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Direct-to-adolescent text messaging for vaccine reminders: What will parents permit?

James R. Roberts^{a,*}, Kristen Morella^b, Erin H. Dawley^a, Christi A. Madden^c, Robert M. Jacobson^d, Charlene Pope^a, Boyd Davis^e, David Thompson^b, Elizabeth S. O'Brien^a, and Paul M. Darden^{a,c}

^aMedical University of South Carolina, Department of Pediatrics, 135 Rutledge Ave, MSC 561, Charleston, SC 29425, USA

^bMedical University of South Carolina, Department of Public Health Sciences, 20 Ehrhardt St, MSC 207, Charleston, SC 29425, USA

^cUniversity of Oklahoma Health Sciences Center, Department of Pediatrics, Section of General and Community Pediatrics, 1200 Children's Avenue, OUCPB Suite 12400, Oklahoma City, OK 73104, USA

^dDepartment of Pediatric and Adolescent Medicine, Mayo Clinic, Desk Ba3b, 200 First St SW, Rochester, MN 55905-0001, USA

^eApplied Linguistics/English, University of North Carolina Charlotte, Charlotte, NC 28223, USA

Abstract

Background: Direct-to-adolescent text messaging may be a consideration for vaccine reminders, including human papilloma virus (HPV), but no studies have explored the minimum age at which parents would allow adolescents to receive a text message.

Methods: We distributed a survey to parents of 10–17 year olds during any office visit in two practice based research networks in South Carolina and Oklahoma. We asked about parental preference for receiving vaccine reminders for their adolescent, whether they would allow the healthcare provider to directly message their adolescent, and if so, what would be the acceptable minimum age.

Results: In 546 surveys from 11 practices, parents of females were more supportive of direct-to-teen text message reminders than were parents of males, (75% v. 60%, $p < .001$). The median age at which parents would allow direct text messages from physicians' offices was 14 in females compared to 15 in males, $p = .049$. We found a correlation between the child's age and the youngest age at which parents would allow a direct text message. Of the parents who permitted a text message directly to their adolescent, most reported an allowable age higher than their adolescent's current age until the age of 15.

Conclusion: Our study suggests that direct-to-adolescent text messaging would be allowed by parents for older adolescents. This supports an intervention aimed at older adolescents, such as for

*Corresponding author. robertsj@musc.edu (J.R. Roberts).

receipt of MCV4 dose #2, delayed HPV vaccine series completion and annual influenza vaccination.

Keywords

Vaccines; Immunizations; Adolescent; Reminders; Text message

1. Introduction

Many adolescents do not get vaccinated on time, and as a result, remain under-immunized and at risk for vaccine preventable illness. All U.S. adolescents at 11 to 12 years of age should receive one dose of the quadrivalent meningococcal conjugate vaccine (MCV4), 1 dose of the tetanus-diphtheria-acellular pertussis (Tdap) vaccine, and, until December 2016, 3 doses of the human papillomavirus (HPV) vaccine [1–3]. At that time, the Advisory Committee on Immunization Practices of the Centers for Disease Control and Prevention (CDC) recommended a change to a 2-dose series for the HPV vaccine for immunocompetent adolescents who initiate the series between the ages of 9–14 years [4]. The HPV vaccine is not the only adolescent vaccine that has a subsequent dosing schedule. All adolescents are to receive a second dose of the MCV4 at 16 years of age [5]. All adolescents are to receive an influenza vaccine every year by the end of October [6].

The National Immunization Survey-Teen survey found that, among US adolescents 13–17 years of age in 2016, only 49.5% of females and 37.5% males had completed the 3-dose HPV series. When evaluating series completion by age, there is little change in the up-to-date (UTD) rates beyond 15 years. By age 17, 65.4% of all adolescents have started the series, but only 47.3% completed the series [7]. UTD rates for Tdap are 88% [7]. For the MCV4, while 83.5% of all adolescents receive the initial dose, only 39.1% received the second dose [7]. In 2016, only 28.7% of 13–17 year olds received a flu shot, compared to 45.0% of 6 month–4 year olds (Table 2 in <https://www.cdc.gov/flu/fluview/nifs-estimates-nov2016.htm#data> - accessed on 2/9/18).

Numerous barriers for adolescent vaccination have been identified. These include a lack of parental knowledge about the vaccine and a lack of awareness that their adolescent is due [8–15]. The lack of a provider recommendation was noted for the three primary adolescent vaccines (Tdap, MCV4, and HPV vaccine). In addition, between 13% and 17% of parents reported their opinion that vaccines were not necessary. Concerns about safety of the vaccine were reported specifically for HPV vaccine [15]. Another barrier specific to HPV vaccination rates is because the dose or doses were not received according to the recommended schedule [16,17].

A system of reminder and recall including text messaging may be useful in increasing rates for HPV vaccine completion, receipt of the second meningococcal vaccine, and annual influenza vaccination [18]. Adolescents increasingly use text messaging [19], which is also reported to be their preferred method to communicate for health concerns [20]. Parents also view this form of communication as beneficial for receiving vaccine reminders [21].

Text messaging has been studied for adolescent vaccine reminders and has demonstrated a modest improvement in rates for HPV UTD in girls [22–25]. However, these studies have focused on sending text message reminders to the parent but not to the adolescent. One study, which reported experience with texting adolescents about asthma care, examined 64 patients aged 12–22 years, with a mean age of 17; however the authors did not comment on whether they had difficulty recruiting adolescents or obtaining parental permission [26]. In 2006, Haller found in Australia that 97% of adolescents 16–24 years would consent to text messaging for clinical research [27].

Direct-to-adolescent messaging may be useful for vaccine reminders, but no studies have explored whether parents would allow their adolescents to receive text messages directly from medical providers. Nor have they studied the minimum age at which parents would permit direct text messaging. This study's objectives were to address these gaps in vaccination research by assessing parents' preferences about modalities for vaccine reminders (phone, text message, email, US mail), the acceptability of providers texting adolescents directly with vaccine reminders, and the minimum age at which parents would permit texting.

2. Methods

2.1. Survey development

We developed a survey instrument de novo to inquire about parents' opinions on preferred methods of provider communication with parents and their adolescent. The survey instrument, which is available from the authors on request, queried if both adolescents and parents had personal cell phones, and whether those phones could receive free text messages. We also asked about preferences for communication modalities (email, phone, text message, US mail), and whether they would prefer to receive reminders about the adolescent's upcoming immunizations. Parents were also asked whether they would permit direct messaging to their adolescent, and if so, the age at which the child could receive direct-to-adolescent messaging.

The survey was developed by the authors, and was pilot tested among a group of parents for clarity, and then revised based on their responses. The survey was translated into Spanish using a certified translator. We included a cover sheet with the survey containing a brief description of the study and assurances that the decision whether or not to participate was voluntary and would not affect the care the adolescent received at the practice. Although the introduction included medical terminology, raising the reading level for the rationale, the survey questions themselves were written at third grade level.

2.2. Setting

This study took place in pediatric practices that are active members in either the South Carolina Pediatric Practice Network (SCPPRN), located at the Medical University of South Carolina (MUSC), or the Oklahoma Child Research Health Network (OCHRN), which is affiliated with the University of Oklahoma (OU). Both Networks are socio-economically and racially/ethnically diverse. In SCPPRN, the range of Medicaid recipients among practices

ranges from 5% to 90%, and the range of Black race ranges from 5% to 84%. Four SCPPRN practices have at least 30% Hispanic patients. Likewise, OCHRN is similarly diverse. Sites vary from 4% to 97% Medicaid, 5% to 76% Hispanic, and 1% to 25% Black.

2.3. Survey distribution & collection

We distributed a survey to adults responsible for 10–17 year olds during any office visit (sick or well) in seven practices in SCPPRN and four practices in OCHRN. We refer hereafter to the responsible adults as parents. The front office staff members or triage nurses asked parents to complete the survey. We asked each practice to obtain 50 surveys. Parents of any adolescents age 10 to 17 were eligible to complete the survey, and we did not exclude parents based on gender, race, or language proficiency. We did not collect identifying information, nor did we provide incentives to complete the survey.

Staff in the research network practices collected the paper surveys from the parent and placed in an envelope for research staff to pick up. For the surveys located in the OCHRN, research staff scanned the surveys and uploaded to a secure connection between OU and MUSC.

2.4. Data analysis

Research staff entered survey information into the Research Electronic Data Capture (REDCAP) database, a secure, online system for management of survey data [28]. Data were exported from REDCAP to SAS version 9.4 (Cary, NC) for analysis. We calculated frequency distributions and descriptive statistics. We used chi-square tests to compare messaging preferences of parents of male and female adolescents. We used the median two-sample test to compare, by adolescent's gender, the minimum age at which parents would permit direct text messaging. All the tests were 2-sided, with $\alpha = .05$ and $P < .05$ considered statistically significant.

This study was approved by the Institutional Review Board (IRB) at the Medical University of South Carolina and the University of Oklahoma.

3. Results

We collected 546 surveys from 11 practices among the two practice based research networks (PBRNs). Table 1 lists the demographic variables of the sample. Table 2 lists parental responses about preferred communication methods from physicians about vaccines and vaccine reminders. Nearly all parents (95%) and most adolescents (65%) have a text-message enabled cell phone. Out of the 86% of respondents who would find a reminder about vaccines helpful, 67% would allow a text message sent directly to their adolescent from a physician's office. Out of the entire sample, 75% of parents of girls and 60% of parents of boys would allow direct messaging. More parents preferred text message reminders (70%) than any other type of reminders for vaccines ($p < .0001$).

Table 3 shows the parental responses about vaccine reminders and demographic factors stratified by adolescents' gender. Of note, parents of females were more permissive in allowing direct-to-teen text messaging from physicians' offices than males, (75% v. 60%, p

= .0009). The median age at which parents would allow their teen to get direct text messages from physicians' offices was 14 in females compared to 15 in males, $p = 0.049$.

Fig. 1 illustrates the cumulative distribution of the youngest age at which parents would permit adolescents to receive text messages directly from providers. Among parents of females, 75% would permit such direct messaging, compared to 60% of parents of males. The figure demonstrates the widening permissiveness among parents of girls. Insurance status and race were not related to the likelihood that parents would allow direct messaging to adolescents, nor to the type of messaging they would permit. The median minimum age when parents considered direct messaging to be acceptable (14 years for female, and 15 for male) did not differ among the subgroup of adolescents with text-enabled phones ($n = 347$).

Both age and sex were associated with whether a parent would allow their teen to receive a text message directly from the provider. For example, among those parents who would allow adolescents to receive a text, 6% indicated that they would permit direct text messaging to males or females as young as 11 years old. Ten percent of parents of females, and 6% of parents of males, specified 12 years as the youngest age at which they would permit direct messaging. On the other end of the age distribution, 24% of parents of males and 16% of parents of females stated that 16 years was the youngest age at which they would permit direct-to-adolescent text messages.

The age of the adolescent at the time of the visit was associated with the youngest age at which the parent would allow direct-to-adolescent text messaging. Fig. 2 demonstrates how the slope of the line increases through age 15 and then levels off. For parents of adolescents less than 15 years, the minimum age permitted for a direct text was higher than the adolescents' current age. This observational difference disappeared by age 15. For example, of parents with 10-year-old females, the mean age at which parents would allow direct text messaging was 13.1 years, whereas parents of 15-year-old females reported a mean age of 14.8 years. The allowable age for females was still lower than that for males.

4. Discussion

Text messaging appears to be an acceptable form of vaccine reminders for the majority of parents responding to our survey. Most parents were amenable to having medical providers contact their adolescent directly to remind them about upcoming immunizations. The minimum age is still higher than that when an adolescent might be due for the 2nd HPV vaccine, assuming they initiated the series by 11 years of age and the second dose was given on time. However, it would be acceptable for the 2nd dose of MCV4 and influenza vaccines.

There is a lot of unmet vaccine need in the older adolescent age groups. We have uncovered a tool that demonstrates a confluence at around age 15–17 where parents would permit providers to send text message reminders directly to their teens. Even with the HPV vaccine, UTD rates level off by 15 years, indicating that direct text messaging to the adolescent may address the need to communicate about vaccine delay. Direct messaging may also address the need to improve influenza vaccination rates in adolescents and to provide the second MCV4 at 16 years of age.

We recognize that adolescents under the age of 18 in many states, including South Carolina and Oklahoma, cannot consent on their own for the HPV vaccine [29–31]. Still, the fact that parents with older but still minor adolescents expressed a willingness to allow their children to be reminded directly when a dose of vaccine, whether it is HPV, MCV4, or other, is due, is a significant finding. We suspect that the parents would appreciate having their older adolescent children take an active role in participating in their own healthcare and perhaps reminding their parents that they need to go to their healthcare provider. This observation is just one way that healthcare providers caring for adolescents might consider involving adolescents in their own care.

While we were not surprised to see that the median age at which parents would allow direct messaging was 14 to 15 years, we were surprised to see that parents of females were more willing than parents of males to allow text messages. In addition, the slightly lower allowable age for females was also surprising. One possible explanation is that parents of females perceive them to be more mature at younger ages, and to be more willing to take a greater role in their own health. Ford and colleagues, in a survey of 91 parent-adolescent dyads, found adolescent girls to have a higher level of interest in receiving health information from their doctors compared to boys [32].

Text messaging has been studied to a limited extent and demonstrated a modest effect in delivering HPV vaccine to females. In the Kharbanda study, texting was conducted based on an “optin” method to parents and found an increase of on-time receipt of the subsequent vaccine dose of 51.6% compared to 35% for usual care [22]. Two newer studies evaluated larger patient populations with various forms of messaging. Rand et al. found a modest improvement for HPV dose 1 in some patients, but no difference by gender [25]. When Bar-Shain et al. used a combination of voice recorded telephone messages and text messages; they found that text messages and post cards correlated with more vaccination visits than phone calls. The authors found no differences in vaccine delivery by sex [24]. Other social media platforms are widely accepted for vaccine delivery interventions. Facebook, Twitter, and YouTube have all become more commonly used as a strategy in recruiting participants for vaccination studies and offer the possibility to increase vaccine uptake and immunization coverage across all demographic groups [33–35].

By providing preliminary evidence that parents would be receptive to pediatrics practices sending text messages directly to adolescents to remind them about vaccines, this study provides supporting evidence for the next wave of research on text messaging and other patient reminders. We attempted to enhance the study’s generalizability by conducting it in 11 practices in two demographically diverse PBRNs in two different states. We obtained a broad sample of participants, including Medicaid and non-Medicaid recipients, rural and urban residents, and Spanish as well as English speaking families. To our knowledge, these findings are the first that identify an acceptable age at which parents would allow a vaccine reminder to be sent directly to their child from a health care provider. Future randomized controlled trials of the effects of text messaging on series completion should be powered to evaluate the possible differences between genders.

There are some limitations in this study. It is cross-sectional, and selection of patients was not random. We used convenience sampling, although it still provides hypothesis-generating data. Given the complexity of collecting data in multiple practices at the same time, and to ensure we did not interrupt patient flow, we did not ask the practice's front office staff members or triage nurses to record refusals. Some parents or legal guardians accepted the receipt of the survey but some did not return the survey completed. Tracking who received a survey but did not complete it would require substantial, additional effort including the collection of personal identifying information to link the survey to the patient, which was not practical in the context of multiple practice participation in these two networks. We did not obtain parents gender. Given the age of when the sampling occurred, parents may have been biased towards that as being the minimum age they would allow; we attempted to account for this possible bias in the analysis. Finally, the nature of text messaging is a rapidly changing phenomenon. At the time of the study, 65% of adolescents had a cell phone with text messaging capability and this number has already likely increased since the time of this survey.

5. Conclusions

Parents largely approve of direct messaging of adolescents by providers, and express a clear preference for text messaging over other communication modalities for vaccine reminders. Direct-to-adolescent text messaging would be allowed for older adolescents. Parents were more likely to allow text messaging to their daughters earlier than to their sons. The age at which they would allow the text message reminders would appear to support an intervention directed at older adolescents. This finding supports an intervention aimed at older adolescents to help solve the problems of poor rates of receipt MCV4 dose #2 and low annual influenza vaccine coverage. It may also be useful for those who initiate HPV vaccine but fail to complete the series on time.

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References

- [1]. Markowitz LE, Dunne EF, Saraiya M, et al. Quadrivalent human papillomavirus vaccine: recommendations of the Advisory Committee On Immunization Practices (ACIP). *MMWR Recomm Rep* 2007;56:1–24.
- [2]. Bilukha OO, Rosenstein N. National center for infectious diseases Centers for Disease Control and Prevention. Prevention and control of meningococcal disease. Recommendations of the Advisory Committee On Immunization Practices (ACIP). *MMWR Recommendations Rep: Morbidity Mortality Weekly Rep Recommendations Rep/Centers Dis Control* 2005;54:1–21.
- [3]. Broder KR, Cortese MM, Iskander JK, et al. Preventing tetanus, diphtheria, and pertussis among adolescents: use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccines recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recommendations Rep: Morbidity Mortality Weekly Rep Recommendations Rep/Centers Dis Control* 2006;55:1–34.

- [4]. Meites E, Kempe A, Markowitz LE. Use of a 2-dose schedule for human papillomavirus vaccination - updated recommendations of the advisory committee on immunization practices. *MMWR Morb Mortal Wkly Rep*. 2016;65:1405–8. [PubMed: 27977643]
- [5]. Centers for Disease Control and Prevention. Updated recommendations for use of meningococcal conjugate vaccines - Advisory Committee on Immunization Practices (ACIP), 2010. *MMWR*. 2011;60:72–6. [PubMed: 21270745]
- [6]. Grohskopf LA, Sokolow LZ, Broder KR, et al. Prevention and control of seasonal influenza with vaccines: recommendations of the Advisory Committee on Immunization Practices - United States, 2017–18 influenza season. *MMWR Recommendations Rep: Morbidity Mortality Weekly Rep Recommendations Rep/Centers Dis Control* 2017;66:1–20.
- [7]. Walker TY, Elam-Evans LD, Singleton JA, et al. National, regional, state, and selected local area vaccination coverage among adolescents aged 13–17 years - United States, 2016. *MMWR Morbidity Mortality Weekly Rep* 2017;66:874–82.
- [8]. Brabin L, Greenberg DP, Hessel L, Hyer R, Ivanoff B, Van Damme P. Current issues in adolescent immunization. *Vaccine*. 2008;26:4120–34. [PubMed: 18617295]
- [9]. Chao C, Slezak JM, Coleman KJ, Jacobsen SJ. Papanicolaou screening behavior in mothers and human papillomavirus vaccine uptake in adolescent girls. *Am J Publ Health* 2009;99:1137–42.
- [10]. Daley MF, Curtis CR, Pyrzanowski J, et al. Adolescent immunization delivery in school-based health centers: a national survey. *J Adolescent Health: Off Publ Soc Adolescent Med* 2009;45:445–52.
- [11]. Kempe A, Beaty BL, Steiner JF, et al. The regional immunization registry as a public health tool for improving clinical practice and guiding immunization delivery policy. *Am. J. Publ. Health* 2004;94:967–72.
- [12]. Oster NV, McPhillips-Tangum CA, Averhoff F, Howell K. Barriers to adolescent immunization: a survey of family physicians and pediatricians. *J Am Board Family Pract/Am Board Family Pract* 2005;18:13–9.
- [13]. Schaffer SJ, Humiston SG, Shone LP, Averhoff FM, Szilagyi PG. Adolescent immunization practices: a national survey of US physicians. *Arch Pediatr Adolescent Med* 2001;155:566–71.
- [14]. Stretch R, Roberts SA, McCann R, et al. Parental attitudes and information needs in an adolescent HPV vaccination programme. *Br J Cancer* 2008;99:1908–11. [PubMed: 18985038]
- [15]. Darden PM, Thompson DM, Roberts JR, et al. Reasons for not vaccinating adolescents: National Immunization Survey of Teens, 2008–2010. *Pediatrics* 2013;131:645–51. [PubMed: 23509163]
- [16]. Dorell CG, Stokley S, Yankey D, Markowitz LE. Compliance with recommended dosing intervals for HPV vaccination among females, 13–17 years, National Immunization Survey-Teen, 2008–2009. *Vaccine* 2012;30:503–5. [PubMed: 22119587]
- [17]. Tan W, Viera AJ, Rowe-West B, Grimshaw A, Quinn B, Walter EB. The HPV vaccine: are dosing recommendations being followed? *Vaccine* 2011;29:2548–54. [PubMed: 21300098]
- [18]. Nordin JD, Solberg LI, Parker ED. Adolescent primary care visit patterns. *Ann Fam Med* 2010;8:511–6. [PubMed: 21060121]
- [19]. Pierce T. Social anxiety and technology: face-to-face communication versus technological communication among teens. *Comput Hum Behav* 2009;25:1367–72.
- [20]. Buhi ER, Klinkenberger N, Hughes S, Blunt HD, Rietmeijer C. Teens' use of digital technologies and preferences for receiving STD prevention and sexual health promotion messages: implications for the next generation of intervention initiatives. *Sex Transm Dis* 2013;40:52–4. [PubMed: 23250302]
- [21]. Ahlers-Schmidt CR, Chesser AK, Paschal AM, et al. Parent opinions about use of text messaging for immunization reminders. *J Med Internet Res* 2012;14:e83. [PubMed: 22683920]
- [22]. Kharbanda EO, Stockwell MS, Fox HW, Andres R, Lara M, Rickert VI. Text message reminders to promote human papillomavirus vaccination. *Vaccine* 2011;29:2537–41. [PubMed: 21300094]
- [23]. Stockwell MS, Kharbanda EO, Martinez RA, et al. Text4Health: impact of text message reminder-recalls for pediatric and adolescent immunizations. *Am J Publ Health* 2012;102:e15–21.

- [24]. Bar-Shain DS, Stager MM, Runkle AP, Leon JB, Kaelber DC. Direct messaging to parents/guardians to improve adolescent immunizations. *J Adolescent Health: Off Publ Soc Adolescent Med* 2015;56:S21–6.
- [25]. Rand CM, Blumkin A, Vincelli P, Katsetos V, Szilagyi PG. Parent preferences for communicating with their adolescent's provider using new technologies. *J Adolescent Health: Off Publ Soc Adolescent Med* 2015;57:299–304.
- [26]. Britto MT, Rohan JM, Dodds CM, Byczkowski TL. A randomized trial of user-controlled text messaging to improve asthma outcomes. *Clin Pediatr* 2017;9922816684857.
- [27]. Haller D, Sanci L, Sawyer S, Coffey C, Patton G. R U OK 2 TXT 4 RESEARCH?—feasibility of text message communication in primary care research. *Aust Family Phys* 2006;35:175–6.
- [28]. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009;42:377–81. [PubMed: 18929686]
- [29]. Farrell RM, Rome ES. Adolescents' access and consent to the human papillomavirus vaccine: a critical aspect for immunization success. *Pediatrics* 2007;120:434–7. [PubMed: 17671069]
- [30]. Chen DT, Shepherd L, Becker DM. The HPV vaccine and parental consent. *The Virtual Mentor: VM* 2012;14:5–12. [PubMed: 23116909]
- [31]. Ford CA, Skiles MP, English A, et al. Minor consent and delivery of adolescent vaccines. *J Adolescent Health: Off Publ Soc Adolescent Med* 2014;54:183–9.
- [32]. Ford CA, Cheek C, Culhane J, et al. Parent and adolescent interest in receiving adolescent health communication information from primary care clinicians. *J Adolescent Health: Off Publ Soc Adolescent Med* 2016;59:154–61.
- [33]. Das R, Machalek DA, Molesworth EG, Garland SM. Using facebook to recruit young australian men into a cross-sectional human papillomavirus study. *J Med Internet Res* 2017;19:e389. [PubMed: 29150417]
- [34]. Odone A, Ferrari A, Spagnoli F, et al. Effectiveness of interventions that apply new media to improve vaccine uptake and vaccine coverage. *Hum Vaccines Immunother* 2015;11:72–82.
- [35]. Quach S, Pereira JA, Russell ML, et al. The good, bad, and ugly of online recruitment of parents for health-related focus groups: lessons learned. *J Med Internet Res* 2013;15:e250. [PubMed: 24231040]

Fig. 1.
Youngest age that parent would allow physician's office to send text message directly to their child.

Fig. 2. Comparison between the age of the child brought to the Clinic/Practice and the youngest age that parent would allow physician's office to send text message directly to their child.

Table 1

Demographic characteristics of sample.

Variable	Total (n = 546)	Male (n = 289; 53%)	Female (n = 257; 47%)	p-value
Child's age				
10	13%	11%	16%	0.3999
11	14%	15%	13%	
12	16%	18%	12%	
13	16%	17%	15%	
14	13%	13%	13%	0.158
15	11%	11%	11%	
16	9%	9%	10%	
17	9%	8%	10%	
Parent's education				
Some High School	17%	18%	16%	0.153
High School Graduate	27%	26%	27%	
Some College	27%	23%	31%	
College Graduate or Beyond	30%	33%	26%	
Insurance				
Medicaid	62%	57%	66%	0.153
Private	27%	31%	23%	
Other *	11%	12%	11%	
Race/ethnicity				
White	49%	49%	52%	0.627
Black	17%	18%	16%	
Hispanic	28%	29%	26%	
Other	6%	5%	5%	

* Includes Tricare, Self-pay, or "other insurance".

Table 2

Parental responses about preferred communication methods from physician about vaccines and vaccine reminders.

Parental responses and preferences	% Yes (95% CI) *	N
Do you have a smart phone that receives text messages?	95% (93–97%)	n = 544
Does your teen have a smart phone that is able to receive text messages?	65% (61–69%)	n = 536
Assuming you and your teen can receive text messages, do you have to pay to receive text messages?	18% (15–22%)	n = 528
Would a reminder from your teen's physician about an upcoming vaccine be helpful to you and your family?	86% (83–89%)	n = 545
Would you be willing to receive reminders about vaccines that were past due?	97% (95–98%)	n = 411
Parent's preferred communication modalities		
Which method of communication would you prefer your teen's physician to use to send vaccine reminders to you?	70% (64–75%) Text ** 19% (15–24%) Phone 10% (6–13%) Email 1% (0–4%) US Mail	n = 463

* Exact binomial confidence intervals.

** p value < .0001 using chi-square.

Table 3
Parental responses about vaccine reminders and demographic factors compared by gender of adolescent.

Parental response	Female (95% CI) ¹	Male (95% CI) ¹	N ²
Percent reporting that any type of reminder about upcoming vaccines would be helpful	90% (85–93)	84% ³ (79–88)	522
Percent whose adolescent has cell phone that can receive texts	69% (62–74)	62% (55–68)	513
Percent who would allow text messaging directly to their teen from physician’s office	75% (68–80)	60% (53–66) ³	444
Median age (in years) that direct text messaging would be allowed (among those whose parent allowed direct text messaging)	14	15 ⁴	298
Percent of adolescents covered by Medicaid	66% (59–72)	57% (51–63)	495

¹Exact binomial confidence intervals.
²N varies; as based on answers to some questions, parent would skip the next question.
³p < .0009.
⁴p = .049.