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RESEARCH ARTICLE

Addressing Parents' Vaccine Concerns: A Randomized Trial of a Social Media Intervention

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Introduction: Successful strategies are needed to address parental vaccine hesitancy, a significant public health issue. The study objective was to assess whether an Internet-based platform with vaccine information and interactive social media components improved parents' vaccine-related attitudes.

Study design: A three-arm RCT.

Setting/participants: The study was conducted in a large Colorado integrated healthcare organization. Parents were enrolled during September 2013 through October 2015 and followed through November 2016; data were analyzed in 2017. Parents, recruited during pregnancy, were given a survey about vaccine-related attitudes at enrollment (i.e., baseline) and when their child was aged 3–5 months and 12–15 months (Timepoints 1 and 2, respectively). Parental vaccine hesitancy was assessed at baseline.

Intervention: Study participants were randomized to the following: a study website with vaccine information and social media components (VSM arm); a website with vaccine information only (VI); or usual care.

Main outcome measures: Change in parental vaccine attitudes over time by baseline degree of vaccine hesitancy.

Results: Among 1,093 study participants, 945 (86.5%) completed all three surveys. Comparing baseline with Timepoint 1 among vaccine-hesitant parents, the VSM and VI arms were associated with significant improvements in attitudes regarding vaccination benefits compared to usual care (VSM mean change 0.23 on a 5-point scale, 95% CI=0.05, 0.40, VI mean change 0.22, 95% CI=0.04, 0.40). Comparing baseline with Timepoint 2 among hesitant parents, the VSM and VI arms were also associated with significant reductions in parental concerns about vaccination risks compared to usual care (VSM mean change −0.37, 95% CI= −0.60, −0.14, VI mean change −0.31, 95% CI= −0.55, −0.07). Self-efficacy around vaccine decision making also improved among vaccine-hesitant parents. No intervention effect was observed among parents not vaccine-hesitant at baseline.

Conclusions: Among vaccine-hesitant parents, an Internet-based intervention improved parents' attitudes about vaccines.

Trial registration: This study was registered at www.clinicaltrials.gov NCT01873040.

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INTRODUCTION

Although immunization coverage remains high nationally,[1,2] parental vaccine hesitancy[3] is a significant public health concern in the U.S.[4] and globally.[5] An estimated 0.8% of children aged 19–35 months in the U.S. are completely unimmunized,[1] 10% to

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20% of parents report having refused or delayed one or more vaccines,[4,6,7] and even higher proportions of parents report concerns about vaccines.[7,8] Children whose parents have refused vaccines are at increased risk of vaccine-preventable diseases[9–11] and contribute to community disease outbreaks.[12]

Developing strategies to reduce parental vaccine hesitancy is a challenging task, because the phenomenon is complex and evolving.[13,14] Seemingly sensible approaches may even have a negative effect: Nyhan and colleagues[15] found that presenting a dramatic narrative about measles or showing pictures of children with vaccine-preventable diseases increased parental misperceptions about the measles, mumps, rubella (MMR) vaccine. Several systematic reviews of interventions targeting vaccine hesitancy were recently published. The review authors concluded that although parent-focused educational interventions may improve parents' attitudes toward vaccination, the strength of evidence was relatively poor, and additional well-designed studies of novel interventions were needed.[14,16,17]

Using Internet-based interventions to address parents' vaccine concerns may be a constructive strategy. Parents often seek vaccine information on the Internet.[18,19] Additionally, Internet-based interventions can be delivered outside the confines of routine well-child visits. This may be important because some parents have begun considering vaccine-related decisions well before the 2-month well-child visit,[20,21] and providers report insufficient time during well-child visits to adequately address parents' vaccine concerns.[22] Internet-based decisions aids were shown to improve attitudes about MMR vaccination in England, Australia, and New Zealand,[23,24] but little is known about Internet-based interventions in the U.S., particularly the use of social media to engage with parents regarding early childhood vaccination. The objective of the current study is to assess whether an Internet-based platform with vaccine information and interactive social media components improved parents' vaccine-related attitudes.

METHODS

During September 2013 through November 2016, an Internet-based platform of vaccine-related content was developed and tested in a single-site RCT. Results for the primary study outcome of vaccination timeliness are presented elsewhere.[25] The intervention was delivered during pregnancy and early childhood, and the study assessed whether parents exposed to the intervention had a greater change in their vaccine-related attitudes and beliefs compared to parents receiving usual care. Parental attitudes and beliefs were assessed at three timepoints: when recruited during pregnancy, when their child was aged 3–5 months, and when their child was aged 12–15 months. The human subjects research review board at Kaiser Permanente Colorado (KPCO) reviewed and approved the study.

Study Population

The study was conducted at KPCO, a large integrated healthcare organization with ≅628,000 members. Each year, KPCO provides care to roughly 5,000 pregnant women and 130,000 children aged <18 years. Pediatricians, family physicians, and physician assistants provide routine pediatric care, with most children seen by pediatricians.

Study participants were recruited during September 2013 through October 2015 and followed through November 2016. To begin the recruitment process, electronic health record data were used to identify pregnant women in the third trimester of pregnancy. Women were considered study-eligible if they were aged ≥18 years, spoke English, had Internet access, and had health insurance through KPCO. Women were ineligible if they had a diagnosis of fetal demise, miscarriage, or congenital anomaly. Study-eligible women were recruited using a combination of letters, postcards, e-mails, and telephone calls. Informed consent was obtained online using a secure encrypted program.

Participants were randomized to one of three study arms: a vaccine social media (VSM) arm that received access to a website with vaccine information as well as interactive social media components, a vaccine information (VI) arm that had access to a website with vaccine information but without social media components, and a usual care arm. Participants were given a baseline survey at the time of study enrollment. As part of the baseline survey, participants were administered the Parent Attitudes and Childhood Vaccines (PACV) screener, a validated 15-item questionnaire assessing vaccine hesitancy on a scale from 0 to 100.[26,27] Consistent with prior studies, participants with a PACV score ≥50 were classified as vaccine hesitant, whereas those with a score <50 were considered non-hesitant.[26,27] To ensure a balance of vaccine hesitancy across study arms, randomization was conducted independently among hesitant and non-hesitant parents. A randomization allocation ratio of 3:2:1 was used across the VSM:VI:usual care study arms, respectively. Although an unequal randomization allocation ratio reduces statistical power,[28,29] this allocation approach was taken to ensure that the VSM arm was of sufficient size to generate social media interactions among participants. SAS/STAT Proc Plan, version 9.2, was used to generate random allocation sequence lists, with randomization performed by an unblinded statistician. Given the nature of the intervention, the participants and study team were not blinded to study arm assignment.

Measures

The multidirectional communication model[30] served as the theoretic basis for the Internet-based social media intervention,[25,31] and consisted of three components. Component one was a top-down process in which the study team developed and presented content to users on the study website. Component two was a bottom-up process that allowed website users to create content and interact with the study team. Component three was a side-to-side process in which website users could interact with each other and share information. This model is designed to empower users by allowing them to become active, engaged participants in the communication process, a process thought to