

Program Director/Principal Investigator (Last, First, Middle): Rand, Cynthia M.

Title: Using Health Information Technology to Improve Delivery of HPV Vaccine

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Organization: University of Rochester

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1. Structured Abstract

Purpose: The objectives of this study were to: (1) assess parent preferences for communicating with their adolescent's physician and (2) implement a health informatics-based intervention to reduce missed opportunities, reduce intervals between doses, and increase completion of the HPV vaccination series in inner-city practices.

Scope: Parent survey in 2 urban, 2 suburban pediatric practices; health informatics intervention in 3 urban primary care practices in Rochester, NY.

Methods: (1) Survey of parents of adolescents to assess preferences for communication; (2) two randomized controlled trials of parents of adolescents to assess whether phone or text message reminders improved the rate of HPV immunization and time to complete immunization.

Results:

1. Parent survey: Being a younger parent was associated with preferring text message vaccine reminders, and parents who were younger and suburban were most interested in general use of a personal health record.

2. Text message and telephone HPV vaccination reminders: We enrolled 178 phone intervention (180 control) and 191 text intervention (200 control) participants. At the end of the study, 48% of phone intervention (40% of control), and 49% of text intervention (30% of control) adolescents had received 3 HPV vaccine doses. In multivariate survival analysis, there was no significant difference in time from enrollment to receipt of 3rd HPV vaccine dose for those receiving a phone reminder compared to controls (hazard ratio [HR] 1.26, $p=.16$), but there was a significant difference in those receiving a text reminder compared to controls (HR 2.27, $p<.0001$).

Key Words: HPV vaccine, text messaging, reminder systems

2. Purpose

Research Objectives:

Aim 1. Measure preferences for parents of adolescents and adolescents themselves to understand how they prefer to receive immunization reminders and other information from the adolescent's physician (e.g. phone, mail, e-mail, text, personal health records (PHRs)).

Aim 2. Measure baseline rates of missed opportunities for HPV vaccination, the intervals between HPV vaccine doses and the proportion of patients who received 1, 2 or 3 vaccinations.

Aim 3. Develop and implement an HIT-based intervention to reduce missed opportunities, reduce intervals between doses, and increase completion of the HPV vaccination series in inner-city practices.

Aim 4. Measure post-intervention rates, analyze data

Aim 5. Design and submit R01

3. Scope:

Human papillomavirus (HPV) is the most common sexually transmitted infection in the U.S.¹ The prevalence of HPV infection in women ranges from 20 to 45% and rates are highest among women 20 to 24 years.² There were an estimated 11,070 cases and 3,870 deaths in 2008 in the U.S. from cervical cancer³ and costs for its treatment have been estimated at 1.7 billion dollars.⁴ Black and Hispanic women have higher cervical cancer incidence and mortality due to lower screening and later diagnosis.⁵ HPV-16 is associated with 50-60% of cervical cancers and high-grade cervical neoplasias, and type 18 with another 15%.⁶ HPV types 6 and 11

cause 90% of anogenital warts.⁷ A vaccine that targets HPV types 6, 11, 16, and 18 was recommended by the ACIP for females aged 11-12, and for females ages 13-26 who have not been previously vaccinated.⁸

Many inner-city adolescents begin the HPV vaccine series but few complete the 3-dose series within the recommended timeframe. For example in one large inner-city clinic used in our study, 87% of teens with visits in the prior 2 years began the series but only 26% completed it within 27 months. As of 2007, a national study found even lower rates of vaccination-- only 25% of adolescents had received at least one dose of the vaccine.⁹ The vaccine is 100% effective in prevention of cervical neoplasia in women not exposed to HPV types included in the vaccine, but is far less effective once exposure has occurred.¹⁰ Therefore, all three doses of the vaccine should be given before a patient becomes sexually active.

Given its high efficacy, the HPV vaccine has the potential to dramatically reduce rates of cervical cancer. However, if poor and minority women have lower rates of vaccination than those in higher income groups, it could widen the disparity in cervical cancer rates even further.¹¹ Risk factors for HPV infection include early initiation of sex, history of other STIs, lack of condom use, and greater number of sexual partners.¹²⁻¹⁵

Sexually active urban adolescents have been shown to have HPV prevalence rates ranging from 64%¹⁶ to as high as 90%,¹⁷ which are higher than the general population. A recent national study found that Black women, compared with white women, had 50% higher odds of infection with HPV.¹¹ Women living below the poverty line had a 36% higher risk compared to those three or more times above the level of poverty. All of these factors combine to make it imperative to ensure widespread HPV immunization for inner-city adolescent girls. While HPV vaccine acceptance rates are high in urban populations,¹⁸ visit rates are variable, and impede completion of the vaccine series, particularly for Black and Hispanic teens.¹⁹

Reminder-recall is effective to increase immunization rates for childhood and other adolescent vaccines, but it is unclear whether and what type of (phone or text message) reminders are effective for HPV vaccine series completion.²⁰⁻²³

4. Methods:

A. Parent survey: Four-hundred parents were recruited from 4 offices in Rochester, NY (2 urban, 2 suburban) to assess their perspectives about preferences for communication with the adolescent's physician. We used an electronic survey tool to collect data from a consecutive sample of 200 urban and 200 suburban parents of adolescents (aged 11-17) who were attending any type of healthcare visit at their adolescents' primary care practice. The survey included items describing parent's use of technology (internet, e-mail, text messaging, social networking), location and frequency of use, whether they paid additionally for text messaging, and their preferred method of communication for (a) vaccination reminders, (b) scheduling vaccination appointments, (c) obtaining medication refills, and (d) receiving laboratory results. We used Pearson's chi-square tests to compare responses by parent demographics, technology use, and preferences for the best mode of vaccine reminders, scheduling appointments, getting medication refills and lab results. We also used bivariate analyses to assess factors associated with preferring text message and email vaccination reminders, and examined factors associated with an interest in using a PHR to receive a vaccine reminder. Finally, we used relative risk regression, using log-binomial models, to examine parent factors independently associated with the use of text message, e-mail vaccine reminders, and the general use of a PHR.

Adolescent survey: Two-hundred parents were recruited from 4 offices in Rochester, NY (2 urban, 2 suburban) to assess their perspectives about preferences for communication with the adolescent's physician. The data from these surveys were used to inform the design of the randomized controlled trial.

B. RCT: We performed randomized controlled trials of phone and text reminders for parents of 11-17 year olds in three urban primary care clinics. Parents of adolescents receiving an HPV vaccine chose which method of reminder (phone or text) they preferred, and after consenting, were randomized to receive or not receive a reminder. A maximum of 3 reminders for each dose due were sent to the phone and text intervention groups. The main outcome measure was time to receipt of 3 doses of HPV vaccine. We enrolled 178 phone

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intervention (180 control) and 191 text intervention (200 control) participants. Kaplan-Meier curves were calculated for the time from enrollment to receiving a 3rd HPV dose comparing no phone reminders to phone reminders and no text reminders to text reminders, and multivariate analyses were performed controlling for gender, age, practice, insurance, race, and ethnicity.

C. Provider prompts: Electronic provider prompts were turned on in the EHR to remind providers to give HPV vaccine for patients eligible. The prompts appeared in the 'health maintenance' section in the patient banner in Epic. Education about the prompts was delivered to the three urban intervention primary care practices just after they were turned on. We measured baseline HPV vaccination rates and missed opportunities 6 months prior to the prompts being turned on, 6-12 months after turning them on, and 18-24 months later.

5. Results:

A. Parent survey: Roughly half of parents (60% urban, 52% suburban, $p=.11$) were accepting of teens receiving their own vaccine reminders. Urban parents preferred communicating with the provider via telephone, whereas suburban parents preferred e-mail for most issues, and a PHR for receipt of test results. In adjusted analyses, being younger was associated with preferring text message vaccine reminders (41-<51 years aRR 0.8, $p=.02$; >51 years aRR 0.5, $p<.001$); being a suburban parent was associated with preferring email reminders (aRR 1.6, $p<.001$). Those who were younger (41-<51 years aRR 0.6, $p=.007$; >51 years aRR 0.4, $p<.001$) and suburban (aRR 2.4, $p<.001$) were most likely to be interested in general use of a PHR.

Conclusion: Our study shows that some, but not all parents are ready for electronic (text message, e-mail, PHR) communications for their adolescents' healthcare, and that a parent age and socio-economic divide exists. Providing options in the means in which parents communicate with an adolescent's provider is ideal.

B. RCT: Adolescents were: male (66%), Black (66%) and publicly insured (80%). At the end of the study, 48% of phone intervention (40% of control), and 49% of text intervention (30% of control) adolescents had received 3 HPV vaccine doses. In multivariate survival analysis controlling for gender, age, practice, insurance, race and ethnicity, there was no significant difference in time from enrollment to receipt of 3rd HPV vaccine dose for those receiving a phone reminder compared to controls (hazard ratio [HR] 1.26, $p=.16$), but there was a significant difference in those receiving a text reminder compared to controls (HR 2.27, $p<.0001$)

Conclusion: Text message reminders for HPV vaccine completion for those who had already started the series were effective, whereas phone message reminders were not in this urban population of parents of adolescents.

C. Provider prompts: Analyses are in process.

6. List of Publications and Products:

[Electronic health record use and preventive counseling for US children and adolescents.](#)

Rand CM, Blumkin A, Szilagyi PG. *J Am Med Inform Assoc.* 2014 Feb;21(e1):e152-6. doi: 10.1136/amiajnl-2013-002260. Epub 2013 Sep 6.
PMID:24013091

Parent preferences for communicating with their adolescent's provider: a focus on vaccine reminders. Rand, CM, Blumkin, A, Vincelli, P, Katsetos, V, Szilagyi, PG. (Under review, *J. Adol Health*)

Effect of phone and text message reminders on completion of HPV vaccine series. Rand, CM, Vincelli, P, Goldstein, NP, Blumkin, A, Szilagyi, PG. Poster symposium, Pediatric Academic Societies' Meeting, San Diego, CA, April 26, 2015.

7. Educational Objectives

Objective 1: Learn health informatics theory, and be able to apply it to both clinical decision support for providers and self-management support for patients

Completed a Certificate in Health Informatics in 2012

Implemented a health informatics intervention using clinical decision support and patient self-management

Objective 2: Become expert in implementing and sustaining QI projects based in health information technology, and teach these skills to other healthcare providers

Completed coursework and workshop in QI

Designed and implemented educational intervention and provider prompt intervention

Objective 3: Skillfully implement qualitative research methods and develop advanced skills in the application of quantitative statistical methods

Completed coursework in Qualitative methods and applied to research project

Objective 4: Improve career skills by writing sound manuscripts and competitive grants, and networking with leaders in health IT, immunization delivery, QI and adolescent preventive health

Attended and presented at national meetings (PAS, NIC)

Prepared and submitted R21

Primary author on 2 publications from grant projects (with a 3rd in progress), collaborating author on 3 other immunization-related publications:

Szilagyi PG, Albertin C, Humiston SG, **Rand CM**, Schaffer S, Brill H, Stankaitis J, Yo BK, Blumkin A, Stokley S. A randomized trial of the effect of centralized reminder/recall on immunizations and preventive care visits for adolescents. *Acad Pediatr*. 2013 Jan 9.

Humiston SG, Serwint JR, Szilagyi PG, Vincelli PA, Dhepyasuwan N, **Rand CM**, Schaffer SJ, Blumkin AK, Curtis CR. Increasing adolescent immunization rates in primary care: strategies physicians use and would consider implementing. *Clin Pediatr* 2013 Aug;52(8):710-20.

Szilagyi PG, Serwint JR, Humiston SG, **Rand CM**, Schaffer S, Vincelli P, Dhepyasuwan N, Blumkin A, Albertin C, Curtis CR. Effect of provider prompts on adolescent immunization rates: a randomized trial. *Acad Pediatr*. 2015 Mar-Apr;15(2):149-57.

This work, combined with my career development activities, have enabled me to use HIT to perform QI research designed to provide better preventive care to underprivileged adolescents. This training and experience prepared me to submit an R21 application to NCI to explore the use of prompts via a patient portal to enhance HPV vaccine delivery, and to apply for a CDC partnership grant to improve HPV vaccination rates.

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