Published in final edited form as:

J Consum Health Internet. 2014 January 1; 18(3): 226–237. doi:10.1080/15398285.2014.931771.

Beta-test Results for an HPV Information Web site:

GoHealthyGirls.org – Increasing HPV Vaccine Uptake in the United States

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Abstract

A web site, *GoHealthyGirls*, was developed to educate and inform parents and their adolescent daughters about human papillomavirus (HPV) and HPV vaccines. This article provides an overview of web site development and content followed by the results of a beta-test of the web site. 63 New Mexican parents of adolescent girls tested the site. Results indicated that *GoHealthyGirls* was a functioning and appealing web site. During this brief educational intervention, findings suggest that the web site has the potential to increase HPV vaccine uptake.

This research supports the Internet as a valuable channel to disseminate health education and information to diverse populations.

Keywords

HPV; Internet; Vaccines; Adolescents

Introduction

According to the Centers for Disease Control and Prevention (Center for Disease Control and Prevention 2013a), human papillomavirus (HPV) is the most common sexually transmitted infection (STI) in the United States (U.S.), with almost eighty million existing cases of HPV in the U.S. and over 14 million new cases of HPV in the U.S. annually. Furthermore, approximately half of sexually active adults in the U.S. will contract HPV at some point in their lives (Center for Disease Control and Prevention 2013a). There are more than 100 types of HPV and over 40 of them infect the human anogenital tract. Persistent HPV infections with several of these HPV types have been recognized as causative factors in the development of cervical cancer and genital warts (Center for Disease Control and Prevention 2010; Weinstock, Berman, and Cates 2004; Grabel et al. 2013).

Currently, two vaccines have been approved by the Food and Drug Administration (FDA) that are designed to prevent various anogenital cancers and genital warts caused by HPV (Center for Disease Control and Prevention 2010). Gardasil, a quadravalent vaccine, is approved by the FDA for use in males and females between the ages of 9–26 years (U.S. Food and Drug Administration 2013b). Cervarix, a bivalent vaccine, is approved for females between the ages of 10–25 years (U.S. Food and Drug Administration 2013a). HPV vaccination (3 injections over 6 months) is recommended for 11–12 year olds (Center for Disease Control and Prevention 2013c). Both vaccines have been shown to be effective (Garland et al. 2007; Paavonen et al. 2007; FUTURE II Study Group 2007); however, the vaccines do not treat those with pre-existing genital HPV infections (Hildesheim et al. 2007), which is why the vaccines are recommended for younger adolescents who most likely have not been exposed to genital HPV.

Although Healthy People 2020 set an objective of having 80% of adolescents receive all 3 recommended doses of an HPV vaccine, (U.S. Department of Health and Human Services and Office of Disease Prevention and Health Promotion) recent data from the National Immunization Survey of Teens (Center for Disease Control and Prevention 2013b) reveals that in 2012, only 33.4% of 13–17 year old girls in the U.S. completed the 3-dose series (compared to 34.8% in 2011). A reason that adolescent females are not receiving the recommended HPV vaccine may be the attitudes and beliefs of parents regarding vaccines (Rand, Humiston, et al. 2011; Rand, Schaffer, et al. 2011; Dempsey et al. 2009; Bernat et al. 2009).

A recent study by Darden et al. (2013) found that parents of adolescent girls reported an increase in clinician recommendations for HPV vaccines (from 47% to 52% between 2008–2010) (Darden et al. 2013). Despite this increase in clinician recommendations, research has

confirmed many reasons that still contribute to parental decisions against HPV vaccination (Darden et al. 2013; Jacobson, Roberts, and Darden 2013; Trim et al. 2012; Gerend, Weibley, and Bland 2009). Parents are concerned about the safety of the vaccine, believe the vaccine is not necessary (Darden et al. 2013; Grabel et al. 2013; Jacobson, Roberts, and Darden 2013), or their 11–12 year old adolescent girl is too young or not yet sexually active (Darden et al. 2013; Jacobson, Roberts, and Darden 2013), and are worried that the vaccine may encourage promiscuity and early sexual behavior among adolescents (Luedtke 2008). Parents are also under-or mis-informed about HPV and HPV vaccines. Grabel et al. (2013) found that parents showed a lack of knowledge regarding the specifics of HPV and associated vaccines; e.g., only 31% of study respondents knew that HPV vaccines have not caused thousands of deaths or only 34% being aware that HPV causes genital warts (Grabel et al. 2013). Trim et al. (2012) found that parents have reported being aware of HPV, including the HPV infection and cervical cancer link, but that awareness waned over time as did intentions to vaccinate, partially due to parents wanting further information on HPV and HPV vaccines (Trim et al. 2012). In contrast, a study by Lai et al. (2013) found that general knowledge about HPV among parents of adolescent girls was high but was not associated with a willingness to vaccinate their daughters against HPV (Lai, Tinker, and Cheung 2013).

Although parents of adolescent girls may appear to have some knowledge of HPV and HPV vaccines, their knowledge about specifics of both HPV and HPV vaccines may be insufficient in helping them make an informed decision to vaccinate their child. As such, there is an opportunity and need for additional information on these topics to be provided to parents of adolescent girls. The objective of this study was to develop and pilot-test an HPV information web site designed for parents and their 11–13 year old daughters to help them make an informed decision regarding being vaccinated against HPV infections.

Methods

Web site Creation

The project web site, titled *GoHealthyGirls*, had its content and structure developed over a two-year period by an interdisciplinary research team including expertise in health communications, psychology, HPV and HPV vaccines, pediatrics, and public health and internet-based interventions, using iterative focus groups with parents and adolescent girls, one-on-one interviews with a variety of stakeholders (Nodulman et al. under review), and input from external expert reviewers. The web site employed theoretical concepts in diffusion of innovations (Rogers 2003) and reasoned action (Montano and Kasprzyk 2008) theories in conjunction with feedback from users to further inform its design. After the development process, the beta version of the web site was tested for usability with mothers and daughters. Adjustments to the web site design were made based on the feedback obtained during that process.

Web site Overview

GoHealthyGirls is an interactive, multicomponent, multimedia web site with open non-linear navigation. The web site contains four main modules. The first module, *Get Answers!*, addresses parents' questions about HPV and vaccines, discusses risks and side effects of the

vaccine, explains the risks of HPV, and reviews the benefits of HPV vaccination and organizations that recommend HPV vaccination. Users browse this module by choosing section headings and then clicking on graphic tabs that display related visual and textual information on each subtopic. The second module, *Let's Talk!*, focuses on the communication process around vaccination. There are three features within this module, the first being a video simulation on how to talk with your daughter about HPV vaccination, the second, guidelines for how to talk to other family members about HPV vaccination, and the third, advice on how to talk with your physician about HPV vaccination.

The third module, *Info for Teens*, is specifically for adolescent users and includes an interactive game show style HPV Challenge Quiz, a "It was no big deal" texting simulation, and a teen Frequently Asked Questions (FAQ) section. Finally, the fourth module, *Preteen Vaccine*, contains a checklist for adolescent vaccines, a "We're Ready" section that locates clinics offering the HPV vaccine within the user's zip code, and an email vaccination reminder system that can issue email reminders to the user when the second and third HPV vaccine shots are due. In addition, the *GoHealthyGirls* homepage contains a video introduction by the Chair of the Pediatrics Department at the University of New Mexico Health Sciences Center, and a general FAQ section that can be accessed from any page in the web site.

Participants and Procedures

A convenience sample of 63 parents and their daughters were recruited from the Central and Northern New Mexico area to participate in the beta-test of *GoHealthyGirls*. Participants were recruited through community contacts at schools and school based health centers in Central and Northern New Mexico communities. Participants who provided consent online engaged in beta-test activities once login instructions were provided. Two rounds of beta-testing were conducted. In Round 1, 35 participants engaged in beta-test activities, including pretest and posttest, on their personal home computers. In Round 2, 28 participants in rural areas were invited to reserved hotel conference rooms where several project computers were set to go online for simultaneous project beta-testing. Those that participated on home computers received email reminders about the project posttest. About half of these participants received follow-up phone calls in addition to the email reminders when they did not complete the posttest within a reasonable time. Participants in the reserved hotel conference rooms were asked to complete the pretest, beta-test, and posttest in one sitting at the conference room. Data was only collected from adult participants.

Upon consent to participate, adult participants were given the URL to the assessment portion of the *GoHealthyGirls* web site. Each participant was provided a unique six digit code to enter the assessment site (each one of these codes had been pre-programmed into the database of the project web site so when a user entered that code it would grant them access). Once a participant entered the code, they were asked to complete an online baseline assessment. (Only adults were asked to complete the baseline.) Upon completion of the baseline assessment, which took approximately 20 minutes, participants used the *GoHealthyGirls* project web site. Participants were asked to browse it thoroughly, and to have their daughters browse the sections of the web site designed for adolescents. As parents

typically make health related decisions for their adolescents (Fost 1986), data and feedback from adolescents was not collected and it is unknown if participants and their daughters had conversations about the web site. Twenty four to 48 hours after browsing *GoHealthyGirls*, adult participants using their home computers took an immediate posttest that included measures assessed at pretest. The design was a single-group pretest, posttest design.

Measures and Data Analysis

Participant assessments were administered online via Inquisite software. The assessments included measures that were largely adapted from previous work conducted by Zimet (Zimet 2005). A Cronbach's Alpha was conducted on each of the measures to establish internal consistency. Participant attitudes towards vaccination in general consisted of 6 items ($\alpha = .68$), attitudes about HPV vaccines consisted of 8 items ($\alpha = .89$), perceptions of risk due to HPV and not being vaccinated consisted of 6 items ($\alpha = .73$), perception of negative consequences associated with HPV vaccination consisted of 10 items ($\alpha = .78$), positive consequences associated with HPV vaccination consisted of 5 items ($\alpha = .91$), self-efficacy to make informed decisions about HPV vaccination consisted of 16 items ($\alpha = .98$), and HPV knowledge consisted of 12 items ($\alpha = .60$). Demographics of participants were also collected online during the pretest, and feasibility of the *GoHealthyGirls* web site was collected online from participants after completion of the posttest. Measures were analyzed via SPSS Version 19 statistical software. *T* tests for repeated measures were conducted on all seven assessment factors.

Results

Participants

The sample ($n=63$, 82.5% female) had a mean age of 39.17 years, $sd=9.58$, was racially/ethnically diverse (54% Hispanic/Latino, 34.9% non-Hispanic White, 1.6% African American, 4.8% American Indian), and economically diverse using surrogates of SES (60.3% paid full price, 15.9% paid reduced price, 17.5% received free school lunch, and 6.3% did not answer this question). The average age of daughters involved in the beta-test was 12.89 years, $sd = 2.28$. Over 14% of participants indicated that Spanish language was spoken in their home. Educational attainment of the adult participants indicated 30% with a high school degree or equivalent, 19% with an Associates of Arts degree, 30.2% with a Bachelor's degree, 11.1% with a Master's degree, and 1.6% with a professional (M.D., J.D., or D.D.S.) degree. Approximately 9% did not answer this question. In terms of health insurance coverage, 91.4% indicated coverage, with 22% indicating Medicaid coverage. Table 1 provides a brief overview of participant demographics.

Participant Feedback

Participants in the beta-test of *GoHealthyGirls* intervention were asked for their direct feedback on the feasibility of using the web site. Participants, both adult and adolescents, stated that the *GoHealthyGirls* web site was easy to use and stable during use. All participants indicated that they encountered no technical problems during beta-test browsing of the program. Table 2 reflects comments from beta-test participants about their experience with the web site.

Pre-Posttest Results

Pretest to posttest analyses were conducted to detect desired changes in the seven measures related to vaccine adoption. Significant pretest to posttest differences for the measures were found. Attitudes towards vaccination shifted more positively at posttest (t (df=50) = 3.71, $p=.001$), as did attitudes about HPV vaccines (t (df=53) = 2.01, $p=0.049$). Perceptions of risk due to HPV and not being vaccinated was found to be higher at posttest compared to pretest (t (df=50) = 4.18, $p=.0001$). Perception of negative consequences associated with HPV vaccination significantly decreased at posttest as predicted (t (df=48) = 3.21, $p=.002$). Positive consequences associated with HPV vaccination significantly increased at posttest (t (df=54) = 2.41, $p=.019$), as did self-efficacy to make informed decisions about HPV vaccination (t (df=46) = 4.28, $p=.0001$). HPV knowledge increased significantly from pretest to posttest (t (df=60) = 4.09, $p=.0001$). Finally, a Chi-square analysis found a significant number of parents shifting from waiting to get their daughter vaccinated soon to intending to get their daughter vaccinated right now ($\chi^2=64.13$, $p=.0001$). See Figure 1 for a summary of these results.

Discussion

Findings from the beta-test suggest that *GoHealthyGirls* is a usable and potentially effective web-based intervention. Users found *GoHealthyGirls* to be easy to navigate, attractive, and informative. The information presented in the web site had a clear, favorable impact on the seven assessment measures; specifically, 1) attitudes about vaccines, 2) attitudes about HPV vaccines, 3) risk perception, 4) negative consequences of vaccination, 5) positive consequences of vaccination, 6) HPV knowledge, and 7) informed decision making. Thus, the web site has the potential to increase HPV vaccine uptake in an upcoming randomized efficacy trial.

Similar to results of other studies that examined knowledge among adults of HPV and HPV vaccines (Friedman and Sheppard 2007; Tiro et al. 2007), many parents of adolescent daughters in this beta-test had a limited knowledge of HPV and HPV vaccines. Most parents of this age group of children are the primary decision makers for health related matters for their children (Fost 1986); health behaviors are influenced by their health beliefs (Janz and Becker 1984). Hence, the parents' lack of knowledge of HPV and HPV vaccines may be delaying or preventing uptake of HPV vaccines. Notably, few if any studies have examined the potential for web-based interventions to address parent HPV knowledge and decision-making. The current investigation provides promising results indicating that a web-based approach can close parents' knowledge gaps.

Limitations

Although these findings appear positive, they should be interpreted with a few limitations in mind. First, the small number of participants limited the statistical power and the generalizability of the findings. Internal consistency was established with only a small sample, but indicated encouraging ratings. Second, although participants were demographically similar to the state of New Mexico, their reported measures of socioeconomic status may not reflect state averages; e.g., as recently as 2011, 21% of New

Mexicans were uninsured and 22% used Medicaid (Kaiser Family Foundation 2012). Third, although parents indicated in the posttest increased intentions to have their daughter vaccinated against HPV, it is unknown if they actually did. Fourth, the lack of a control group prevented ruling out the possibility that the improvements in parents was a Hawthorne effect. An additional limitation to be considered is that the time to posttest varied among participants between 24–48 hours after completing the program. It is unknown if those lagging in completing the posttest had different attitudes or perceptions regarding HPV vaccines.

Future Research

Future research with this site will include a randomized efficacy trial targeting a large population-based sampling strategy to test the effectiveness of this site in HPV vaccination uptake. In this efficacy trial, New Mexico based parents of 11–13 year old daughters will be randomized to receive one of two interventions, the *GoHealthyGirls* web site or usual and customary information. Usual and customary information will consist of an online Center for Disease Control and Prevention (CDC) pamphlet about HPV and HPV vaccination. Participants will be administered online pretests, posttest, and a follow-up survey after several months. HPV vaccine uptake by adolescent daughters of consenting participants will be evaluated using state-based vaccine administrative data several months following the posttest, and vaccination status will be correlated with parent survey responses. This information will then be analyzed to determine if HPV vaccine uptake was influenced, at least in part, by the *GoHealthyGirls* web site.

Additional suggestions for further research specifically with the *GoHealthyGirls* web site include 1) creating an informed decision making web site about HPV in Spanish language and 2) creating an informed decision making mobile web application on HPV and conducting an efficacy trial. With the recent recommendations for HPV vaccinations of boys, similar research should be conducted on effective strategies to help parents make informed decisions about vaccinating their sons. This may require additional studies on parents' perceptions of and barriers to HPV vaccination of boys for it may be risky to assume that prior research regarding daughters directly translates. Another research suggestion would be comparing the influence of *GoHealthyGirls* on vaccine uptake with the influence of other online consumer health information sources; e.g., WebMD.

In sum, this study presents encouraging results on using the Internet to disseminate health information and education to the general public on HPV vaccination for adolescent girls. HPV infections can lead to serious health problems; therefore, a site such as *GoHealthyGirls* can be a useful tool in empowering parents and adolescents to make an informed decision about vaccination against these infections.

Acknowledgments

The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Allergies and Infectious Diseases Institute or the National Institutes of Health This research is funded by the U.S. National Institutes of Health (U19 AI084081)

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FIGURE 1.
Pretest to posttest means

Table 1

GoHealthyGirls Beta-Test Participant Demographics

Gender	White	Black	Hispanic	Am. Indian	Other	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Male	0 (0)	0 (0)	5 (7.93)	0 (0)	0 (0)	5 (7.9)
Female	20 (31.7)	1 (1.6)	27 (42.86)	3 (4.8)	1 (1.6)	52 (82.5)
Not Reported	2	0	2	0	0	4
Total	22 (34.9)	1 (1.6)	34 (54.0)	3 (4.8)	1 (1.6)	61 (90.3)*

* Not Reported: 2 participants chose not to report gender and race/ethnicity, although they did answer other questionnaire items. The inclusion of these participants brings the total to 63 participants.

Table 2**Navigability and Use Comments**

It was easy to navigate around. Nice graphics.

We liked the jeopardy type quiz game. That's a great way to get information out! I prefer to have more in depth information when making a decision, so the quiz was fun and somewhat educational, but I still want more information.

It was easy to use. I liked the question/answer format.

Simple and easy to understand.

The website is colorful, informative, easy to read and up to date.

I liked that it had a section for both the moms and girls separately.

It's easy to navigate through.

The content and the games.

Mother daughter talking video.

The website has a lot of valuable information for me and my daughters to read about and become more informed about HPV.

Each area was easy to read and understand. In addition, responses got to the point and none were medical jargon that is difficult to understand.

I liked how it was organized and that it was simple (not too cluttered). It was easy to find information.

The information that is available some of which I did not know.

Every thing seemed to be pretty easy to find. I think the information is very useful for young girls. They can get on and learn the facts about HPV. I think the website can also help parents when talking to their children about HPV.

I liked all of the valuable info.

The website was user friendly. My daughter liked the sections for girls.

Simple to answer.