

A Digital Storytelling Intervention for Vietnamese American Mothers to Promote Their Children's HPV Vaccination

Angela Chia-Chen Chen, Wonsun Sunny Kim, Michael Todd, and Linda Larkey



ABSTRACT

Despite higher rates of human papillomavirus (HPV)-associated cancer in Vietnamese Americans (VA), their vaccination rate remains low. Culturally grounded narratives incorporating culture-specific beliefs and practices may be a promising approach to promote HPV vaccination and potentially mitigate HPV-associated cancer disparities experienced by VAs. We codeveloped personal, audiovisual digital stories about HPV vaccination with VA mothers of vaccinated children, and examined the effects of the digital storytelling (DST) intervention on vaccination intention among VA mothers of unvaccinated children ages 11–14. The stories (3 minutes each) were produced in both English and Vietnamese through a 2-day workshop in collaboration with two VA first-generation immigrant mothers. A community sample of 114 VA mothers of unvaccinated children viewed the stories and filled out an anonymous survey before and after the intervention. Of these mothers (mean age = 41.5 years; SD = 5.4), 35.2% were immigrants, and about

half (51%) reported having a child who received free or reduced-price lunch at school. After the intervention, changes in two items indicating mothers' positive attitudes toward HPV vaccination were significant. Mothers' intention to vaccinate their children increased from 53% to 74%; the difference was large (OR = 9.12; Cohen $g = 0.40$) and statistically significant, $\chi^2(1, N = 114) = 17.63, P < 0.001$. Mothers' scores on the narrative quality assessment scale were high, suggesting high levels of identification and engagement with the stories. This brief intervention using digital stories was feasible and showed preliminary effects on promoting VA mothers' intention to vaccinate their children against HPV.

Prevention Relevance: HPV vaccination has effectively prevented its related cancers. A culturally and linguistically congruent DST intervention targeting HPV vaccination can increase mothers' intention to vaccinate their children.

See related Spotlight, p. 419

Introduction

The human papillomavirus (HPV) is the most common sexually transmitted infection in the United States. An estimated more than 42 million Americans are currently infected with HPV types that can cause diseases; this number is projected to increase by 13 million new cases each year (1). Oncogenic HPV infection is associated with cancers in both sexes. HPV infection can cause cervical, oropharyngeal, anal, vaginal and vulvar cancers in females. In males, HPV can cause genital warts and is associated with oropharyngeal, anal, and penile cancers. The economic value of future lost productivity related to mortality due to HPV-related cancers was \$3.8 billion (2). Because HPV vaccines have been shown to be effective in preventing HPV-related cancers, routine

vaccination of boys and girls at age 11–12 years are recommended (3).

Asian American (AA) females are disproportionately affected by cervical cancer. Among AA subgroups, Vietnamese American (VA; 18.9 per 100,000) females had the highest rates of cervical cancer mortality compared with White females (7.1 per 100,000; refs. 4, 5). Despite HPV-related cancer disparities in the VA population, vaccination rate remains low in this at-risk population. Yi and colleagues (6) reported that the HPV vaccine completion rate was only 9% for VA women, substantially below the Healthy People 2030 goal of 80% (7). These findings are concerning because HPV-related cancers are preventable with vaccination (1, 3). The suboptimal HPV vaccination rate in VA children is associated with VA mother's limited English proficiency and lack of knowledge about HPV vaccine, or their beliefs that vaccination would encourage children's premarital sex (6, 8). These findings underscore the importance of developing culturally and linguistically congruent interventions to improve HPV vaccine uptake in the VA population. While empirical understanding of VA mothers' decision-making about HPV vaccination for their children is growing, limited interventions have been developed for VAs. Despite the fact that VA mothers usually make decisions for their children's health care (6, 8), there is a

Edson College of Nursing and Health Innovation, Arizona State University, Phoenix, Arizona.

Corresponding Author: Angela Chia-Chen Chen, Edson College of Nursing and Health Innovation, Arizona State University, 500 N 3rd St, Phoenix, AZ 85004. Phone: 602-496-0832; Fax: 602-496-1168; E-mail: angela.ccchen@asu.edu

Cancer Prev Res 2022;15:465–72

doi: 10.1158/1940-6207.CAPR-21-0618

©2022 American Association for Cancer Research

paucity of rigorous research on engaging these mothers in the process of developing culturally and linguistically congruent interventions.

Health disparities in the VA population can be mitigated by using culturally grounded narratives incorporating culture-specific beliefs and practices to promote HPV vaccination intentions (9). Storytelling is a specific form of cultural narrative developed with community engagement; it has increasingly shown promise as an effective culture-centric health promotion strategy (10–20). Digital storytelling (DST), an innovative community-based participatory research (CBPR) method, involves individuals' own brief first-person audiovisual narratives/stories that synthesize digital images, audio recordings, music, and text to document personal experiences. The process is person centered, with the participant retaining control over their story (11, 12). DST combines oral storytelling with computer technology and has been used as a tool to produce and communicate culturally relevant messages in health, education, and community settings (11, 21). Recent studies have explored storytelling interventions and their potential for promoting HPV vaccinations. For example, Lee and colleagues (20) developed a narrative intervention using CBPR principles to promote HPV vaccination among 19 dyads of Khmer mothers and daughters ages 14–17. Their findings suggested a high acceptability of the intervention, and the intervention group showed higher vaccination intent than the control group at 1-month follow-up. Kim and colleagues (13) conducted a pilot randomized controlled trial (RCT) to examine feasibility, acceptability, and preliminary efficacy of an online DST intervention to promote HPV vaccination in 104 Korean American female college students ages 18–26. Participants in the intervention group demonstrated better knowledge and higher vaccination intent than the control group at the 2-month follow-up. However, limited research has engaged VA mothers in the process of developing culturally and linguistically congruent storytelling interventions.

Larkey and colleagues (16) proposed a model in which certain characteristics of stories (e.g., perception of similar, likeable characters, resonance of culture, and community) are essential for identification (with characters, story, and cultural elements) and transportation (emotional engagement, getting “carried away” by the story). These two factors, in turn, are expected to change viewers' attitudes, beliefs, intentions, and behaviors. Emotional engagement, in particular, has been empirically shown to influence behavioral change on colorectal cancer screening in low-income patients (19). We cocreated linguistically and culturally resonant/embedded stories with VA mothers of vaccinated children to generate the experience of identification and transportation that changed HPV-related attitudes and beliefs, and vaccination intent among VA mothers whose child were not yet vaccinated. In the intervention, the VA mothers' characteristics (how they looked, their voices and language spoken, their family photos with children) that are similar to other VA moms created identification. Viewing stories of VA moms going through their personal

experiences about being a mother who vaccinated her children to prevent cancers helped engage other VA mothers of unvaccinated children.

Given the requirement of parental consent (22) and the importance of engaging parents, especially mothers, in health-related decision-making in the Asian culture (6), mothers' attitudes and intentions to vaccinate their children are keys for promoting HPV vaccination. Thus, this study aimed to codevelop a DST intervention with VA mothers of vaccinated children and examine the effects of the intervention on intention to have their children vaccinated among other VA mothers with unvaccinated children ages 11–14.

Materials and Methods

Design, sample, and recruitment

There were two phases in this study. In phase I, we codeveloped digital stories about HPV and HPV vaccination with two VA mothers whose children have received HPV vaccination. The two VA mothers were invited to spend 2 consecutive days (8 hours each day) for an online DST workshop with our team in developing their personal stories into materials for use in our DST intervention. Women were recruited if they (i) self-identified as VA or Vietnamese immigrant, (ii) were 18 years old or older, (iii) spoke English or Vietnamese, (iv) had one or more children ages 11–14 years old who had been vaccinated for HPV.

In phase II, we used a quasiexperimental single-group pretest-posttest design to examine the impact of the DST intervention on VA mothers' attitudes toward HPV vaccination and their intentions to have their child vaccinated. Women were recruited if they (i) self-identified as VA or Vietnamese immigrant, (ii) were 18 years old or older, and (iii) had one or more children ages 11–14 years old who had not been vaccinated for HPV. English fluency was not required, given the bilingual (English/Vietnamese) features of the intervention (digital stories) and multicultural and multilingual resources of our team. If an eligible mother had more than one child ages 11–14 years old who had not received the HPV vaccination, we asked her to answer questions based on the oldest child. The sample included 114 VA mothers who met the inclusion criteria.

We partnered with Asian Pacific Community in Action and bilingual (English/Vietnamese) research assistants to recruit our target sample for both phases via strategies proven to be effective in prior research, including word of mouth, Vietnamese community organizations, media (Facebook, radio broadcast, newspaper), and flyers posted in local Asian supermarkets and nail salons in the Phoenix Metropolitan areas between March 2020 and October 2021. We obtained written informed consent from the participants online. The study was conducted in accordance with Federal Regulations 45CFR46 US Common Rule and University Policy, and was approved by the Institutional Review Boards (IRB# STUDY00011207).

Setting and procedures

Because of the safety concerns amid the pandemic, we conducted the virtual DST workshop via Zoom and implemented the intervention and data collection online via REDCap (23).

DST workshop (phase I)

DST comprises three components: (i) an individual process, (ii) a group process, and (iii) a process mediated by participants, researchers, and facilitators (24). Two team members with experience conducting DST workshop and one media producer facilitated the 2-day DST workshop. Two VA mothers with vaccinated children consented for participating in this workshop to codevelop the stories received study information prior to the workshop. We created prompts and questions based on our prior work (e.g., What led you to have your child vaccinated? What downsides did you consider and overcome?) to help participants think through and write down their thoughts and feelings, and remember their own process and experiences. Specifically, they were told to think about the stories based on their experience of going through the process of discovering HPV-related information, their decision-making processes (including challenges), and their engagement with children and the health care system to complete vaccination. Next, we facilitated a virtual story circle using the initial scripts generated in the “story idea generation” activity. Participants were encouraged to share their story with the group and receive feedback from other participants and facilitators to elicit the most powerful story and finalize their stories at the end of the first day of the workshop. All activities were digitally recorded and transcribed.

On the second day of the workshop, we collaborated with workshop participants to choose meaningful photos/images from participants, identify story content within photos and use software to create storyboards that combine the stories, photos/images, and copyright free background sound for their stories. The media producer assisted participants recorded participants’ voiceovers and added a title, credits, textual graphics, and background music they selected to finalize their stories. Our team provided coaching, technical support, and assistance during the entire process to maximize their learning about digital editing, reduce their frustration, and ensure the stories are their personal and authentic expressions. The participants signed a story release form to permit the sharing of their stories in public settings. Each participant also received \$150 USD for their invaluable time and effort.

Intervention content

The DST intervention consisted of two stories codeveloped by two VA mothers of vaccinated boys and girls. Because both mothers were immigrants, they briefly described their immigration history (e.g., when and why came to the United States), perception and source of learning about HPV and the vaccine (e.g., recommended by health care provider), their own experience of getting HPV vaccine, and reasons to vaccinate their

children. Although not required, both VA mothers used their family photos consisting of their boys and girls and other images/photos and music in their stories. In the stories, one VA mother described her family cancer history and the other mother described her initial worries about the misinformation she saw in social media. They sought information from reliable resources including health care providers, school nurse, and their family members who had medical background to learn about HPV and the vaccine before they made the decision. One mother stated “I am absolutely sure that I have made a right decision (to vaccinate my children);” the other mother ended her story with “If there is anything we (parents) could do to prevent our children from getting diseases, we should do it!”

Intervention and survey data collection (phase II)

The DST intervention consisted of two stories, each about 3 minutes long. Each eligible and consented participant was invited to complete a preintervention (T0) questionnaire, view the digital stories, and then immediately complete another online postintervention (T1) questionnaire. The intervention and questionnaires were built and administered using REDCap (23), a secure online data collection and management platform. Participants were able to access and complete these activities by following a single online link, making participation feasible despite their busy schedules. To compensate them for their time and effort, each participant was given a \$40 USD e-gift card for answering preintervention and postintervention questionnaires.

Measures

Study materials had previously been translated into Vietnamese using a modified committee translation method (25). Majority of survey items were tested in our prior work (9, 26). The T0 assessment included items measuring sociodemographic characteristics and questions related to health and HPV. Numbers of questions for each participant varied on the basis of her responses (for instance, participants born in the United States would skip immigration-related questions). We measured the same variables at the T1 assessment except the sociodemographic characteristics. A narrative quality assessment scale (27) was also assessed in T1 to understand participants’ perceptions of the stories included in the intervention.

Sociodemographic characteristics and health-related questions

Questions were used to assess mother’s age, birthplace, immigration- and language-related questions, education, employment, whether child receives free or reduced-price lunch in school, health insurance, cancer history (self and family), and source of information about HPV and vaccine.

Attitudes

Six Likert items (If nothing is physically wrong, then my child does not need the vaccines; It’s shameful to have my child vaccinated because people may think they’re already sexually

active in this young age; It is not important to have the HPV vaccination for my child because everyone will eventually die of something anyway; Girls won't have kids if they are vaccinated; It is not necessary to have the HPV vaccination for my child because it is in God's hands; It is our obligations to protect girls, so only girls should be vaccinated) were used to assess mothers' attitudes toward HPV vaccination. Participants rate each item on a scale from 1 (strongly disagree) to 5 (strongly agree). The composite score, computed as a mean of the item scores, has a potential range of 1 to 5, with a lower score indicating more positive attitudes toward HPV vaccination. These questions have been tested in our prior work (9). Reliability in this sample was good (Cronbach alpha = 0.78 and 0.81 at T0 and T1, respectively).

Intent to vaccinate children against HPV

One binary (yes/no) question was used to assess mothers' intention to vaccinate their children.

Narrative quality

The narrative quality assessment scale used to assess mothers' perceptions of the digital stories comprises two 6-item subscales: identification with story and engagement/transportation. Item response options range from 1 (disagree a lot) to 5 (agree a lot); a higher score in subscales indicates stronger identification (with characters, story, and cultural elements), and higher level of transportation (emotional engagement). Psychometric properties of the scale were reported in our previous work (27). In the current sample, Cronbach alpha was 0.94 for identification and 0.95 for engagement/transportation.

Statistical analysis

Quantitative data were managed and analyzed using SPSS 27.0 (28). We conducted univariate (e.g., means, frequencies) and correlation analyses to describe distributions of, and association among, key variables. Paired-sample *t* tests were used to examine changes in attitudes from preintervention to postintervention. To examine changes in intention to vaccinate, we used McNemar test for binary repeated measurements. We also explored potential differences by the target child's sex (boy vs. girl) in preintervention and postintervention attitudes (via *t* tests) and intentions to vaccinate (via χ^2 tests) as well as in change in attitudes and intentions (via Time \times Sex interaction terms in generalized linear mixed models). At α of 0.05, $N = 114$ affords 0.80 power to detect small to moderate standardized within-person differences (Cohen $d \geq 0.27$) for continuous measures and moderate effects (OR ≥ 2.55 ; Cohen $g \geq 0.22$) on the binary intention outcome.

Data availability statement

The data generated in this study are not publicly available due to the information that could compromise consent but are available upon reasonable request from the corresponding author.

Results

Sample characteristics

DST workshop (phase I)

The two VA mothers (mean age = 45.5 years; one with two children and the other with three) were born in Vietnam. They immigrated to the United States at ages 9 and 13. Both mothers speak Vietnamese and English. They both worked full time and had family members diagnosed with cancer. One mother learned about HPV vaccine from her health care provider, while the other heard about HPV vaccines through the media.

Intervention (phase II)

In the community sample of 114 VA mothers (mean age = 41.5 years; SD = 5.4), 34.2% were born outside of the United States, and the mean length of immigration was 26.2 years (SD = 9.1). About 51% of the mothers reported their highest education level as high school or below, 58% were not working, and about half (51%) reported having a child who received free or reduced-price lunch at school. Regarding cancer history, 12% of mothers had been diagnosed with cancer and 37% reported having one or more family members diagnosed with cancer. About 60% of the mothers learned about HPV and vaccine; 31% identified health care provider was one of the learning sources. **Table 1** presents characteristics of the intervention sample.

Attitudes

Examination of change in composite attitude scale scores showed no significant difference from preintervention to postintervention (pretest $M = 2.24$; posttest $M = 2.16$), $t(113) = 1.108$, $P = 0.270$. We followed this analysis by examining change in the composite's constituent items. Among the six attitude items, findings from paired *t* tests indicated significant improvement on two items: "If nothing is physically wrong, then my child does not need the vaccines" (pretest $M = 2.32$; posttest $M = 2.07$), $t(113) = -2.11$, $P = 0.037$, and "It's shameful to have my child vaccinated because people may think they're already sexually active in this young age." (pretest $M = 2.31$; posttest $M = 1.99$), $t(113) = -2.60$, $P = 0.011$. Effect sizes for preintervention to postintervention change in these attitude items were small (Cohen $d_s = 0.23$ and 0.24 , respectively).

One item "It is our obligation to protect girls, so only girls should be vaccinated," however, showed change that was contrary to expectations (pretest $M = 2.39$; posttest $M = 2.75$), $t(113) = 2.49$, $P = 0.014$. Three attitude items "It is not important to have the HPV vaccination for my child because everyone will eventually die of something anyway," "Girls won't have kids if they are vaccinated," "It is not necessary to have the HPV vaccination for my child because it is in God's hands" showed no significant change.

Intent to vaccinate children against HPV

After the intervention, 74% of the VA mothers intended to vaccinate their children against HPV versus 53% prior to the

Table 1. Characteristics of intervention (phase II) sample ($n = 114$).

Variable	<i>M (SD) or n (%)</i>
Mean number of children (<i>SD</i>) ^a	2.3 (0.9)
Mean age of target child (<i>SD</i>) ^{b,c}	12.7 (1.0)
Sex of target child ^b	
Male	51 (44.7)
Female	63 (55.3)
Education level	
Elementary school or below	13 (11.4)
Middle school	27 (23.7)
High school or GED	18 (15.8)
Some vocational or college training	25 (21.9)
Bachelor degree	28 (24.6)
Graduate or professional degree	3 (2.6)
Primary language spoken with child (ren)	
Vietnamese	19 (16.7)
English	93 (81.6)
Both Vietnamese and English	2 (1.8)
Health insurance	
Yes	89 (78.1)
No	25 (21.9)
General health	
Poor	1 (0.9)
Fair	14 (12.3)
Good	42 (36.8)
Very good	44 (38.6)
Excellent	13 (11.4)

^aRange = 1–6 children, Median = 2 children.

^bTarget child was defined as the oldest unvaccinated child ages 11–14 in the family.

^cRange = 11–14 years old.

intervention. The difference was large (OR = 9.12; Cohen $g = 0.40$) and statistically significant, $\chi^2(1, N = 114) = 17.63, P < 0.001$; exact test $P < 0.001$.

Narrative quality assessment

The mean score for identification was 3.9 (SD = 1.0; range, 1–5), and the mean score for engagement/transportation was 4.1 (SD = 1.0; range, 1–5). The two items with highest scores in this scale were “The stories touched my heart” and “I was captivated by the stories.” Furthermore, about 87% of participants ($n = 99$) reported they would recommend the digital stories to their relatives, friends, or colleagues to learn more about HPV and vaccine. **Table 2** presents the descriptive statistics of these key measures and the score changes before and after the intervention.

Comparison of key measures by the target child’s sex

We explored whether VA mother’s attitudes (pretest, posttest, and pretests to posttest change), vaccination intention (pretest, posttest, and pretest to posttest change), and narrative quality score (posttest only) differed by the target child’s sex. None of these comparisons showed significant differences except for the change in one attitude item “If nothing is physically wrong, then my child does not need the vaccines.” Mothers of boys showed a significant improvement ($M = 2.58$ and $M = 1.99$ at T0 and T1, respectively, $P = 0.002$) while

mothers of girls did not ($M = 2.11$ and $M = 2.14$ at T0 and T1, respectively, $P = 0.852$).

Discussion

To our knowledge, this is the one of very few DST interventions designed for VA mothers to increase HPV vaccination rates among their adolescent boys and girls. With this study we sought to address a highly significant public health problem, HPV-related cancers among a vulnerable and underserved VA population. During a 2-day online workshop, we codeveloped a DST intervention consisting of two personal digital stories about HPV and HPV vaccination with VA mothers who had vaccinated children. Then, we examined the preliminary effects of the DST intervention on vaccination attitudes and intention among a community sample of 114 VA mothers of unvaccinated children.

The increase in mothers’ intention to vaccinate their children provided preliminary support for the effectiveness of using digital stories as an intervention to promote HPV vaccination in the VA population including financially disadvantaged families (51% indicated their children receiving free or reduced-price lunch at school). The success of the intervention may be explained by the unique characteristics of the intervention, which was codeveloped with VA mothers who shared similar cultural norms and values with our target population. Similar to Larkey and colleagues (18), VA mothers reported that the digital stories were highly engaging and held their attention. Importantly, nearly 9 in 10 stated that they would recommend this DST intervention to their relatives, friends, or colleagues.

The findings suggest that the DST intervention changed VA mothers’ attitudes toward HPV vaccination in relation to absence of child’s physical symptoms (i.e., if nothing is physically wrong, then my child does not need the vaccines) and sexual engagement (i.e., it is shameful to have my child vaccinated because people may think they are already sexually active in this young age). The changes of three other attitude items (i.e., it is not important to have the HPV vaccination for my child because everyone will eventually die of something anyway, girls won’t have kids if they are vaccinated, It is not necessary to have the HPV vaccination for my child because it is in God’s hands) were in the hypothesized direction although the differences did not reach statistical significance. It is possible that mothers already disagreed with these statements before the intervention and remained the same afterward.

Interestingly, mothers expressed slightly more positive attitudes toward the need to vaccinate girls after the intervention. This result could possibly be related to the fact that many of photos shown in the stories were female figures. A health care provider’s recommendation is one of the most potent factors for promoting HPV vaccination (26, 29); however, only 31% of our sample learned about HPV vaccines from providers. This finding suggests the need for health care providers to make special efforts with VA mothers to advocate and make recommendations for HPV vaccination in their practices, in addition

Table 2. Descriptive statistics and comparisons of pretest-posttest differences on key measures ($n = 114$).

Variable	Pretest	Posttest	P value for pre-post change
	M (SD) or n (%)	M (SD) n (%)	
Attitude item ^a			
It is not important to have the HPV vaccination for my child because everyone will eventually die of something anyway	1.90 (1.1)	1.88 (1.2)	0.812 ^b
It is not necessary to have the HPV vaccination for my child because it is in God's hands anyway	2.29 (1.3)	2.18 (1.2)	0.354 ^b
If nothing is physically wrong, then my child does not need the vaccines	2.32 (1.4)	2.07 (1.2)	0.037 ^b
It is our obligations to protect girls, so only girls should be vaccinated	2.39 (1.4)	2.75 (1.4)	0.014 ^b
Girls won't have kids if they are vaccinated.	2.25 (1.2)	2.05 (1.1)	0.066 ^b
It's shameful to have my child vaccinated because people may think they are already sexually active in this young age	2.31 (1.4)	1.99 (1.1)	0.011 ^b
Attitude composite score ^a	13.46 (5.5)	12.93 (4.9)	0.270 ^b
Narrative quality assessment ^{a,c}			
Story identification subscale	—	3.87 (1.0)	—
Story engagement/transportation subscale	—	4.06 (1.0)	—
Vaccination intention n and (%) Yes responses	60 (52.6)	84 (73.7)	<0.001 ^d

^aScale range, 1–5.

^bPaired samples t test ($df = 113$).

^cNarrative quality assessment used to measure identification and engagement with narrative stories administered only at posttest.

^dMcNemar test for paired proportions, $n = 114$ pairs.

to culturally based messaging through methods like our DST intervention.

Although prior research (13, 20) using DST interventions to promote HPV vaccination yielded encouraging results, they targeted highly acculturated Korean American female college students and Khmer mother-daughter dyads. The promising findings from our study suggest that the unique barriers of language and culture for VA population may be mitigated by a DST intervention that describes scenarios using voices from their community in an easily delivered and highly accessible digital video format.

Although this study provides preliminary support for the effect of a DST intervention on vaccination intention, it has several limitations. Without a control group, we could not examine how the observed change in reported vaccination intent might have differed from change observed in a no-intervention (e.g., usual care) group. Also, because we are still collecting long-term follow-up data regarding vaccine uptake, the effect of the intervention on the HPV vaccine uptake is not included. Because of their work schedules, the mothers who codeveloped the intervention with us preferred to participate in 8-hour workshops conducted on 2 consecutive weekend days, but we recognize that this arrangement could be challenging for others. Finally, the findings reported here may not generalize beyond VA mothers. These limitations suggest directions and important design features for future studies that are larger in scope and purpose.

Implications and Conclusion

Despite the limitations, our results add a meaningful practical and research contribution to a highly significant public health problem, HPV-related cancers among a vulnerable and

underserved VA population. The Healthy People 2030 target of 80% HPV vaccination rate (2–3 doses) for all youth by age 15 (7) is far from being met, especially among VA children. The suboptimal HPV vaccination rates have become even worse during the COVID-19 pandemic (30) possibly due to increased concerns about vaccination that has spill-over effects to HPV vaccination (31). The VA population is the fourth largest and fast-growing Asian population in the United States and has increased 87% during the last decade in the State of Arizona (32). Our culturally and linguistic congruent DST intervention shows high potential to reach this population with a higher risk and demonstrates promising results to increase VA mothers' intention to vaccinate their children against HPV-related cancers. A technology-based online DST intervention like ours is easy to deliver, feasible, flexible, and low cost. Collaborating with community partners, we successfully recruited, screened, consented, and implemented the intervention and collected data at different timepoints through online platforms, suggesting the promise of delivering such intervention in a flexible and affordable approach. The intervention can be sustained through community partners due to its low cost to main and deliver. Additional studies using fully powered RCT designs that include vaccine uptake as an outcome measure are needed to examine the efficacy and effectiveness of the intervention.

Authors' Disclosures

No disclosures were disclosed.

Authors' Contributions

A.C.-C. Chen: Conceptualization, resources, data curation, formal analysis, supervision, funding acquisition, validation, investigation,

visualization, methodology, writing—original draft, project administration, writing—review and editing. **W.S. Kim:** Conceptualization, resources, validation, investigation, methodology, writing—original draft, writing—review and editing. **M. Todd:** Conceptualization, formal analysis, validation, visualization, methodology, writing—original draft, writing—review and editing. **L. Larkey:** Conceptualization, validation, methodology, writing—original draft, writing—review and editing.

Acknowledgments

We wish to acknowledge study participants and community partner Asian Pacific Community in Action for their invaluable contributions. All

authors would also like to thank Oncology Nursing Foundation for funding this research (AWD34993).

The costs of publication of this article were defrayed in part by the payment of page charges. This article must therefore be hereby marked *advertisement* in accordance with 18 U.S.C. Section 1734 solely to indicate this fact.

Received December 10, 2021; revised February 4, 2022; accepted March 16, 2022; published first March 21, 2022.

References

- Centers for Disease Control and Prevention. Human papillomavirus (HPV). Atlanta, GA: Centers for Disease Control and Prevention. Available from: <https://www.cdc.gov/hpv/parents/about-hpv.html>.
- Priyadarshini M, Prabhu VS, Snedecor SJ, Corman S, Kuter BJ, Nwankwo C, et al. Economic value of lost productivity attributable to human papillomavirus cancer mortality in the United States. *Front Public Health* 2021;8:624092.
- Centers for Disease Control and Prevention. CDC recommends only two HPV shots for younger adolescents. Atlanta, GA: Centers for Disease Control and Prevention. Available from: <https://www.cdc.gov/media/releases/2016/p1020-hpv-shots.html>.
- Bates JH, Hofer BM, Parikh-Patel A. Cervical cancer incidence, mortality, and survival among Asian subgroups in California, 1990–2004. *Cancer* 2008;113:2955–63.
- Wang S, Carreon JD, Gomez SL, Devesa SS. Cervical cancer incidence among 6 Asian ethnic groups in the United States, 1996 through 2004. *Cancer* 2010;116:949–56.
- Yi J, Anderson K, Le Y-C, Escobar-Chaves SL, Reyes-Gibby CC. English proficiency, knowledge, and receipt of HPV vaccine in Vietnamese-American women. *J Community Health* 2013;38:805–11.
- Office of Disease Prevention and Health Promotion. U.S. Department of Health and Human Services. Increase the proportion of adolescents who get recommended doses of the HPV vaccine — IID 08. Rockville, MD: U.S. Department of Health and Human Services; D.C.: Office of Disease Prevention and Health Promotion. Available from: <https://health.gov/healthypeople/objectives-and-data/browse-objectives/vaccination/increase-proportion-adolescents-who-get-recommended-doses-hpv-vaccine-iiid-08>.
- Yi J, Lackey S, Zahn M, Castaneda J, Hwang J. Human papillomavirus knowledge and awareness among Vietnamese mothers. *J Community Health* 2013;38:1003–9.
- Chen ACC, Kim WS, Larkey L. Developing and pilot testing a digital storytelling intervention to promote HPV vaccination among Vietnamese American adolescents. *J Nurs Healthc* 2019;4.
- Cumming GP, Currie HD, Moncur R, Lee AJ. Web-based survey on the effect of digital storytelling on empowering women to seek help for urogenital atrophy. *Menopause Int* 2010;16:51–5.
- Gubrium A. Digital storytelling: an emergent method for health promotion research and practice. *Health Promot Pract* 2009;10:186–91.
- Gubrium AC, Fiddian-Green A, Lowe S, DiFulvio G, Del Toro-Mejias L. Measuring down: evaluating digital storytelling as a process for narrative health promotion. *Qual Health Res* 2016;26:1787–801.
- Kim M, Lee H, Kiang P, Aronowitz T, Sheldon LK, Shi L, et al. A storytelling intervention in a mobile, web-based platform: a pilot randomized controlled trial to evaluate the preliminary effectiveness to promote human papillomavirus vaccination in Korean American college women. *Health Educ Behav* 2020;47:258–63.
- Larkey LK, Del Toro-Mejias L, DiFulvio G, Gubrium A. Narrative influences on "Desire to act in my community" in digital storytelling workshops for Latina teens. *Int Q Community Health Educ* 2018;38:163–7.
- Larkey LK, Gonzalez J. Storytelling for promoting colorectal cancer prevention and early detection among Latinos. *Patient Educ Couns* 2007;67:272–8.
- Larkey LK, Hecht M. A model of effects of narrative as culture-centric health promotion. *J Health Commun* 2010;15:114–35.
- Larkey LK, Hill A. Using narratives to promote health: a culture-centric approach. In: Cho H, editor. *Health communication message design: theory and practice*. Thousand Oaks, CA: Sage; 2011. p. 95–112.
- Larkey LK, Lopez AM, Minnal A, Gonzalez J. Storytelling for promoting colorectal cancer screening among underserved Latina women: a randomized pilot study. *Cancer Control* 2009;16:79–87.
- Larkey LK, McClain D, Roe D, Hector R, Lopez A, Sillanpaa B, et al. Randomized controlled trial of storytelling compared to a personal risk tool intervention on colorectal cancer screening in low-income patients. *Am J Health Promot* 2015;30:e59–70.
- Lee H, Kim M, Cooley ME, Kiang PN, Kim D, Tang S, et al. Using narrative intervention for HPV vaccine behavior change among Khmer mothers and daughters: a pilot RCT to examine feasibility, acceptability, and preliminary effectiveness. *Appl Nurs Res* 2018;40:51–60.
- Cueva M, Kuhnley L, Revels L, Cueva K, Dignan M, Lanier P. Bridging storytelling traditions with digital technology. *Int J Circumpolar Health* 2013;72.
- Brandenberger M, Wesoloskie T. Mandatory HPV vaccination: an Arizona policy choice. *Perspect Public Aff* 2008;7–21.
- Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009;42:377–81.
- Lambert J. *Digital storytelling: capturing lives, creating community*. Berkeley: Digital Diner; 2002.
- Agency for Healthcare Research and Quality. Guidelines for translating CAHPS® surveys. Rockville, MD: Agency for Healthcare Research and Quality. Available from: https://www.ahrq.gov/cahps/surveys-guidance/helpful-resources/resources/cahpsGuidelines_Translation.html.
- Chen ACC, Todd M, Amresh A, Castro F. Tailored intervention for parents to promote their adolescents' vaccination against HPV. *GSTF J Nurs Health Care* 2019;4:1–8.

27. Kim WS, Shin CN, Larkey L, Roe D. Development and validation of a measure to evaluate critical components of storytelling interventions: the Narrative Quality Assessment Tool. *J Nurs Meas* 2017;25:171–83.
28. IBM SPSS Statistics for Windows. Computer Software. Version 27.0 [software]. Available from: <https://www.ibm.com/support/pages/downloading-ibm-spss-statistics-27>.
29. Dempsey AF, O’Leary ST. Human papillomavirus vaccination: narrative review of studies on how providers’ vaccine communication affects attitudes and uptake. *Acad Pediatr* 2018;18:S23–7.
30. The Blue Cross Blue Shield Association. HPV vaccination rates low despite risks or related cancers. Chicago, IL: The Blue Cross Blue Shield Association; c2022. Available from: <https://www.bcbs.com/the-health-of-america/infographics/hpv-vaccination-rates-low-despite-risks-of-related-cancers>.
31. Gilkey MB, Bednarczyk RA, Gerend MA, Kornides ML, Perkins RB, Saslow D, et al. Getting human papillomavirus vaccination back on track: protecting our national investment in human papillomavirus vaccination in the COVID-19 era. *J Adolesc Health* 2020;67:633–4.
32. United States Census Bureau [dataset on the Internet]. 2014–2018 American Community Survey (ACS) 5-year Public Use Microdata Sample (PUMS). Suitland, MD: United States Census Bureau; 2018. Available from: <https://data.census.gov/mdat/#/search?ds=ACSPUMS5Y2018>.