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How to Implement HPV Vaccines in Practice

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Implementation of the HPV vaccines is the true test of success of this science. An effective, safe, immunogenic, cost-effective agent to prevent one of the most common viruses from infecting human epithelium will only impact individual- and population-based health when it is available, accepted and used. Many logistical events are necessary at the detail level to ensure vaccine delivery, cold chain storage, actual injection and archived regulatory medical documentation. However, before these critical elements are pertinent, there are the abstract concepts of the understanding of the infection and human perspective that must be acknowledged prior to HPV vaccine acceptance.

Educating Physicians and Patients

Using a three-point educational format for HPV infection provides a simple skeleton for both physicians and patients to accrue information necessary to guide their decision making about HPV prophylaxis. Terminology that emphasizes impartiality removes associations similar to the latency/herpes simplex 2 link.

Residential Infection

This basal cell nuclear infection is a protein coat-less HPV virion that can persist in this lowermost cell layer undetected from weeks to decades after infection. Only one HPV type per cell can exist, but it can be a benign or oncogenic type. This HPV format is the necessary basis for the development of the remaining two formats and is prevented with the current HPV L1 virus-like particle vaccines.

Episomal Infection

The HPV replicates in the basal cell nucleus separate from the human genome. As the basal cell differentiates into stratified squamous epithelium, the protein coat-less HPV continues to replicate episomally until it can reproduce its viral coat in the superficial layer where it is released as an infective virus to another basal stem skin cell. Both benign and oncogenic HPV types replicate episomally, causing identical abnormal cytology and colposcopically visible low-grade intraepithelial lesions.

Integrated Infection

Integration ensues in one of two ways. The first can occur after the residential infection with an oncogenic HPV type is established. The oncogenic HPV genome disassembles in the basal cell nucleus integrating with the human DNA preventing maturation of the basal cell into stratified layers, eventually either regressing, if small enough, or progressing into cancer. This is cytologically and colposcopically detected as a high-grade intraepithelial lesion (cervical intraepithelial neoplasia 2/3).

The second occurs after the residential infection with an oncogenic HPV type has become a persistent cytologically and colposcopically visible episomal infection. The ordered viral replication is interrupted by chromosomal breaks, allowing viral integration with the human genome to occur, prohibiting HPV virion production and infectivity, prohibiting squamous cell maturation, and eventually, progressing into invasive cancer.

Discussing HPV-Related Sexuality Issues Neutrally

Personal perspective and interpretation color scientific understanding, especially when scientific implications bear on personal beliefs and morals. Trigger words that describe HPV infection as a sexually transmitted infection have raised similar issues that oral contraceptives highlighted in public discussions over 70 years ago. Messaging the scientific facts about HPV infection in neutral language is necessary before vaccination can be popularly accepted. Despite oral, anal and genital skin to skin contact, we have a responsibility to communicate that HPV transmission differs significantly from other infections classified as sexually transmitted. HPV infection lives in the 400 nm of epithelial surface that covers the mucosal organs; it cannot live internally. Bodily fluids are not pertinent to HPV transmission. The *Treponema* spirochete of syphilis is transmitted through abraded anogenital skin, but immediately invades the lymphatic and circulatory systems for multiorgan destruction. Likewise, viremic expression commonly seen in hepatitis B and HIV/AIDS, and cytolysis common with hepatitis simplex virus 2, do not occur with HPV infection. Finally, unlike chlamydia or gonorrhea whose primary site of

infection is the endocervical cell, HPV infections occur in squamous epithelial stem cells, such as the basal and reserve cells. Educational messages that neither ignore nor promote sexuality facilitate a neutral discussion of HPV.

To date, the psychological cost of HPV infections has been primarily borne by women. The anxiety, depression, worry and horror that transitions from potentially having a cancer to having a lower genital tract infection can be alleviated or exacerbated by the manner in which the woman receives her HPV DNA or cytology test results. Relationships and families can be destroyed or strengthened by words of condemnation or comfort. The quality of life with an HPV-associated disease can fluctuate daily for her and her partner, making protection against this virus a genderless goal.

Infection Affects Both Genders

This particularly common virus must be described in terms of a human infection in both men and women. Benign mucosal HPV types replace normally functioning epithelium in the multiple forms of warts in both genders, limiting the external barrier protection that the epithelium is designed to provide. Cancers in the mouth, anus, vagina, cervix, penis, vulva and oro-pharynx can develop from the oncogenic HPV infections requiring surgical treatment to avoid death in both men and women. The L1 virus-like particle vaccines designed to prevent the initial residential HPV infection in the basal stem cell could eventually provide protection for up to 5% of all the cancers worldwide for both genders, numerically having the largest impact for women and cervical cancer. Communicating the science, the shared HPV risks and the benefits of vaccination, potentially for both genders, becomes germane to HPV vaccination implementation.

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