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Original article

Gender of the Clinician, Child, and Guardian and the Association With Receipt of Routine Adolescent Vaccines

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A B S T R A C T

Purpose: To analyze the relationship of the gender of the clinician, child, and guardian to the child's receipt of human papilloma virus (HPV) vaccine, which prevents a sexually transmitted infection, compared to tetanus, diphtheria, acellular pertussis (Tdap) and meningococcal dose 1 (MCV4) vaccines, which do not.

Methods: We extracted electronic health record data from visits by adolescents 11–18 years of age to 27 primary care practices from 2009 to 2014. Visits with pediatricians, physician assistants, and nurse practitioners were included if they were the first at which HPV vaccine was due (n = 102,736). After stratifying by visit type (preventive/acute), generalized estimating equations with robust variance estimators accounted for clustering of visits within practices. Adjusting for all covariates, these models were used to estimate standardized proportions of "captured opportunities" (vaccine due and given) for HPV dose 1 (HPV), Tdap, and MCV4.

Results: Fewer opportunities were captured at acute versus preventive visits. Although rates were low, female clinicians delivered all three vaccines at higher rates than male clinicians at acute (HPV: 2.7% vs. 1.2%, $p < .001$; Tdap: 6.4% vs. 4.1%, $p = .013$; MCV4: 6.0% vs. 3.7%, $p = .013$) but not preventive visits. Girls received HPV vaccine at higher rates than boys early in the study period, but the gap closed over time ($p < .001$). Guardian gender was not associated with vaccination.

Conclusions: Clinician gender was associated with vaccination at acute, but not preventive, visits. In the context of efforts to increase acute visit vaccination, differences between female and male clinicians' rates might reflect alternate practice styles by gender that deserve future study.

IMPLICATIONS AND CONTRIBUTION

In examining the relationship between clinician, child, and guardian gender and adolescent vaccination, this study found low acute visit vaccination rates; differences in HPV, Tdap, and MCV4 vaccination at acute visits by clinician gender; diminishing differences in HPV vaccination by child gender over time; and no associations with guardian gender.

Human papilloma virus (HPV) is the most common sexually transmitted infection with an estimated 79 million individuals currently infected and 14 million new infections per year [1]. Quadrivalent HPV vaccine was licensed for girls in 2006, routinely recommended for girls by the Advisory Committee on Immunization Practices in 2007, licensed for boys in 2009, then routinely recommended for both boys and girls 11–12 years of age in 2011 [2,3]. More recently, in December 2014, a nine-valent HPV vaccine was licensed for use in girls and boys. In 2014, vaccination coverage with at least one dose of HPV vaccine was only 60% among girls 13–17 years and 42% among boys [4].

Conflicts of Interest: The authors have no conflicts of interest to disclose.

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According to the National Cancer Institute's 2013 Report to Congress and the President's Cancer Panel Annual Report 2012–2013, coverage remains far below Healthy People 2020's target of 80% of 13- to 15-year-old girls and boys having received three doses of HPV vaccine and far below rates in other high-income countries [4–6]. Commonly cited barriers to receipt of HPV vaccine include parental concerns about the effect on sexual behavior, low perceived risk of HPV infection, social norms, irregular preventive care, and vaccine cost [7]. The strength of the clinician's recommendation for the HPV vaccine has been established as a major target for education and outreach to improve vaccination rates [7].

Although previous studies of HPV vaccine acceptability and receipt have shown that providers are more likely to recommend the vaccine to girls than to boys [8,9], they have not examined clinician gender in relation to vaccination behavior, nor have they considered the gender of the accompanying guardian [10,11]. Although studies have examined the knowledge, attitudes, and intentions to accept the HPV vaccine among parents of daughters [12–15], parents of sons [16–18], and mother–daughter dyads [19–21], these studies did not consider all the possible gender triads among clinician, patient, and guardian. One study considered the clinician-patient-guardian triad but only interviewed mothers [22]. Although there is a growing evidence base that involving fathers in pediatric care improves outcomes, little is known about the biases of fathers versus mothers in vaccinating children [23–25].

In the adult literature, multiple studies conclude that female clinicians are more likely to deliver preventive services than their male counterparts. Benefits have been reported for cancer screening for female patients, including Papanicolaou (Pap) smears and mammograms, and for immunizations [26–30]. However, the role of clinician gender has not been well-studied in pediatrics.

Given the paucity of data on how clinician, child, and guardian gender relate to receipt of adolescent preventive care, including HPV vaccine; tetanus, diphtheria, acellular pertussis (Tdap) vaccine; and dose 1 of meningococcal vaccine (MCV4), this study aimed to determine how initiation of the HPV vaccine series (HPV dose 1, subsequently referred to as HPV) varies by clinician, child, and guardian gender. We aimed to determine whether the same patterns in vaccination behavior by gender of the clinician, child, and guardian are observed for the other two routine adolescent vaccines (Tdap and MCV4), which do not prevent a sexually transmitted infection and are not associated with gender-specific diseases or gender-specific vaccination recommendations. Finally, we examined time trends in HPV vaccine delivery by clinician, child, and guardian gender.

We hypothesized that female clinicians would deliver vaccinations at higher rates than male clinicians because of prior literature demonstrating their prevention orientation. We expected that given the earlier licensing for female children, girls would receive HPV vaccine at higher rates at the beginning of the study period but that the gap between boys and girls would narrow over time. We hypothesized that a prevention orientation might exist with guardians and clinicians and therefore expected an association between a female guardian being present at the visit and HPV vaccine receipt. Finally, because the other routine adolescent vaccines are well established and more widely accepted by families [4,31], we did not expect a relationship between clinician, child, and guardian gender and the Tdap and MCV4 vaccines.

Methods

Data source

Data were obtained from The Children's Hospital of Philadelphia Pediatric Research Consortium (PeRC), a hospital-owned ambulatory research network that includes more than 202,000 children in 27 practices (across 31 sites) and two states [32]. Three urban resident teaching practices and 24 primarily suburban, nonresident teaching practices comprise the PeRC network. A common electronic health record (EHR; EpicCare; Epic Systems, Inc., Verona, WI) used by all practices served as the data source for all exposures and covariates except for clinician gender, which was ascertained from an external database. The Children's Hospital of Philadelphia Institutional Review Board exempted this study from review and waived the requirement for consent.

Study cohort

For this retrospective cohort study, EHR data were extracted for all preventive or acute visits with a physician, nurse practitioner, or physician assistant to one of the PeRC-affiliated practices between October 1, 2009, and November 23, 2014, for adolescents 11–18 years of age (Figure 1). Visits were included if they were the first encounter at which the child was eligible to initiate the HPV vaccine series since HPV vaccine decision-making primarily occurs at these visits. Guardian gender was ascertained from EHR data at 80% of visits. In the remainder, the guardian was not identified or was unable to be ascertained from the documentation, which only specified "parent," "grandparent," and so forth. These inclusion criteria yielded a final analytic cohort of 102,736 visits.

Outcomes

The primary outcome was a "captured opportunity" for HPV vaccination, that is, the initiation of the HPV vaccine series at the first eligible visit for that child. Initiation was chosen rather than completion because decision-making is often most complex for HPV dose 1, and follow-up doses in the network studied are often given at nurse-only visits [22]. Secondary outcomes were captured opportunities for Tdap and MCV4 vaccines.

Exposures and covariates

The primary exposures were clinician, child, and guardian gender. Child-level covariates included age, race, insurance type, and relationship of the accompanying guardian (e.g., mother, father, grandmother, aunt, etc.). Visit-level covariates included practice site, urban or suburban practice location, and teaching status; year of visit; season of visit; and visit type (preventive, with Current Procedural Terminology codes of 99382–99385 and 99391–99395, or acute, with Current Procedural Terminology codes of 99202–99205 and 99213–99215); and clinician type (trainee, non–trainee physician, nurse practitioner, and physician assistant).

Statistical methods

We first categorized accompanying guardians by gender. Guardians were designated as "female" if the guardian was