of 50) of surveyed Ethiopian and Eritrean parents and none of 55 Somali parents reported vaccinating their children against the HPV vaccine [28]. Parents from all three communities reported that lack of recommendations from their healthcare providers were the most important barrier preventing HPV vaccination. Additionally, this study also pointed out that parents recognized doctors' vaccination recommendations in their native language as a more trustworthy source compared to recommendations from pharmacists or nurses.

Although there is limited research on specific barriers to HPV vaccination among immigrant communities, there are disparities in who receives HPV vaccine recommendations from their providers [26]. For example, in a study of providers serving large minority populations (defined by the American Community Survey as more than 30% of the community population) in New York, only one-third of providers reported regularly recommending the HPV vaccine to their eligible patients [26]. A primary reason for this was lack of time to properly educate parents [26]. When working with immigrant patients with varied languages and cultures, barriers to effective conversations may increase, potentially contributing to lower HPV vaccine uptake in immigrant communities than in non-immigrant communities [28]. Thus, interventions should encourage and offer tools to providers to make strong, culturally-appropriate, consistent recommendations.

In addition to reading CE review articles, we reviewed 2 CE courses [30,35]. CE course content varied widely, with CE courses focusing on cervical cancer screening, HPV vaccine administration guidelines, and/or the importance of provider HPV vaccine recommendations [27, 32].

We identified two primary gaps related to the HPV vaccine CE courses. First, concrete examples of how to make strong HPV vaccination recommendations were rarely provided. Second, culturally-specific information was generally not included, and most CEs reviewed did not include cultural considerations for providers to make strong recommendations [27]. For example, *You are the Key to HPV Cancer Prevention* [30] focuses on making strong HPV vaccine recommendations but does not include tailored recommendations for any subpopulations. A notable exception is a webinar presented by the American College of Physicians that discussed the importance of cultural competence and immunization, but lacked concrete examples [35]. Cultural humility, a process of remaining open to patient perspectives when interacting with patients from diverse backgrounds and maintaining awareness of and challenging the power dynamic between patients and providers [36], was mentioned briefly.

Step 2) Focus Groups. We conducted four focus groups. Three focus groups, one for each of three languages (Somali, Amharic, or Tigrinya), were held with mothers (n = 30) of 11-to 17-year old children and explored HPV vaccine perception and uptake in East African communities [37]. Fathers and other caregivers were not included in these focus groups because mothers tend to be the primary caregivers in East African families. Recruitment, data collection, and participant demographics were described previously [37]. Participating mothers reported a lack of knowledge about the HPV vaccine, concerns about side effects such as general sickness and fever as well as the impact on fertility, and religious and cultural considerations such as vaccine ingredients and conversations about sex.

A fourth focus group was held with healthcare providers who regularly work with East African community members. Information from the mother focus groups was used to inform the moderator guide for the

Table 1
Mapping table for provider CE course content.

CE Course Section	Topic
Understand the burden of HPV infection and disease HPV vaccine information	The burden of HPV infection and disease, focused on HPV infection, types, and associated cancers. Details about HPV vaccines available in the United States, including recommended ages for administration and variations in the dosing schedule by age at administration.
East African demographic and cultural context	Basic demographic information and background on East African immigrant populations in the Seattle metropolitan area, norms that may be shared among the three East African communities (Somali, Ethiopian, and Eritrean), and an explanation of cultural humility and how it is different than cultural competence.
Talking to parents about HPV Vaccines Common concerns about the HPV vaccine	Introduced the Recommend, Ask, Acknowledge, Advise Framework. Recommendations for how to advise parents about common HPV vaccine concerns, including concerns frequently voiced by the Somali, Eritrean, and Ethiopian mothers in our focus groups.

provider focus group. The provider focus group moderator guide included three parts: (1) key strategies providers use to communicate with patient families about HPV vaccines, (2) perceived barriers to HPV vaccine uptake both for East African families and for the provider, and (3) additional support providers need to make strong HPV vaccine recommendations. The first part was broadly focused on all patient families, whereas the second and third parts started broadly and then moved into specific questions about East African patient families (e.g., “In your opinion, what are some barriers that the East African community faces regarding HPV vaccination?”). Additionally, the guide solicited responses to concerns identified by mothers in their focus groups, including not having enough information about the vaccine, trust in the vaccine and the medical system generally, and misinformation about the HPV vaccine.

The focus group moderator (S.M.M.) was trained by an expert in qualitative research methods (L.K.K). The provider focus group was convened in December 2017. Healthcare providers were recruited through email outreach to local hospitals, clinics, and public health organizations in the Seattle metropolitan area. Written consent was obtained prior to the start of the focus group. Four physicians, one nurse practitioner, 5 medical assistants, and one medical interpreter (n = 11) participated in a 2-h discussion. Each participant received a \$100 gift card. The focus group was audio-recorded and transcribed. Multiple research team members read the transcript to identify key ideas and HPV vaccination strategies, and then met to discuss the transcript and to resolve any differences in interpretation or unanswered questions.

Providers who participated in the focus groups reported that general barriers to HPV vaccination include religious beliefs, that the child is too young, and the stigma associated with a vaccine that prevents sexually transmitted infections. For East African patients specifically, providers also reported parental concerns regarding the effect of the vaccine on fertility. Additionally, providers expressed concern about health literacy and that explanations about the impact of the vaccine need to be more tangible. For example, one provider said, “most of my patients don’t know what a cervix is, and so they say protecting from cervical cancer is very obscure. It doesn’t make a lot of sense. If you say *cancer*, then that crosses cultural boundaries, but cervical cancer doesn’t mean anything.”

Step 3) Integrating literature review and focus group findings. To create the online CE course, the study team created a mapping table which outlined CE content in five parts (Table 1). The messages of the course content were guided by interdependence theory, which posits that in a relationship, interacting partners can exert an influence on each other’s behaviors and health outcomes; thus, interventions should include both influencing partners to change behavior [38,39].

Interacting partners can also experience shared or joint outcomes based on the context of their interaction [38,39]. During clinical interactions, healthcare providers and patients have an opportunity to create communication around shared outcomes as being equally important to them [40]. Our online CE course created those opportunities for healthcare providers to use when communicating about HPV vaccine to parents by emphasizing the “we” when responding to parents, e.g. “*You’ve made a great decision. Vaccinating your son/daughter is one of the best ways we can work together to protect his/her health.*” [40]

One common communication strategy providers use with patients is the Ask, Acknowledge, Advise model [41]. Using this model, providers first ask parents about vaccine concerns. Then the provider acknowledges the concern, before finally advising the parent on the immunization (such as risks and benefits). The goal is to end the consultation with a mutually agreed upon action. We used the Ask, Acknowledge, Advise communication model with embedded messages guided by the interdependence theory.

The CE highlighted common concerns about the HPV vaccine, including concerns frequently voiced by the Somali, Eritrean, and Ethiopian mothers in our focus groups as well as suggested responses. Some of the concerns were that the child is too young, the vaccine will make the child sterile, and that the vaccine contains pork gelatin. In addition, mock conversations between providers and East African patients were developed based on barriers and strategies identified through the focus groups and included as concrete examples of common concerns of East African parents and suggested provider responses. To accompany these mock conversations, we selected illustrations that were created for the comic book educational intervention for East African adolescents (Appendix) [42]. Three learning objectives were identified for the course, titled *HPV Vaccination: Framing the Conversation for East African Families*:

1. Explain the basics of HPV related diseases and HPV vaccination recommendations in the U.S.
2. Define cultural humility and explain how it is related to the experience of immigrants and refugees in the healthcare setting
3. Share evidence-based strategies to increase HPV vaccination uptake that are applicable to East African immigrant and refugee communities

After completing a draft of the online CE course, several local providers (3 family medicine physicians, 1 pediatrician, and 1 adolescent medicine physician) with expertise in HPV vaccination and adolescent medicine, as well as our East African community partners reviewed the content to ensure scientific accuracy, cultural appropriateness, and relevancy to healthcare providers. Content was finalized by the research team and the course was assembled (audio narration by co-author A.I. synchronized to PowerPoint slides).

2.3. Online CE course evaluation

Health care providers were recruited between July 2018 and November 2018 to complete and evaluate the online CE course. Providers were eligible if they worked in one of the 107 Vaccines for Children (VFC) clinics that our community partner at Public Health - Seattle & King County (PHSKC) identified as serving East African patients. Other eligibility criteria included seeing adolescent patients and self-identifying as working as either a: physician, nurse practitioner, registered nurse, licensed practical nurse, or medical assistant. Participants received a no-cost CE credit based on current accreditation regulations for their self-reported role. Participants were asked to complete online surveys immediately before and after completing the course and at two-months post-completion.

The CE accreditation and course hosting were provided by Cardea Services (Seattle, WA) on a secure web server. Study questionnaires were hosted on Cardea Services’ SurveyGizmo account (SurveyGizmo,

Table 2

Demographic characteristics of healthcare providers who participated in the evaluation of an online CE course on strategies for making strong recommendations to East African patients and parents about HPV vaccine (N = 202).

	n	%
Health care role		
Physician	78	38.6
Nurse Practitioner	16	7.9
Physician Assistant	4	2.0
Registered Nurse	29	14.4
Licensed Practical Nurse	5	2.5
Medical Assistant	70	34.7
Time in current role (years)		
<5	102	50.5
5–9	46	22.8
10–14	23	11.4
15–19	9	4.5
20+	22	10.9
Gender		
Male	27	13.4
Female	174	86.1
Other	1	0.5
Hispanic ethnicity		
Yes	20	9.9
No	182	90.1
Race		
White	110	54.5
Black	11	5.5
Asian	49	24.3
Pacific Islander	3	1.5
Other	29	14.4
Specialty		
Pediatrics	53	26.2
Obstetrics	5	2.5
Family Medicine	126	62.4
Internal Medicine	3	1.5
Other	10	5.0
N/A ^a	5	2.5
Number of adolescent patients per week		
1–9	98	48.5
10–24	75	37.1
25–49	22	10.9
50+	7	3.5

^a A not applicable option was provided because medical assistants and nurses do not have a specialty associated with their license. However, many may have selected the specialty in which they are actively practicing.

Boulder, CO). Recruitment was conducted by community partners from PHSKC and WithinReach, a local community health promotion non-profit organization with permission and history of distributing research study recruitment through VFC clinics. Recruitment included distributing flyers at conferences and events that VFC providers were attending as well as to clinic staff while PHSKC staff were conducting routine compliance and quality improvement visits. Additionally, a recruitment email was sent to VFC clinic vaccine coordinators and providers, who could post the email on their internal listserv, insert the recruitment text in their internal newsletter, and/or post the recruitment flyer in their clinic. PHSKC collaborators also sent four emails to follow-up on the initial recruitment email to remind VFC clinic vaccine coordinators and providers to notify their providers of this study. Participants received a \$25 gift card for successful completion of the CE course and the pre-/post-CE questionnaires. Two months later, participants were contacted via e-mail to complete the follow-up survey. Up to two reminders were sent, one week apart. Participants received a \$5 gift card for completing the follow-up survey.

2.4. Survey measures

All three questionnaires (pre/post and two-month follow-up) included questions that specifically addressed content covered in the course. Providers' confidence to address common HPV vaccine concerns such as the vaccine is unsafe, administered too young, causes infertility,

Table 3

Proportion of correct and incorrect responses to HPV knowledge questions immediately before and after participating in the online CE course (N = 202).

	Pre-Test		Post-Test		Mean % Difference in Correct Responses
	n	%	n	%	
<i>The HPV vaccine can first be administered when a child is 9 years of age.</i>					
Correct (True)	179	88.6	196	97.0	8.4***
Incorrect (False/Don't know)	23	11.4	6	3.0	
<i>Children who receive their first dose of HPV vaccine before 15 years of age need a total of 3 doses.</i>					
Correct (False)	164	81.2	188	93.1	11.9***
Incorrect (True/Don't know)	38	18.8	14	6.9	
<i>If using the 2-dose HPV vaccine schedule, the 2nd dose should be administered 6–12 months after the first dose.</i>					
Correct (True)	188	93.1	200	99.0	5.9**
Incorrect (False/Don't know)	14	6.9	2	1.0	
<i>Cultural humility is defined as:</i>					
Correct – A process of openness, self-awareness, and self-reflection after interacting with patients from diverse backgrounds.	102	50.5	125	61.9	11.4**
Incorrect – Bringing cultural awareness, sensitivity, knowledge, and skill to your interactions with patients from diverse backgrounds.	88	43.6	71	35.2	
Incorrect – Helping people from diverse backgrounds understand current western medical standards.	6	3.0	4	2.0	
Incorrect – None of the above	6	3.0	2	1.0	

McNemar's tests were used for statistical analysis. *p < 0.05, **p < 0.01, ***p < 0.001.

and contains pork gelatin were measured with Likert scales ranging from strongly disagree (1) to strongly agree (5). In addition to measuring self-efficacy, intention was also measured pre-test and at the two-month follow-up: "how likely are you to discuss the HPV vaccine with your East African patients?" We also measured whether providers recommended the HPV vaccine with one question: "how often do you recommend the HPV vaccine to your East African patients?" These questions were also scored on a 5-point scale: never/very unlikely (1) to always/very likely (5).

Both the pre- and post-test questionnaires also included knowledge questions that focused on HPV vaccine as well as cultural humility.

2.5. Data analysis

Two-sample t-tests were used to assess differences between providers who completed the two-month follow-up and those who did not. McNemar's test for binary dependent variables was used to assess differences between pre- and post-test responses for each of the four knowledge questions.

Responses to confidence and intention questions were analyzed using dependent t-tests to assess differences between the pre- and post-test responses, as well as the pre- and two-month follow-up responses. Pre-/post-test and pre-/two-month follow-up comparisons were also stratified by provider role and specialty in an exploratory analysis. Providers were grouped into practitioners (healthcare providers with prescriptive authority) and staff (healthcare providers without prescriptive authority).

3. Results

Two-hundred and two providers participated, including 78 physicians (39%), 16 nurse practitioners (8%), 4 physician assistants (2%), 34

Table 4

Provider responses to questions about HPV vaccination conversations with East African patients immediately before and after participating in the online CE course (N = 202).

	Pre-Test		Mean Likert Score	Post-Test		Mean Likert Score	Mean Difference in Likert scores
	n	%		n	%		
<i>I am confident that I can address East African parents' concerns that the HPV vaccine is unsafe.</i>							
Strongly Agree	29	14.4	3.4	104	51.5	4.4	0.9***
Agree	80	39.6		82	40.6		
Neutral	51	25.3		4	2.0		
Disagree	35	17.3		9	4.5		
Strongly Disagree	7	3.5		3	1.5		
<i>I am confident that I can address East African parents' concerns that the HPV vaccine can make their child infertile. ^a</i>							
Strongly Agree	29	14.5	3.5	111	55.5	4.4	0.9***
Agree	80	40.0		68	34.0		
Neutral	54	27.0		10	5.0		
Disagree	31	15.5		8	4.0		
Strongly Disagree	6	3.0		3	1.5		
<i>I am confident that I can address East African parents' concerns that their child is too young to get the HPV vaccine. ^a</i>							
Strongly Agree	38	19.0	3.7	116	58.0	4.4	0.7***
Agree	97	48.5		67	33.5		
Neutral	37	18.5		9	4.5		
Disagree	23	11.5		6	3.0		
Strongly Disagree	5	2.5		2	1.0		
<i>I am confident that I can address East African parents' concerns that the HPV vaccine contains pork gelatin. ^a</i>							
Strongly Agree	28	14.0	3.1	121	60.5	4.4	1.3***
Agree	47	23.5		58	29.0		
Neutral	57	28.5		10	5.0		
Disagree	58	29.0		9	4.5		
Strongly Disagree	10	5.0		2	1.0		
<i>I am confident that I can make strong HPV vaccination recommendations to parents of East African patients.</i>							
Strongly Agree	48	23.8	3.8	125	61.9	4.6	0.7***
Agree	90	44.6		72	35.6		
Neutral	50	24.8		3	1.5		
Disagree	12	5.9		2	1.0		
Strongly Disagree	2	1.0		0	0		

Dependent t-tests were used for statistical analysis. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Likert scale 1–5 (strongly disagree – strongly agree).

^a N = 200. Two subjects excluded since no response to this question.

nurses (17%), and 70 medical assistants (35%; Table 2). The two most common specialties were family medicine (126; 62%) and pediatrics (53; 26%). Most reported being female (86%), White (55%), and non-Hispanic (90%). Half reported working in their current role for five years or less. Of the 202 providers, 158 (78%) completed the two-month follow-up survey. Demographic and clinical practice characteristics were similar between providers who did and did not complete the two-month follow up survey (data not shown).

3.1. Knowledge

Although baseline HPV vaccine knowledge was high (the percentage of correct answers to each of the 3 HPV vaccine knowledge questions ranged from 81% to 93% pre-test), knowledge scores for all 3 questions increased significantly ($p < 0.01$) in the post-test (correct responses increased between 6 and 12% points per question; Table 3). Only 51% of participants answered the question about cultural humility correctly at baseline, compared to 62% post-test ($p < 0.01$).

3.2. Confidence

For all confidence questions, providers indicated higher confidence on the post-test compared to the pre-test (Table 4). Confidence to make strong HPV vaccine recommendations to East African families increased from 68% pre-test to 98% post-test ($p < 0.001$). Providers' confidence to address common parental HPV vaccine concerns also increased: safety: 54% pre-test, 92% post-test; fertility: 55% pre-test, 90% post-test; child too young: 68% pre-test, 92% post-test; and pork gelatin in vaccine manufacturing: 38% pre-test, 90% post-test (all changes with $p < 0.001$).

Scores were significantly higher at two-month follow-up (97% for

overall confidence, and 94%–97% for addressing parental concerns) compared to the pre-test (Table 5). When asked prior to the CE course, 84% of providers reported they were likely or very likely to discuss the HPV vaccine with their East African patients, compared to 96% in the two-month follow-up questionnaire.

Stratified Analysis. In analyses stratified by role (practitioner versus staff), statistically significant increases in confidence and intention were observed among both practitioners and staff (Table 6; Table 7). In most pre-/post-test and pre-/two-month follow-up comparisons, practitioner confidence increased more than staff confidence. Additionally, in analyses stratified by specialty, statistically significant increases in confidence and intention were observed among those who did and did not practice in pediatrics (Table 6; Table 7). Furthermore, larger increases in confidence scores were observed among those practicing in pediatrics than among those in other specialties.

4. Discussion

A recommendation from a healthcare provider is one of the strongest predictors of adolescent HPV vaccine uptake [20,43]. Providers do not always make strong HPV vaccine recommendations for certain subpopulations that may have barriers related to limited English proficiency or culture-specific concerns [23,26]. Of the few interventions developed to increase provider confidence in their ability to address parental concerns about HPV vaccination [27,29], we are unaware of any that include tailored recommendations for any particular subpopulation. To address this gap, we developed and evaluated a provider online CE course designed to increase provider self-efficacy in making strong HPV vaccination recommendations to families in East African immigrant communities, a subpopulation with low HPV vaccine uptake [28]. At baseline, most providers were knowledgeable about HPV vaccines and

Table 5

Provider responses to questions about HPV vaccination conversations with East African patients immediately before and two months after participating in the online CE course (N = 158^b).

	Pre-Test		Mean Likert Score	Two Months		Mean Likert Score	Mean Difference in Likert Scores
	N	%		N	%		
<i>In the next two months, how likely are you to discuss HPV vaccination with your East African patient families?^b</i>							
Very Likely	87	55.8	4.3	120	76.9	4.7	0.4***
Likely	44	28.2		30	19.2		
Neutral	16	10.3		5	3.2		
Unlikely	7	4.5		0	0		
Very Unlikely	2	1.3		1	0.6		
<i>How often do you recommend the HPV vaccine to your East African patients?^b</i>							
Always	114	73.1	4.5	125	80.1	4.7	0.2*
Often	25	16.0		18	11.5		
Sometimes	7	4.5		10	6.4		
Rarely	6	3.9		1	0.6		
Never	4	2.6		2	1.3		
<i>I am confident that I can address East African parents' concerns that the HPV vaccine is unsafe.</i>							
Strongly Agree	18	11.4	3.4	90	57.0	4.5	1.1***
Agree	66	41.8		61	38.6		
Neutral	42	26.6		6	3.8		
Disagree	29	18.4		1	0.6		
Strongly Disagree	3	1.9		0	0		
<i>I am confident that I can address East African parents' concerns that the HPV vaccine can make their child infertile.</i>							
Strongly Agree	20	12.7	3.4	92	58.2	4.5	1.1***
Agree	63	39.9		56	35.4		
Neutral	47	29.8		9	5.7		
Disagree	24	15.2		1	0.6		
Strongly Disagree	4	2.5		0	0		
<i>I am confident that I can address East African parents' concerns that their child is too young to get the HPV vaccine.</i>							
Strongly Agree	26	16.5	3.7	97	61.4	4.6	0.9***
Agree	80	50.6		57	36.1		
Neutral	30	19.0		4	2.5		
Disagree	18	11.4		0	0		
Strongly Disagree	4	2.5		0	0		
<i>I am confident that I can address East African parents' concerns that the HPV vaccine contains pork gelatin.</i>							
Strongly Agree	19	12.0	3.1	89	56.3	4.5	1.4***
Agree	37	23.4		61	38.6		
Neutral	47	29.8		7	4.4		
Disagree	46	29.1		1	0.6		
Strongly Disagree	9	5.7		0	0		
<i>I am confident that I can make strong HPV vaccination recommendations to parents of East African patients.</i>							
Strongly Agree	35	22.2	3.9	105	66.5	4.6	0.8***
Agree	76	48.1		48	30.4		
Neutral	36	22.8		5	3.2		
Disagree	11	7.0		0	0		
Strongly Disagree	0	0		0	0		

Dependent t-tests were used for statistical analysis. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Likert scale 1 – 5 (strongly disagree – strongly agree).

^a Sample restricted to include providers who participated in the two-month follow-up.

^b N = 156. Two subjects excluded since no response to this question.

Table 6

Participant responses to questions about HPV vaccination conversations with East African patients immediately before and after participating in the online CE course, stratified by provider role and specialty (N = 202).

	Pre-Test Mean Likert Score	Post-Test Mean Likert Score	Mean Difference in Likert scores
<i>I am confident that I can address East African parents' concerns that the HPV vaccine is unsafe.</i>			
Provider type			
Practitioner (n = 98) ^a	3.4	4.6	1.2***
Staff (n = 104) ^b	3.5	4.2	0.7***
Specialty			
Pediatrics (n = 53)	3.4	4.5	1.2***
Other Specialties (n = 149)	3.5	4.3	0.8***
<i>I am confident that I can address East African parents' concerns that the HPV vaccine can make their child infertile.^c</i>			
Provider type			
Practitioner (n = 97) ^a	3.6	4.6	1.1***
Staff (n = 103) ^b	3.4	4.1	0.7***
Specialty			
Pediatrics (n = 53)	3.4	4.6	1.2***
Other Specialties (n = 147)	3.5	4.3	0.8***
<i>I am confident that I can address East African parents' concerns that their child is too young to get the HPV vaccine.^c</i>			
Provider type			
Practitioner (n = 97) ^a	3.8	4.7	0.9***
Staff (n = 103) ^b	3.7	4.2	0.6***
Specialty			
Pediatrics (n = 53)	3.7	4.7	1.0***
Other Specialties (n = 147)	3.7	4.3	0.6***
<i>I am confident that I can address East African parents' concerns that the HPV vaccine contains pork gelatin.^c</i>			
Provider type			
Practitioner (n = 97) ^a	2.8	4.7	1.9***
Staff (n = 103) ^b	3.4	4.2	0.8***
Specialty			
Pediatrics (n = 53)	2.7	4.7	2.0***
Other Specialties (n = 147)	3.3	4.3	1.1***
<i>I am confident that I can make strong HPV vaccination recommendations to parents of East African patients.</i>			
Provider type			
Practitioner (n = 98) ^a	3.8	4.7	0.9***
Staff (n = 104) ^b	3.9	4.5	0.6***
Specialty			
Pediatrics (n = 53)	3.7	4.8	1.1***
Other Specialties (n = 149)	3.9	4.5	0.6***

Dependent t-tests were used for statistical analysis. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

^a Practitioner = physician, nurse practitioner, and physician assistant.

^b Staff = registered nurse, licensed practical nurse, and medical assistant.

^c N = 200. Two subjects excluded since no response to this question.

indicated that they were likely to discuss and recommend HPV vaccines to their East African patients. In contrast, confidence to make strong recommendations and address specific parental concerns was considerably lower. We found that the course was successful in increasing provider confidence.

Our online CE course addressed four specific parental concerns raised in focus groups with providers and with East African parents: safety, fertility, young age at vaccination, and pork gelatin. Two of these – safety and young age at vaccination – are common concerns shared with parents outside of the East African community [14,28,37]. In contrast, pork gelatin content of vaccines is a culturally-specific concern

Table 7

Participant responses to questions about HPV vaccination conversations with East African patients immediately before and two months after participating in the online CE course, stratified by provider role and specialty (N = 158).

	Pre-Test Mean Likert Score	Two Month Mean Likert Score	Mean Difference in Likert scores
<i>In the next two months, how likely are you to discuss HPV vaccination with your East African patient families?^a</i>			
Provider type			
Practitioner (n = 76) ^b	4.6	4.9	0.2***
Staff (n = 80) ^c	4.1	4.6	0.5***
Specialty			
Pediatrics (n = 40)	4.6	4.8	0.2*
Other Specialties (n = 116)	4.2	4.7	0.4***
<i>How often do you recommend the HPV vaccine to your East African patients?^a</i>			
Provider type			
Practitioner (n = 76) ^b	4.8	4.8	0.1
Staff (n = 80) ^c	4.3	4.5	0.2
Specialty			
Pediatrics (n = 40)	4.7	4.8	0.1
Other Specialties (n = 116)	4.5	4.6	0.2*
<i>I am confident that I can address East African parents' concerns that the HPV vaccine is unsafe.</i>			
Provider type			
Practitioner (n = 78) ^b	3.4	4.6	1.2***
Staff (n = 80) ^c	3.4	4.4	1.0***
Specialty			
Pediatrics (n = 42)	3.3	4.6	1.4***
Other Specialties (n = 116)	3.5	4.5	1.0***
<i>I am confident that I can address East African parents' concerns that the HPV vaccine can make their child infertile.</i>			
Provider type			
Practitioner (n = 78) ^b	3.6	4.7	1.1***
Staff (n = 80) ^c	3.3	4.4	1.1***
Specialty			
Pediatrics (n = 42)	3.3	4.7	1.3***
Other Specialties (n = 116)	3.5	4.5	1.0***
<i>I am confident that I can address East African parents' concerns that their child is too young to get the HPV vaccine.</i>			
Provider type			
Practitioner (n = 78) ^b	3.8	4.7	0.9***
Staff (n = 80) ^c	3.6	4.5	1.0***
Specialty			
Pediatrics (n = 42)	3.7	4.7	1.0***
Other Specialties (n = 116)	3.7	4.6	0.9***
<i>I am confident that I can address East African parents' concerns that the HPV vaccine contains pork gelatin.</i>			
Provider type			
Practitioner (n = 78) ^b	2.9	4.6	1.7***
Staff (n = 80) ^c	3.3	4.4	1.2***
Specialty			
Pediatrics (n = 42)	2.6	4.6	2.0***
Other Specialties (n = 116)	3.2	4.5	1.3***
<i>I am confident that I can make strong HPV vaccination recommendations to parents of East African patients.</i>			
Provider type			
Practitioner (n = 78) ^b	3.9	4.8	0.9***
Staff (n = 80) ^c	3.8	4.5	0.7***
Specialty			
Pediatrics (n = 42)	3.7	4.8	1.1***

Table 7 (continued)

	Pre-Test Mean Likert Score	Two Month Mean Likert Score	Mean Difference in Likert scores
Other Specialties (n = 116)	3.9	4.6	0.7***

Dependent t-tests were used for statistical analysis. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

- ^a N = 156. Two subjects excluded since no response to this question.
- ^b Practitioner = physician, nurse practitioner, and physician assistant.
- ^c Staff = registered nurse, licensed practical nurse, and medical assistant.

for East African patients who practice Islam (we found provider pre-test confidence to be lowest for this concern). Post-test results from after viewing the CE showed increases in provider self-efficacy to address each of these specific concerns, as well as increased overall confidence to make strong HPV vaccine recommendations to East African patients and their families. To the best of our knowledge, the positive effect of our hybrid recommend/conversational approach on provider self-efficacy is unique to this study, as this outcome has typically not been explored. Instead, previous study outcomes have generally focused on provider perceptions (e.g. ease of use, efficacy of the recommendation, and promotion of HPV vaccination) [44], patient visit experience [45], parental vaccine acceptance [45], or vaccine coverage [44,46].

We enrolled physicians, physician assistants, nurse practitioners, nurses, and medical assistants in order to encompass the variety of healthcare provider types involved in making adolescent vaccine recommendations. Most participants who evaluated the CE course were either physicians or medical assistants, and although both are important in immunization, their roles are very different. The CE course was effective for increasing confidence for all subgroups evaluated, including practitioners (providers with prescriptive authority), staff (providers without prescriptive authority), pediatric providers, and providers in other specialties, suggesting broad utility. We did, however, note greater increases in confidence for practitioners compared to staff, and for those in pediatrics compared to other specialties. The prescriptive authority-specific difference suggests that it might be beneficial to tailor education to role, especially since no states permit medical assistants to conduct all parts of the immunization process independently [47].

Because online CE courses are not limited by time or geography, they can reach a broad audience and allow for self-paced learning. Our online CE course and evaluation had several strengths, including a cross-cultural barrier component and measurements that focused on confidence and intention. Additionally, we measured not just immediately post-test, but also at two months after completing the online CE course. We had relatively high retention at the two-month follow-up and increases in confidence were sustained. However, several limitations should also be noted. First, we measured providers' confidence to make strong HPV vaccination recommendations and the likelihood of their discussing and recommending HPV vaccination to East African patients but did not have project resources available to evaluate HPV vaccine uptake among the patients of participating providers. To our knowledge, few intervention studies designed to increase provider confidence have measured vaccine uptake as an outcome [48]; however, in those that have, increases in provider confidence were associated with higher vaccine uptake in patients [48]. Second, to help providers understand that information in the online CE course on shared cultural norms and vaccine concerns was generalized and not representative of all encounters they might have with East African patients, we included a brief section on cultural humility. In particular, given that this can affect provider attitudes in cross-cultural care, cultural competence and cultural humility were defined in the course so as to offer a foundation for understanding cultural contexts in a non-judgmental way [49]. However, in the post-test, only 62% of providers correctly defined cultural

humility (compared to 51% pre-test), suggesting that the information presented may not have been sufficiently clear. Third, because of resource limitations, only one focus group was held per community. We restricted to mothers to ensure participants were comfortable discussing HPV and the HPV vaccine, and also to best inform content for an intervention for mothers that was also being developed. Although mothers tend to be the primary caregivers in East African families, future research and practice would benefit from considering perspectives of fathers or other caregivers when developing trainings for healthcare providers. Finally, we only sampled providers working with East African patients in VFC clinics in King County, Washington, which has a fairly large East African immigrant population. Thus, these findings may not be generalizable to providers who practice in other geographic locations or rarely work with East African patients.

5. Conclusion

Our online CE course provided culturally appropriate information informed by East African community members and health care providers who serve East African patients in the Seattle metropolitan area. After completing the CE course, providers reported more confidence overall in making HPV vaccine recommendations and in addressing concerns tailored to the East African community. Our results suggest that an on-line CE course that includes concrete examples for communicating with patient families is effective for increasing provider confidence to make HPV vaccine recommendations to East African patients and families. Additional research on the use of CE courses for this purpose should include measures of HPV vaccination uptake in patients of participating providers. There may be potential to adapt this kind of CE course – general HPV vaccine knowledge and strategies for communicating with patient families, combined with tailoring to diverse communities – to address gaps in HPV vaccination uptake in other subpopulations.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tvr.2021.200214>.

References

- [1] E. Meites, A. Kempe, L.E. Markowitz, Use of a 2-dose schedule for human papillomavirus vaccination- updated recommendations of the advisory committee on immunization practices, *MMWR Morb. Mortal. Wkly. Rep.* 65 (49) (2016) 1405–1408.
- [2] L.D. Elam-Evans, D. Yankey, J.A. Singleton, et al., National, regional, state, and selected local area vaccination coverage among adolescents aged 13-17 Years - United States, 2019, *MMWR Morb. Mortal. Wkly. Rep.* 69 (33) (2020) 1109–1116.
- [3] K.A. Henry, A.M. Stroup, E.L. Warner, D. Kepka, Geographic factors and human papillomavirus (HPV) vaccination initiation among adolescent girls in the United States, *Cancer Epidemiol. Biomark. Prev.* 25 (2) (2016) 309–317.
- [4] K.A. Henry, A.L. Swiecki-Sikora, A.M. Stroup, E.L. Warner, D. Kepka, Area-based socioeconomic factors and Human Papillomavirus (HPV) vaccination among teen boys in the United States, *BMC Publ. Health* 18 (1) (2017) 19.
- [5] L.J. Finney Rutten, P.M. Wilson, D.J. Jacobson, et al., A population-based study of sociodemographic and geographic variation in HPV vaccination, *Cancer Epidemiol. Biomark. Prev.* 26 (4) (2017) 533–540.
- [6] P. Jeudin, E. Liveright, M.G. del Carmen, R.B. Perkins, Race, ethnicity and income as factors for HPV vaccine acceptance and use, *Hum. Vaccines Immunother.* 9 (7) (2013) 1413–1420.
- [7] H. Fisher, C.L. Trotter, S. Audrey, K. MacDonald-Wallis, M. Hickman, Inequalities in the uptake of human papillomavirus vaccination: a systematic review and meta-analysis, *Int. J. Epidemiol.* 42 (3) (2013) 896–908.
- [8] L. Yu, S.A. Sabatino, M.C. White, Rural-urban and racial/ethnic disparities in invasive cervical cancer incidence in the United States, 2010–2014, *Prev. Chronic Dis.* 16 (2019) E70.
- [9] G.K. Singh, A. Jemal, Socioeconomic and racial/ethnic disparities in cancer mortality, incidence, and survival in the United States, 1950–2014: over six decades of changing patterns and widening inequalities, *J Environ Public Health.* 2017 (2017), 2819372.
- [10] D. Kepka, J. Bodson, D. Lai, et al., Factors associated with human papillomavirus vaccination among diverse adolescents in a region with low human papillomavirus vaccination rates, *Health Equity.* 2 (1) (2018) 223–232.
- [11] K. Kim, A.-R. LeClaire, A systematic review of factors influencing human papillomavirus vaccination among immigrant parents in the United States, *Health Care Women Int.* 40 (6) (2019) 696–718.
- [12] C. Chao, C. Velicer, J.M. Slezak, S.J. Jacobsen, Correlates for human papillomavirus vaccination of adolescent girls and young women in a managed care organization, *Am. J. Epidemiol.* 171 (3) (2010) 357–367.
- [13] J. Healy, A. Rodriguez-Lainz, L.D. Elam-Evans, H.A. Hill, S. Reagan-Steiner, D. Yankey, Vaccination coverage among foreign-born and U.S.-born adolescents in the United States: successes and gaps - national Immunization Survey-Teen, 2012–2014, *Vaccine* 36 (13) (2018) 1743–1750.
- [14] D.M. Holman, V. Benard, K.B. Roland, M. Watson, N. Liddon, S. Stokley, Barriers to human papillomavirus vaccination among US adolescents: a systematic review of the literature, *JAMA Pediatrics.* 168 (1) (2014) 76–82.
- [15] D. Pierre-Victor, D.P. Stephens, A. Omondi, R. Clarke, N. Jean-Baptiste, P. Madhivanan, Barriers to HPV vaccination among unvaccinated, Haitian American College women, *Health Equity.* 2 (1) (2018) 90–97.
- [16] E. McGhee, H. Harper, A. Ume, et al., Elimination of cancer health disparities through the acceleration of HPV vaccines and vaccinations: a simplified version of the president's cancer panel report on HPV vaccinations, *J. Vaccines Vaccin.* 8 (3) (2017) 361.
- [17] L.M. Niccolai, C.E. Hansen, M. Credle, E.D. Shapiro, Parents' recall and reflections on experiences related to HPV vaccination for their children, *Qual. Health Res.* 26 (6) (2016) 842–850.
- [18] A. Kempe, S.T. O'Leary, L.E. Markowitz, et al., HPV vaccine delivery practices by primary care physicians, *Pediatrics* 144 (4) (2019) e20191475.
- [19] J.M. Garbutt, S. Dodd, E. Walling, A.A. Lee, K. Kulka, R. Lobb, Barriers and facilitators to HPV vaccination in primary care practices: a mixed methods study using the Consolidated Framework for Implementation Research, *BMC Fam. Pract.* 19 (1) (2018) 53.
- [20] M.B. Gilkey, W.A. Calo, J.L. Moss, P.D. Shah, M.W. Marciniak, N.T. Brewer, Provider communication and HPV vaccination: the impact of recommendation quality, *Vaccine* 34 (9) (2016) 1187–1192.
- [21] P.M. Darden, R.M. Jacobson, Impact of a physician recommendation, *Hum. Vaccines Immunother.* 10 (9) (2014) 2632–2635.
- [22] C.G. Dorell, D. Yankey, T.A. Santibanez, L.E. Markowitz, Human papillomavirus vaccination series initiation and completion, 2008–2009, *Pediatrics* 128 (5) (2011) 830–839.
- [23] A. Aragones, M. Genoff, C. Gonzalez, E. Shuk, F. Gany, HPV vaccine and latino immigrant parents: if they offer it, we will get it, *J. Immigr. Minority Health* 18 (5) (2016) 1060–1065.
- [24] T.L. Mullins, A.M. Griffioen, S. Glynn, et al., Human papillomavirus vaccine communication: perspectives of 11–12 year-old girls, mothers, and clinicians, *Vaccine* 31 (42) (2013) 4894–4901.

- [25] L.Y. Fu, G.D. Zimet, C.A. Latkin, J.G. Joseph, Associations of trust and healthcare provider advice with HPV vaccine acceptance among African American parents, *Vaccine* 35 (5) (2017) 802–807.
- [26] D.M. Bruno, T.E. Wilson, F. Gany, A. Aragones, Identifying human papillomavirus vaccination practices among primary care providers of minority, low-income and immigrant patient populations, *Vaccine* 32 (33) (2014) 4149–4154.
- [27] M.L. Kornides, J.M. Garrell, M.B. Gilkey, Content of web-based continuing medical education about HPV vaccination, *Vaccine* 35 (35 Pt B) (2017) 4510–4514.
- [28] L.S. Greenfield, L.C. Page, M. Kay, M. Li-Vollmer, C.C. Breuner, J.S. Duchin, Strategies for increasing adolescent immunizations in diverse ethnic communities, *J. Adolesc. Health* 56 (5 Suppl) (2015) S47–S53.
- [29] S.O.A. Leung, B. Akinwunmi, K.M. Elias, S. Feldman, Educating healthcare professionals to increase Human Papillomavirus (HPV) vaccination rates: a qualitative systematic review, *Vaccine* X. 3 (2019) 100037.
- [30] Centers for Disease Control and Prevention, **Vaccine Communication Courses - You are the key to HPV cancer prevention**, Centers for Disease Control and Prevention, 2016. <https://www.cdc.gov/vaccines/ed/vaccine-communication/index.html>.
- [31] A. Raza, A. Coomarasamy, K.S. Khan, Best evidence continuous medical education, *Arch. Gynecol. Obstet.* 280 (4) (2009) 683–687.
- [32] K.B. Roland, T.L. Larkins, V.B. Benard, Z. Berkowitz, M. Saraiya, Content analysis of continuing medical education for cervical cancer screening, *J. Wom. Health* (2002) 19 (4) (2010) 651–657.
- [33] R. Wutoh, S.A. Boren, E.A. Balas, eLearning: a review of Internet-based continuing medical education, *J. Continuing Educ. Health Prof.* 24 (1) (2004) 20–30.
- [34] U.S. Census Bureau, **2018 American Community Survey 5-Year Estimates, Place of birth for the foreign-born population**. Social Explorer. https://www.socialexplorer.com/tables/ACS2018_5yr/R12477594, 2020. (Accessed 28 February 2020).
- [35] J. Dillaha, C. Velazquez, Adult immunization learning series webinar, in: American College of Physicians, 2016.
- [36] K.A. Yeager, S. Bauer-Wu, Cultural humility: essential foundation for clinical researchers, *Appl. Nurs. Res.* 26 (4) (2013) 251–256.
- [37] L.K. Ko, V.M. Taylor, F.B. Mohamed, et al., "We brought our culture here with us": a qualitative study of perceptions of HPV vaccine and vaccine uptake among East African immigrant mothers, *Papillomavirus Res.* 7 (2019) 21–25.
- [38] H.H. Kelley, J.W. Thabaut, *Interpersonal Relations: A Theory of Interdependence*, Wiley, New York, 1978.
- [39] C.E. Rusbult, P.A.M. Van Lange, Interdependence processes, in: E.T. Higgins, A. W. Kruglanski (Eds.), *Social Psychology: Handbook of Basic Principles*. New York, Guilford Press, 1996, pp. 564–596.
- [40] R.L. Street Jr., R.M. Epstein, Key Interpersonal functions and health outcomes: lessons from theory and research on clinician-patient communication, in: K. Glanz, B.K. Rimer, K. Viswanath (Eds.), *Health Behavior and Health Education: Theory, Research and Practice*, fourth ed., Josset-Bass, San Francisco, 2008, pp. 237–263.
- [41] N.B. Henrikson, D.J. Opel, L. Grothaus, et al., Physician communication training and parental vaccine hesitancy: a randomized trial, *Pediatrics* 136 (1) (2015) 70–79.
- [42] I. Celentano, Development and Production of a Theory- Based, Audience Centric HPV Vaccine Promotion Comic Book for East African Adolescents (Master's thesis), University of Washington, 2018.
- [43] M. Rahman, T.H. Laz, C.J. McGrath, A.B. Berenson, Provider recommendation mediates the relationship between parental human papillomavirus (HPV) vaccine awareness and HPV vaccine initiation and completion among 13- to 17-year-old U. S. adolescent children, *Clin. Pediatr.* 54 (4) (2015) 371–375.
- [44] T.L. Malo, M.E. Hall, N.T. Brewer, C.R. Lathren, M.B. Gilkey, Why is announcement training more effective than conversation training for introducing HPV vaccination? A theory-based investigation, *Implement. Sci.* 13 (1) (2018), 57–57.
- [45] D.J. Opel, R. Mangione-Smith, J.D. Robinson, et al., The influence of provider communication behaviors on parental vaccine acceptance and visit experience, *Am. J. Publ. Health* 105 (10) (2015) 1998–2004.
- [46] N.T. Brewer, M.E. Hall, T.L. Malo, M.B. Gilkey, B. Quinn, C. Lathren, Announcements versus conversations to improve HPV vaccination coverage: a randomized trial, *Pediatrics* 139 (1) (2017), e20161764.
- [47] A.M. Stewart, M.C. Lindley, M.A. Cox, State law and standing orders for immunization Services, *Am. J. Prev. Med.* 50 (5) (2016) e133–e142.
- [48] C. Jarrett, R. Wilson, M. O'Leary, E. Eckersberger, H.J. Larson, Strategies for addressing vaccine hesitancy - a systematic review, *Vaccine* 33 (34) (2015) 4180–4190.
- [49] R.M. Kutob, J. Bormanis, M. Crago, J.M. Harris Jr., J. Senf, C.M. Shisslak, Cultural competence education for practicing physicians: lessons in cultural humility, nonjudgmental behaviors, and health beliefs elicitation, *J. Continuing Educ. Health Prof.* 33 (3) (2013) 164–173.