

To the AHNS Cancer Prevention Service,

Human Papilloma Virus (HPV) is the most common sexually transmitted infection in the United States and causes 5% of all malignant neoplasms globally¹⁻³. High risk strains of HPV 16, 18, 31, 33, 45, 52, and 58 cause 90% of HPV-related anogenital and head and neck cancers³. The prevalence of HPV-associated oropharyngeal squamous cell carcinoma has been steadily increasing in North America and Western Europe over the past decade⁴. The Centers for Disease Control and Prevention (CDC) has recognized oropharyngeal cancer as the most common HPV-related malignancy for the past ten years, surpassing cervical cancer⁵⁻⁷. Since 2006, three highly efficacious vaccines have been available to protect against the most prevalent forms of HPV, and in 2019 the FDA expanded indications for vaccination to men and women ages 27 to 45 with shared decision making⁷⁻⁹. In 2020 the FDA included oropharyngeal cancer prevention in its list of indications for 9-valent HPV vaccination¹⁰.

After its initial release, there was difficulty gaining widespread adherence to HPV vaccination, with only one quarter of the eligible population having completed the vaccination series by 2009^{11,12}. While the number of adolescent females and males having initiated the vaccination series has since increased to 77.1% and 73.1% respectively, vaccination among adults remains low¹³. Only 16.2% of males age 18 - 21 have initiated the vaccination series¹⁴. Less than half of the eligible population in the 27 – 45 age range have completed vaccination¹⁵. Adolescents and adults of lower socioeconomic status or from rural areas also have lower rates of vaccination initiation and completion¹⁶⁻¹⁸. This gap in vaccination, especially among the older adult population, is expected to result in continually increasing rates of HPV-associated oropharyngeal cancer through the year 2045^{19,20}. With the expansion of FDA approval of 9-valent HPV vaccine, there now exists a narrow window of opportunity in which its effective implementation can significantly reduce future cancer burden.

Despite this opportunity, improving HPV vaccination among the adult population remains challenging¹⁴. Prior work has focused on increasing vaccination rates in the adolescents, with interventions focusing both on provider recommendations, and parent and patient education, preferably delivered via technology based modalities²¹⁻²⁴. We have previously shown that a structured HPV vaccination clinic with shared decision-making can be implemented within an existing otolaryngology practice to provide point-of-care vaccination²⁵. Yet, even when offered HPV vaccination at the time of established visits in otolaryngology clinic, 2 of 98 men (12.2%) and 7 of 131 women (5.3%) initiated vaccination²⁵. Given the limited window of opportunity to reach those most likely to develop oropharyngeal cancer over the next three decades, significant strides are needed in arming providers with effective interventions to promote HPV-vaccination.

To this end, we will develop a clinic-based educational intervention with the hypothesis that a structured educational intervention with strong recommendation for vaccination will improve vaccination uptake in adults aged 18 – 45. Outcomes recorded will include acceptance rate of an initial offer of vaccination, acceptance rate after viewing a video intervention with strong recommendation for vaccination, and demographics. Because of prior studies showing the importance of a strong recommendation for vaccination and improved accessibility of information regarding vaccination, especially when delivered via technology-based platforms, we believe that this intervention will provide significant improvements in HPV vaccination.

Our targeted population is unvaccinated patients presenting to Otolaryngology clinic at Boston Medical Center (BMC). BMC serves a diverse patient population and is the largest

safety-net hospital in New England. As a result, 72% of patient visits are from underserved populations, and 32% of patients do not speak English as a first language²⁶.

Patients between the ages of 18 and 45 who do not have documented completion of either the 2-, 4-, or 9-valent HPV vaccination series will be approached and offered to complete a tablet-based survey. After assessing vaccination status, the survey will offer upfront vaccination. Patients who decline will be directed to a 60 second video of a physician providing information regarding HPV-associated cancers, HPV transmission, and vaccination efficacy. This video will conclude with a strong recommendation for vaccination. Patients will again be offered the opportunity for vaccination.

The CDC recommends shared clinical decision making for patients ages 27 – 45 and provides considerations when having these discussions⁹. Patients within this age range who elect for vaccination will undergo shared clinical decision making at the point-of-care immediately prior to vaccination. Those who are likely to benefit will then receive vaccination. Vaccinations will be initiated at the point-of-care during the same day as the patient’s clinic visit. The second and third doses will be provided at subsequent scheduled visits or by the patient’s primary care provider. This workflow allows for minimal disruptions to the patient and an efficient means of initiating the vaccine series.

The Qualtrics survey platform (*Qualtrics LLC, Provo, UT USA*) will be utilized to deliver the survey and educational video. The survey has been previously developed and translated into three languages (Spanish, Portuguese, and Haitian Creole)²⁵ so as to serve BMC’s diverse patient population. The video script will be translated into these languages, and four video interventions will be recorded with BMC physicians in their native languages providing strong recommendation for vaccination.

Required expenses for this project are a result of the video script translation, recording, and production, and are expected to cost \$1500. Remaining costs may be covered by the project’s primary investigator, Danial Faden, MD.

We are very excited to have this opportunity to reach our underserved community, to improve health education regarding HPV and head and neck cancer, and to ultimately open the door to a long-term vaccination education program to prevent HPV-related malignancies. Thank you very much for your time in considering our proposal.

Sincerely,

Timothy Rodriggs
PGY4 Resident
Department of Otolaryngology – Head & Neck Surgery
Boston Medical Center
timothy.rodriggs@bmc.org

1. Kreisel KM, Spicknall IH, Gargano JW, et al. Sexually Transmitted Infections Among US Women and Men: Prevalence and Incidence Estimates, 2018. *Sex Transm Dis.* 2013;48(4):208-214. doi:10.1097/OLQ.0000000000001355
2. Lewis RM, Laprise JF, Gargano JW, et al. Estimated Prevalence and Incidence of Disease-Associated Human Papillomavirus Types Among 15- to 59-Year-Olds in the United States. *Sex Transm Dis.* 2021;48(4):273-277. doi:10.1097/OLQ.0000000000001356
3. Serrano B, Brotons M, Bosch FX, Bruni L. Epidemiology and burden of HPV-related disease. *Best Pract Res Clin Obstet Gynaecol.* 2018;47:14-26. doi:10.1016/j.bpobgyn.2017.08.006
4. Scott-Wittenborn N, Fakhry C. Epidemiology of HPV Related Malignancies. *Semin Radiat Oncol.* 2021;31(4):286-296. doi:10.1016/j.semradonc.2021.04.001
5. Centers for Disease Control and Prevention. How Many Cancers Are Linked with HPV Each Year? Published online September 12, 2023. Accessed February 8, 2024. <https://www.cdc.gov/cancer/hpv/statistics/cases.htm>
6. Laura J. Viens, Jane Henley, Meg Watson, et al. Human Papillomavirus–Associated Cancers — United States, 2008–2012. *CDC - Morb Mortal Wkly Rep.* 2016;65(26):661-666.
7. Petrosky E, Jr JAB, Hariri S, et al. Use of 9-Valent Human Papillomavirus (HPV) Vaccine: Updated HPV Vaccination Recommendations of the Advisory Committee on Immunization Practices. 2015;64(11).
8. Lauri E. Markowitz, Eileen F. Dunne, Mona Saraiya, et al. Human Papillomavirus Vaccination Recommendations of the Advisory Committee on Immunization Practices (ACIP). *CDC - Morb Mortal Wkly Rep - Recomm Rep.* 2014;63(5):1-30.
9. Meites E, Szilagyi PG, Chesson HW, Unger ER, Romero JR, Markowitz LE. Human Papillomavirus Vaccination for Adults: Updated Recommendations of the Advisory Committee on Immunization Practices. 2019;68(32).
10. Zhou JZ, Jou J, Cohen E. Vaccine Strategies for Human Papillomavirus-Associated Head and Neck Cancers. *Cancers.* 2021;14(1):33. doi:10.3390/cancers14010033
11. Gamble HL, Klosky JL, Parra GR, Randolph ME. Factors Influencing Familial Decision-Making Regarding Human Papillomavirus Vaccination. *J Pediatr Psychol.* 2010;35(7):704-715. doi:10.1093/jpepsy/jsp108
12. Centers for Disease Control and Prevention (CDC). National, state, and local area vaccination coverage among adolescents aged 13-17 years --- United States, 2009. *MMWR Morb Mortal Wkly Rep.* 2010;59(32):1009-1053.
13. Pingali C, Yankey D, Elam-Evans LD, et al. National, Regional, State, and Selected Local Area Vaccination Coverage Among Adolescents Aged 13–17 Years — United States, 2020. 2021;70(35).

14. Michelle M. Chen, Nicole Mott, Sarah J. Clark, et al. HPV Vaccination Among Young Adults in the US. *JAMA*. 2021;325(16):1674. doi:10.1001/jama.2021.0720
15. Adekanmbi V, Guo F, Hsu CD, Shan Y, Kuo YF, Berenson AB. Incomplete HPV Vaccination among Individuals Aged 27–45 Years in the United States: A Mixed-Effect Analysis of Individual and Contextual Factors. *Vaccines*. 2023;11(4):820. doi:10.3390/vaccines11040820
16. Finney Rutten LJ, Wilson PM, Jacobson DJ, et al. A Population-Based Study of Sociodemographic and Geographic Variation in HPV Vaccination. *Cancer Epidemiol Biomarkers Prev*. 2017;26(4):533-540. doi:10.1158/1055-9965.EPI-16-0877
17. Kurani S, MacLaughlin KL, Jacobson RM, et al. Socioeconomic disadvantage and human papillomavirus (HPV) vaccination uptake. *Vaccine*. 2022;40(3):471-476. doi:10.1016/j.vaccine.2021.12.003
18. Cho D, Ramondetta L, Garcini L, Lu Q. HPV's Vaccination among Racial/Ethnic Minority College Students: Current Status and Future Direction. *J Natl Med Assoc*. 2020;112(6):639-649. doi:10.1016/j.jnma.2020.06.005
19. Zhang Y, Fakhry C, D'Souza G. Projected Association of Human Papillomavirus Vaccination With Oropharynx Cancer Incidence in the US, 2020-2045. *JAMA Oncol*. 2021;7(10):e212907. doi:10.1001/jamaoncol.2021.2907
20. Roman BR, Aragonés A. Epidemiology and incidence of HPV-related cancers of the head and neck. *J Surg Oncol*. 2021;124(6):920-922. doi:10.1002/jso.26687
21. Oliver K, Frawley A, Garland E. HPV vaccination: Population approaches for improving rates. *Hum Vaccines Immunother*. 2016;12(6):1589-1593. doi:10.1080/21645515.2016.1139253
22. Dempsey AF, Pyrzanowski J, Lockhart S, Campagna E, Barnard J, O'Leary ST. Parents' perceptions of provider communication regarding adolescent vaccines. *Hum Vaccines Immunother*. 2016;12(6):1469-1475. doi:10.1080/21645515.2016.1147636
23. Smulian EA, Mitchell KR, Stokley S. Interventions to increase HPV vaccination coverage: A systematic review. *Hum Vaccines Immunother*. 2016;12(6):1566-1588. doi:10.1080/21645515.2015.1125055
24. Oh NL, Biddell CB, Rhodes BE, Brewer NT. Provider communication and HPV vaccine uptake: A meta-analysis and systematic review. *Prev Med*. 2021;148:106554. doi:10.1016/j.ypmed.2021.106554
25. Bloom JC, Kaufmann N, Koss S, Edwards HA, Perkins RB, Faden DL. Deciphering Knowledge and Opinions of Human Papillomavirus and Human Papillomavirus Vaccination for Facilitation of Point-of-Care Vaccination in Adults. *JAMA Otolaryngol Neck Surg*. 2023;149(10):870. doi:10.1001/jamaoto.2023.2073

26. Boston Medical Center. BMC Facts. Published online 2017. Accessed February 24, 2024.
https://www.bmc.org/sites/default/files/For_Medical_Professionals/BMC-Facts.pdf