

Research Article

Outcomes of the cervix project: Measuring college undergraduates knowledge, attitudes, and practices towards human papillomavirus infection and vaccination

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Abstract

Objective: Despite safe and effective vaccines against human papillomavirus (HPV) infection, Student Health Services at University of South Carolina estimates < 5% of students have been vaccinated through the Health Center. We wanted to determine if the Cervix Project (handouts and seminars) would increase both student knowledge about HPV and acceptance/acquisition of HPV vaccine.

Materials and methods: Exempt status was obtained from University of South Carolina Institutional Review Board. Authors developed an undergraduate HPV vaccination marketing campaign which included 1) an HPV vaccination handout provided at student health check-in and 2) a standard PowerPoint seminar presented by medical students at sorority meetings. Following the campaign, undergraduates enrolled from August 2012–May 2013 were invited through university email accounts to participate in a prospective anonymous online survey via SurveyMonkey. Data was analyzed with standard statistical analysis using JMP software and GraphPad.

Results: 1397 females, 332 males completed the online surveys. 6% attended a seminar (104 females, 1 male). 10.3% read the handout (156 females, 23 males). Seminar attendees or those who read the handout had increased ability to assign personal HPV risk and increased understanding of male HPV effects ($p < 0.05$). Reading the handout was associated with increased consideration for obtaining HPV vaccination (female 31.3 to 51.7%, $p < 0.05$; male 5.5 to 42.9%, $p < 0.05$). Reading the handout was associated with decreased misinformation of HPV vaccination protection, increased knowledge of HPV transmission, and increased knowledge/use of Student Health STI testing ($p < 0.05$). Neither the handout nor the seminar was associated with increased knowledge of other HPV-related cancers.

Conclusions: Overall, baseline knowledge about HPV infections and vaccinations was poor among undergraduates survey. The handout was superior in increasing overall HPV knowledge, HPV vaccination knowledge, and intent to vaccinate when compared to the seminars. Development of online individual student learning modules may generate the best uptake of health knowledge among undergraduates. Specific ways to target male undergraduates must be explored.

Introduction/Background

Human papillomavirus (HPV) is one of the most prevalent infections and the most common sexually transmitted disease in the United States [1-4]. While many HPV infections are asymptomatic and cleared without causing morbidity or mortality, prolonged infection with high-risk HPV strains can cause precancerous lesions and cancer [1-4]. HPV infection is associated with cervical, vulvar, oropharyngeal, penile, and anal cancer [6]. High Risk HPV is responsible for almost all cases of cervical cancer in women and is detected in two out of three oropharyngeal cancers [6]. High risk types 16, 18 cause about 70% of cervical cancers. Other low HPV serotypes (types 6, 11) cause 90% warts in the genital area or throat [7,8].

There are several vaccines now available against human papillomavirus infection (bivalent Cervarix; Gardasil -quadrivalent at time of study and now the 9-valent variation is available). All vaccines have showed high efficacy in clinical trials among individuals without previous HPV exposure; four years after vaccine introduction, population prevalence of vaccine-type HPV is decreasing [7-10].

Additionally, in several studies it has been shown in that women not previously exposed to HPV are also at decreased risk for development of cervical dysplasia after vaccination. These results do not extend to women with exposure to HPV prior to vaccination [6-10].

HPV vaccination has been available since 2006 for females and for males since 2009 and is currently recommended for girls and boys age 11-12, with catch up vaccination for girls up to age 26 and boys up to age 21 [8-10]. Despite these recommendations and the fact that HPV is a known carcinogen, there has been only a small increase in vaccine uptake among adolescents, while overall coverage remains low compared to other recommended vaccines [9-11]. Only one third

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of teen females received all three recommended doses of the HPV vaccine and only 21% of males received a dose of the HPV vaccine [9-11] compared to 78% coverage of the tetanus, diphtheria, and acellular pertussis vaccine and 70% coverage of the meningococcal vaccine among adolescents in 2011 [9-11].

Multiple barriers to HPV vaccination have been detailed in the literature, including concerns about the vaccine's effect on sexual behavior, low perceived risk of HPV infection, social influences, irregular preventive care, and vaccine cost; while the barriers specifically facing men include lack of knowledge, perception of not being at risk, vaccine cost, safety, side effects, and fear [10-15].

The Centers for Disease Control (CDC) estimates that approximately 50% of all new HPV infections are acquired by youth between the ages of 15 and 24. Therefore, college-aged individuals are at risk for HPV infection, and continue to be candidates for vaccination [10-15].

Current research suggest that social norms, perceiving a risk of human papillomavirus (HPV) infection, and perceiving severe consequences of HPV infection are associated with vaccination [10-17]. Furthermore, it has been shown that brief educational interventions are an effective means to increase understanding and appropriate risk assessment for HPV infection and may be an important avenue to higher vaccination rates [16].

The uptake of the HPV vaccine among University of South Carolina (USC) undergraduates mirrors national and statewide trends. In 2012 only 136 individuals sought HPV vaccination through the Student Health Center with only 18 of them male. From student immunization forms, 860 individuals received the HPV vaccine in 2012 [17]. Though the exact number of vaccinated undergraduates is unclear (as some may not be documented through immunization forms with the University), these estimates represent a disturbingly small proportion of USC's 23,000 undergraduates.

Historically, the American Medical Women's Association at the University of South Carolina, School of Medicine has hosted the annual Cervix Project to raise funds to provide vaccination against HPV free of charge to uninsured or underinsured students presenting at the USC Thomson Student Health Center for vaccination. The Cervix Project had been adapted to expand its reach as an educational campaign at the Student Health Center and within Sorority Chapter meetings to determine what types of programs (seminars verses handouts) would increase both knowledge about HPV as well as acquisition of HPV vaccine in the undergraduate population.

Materials and methods

The Cervix Project was developed to determine which educational interventions modalities would help prevent cervical cancer by promoting vaccination against human papillomavirus (HPV) and appropriate screening among USC undergraduates. IRB exempt status was obtained from the University of South Carolina Institutional Review Board.

The project took place during the month of October 2012 starting with an educational campaign through two components:

1. HPV Vaccination Handout Campaign (October 2 – 31, 2012)

- An HPV vaccination handout provided at student health check-in during the month of October (General Medicine, Women's Care, Allergy & Immunization Departments)

2. Cervical Cancer PowerPoint Seminar (October 14 – 31, 2012)

- USC School of Medicine students were trained in a standardized PowerPoint presentation on cervical cancer prevention through vaccination
- Presentations were completed at a chapter meeting for each USC sorority during the month of October
- Over 1000 undergraduates were targeted through this presentation

Knowledge assessment and data analysis

Following the HPV Vaccination campaign, all undergraduates enrolled from August 2012–May 2013 were invited through university email accounts to participate in a voluntary prospective anonymous online survey via Survey Monkey that assessed knowledge about HPV in general (agent of which diseases, cancer, how transmitted) as well knowledge about HPV vaccination, HPV vaccination history and intention to get vaccinated in the future. The data was stratified by intervention exposure – attending a seminar, reading the educational handout, or participated in neither intervention which provided data about baseline knowledge of the undergraduate students. Results were analyzed with standard statistical analysis with GraphPad and JMP statistical software (Student's T-test and Fisher Exact test).

Results

A total of 1880 online surveys were completed. The respondents that did not attend a seminar or read the handout accounted for 83% of the respondents and served as our baseline or control group. 10.3% of respondents read the handout at student health and 6% attended a HPV information seminar (Table 1). Age of participants did not vary among the study groups (data not shown) and reflected the undergraduate population at the university (Table 2A-B). When stratified by gender, 21.5% of respondents were male and 78.5% were female in our baseline group. Those that attended the seminar on HPV were predominantly female as expected given the seminars were targeted at sorority groups (p=0.0001; Table 2C). Statistically more males read the handout than attended seminar (p=0.0002), but still significantly less than the baseline group (p=0.001).

The race/ethnicity of respondents answering the survey reflected the student population at University of South Carolina. There was no statistical difference in the race/ethnic distribution in those reading the handout as compared to the baseline group, but statistically more

Table 1. Survey.

| | |
|-----------------------------------|-------------|
| Read HPV Handout | 193 (10.3%) |
| Attended Seminar | 113 (6%) |
| Read Handout and Attended Seminar | 14 (0.7%) |
| Neither; Baseline | 1560 (83%) |

Tables 2A. Demographics.

| Age | Percentage (No.) |
|-------------|------------------|
| 18 | 15.7% (268) |
| 19 | 19.6% (335) |
| 20 | 23.0% (393) |
| 21 | 22.4% (383) |
| 22 | 12.0% (206) |
| 23 | 4.6% (78) |
| 24 | 1.7% (29) |
| 25 or older | 9.8% (1167) |

Table 2B. Gender distribution.

| Gender | Baseline | Read Handout | Attended Seminar | Both |
|--------|-------------|--------------|------------------|------------|
| Male | 21.5% (307) | 12.8% (23) | 1.0% (1) | 7.1% (1) |
| Female | 78.5% (112) | 87.2% (156) | 99.0% (104) | 92.9% (13) |

Table 2C. Race/Ethnic distribution.

| Race/Ethnicity | Baseline | Read Handout | Attended Seminar |
|------------------------|----------|--------------|------------------|
| Caucasian/White | 81.2% | 75.1% | 91.1% |
| African American/Black | 8.8% | 11.4% | 4.4% |
| Asian | 3.0% | 4.7% | 1.8% |
| Hispanic | 2.2% | 3.6% | 0.9% |
| Mixed Race/Other | 4.6% | 5.2% | 1.8% |

Table 3A. Vaccination status of baseline group.

| HPV Vaccination status | All | Female | Male |
|---------------------------|-------|--------|-------|
| I don't know | 13.4% | 6.4% | 36.5% |
| Started; plan to complete | 2.7% | 2.3% | 4.2% |
| Started; didn't complete | 4.9% | 6.3% | 1.0% |
| Not started | 36.5% | 32.9% | 46.6% |
| Yes; completed series | 42.6% | 52.1% | 11.7% |

Table 3B. Vaccination status of those not vaccinated.

| | All | Female | Male |
|-----------------------------|-------|--------|-------|
| Considering vaccination | 27.6% | 31.4% | 17.6% |
| Not considering vaccination | 72.4% | 68.6% | 82.4% |

| HPV vaccination status | Baseline | Read Handout | Attended Seminar |
|---------------------------|----------|--------------|------------------|
| I don't know | 13.4% | 5.0% | 1.8% |
| Started; plan to complete | 2.7% | 4.0% | 0.9% |
| Started; didn't complete | 4.9% | 4.5% | 4.5% |
| Not started | 36.5% | 43.0% | 23.2% |
| Yes; completed series | 42.6% | 43.5% | 69.6% |

Caucasian/white students attended the seminars. This likely reflects the propensity of white sororities at this university.

As seen in Table 3A, only 42.6% of participants had completed the vaccination the series; males were statistically less likely to have completed series than the female participants ($p=0.0001$). One third of the male participants were unsure of their vaccination status. Among the participants unvaccinated on 27.6% were considering vaccination. Although statistically more females students than males were considering vaccination ($p=0.0019$), the vast majority were not considering HPV vaccination (72.4%).

In addition to decreased uptake of HPV vaccination, male respondents in our baseline group also had inferior knowledge as compared to females regarding HPV infections. Males were more likely to report risky sexual practices including > 5 partners in the last year, no use of contraception, but had lower uptake of Student Health sexual/ reproductive services (all statistically significant, $p<0.05$; data not shown). Both genders had low baseline knowledge regarding routes of HPV transmission beyond sexual intercourse with 20% of female and 32.9% male students not knowing how HPV is transmitted.

When compared to our baseline group (42.6%) and those attending the seminar (43.5%), statistically more participants who attended seminar were already vaccinated (69.6%) ($p=0.001$; Table 3B). Additionally, those attending the seminar ($p=0.0001$) or reading the handout ($p=0.0004$) were more likely to know their vaccination status than the baseline group.

After attending the seminar or reading the handout of those not vaccinated, significantly more participants were considering vaccination as compared to baseline; after attending the seminar 46.2% were considering vaccination ($p=0.0411$) and after reading the handout those considering was 50% ($p=0.0001$) (Table 3B).

We wanted to assess if either the seminar or the handout increased knowledge about who should get vaccinated, what the vaccine does, and how is HPV transmitted. Regardless if participants attended seminar or read the handout, there was no statistical increase over baseline numbers (74% and 71% vs. 65%; Table 4).

When assessing knowledge about what the HPV vaccine actually does – both the seminar attendees and handout readers had a decrease in “I don’t know” answers and increased overall knowledge. Those reading the handout also decreased the incorrect answer that the vaccine confers STI protection ($p<0.05$) (Table 5).

Lastly we wanted to determine what type of interventions increased general knowledge about HPV. Seminar attendees or those who read the handout had increased ability to assign personal HPV risk and increased understanding that HPV affects men ($p<0.05$). The handout was also associated with decreased misinformation about the protection HPV vaccination confers. The handout and seminar both increased awareness of routes of HPV transmission (Table 6); neither increased knowledge that HPV could be acquired through oral – genital sex. Also, neither the handout nor the presentation increased students’ knowledge of other cancers caused by HPV.

Table 3C. Vaccination status of those not vaccinated.

| | Baseline | Read Handout | Attended Seminar |
|-----------------------------|----------|--------------|------------------|
| Considering Vaccination | 27.6% | 50.0% | 46.2% |
| Not Considering Vaccination | 72.4% | 50.0% | 53.8% |

Table 4. Who should get vaccinated?

| | Baseline | Read Handout | Attended Seminar | Both |
|--|----------|--------------|------------------|------|
| Don't Know | 13% | 6% | 3% | 0% |
| Females (only) | 20% | 19% | 25% | 50% |
| Males (only) | 0% | 0% | 0% | 0% |
| Both | 65% | 74% | 71% | 43% |
| People with greater than 5 sexual partners | 2% | 2% | 1% | 7% |

Table 5. What does the HPV vaccination do?

| What does HPV vaccine do? | Baseline | Read Handout | Attended Seminar |
|--|----------|--------------|------------------|
| Don't know | 13% | 5% | 2% |
| Cure HPV infection | 0% | 1% | 0% |
| Protect against future infection by STIs | 5% | 2% | 3% |
| Protect against future infection of certain strains of HPV | 82% | 92% | 95% |

Table 6. How is HPV transmitted?

| How is HPV transmitted | Baseline | Read Handout | Attended Seminar |
|------------------------|----------|--------------|------------------|
| Don't Know | 23% | 8% | 14% |
| Air | 1% | 1% | 0% |
| Needles | 16% | 14% | 12% |
| Oral Sex | 45% | 54% | 56% |
| Genital Contact | 57% | 70% | 71% |
| Sexual Intercourse | 74% | 87% | 84% |

Discussion and conclusions

Increasing HPV vaccination uptake continues to be an ongoing issue in the United States. Optimally, the vaccine should be administered in the pediatric age group (9 – 11 years old) to both females and males. There has been ongoing emphasis to pediatricians to making the vaccine routine but there continues to be resistance and misconceptions among patients, parents and providers.

Our study targeted college age students to assess their baseline knowledge about HPV and HPV vaccination, and to develop strategies to increase not only knowledge but the intent to vaccinate. Both interventions employed for this study, attending a seminar and reading the handout while waiting for appointments increased knowledge about HPV and vaccination. The handout targeted a greater proportion of unvaccinated individuals and more racially diverse population. Additionally, although the numbers were small it appeared that the handout was superior in increasing overall HPV knowledge, HPV vaccination knowledge, and intent to vaccinate. The handout may be superior in that students are reading the handout without peer interruption and in a health setting as opposed to obtaining information in a group social setting like the seminar. Point of care interventions such as the handout may be an effective way to improve knowledge and vaccine uptake. A laminated handout administered with check-in paperwork regardless of appointment reason may have the most impact.

Despite increasing knowledge and intent to vaccination with our interventions, only small numbers of students increased intention to vaccinate, underscoring that there needs to be better interventions to reach all students, especially male students. Another important finding in this study was the large sample size of our survey that was reached through University email. Just under 2000 (8.04% of total undergraduates at USC) student filled out the survey with only two reminders [18]. This suggests that University email may be an effective way to reach undergraduate students. Online individual student learning modules may generate the best uptake of health knowledge among undergraduates.

Finally, specific ways to target male undergraduates must be explored. Male respondents report poor knowledge regarding HPV risk and transmission; however, risk factors for HPV infection are numerous among males including more sexual partners and decreased uptake of sexual and reproductive services compared to female respondents in this study population as self reported in the administered survey. With only 12% of male respondents having completed the vaccination series and the recommendation for catch-up vaccination in males through age 21, it is important in the fight against cervical cancer and other HPV-related diseases to target this population at universities while these individuals are still eligible for vaccination.

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