

# Relationship Between Intent to Vaccinate and the Education and Knowledge of Human Papillomavirus Among Medical School Faculty and Students in Texas

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### **Abstract**

Little attention has been given to the state of human papillomavirus (HPV) education in medical schools and how this impacts future vaccination practices. We surveyed medical school faculty and students to assess the relationship between knowledge and willingness to recommend HPV vaccination.

Students and faculty at 8 medical schools across Texas participated in an online survey testing HPV knowledge, HPV education in medical curricula, and the likelihood of respondents to recommend HPV vaccination. Linear mixed models were created to examine how the differences in faculty members' and students' knowledge of HPV and the vaccine related to likelihood of recommending vaccination.

Students and faculty did not have significantly different perceptions about HPV education. Increased general knowledge of HPV rather than vaccine-related knowledge was associated with the likelihood of recommending the vaccine among students and clinical faculty as opposed to preclinical faculty. Upper-year medical students were more likely to score higher on general knowledge than were clinical and preclinical faculty.

Knowledge of HPV improves throughout medical school, and higher general knowledge is associated with willingness to recommend vaccination. Not all students indicated they would recommend vaccination, and universally prepared vaccine education modules or education interventions for faculty may help improve rates of HPV vaccine recommendation.

## Introduction

The incidence of human papillomavirus (HPV)-related cancers continues to rise, including HPV-positive cervical, anal, oropharyngeal, vaginal, vulvar, and penile cancers. More than 40,000 new cases of these HPV-associated cancers are diagnosed every year in the United States alone.<sup>1</sup> As the costs, morbidity, and mortality associated with HPV infection increase, national efforts to raise vaccination rates have intensified.

The HPV vaccination coverage lags far behind that of other scheduled teen vaccinations.<sup>2</sup> Despite the American College of Immunization Practice recommendation for universal vaccination of boys and girls aged 11 to 12 years, among adolescents aged 13 to 17 only 53.1% of females and 44.3% of males complete the recommended series of vaccine doses.<sup>2,3</sup> This rate remains far below the Healthy People 2020 goal of 80% coverage, the rate recommended for adequate herd immunity.<sup>2,3</sup> In addition, Texas continues to be ranked as one of the 10 states with the lowest HPV vaccination rates. The estimated proportion of Texas adolescents with one dose of the vaccine was 9% lower than the national average.<sup>2,3</sup>

Research on barriers to vaccination has focused on many subjects, including providers, access to care, and parental opinion. Surveys of parents have reported that acceptance of HPV vaccine is essentially equivalent to that of other vaccines<sup>2,3</sup> and that access alone does not explain the large gap between Texas and the nation. Providers play a huge role in increasing vaccination rates, but most studies on this role have focused on practicing clinicians. Little attention has been paid to future providers or those who train them as targets to increase HPV vaccination rates.<sup>4</sup> While several studies have surveyed HPV knowledge among medical students internationally,<sup>4-7</sup> few studies have assessed the HPV knowledge and education of U.S. medical students.<sup>8</sup> These few studies with U.S. medical student cohorts have revealed that health-professions students possess inadequate baseline HPV knowledge and are uncomfortable counseling patients on HPV vaccination.<sup>8,9</sup> These studies did not investigate whether HPV education improved during graduate medical education, nor did they explore whether HPV knowledge levels among teaching faculty affected medical school education.

As medical students are potential future immunizers, they will play a central role in counseling patients on HPV vaccination and HPV-related cancers. The objective of this study was to determine current medical students' and faculty members' knowledge of HPV-related topics and the HPV vaccine and to examine how willingness to recommend HPV vaccination to future patients changed over the course of medical school. To this end, we asked current medical students and faculty knowledge-based questions on HPV and vaccination and compared knowledge and willingness to vaccinate as years of medical school and medical education increased. Our goal was to understand if Texas medical schools are effectively teaching HPV-related concepts to future vaccinators and how HPV-related knowledge relates to willingness to vaccinate future patients. The goal is to establish whether interventions aimed at improving medical students' knowledge would affect future vaccination behaviors.

## Methods

We conducted a cross-sectional study of the knowledge and attitudes of Texas medical school students and faculties toward HPV vaccination. This research project was reviewed and approved by The University of Texas MD Anderson Cancer Center Institutional Review Board.

## **Participants**

The survey was sent to all students and teaching faculty at eight, 4-year medical schools across Texas: Baylor College of Medicine, Texas A&M College of Medicine, Texas Tech University Health Sciences Center El Paso, Texas Tech University Health Sciences Center, University of North Texas Health Science Center (UNT), University of Texas Medical Branch (UTMB), University of Texas Health Science Center at San Antonio (UTSA), and University of Texas Southwestern Medical School (UT Southwestern). To get a broad view of medical education, we chose schools that varied widely in admission characteristics, school mission, location, and curriculum ideology. Newly established medical schools with fewer than four full medical school classes were not included in this study.

Students and faculty each were divided into two groups. Students were divided on the basis of their school year into preclinical students (first- and second-year students) and clinical students (third- and fourth-year students). Faculty members were asked to identify whether they were preclinical or clinical educators.

## **Survey development**

The online survey, adapted from one developed previously by Javaid et al. to assess HPV knowledge in state providers,<sup>10</sup> consisted of 40 questions divided into 4 sections and took fewer than 10 minutes to complete. Section 1 queried demographic information, including age, gender, year of medical school (for students), ethnicity, vaccination status, and prospective specialty (for students). Section 2 questions (n=10) included the following topics: mechanism of disease, pathogenesis, and transmission. Section 3 questions (n=10) included the following topics: HPV vaccination efficacy, indications, and risks. Section 4 inquired about self-perceived quality of HPV-related education, assessed with nine Likert scale questions: basic science including virology, epidemiology, and presentation of HPV infection (n=3); vaccination education including indications for and risks and benefits of HPV vaccination (n=2); and patient care skills, including addressing vaccine hesitancy, providing resources, and communication skills (n=4). To verify that the questions were unambiguous and instructions were clear, this questionnaire was piloted among 15 upper-level Texas medical students and faculty at a site not included in the final study. No major changes were made to the final survey.

## **Survey distribution**

All medical students and faculty at the 8 participating institutions were invited to complete this online survey via their respective faculty affairs or student affairs office. Two faculty affairs departments, UT Southwestern and UNT, elected to invite only faculty members directly involved in medical student teaching or curriculum development; all other faculty departments invited their entire medical school faculty. An introductory email with an embedded reusable survey

hyperlink inviting participation was sent, and a reminder link was sent once to all participants 2 weeks after the initial invitation. The survey was open for a total of 4 weeks. Data collection was completed using Qualtrics at MD Anderson, and data were encrypted and de-identified.

### Statistical analysis

Descriptive statistics were used to summarize demographic information, knowledge, and other items such as responses to perception questions. Linear mixed models were created to compare knowledge by respondent type (faculty or student), preclinical or clinical educator status, and year in medical school. In addition, generalized linear mixed models using a logit transformation were created to make comparisons regarding perception of adequacy of HPV education, odds of recommending HPV vaccination, and personal vaccination history. In these models, students and faculty were nested within their schools. A P value of .05 was used to indicate significance.

## Results

### Study participants

In total, 5,765 students across the state of Texas were invited to participate in this survey, and 895 (15.5%) responded. Of those students, 118 (13.2%) were from Baylor College of Medicine, 117 (13.1%) from Texas A&M, 90 (10.1%) from Texas Tech El Paso, 60 (6.7%) from Texas Tech Lubbock, 150 (16.8%) from UNT, 112 (12.5%) from UTMB, 111 (12.4%) from UTSA, and 137 (15.3%) from UT Southwestern. Of the students, 58.4% were women, 71.2% identified as white, and 94.1% were younger than 30 years.

A total of 168 faculty members responded. Of these, 30 (18%) were preclinical and 137 (82%) were clinical (1 faculty member did not identify whether he or she was preclinical or clinical). Because of the nature of survey distribution by the schools' faculty affairs departments, the total number of faculty invited to participate is unknown. Of the faculty, 16 were from Baylor College of Medicine, 40 from Texas A&M, 18 from Texas Tech El Paso, 1 from Texas Tech Lubbock, 10 from UNT, 35 from UTMB, 42 from UTSA, and 6 from the UT Southwestern. Both the UT Southwestern and Baylor chose to limit their invited participants to only faculty directly involved in curriculum development. Of these faculty members who responded, most (30.5 %) fell within the 41-50 year age range; 54.8 % identified as female, and 82.6% identified as white. Faculty members were significantly older ( $P < .0001$ ) and more likely to identify as white ( $P = .0037$ ) than students.

### Knowledge scores

The HPV-related knowledge was evaluated as general knowledge and as vaccine-related knowledge. Mean scores calculated from the models are shown in [Table 1](#).

Students tended to score better than faculty with regard to general knowledge ( $P = .0019$ ) but not with regard to vaccine-related knowledge. Also, clinical faculty and students scored higher than preclinical faculty and students with regard to both general ( $P < .001$ ) and vaccination ( $P < .0001$ ) knowledge. Clinical faculty had higher general knowledge scores than both preclinical

faculty ( $P = .0298$ ) and preclinical students ( $P < .0001$ ). However, clinical students had higher general knowledge scores than clinical faculty ( $P = .0003$ ). Clinical students also had higher general knowledge scores than either preclinical faculty or preclinical students ( $P < .0001$ ). No difference was found in general knowledge between preclinical faculty and preclinical students. No differences in vaccination knowledge were found between clinical faculty and clinical students.

### **Perception of education**

Students and faculty also were asked how well they perceived their institution to perform at teaching HPV-related knowledge and skills. Generally, students' perceptions were in line with faculty members' perceptions, although more students than faculty members thought that their institution was good at teaching the aspects of HPV virology and pathogenesis ( $OR=1.9$ ,  $P=.0005$ ). In addition, more students than faculty felt their institution taught motivational interviewing techniques well ( $OR=2.0$ ,  $P=.0002$ ). In most cases, as the year in school increased, so did the perception that the institution instructed students well with regard to HPV infection, HPV vaccines, and how to approach patients and parents regarding HPV vaccination ([Table 2](#)).

### **Personal vaccination history**

Of those students between the ages of 20 and 30 years, 71.2 % of women but only 21.7% of men had received the full HPV vaccine series ( $OR 9.1$ , 95% CI: 6.5–12.8;  $P < .0001$ ). This age group was examined because all respondents in this age group were eligible to receive the HPV vaccine. Furthermore, only 40.7% of those between the ages of 26 and 30 years had received the full HPV vaccine series, compared with 54.9% of those between the ages of 20 and 25 years ( $OR 0.6$ , 95% CI: 0.4 –0.8;  $P = .0014$ ).

### **Recommendation of vaccination**

For each unit increase in general knowledge score, the odds of a student recommending HPV vaccination increased 10% ( $OR=1.10$ , 95% CI: 1.02-1.17;  $P=.0096$ ). However, no association was found between vaccine knowledge and the odds of a students' recommending vaccination. We also found no association between preclinical faculty members' knowledge and their recommending HPV vaccination. The odds of a clinical faculty member's recommending vaccination increased 15% as general knowledge score increased by 1 point ( $OR 1.15$ , 95% CI: 1.02 – 1.29;  $P = .0264$ ), but no association was seen between vaccine knowledge and odds of recommending vaccine. Additionally, as year in school increased, so did a student's odds of recommending the vaccine ( $P=.0002$ ). This information appears in [Table 3](#). Among graduating students, 7% did not agree with the statement, "I will recommend the HPV vaccine to my future patients," but 60% of faculty did not agree. This is shown in [Table 4](#).

### **Discussion**

Provider recommendations have been shown to be a key factor in a patient's choice to vaccinate<sup>2,3</sup>; thus, robust education of future providers may improve HPV vaccination rates. The results of this study demonstrate that the faculty responsible for training the future providers

are themselves often undereducated about HPV and that medical students are graduating with an inadequate level of HPV vaccine knowledge. Most importantly, HPV-related knowledge is related to a future provider's willingness to vaccinate.

Overall, medical students across Texas showed significant improvement over the 4 years of school in general HPV-related and HPV vaccination-related knowledge, indicating that the basic science of HPV is being taught in medical schools. However, variation exists across Texas, and not all schools had a significant increase in HPV vaccination-related knowledge over the 4 years of medical school, despite a low initial baseline. It may be that students are taught the presentation and management of disease but are not kept up to date about when and for whom vaccinations are appropriate. This would be consistent with previous research on HPV knowledge in medical students, which indicated that most graduating students do not feel confident in vaccination counseling.<sup>11</sup> We believe the lack of training in HPV-related topics could be reduced if a centralized location, such as the National HPV Roundtable (<http://hpvroundtable.org/>) or the Association of American Medical Colleges MedEdPortal (<https://www.mededportal.org/>), were to release provider education modules for each year of medical school to allow for consistent education of future providers.

Examination of the relationship between knowledge and intent to vaccinate showed that in both clinical faculty and students the intent to vaccinate is significantly associated with better knowledge of HPV. This suggests that students who obtain a higher level of HPV-related knowledge in medical school are more likely to recommend vaccination in their future practices, but students may be more likely than faculty to recommend HPV vaccination overall.

In both 2014 and in 2018, the President's Cancer Panel listed provider recommendation as one of most significant factors for improving the uptake of HPV vaccination and meeting the Healthy People 2020 goal of 80% coverage; however, provider recommendation is frequently lacking.<sup>11,12</sup> Our study found that only 7% of students did not agree with the statement "I will recommend the HPV vaccine to my future patients," while 60% of faculty did not agree. Education focused on improving faculty opinion and knowledge regarding HPV vaccines, as well as targeting the 7% of students who remain hesitant about vaccine recommendation, could play a profound role in increasing the number of strong vaccine recommendations and eventually vaccination rates.

Our study found that both preclinical and clinical faculty had lower scores on all knowledge tests of HPV than did clinical medical students. We did not query faculty members about their area of specialization, so the low faculty scores on HPV knowledge may reflect faculty members whose specialties do not involve HPV vaccination or HPV-related disease. This may suggest that students receive HPV-related education from a small subset of the faculty rather than a multidisciplinary educational team that reinforces this knowledge across disciplines. As some academic clinical faculty members are responsible not only for the education of future providers but also for caring for their own patients, faculty education on HPV and vaccination may help to increase current recommendations as well as recommendations for the vaccine from future providers.

Despite the difference in HPV knowledge between faculty and students, perceptions of the institutions' quality of education on HPV-related topics were similar between the 2 groups.

Approximately half of students and faculty agreed with the idea that the education on most HPV-related topics was adequate. Students were significantly more likely to report that their school instructed them in HPV-related topics in upper class years, presumably as they finished more of the 4-year curriculum. However, only two-thirds of final-year students agreed that they were well taught in most HPV-related topics, with the exception of higher rates for virology, clinical presentation, and which patients should be offered HPV vaccines. This indicates that both faculty and students perceive a great deal of room for improvement in the current state of HPV instruction in medical education. Wiley et al. developed a HPV-related curriculum that students found satisfactory and that significantly improved knowledge and vaccination rates; this curriculum could be used as an avenue to improve the state of HPV education.<sup>13</sup> Furthermore, repeated exposure to medical knowledge over the span of 4 years is expected to increase retention and understanding and may translate into physicians who are better informed about HPV vaccination and are more effective communicators.<sup>13</sup>

Although consistent with other literature on medical students' HPV-related education, this study has several limitations. The response rates for both students and faculty, especially preclinical faculty, were quite low; therefore, participants in this study may have some additional interest in HPV. However, if this is true, it would inflate scores rather than deflate them, and the knowledge of students and faculty would be even poorer than our results indicate. The response rates showed significant heterogeneity among the different institutions, which is why they were pooled and not examined separately. Furthermore, the questionnaire developed for this study, which was only tested among a small group of faculty and students, may have limited our ability to assess knowledge. Finally, we do not know how knowledge obtained in medical school will translate into future practice, which is the ultimate goal of medical education.

This study has several strengths. It is the first to examine the progression of HPV-related knowledge over the course of medical school education as well as faculty knowledge on HPV. This study also examines the relationship between knowledge and willingness of future providers to recommend vaccination. Based on this study, it is reasonable to believe that different avenues of improving medical education on HPV may help increase vaccination rates in the future. While medical students do make significant gains in HPV-related basic science knowledge, gains in vaccination knowledge are more varied and less consistent. A preformed, up-to-date module released by a governing body could help create consistent, efficacious HPV education across various schools. Furthermore, faculty in this study were found to have a lower level of HPV-related knowledge than upper-year medical students, despite holding the responsibility for training young doctors and often caring for patients themselves. Stronger faculty development for HPV-related topics might be an additional way to address inadequate gains in medical students' knowledge. This study offers an alternate route to improve the strength and enthusiasm of future providers' vaccination recommendations to help prevent HPV-related disease.

## References

1. Van Dyne EA, Henley SJ, Saraiya M, et al. Trends in Human Papillomavirus-Associated Cancers-United States 1999-2015, *MMWR Morb Mortal Wkly Rep*. 2018 Aug 24;67(33):918-924.

2. Walker TY, Elam-Evans LD, Yankey D, et al. National, regional, state and selected local area vaccination coverage among adolescents aged 13-17 years – United States, 2017. *MMWR Morb Mortal Wkly Rep.* 2018; 67(33):909–917.
3. Robinson CL. Advisory Committee on Immunization Practices recommended immunization schedules for children and adolescents age 18 years or younger – United States, 2018. *MMWR Morb Mortal Wkly Rep.* 2018; 2018 Feb 9;67(5):156-157.
4. Texas Medical Association HPV Resource Center. CSPH Report 6-A-18, Report of Council on Science and Public Health, “Physician Role in Increasing Vaccination for HPV.” 2018. <https://ssl.texmed.org/wa40/TexasMedicalAssociation/Tma.Meeting.Informer/content/pdfs/SPH%20Reports%20and%20Resolutions.pdf>. Accessed June 12, 2018.
5. McCusker SM, Macqueen I, Lough G, Macdonald AI, Campbell C, Graham SV. Gaps in detailed knowledge of human papillomavirus (HPV) and the HPV vaccine among medical students in Scotland. *BMC Public Health.* 2013;13:264.
6. Pan XF, Zhao ZM, Sun J, et al. Acceptability and correlates of primary and secondary prevention of cervical cancer among medical students in southwest China: implications for cancer education. *PLoS One.* 2014;9:e1110353.
7. Kernéis S, Jacquet C, Bannay A, et al. Vaccine education of medical students: a nationwide cross-sectional survey. *Am J Prev Med.* 2017;53:e97-e104.
8. Liu A, Ho FK, Chan LK, et al. Chinese medical students' knowledge, attitude and practice towards human papillomavirus vaccination and their intention to recommend the vaccine. *J Paediatr Child Health.* 2018;54:302-310.
9. Afonso NM, Kavanagh MJ, Swanberg SM, Schulte JM, Wunderlich T, Lucia VC. Will they lead by example? Assessment of vaccination rates and attitudes to human papilloma virus in millennial medical students. *BMC Public Health.* 2017;17:35.
10. Javid M, Ashrawi D, Landgren R, et al. Human papillomavirus vaccine uptake in Texas pediatric care settings: a statewide survey of healthcare professionals. *J Community Health.* 2017;42:58-65.
11. National Cancer Institute. Accelerating HPV Vaccine Uptake: Urgency for action to prevent cancer. A report to the President of the United States from the President’s Cancer Panel. Bethesda, MD; February 2014. <https://deainfo.nci.nih.gov/advisory/pcp/annualreports/HPV/index.htm>. Accessed June 12, 2018.
12. HPV Vaccination for Cancer Prevention: Progress, Opportunities and a Renewed Call to Action. A report to the President of the United States from the President’s Cancer Panel. Bethesda, MD; November 2018. [https://prescancerpanel.cancer.gov/report/hpvupdate/pdf/PresCancerPanel\\_HPUpdate\\_Nov2018.pdf](https://prescancerpanel.cancer.gov/report/hpvupdate/pdf/PresCancerPanel_HPUpdate_Nov2018.pdf) Accessed November 1, 2018.



13. Wiley RL, Shelal Z, Bernard C, Urbauer D, Toy E, Ramondetta L. Team-based learning module for undergraduate medical education: A module focused on the human papilloma virus to increase willingness to vaccinate. *J Cancer Educ.* 2017 Dec 26. doi:10.1007/s13187-017-1311-7. [E pub ahead of print]

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