



Electronic reminders for cancer prevention: Factors associated with preference for automated voice reminders or text messages[☆]

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ABSTRACT

Objective. Prompting may promote engagement with behavior change interventions. Prompts can be delivered inexpensively via automated voice response (AVR) reminders or short message service (SMS) text messages. We examined the association between participants' characteristics and preferred reminder modality.

Methods. Healthy Directions 2 is a cluster randomized controlled trial implemented in Boston, Massachusetts to promote change in multiple behavioral cancer risk factors. At baseline (2009), participants completed a survey assessing socio-demographics, health status, height/weight, and factors associated with technology. One-third of participants randomized to receive the intervention ($n = 598$) were randomized to receive automated reminders, with participants selecting modality.

Results. 28% (167/598) of participants selected SMS reminders. Controlling for clustering by primary care provider, younger participants ($OR = 0.97$, 95% $CI = (0.95, 0.99)$, $p < 0.01$), those most comfortable with computers (very uncomfortable $OR = 0.54$, 95% $CI = (0.29, 1.01)$, $p \leq 0.05$; referent group = very comfortable), and those who frequently sent/received text messages (never $OR = 0.09$ $CI = (0.04, 0.16)$ $p < 0.01$; 1–3 times/month $OR = 0.38$, 95% $CI = (0.15, 0.93)$ $p = 0.04$; referent group = 1–5 times/week) were more likely to choose SMS.

Conclusions. Interventions should make both modalities available to ensure that more participants can benefit from prompting. Studies examining the effect of automated reminders may have reduced effectiveness or generalizability if they employ only one modality.

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Introduction

Escalating healthcare costs have placed greater emphasis on prevention and encouraging patient activation regarding healthful lifestyle choices and decisions (Honore et al., 2011; Koh and Sebelius, 2010). Given that most patients seen in the primary care setting have more than one behavioral risk factor (Pronk et al., 2004), this setting is an important venue in which to promote behavior change.

eHealth, as defined by the World Health Organization (2012) is “the use of information and communication technologies (ICT) for health”, while mHealth, a subset of eHealth, is defined by U.S. Health Resources and Service Administration (HRSA) (2012) as “the

use of mobile and wireless devices to improve health outcomes, health care services, and health research”. Both can bring behavior change interventions to people who have access to some technology, such as a telephone or a smartphone, but do not have access to a computer. Furthermore, self-guided and e- and mHealth interventions may be more economical to implement at the population level than those involving person-delivered components: however, interventions must be well utilized to lead to population-level health improvement. Active intervention engagement is associated with greater behavior change, and there is concern about the relatively low use of web-based interventions (Bennett and Glasgow, 2009; Leslie et al., 2005). Email and telephone contact may promote return visits to websites (Brouwer et al., 2011). Prompting may also help initiate (Fry and Neff, 2009) and maintain (Fjeldsoe et al., 2011) behavior change efforts.

In the U.S., just 2.4% of households do not have telephone access (U.S. Census, 2000), and recent data indicate that 87% of adults own a cell phone, and 46% have smartphones (Smith, 2012) making

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automated voice response (AVR) messages and short message service (SMS) text messages inexpensive and readily available modalities to deliver automated reminders to prompt behavioral action. SMS are brief written messages transmitted to cell phones, and AVR are automated telephone calls; both are easy to implement and to tailor. Research examining the use of reminders to promote behavior change is promising (Fry and Neff, 2009), but to our knowledge no research has been conducted discerning what reminder modality people prefer or what characteristics are associated with preferred modality. These questions must be answered to ensure that offered options meet the needs of the audience and to understand the impact of reminders. Thus, we examined the relationship of socio-demographics, health status, and factors associated with technology use and selected reminder modality.

Methods

Study design

Healthy Directions 2 (HD2) was a cluster randomized controlled trial of a multiple risk behavior intervention conducted in two urban health centers in the Boston area. Briefly, HD2 had three arms: 1) usual care; 2) HD2 intervention materials, delivered via print or web; or 3) HD2 intervention materials plus coaching calls. Randomization occurred at the primary care provider (PCP) level. The intervention was designed to simultaneously target physical activity, fruit and vegetable intake, red meat consumption, multi-vitamin use, and smoking. One-third of intervention participants from both intervention arms ($n=598$) were randomized to receive electronic reminders designed to increase intervention engagement.

Recruitment

Patients with scheduled well visit appointments who were aged 18+, spoke English, had not undergone cancer therapy within the past year, and did not have a diagnosis of dementia, neurodegenerative disorder, or major psychiatric condition within the past 5 years were sent a letter introducing the study. Recruitment occurred onsite during the patient's appointment, with HD2 staff confirming participant interest. Interested individuals provided informed consent, and participants randomized to receive electronic reminders selected preferred modality after study staff described both modalities and let participants know that they would receive a reminder every other week during the 6-month intervention. This study was approved by the IRB at Harvard Pilgrim Health Care. This present analysis is limited to intervention participants randomized to receive reminders.

Data collection and measures

In 2009, participants completed a self-administered baseline survey that included the following:

Socio-demographics: Participants reported race/ethnicity, education, marital/partner status, and household financial situation (range: cannot make ends meet to comfortable with some extras).

Health and weight status: Participants reported self-perceived health using the one-item assessment from the Medical Outcomes Study Short-Form (range: poor to excellent) (Ware and Sherbourne, 1992). They also reported their height and weight, which were used to calculate body mass index (BMI).

Factors associated with technology use: Participants reported if they had a cell phone (yes, no), and their comfort-level using computers (range: very uncomfortable to very comfortable). Frequency of internet use (range: never to 5+ times/week) and sending/receiving SMS (range: never to 2+ times/day) were assessed using items from the Health Information National Trends Survey (HINTS), a cross-sectional survey of health communication among U.S. adults (Nelson et al., 2004).

Data analysis

This was a cluster randomized study with the primary sampling unit (cluster) being the PCP and the secondary sampling unit being the patient. Analyses were weighted ($n=9695$) to account for clustering by PCP. Samples obtained within each PCP were weighted up to the overall panel size of the PCP without accounting for demographic characteristics. We calculated descriptive

statistics for key variables, and then conducted bivariate analyses to examine the associations between all predictor variables and selected reminder modality. Variables significant at $p<0.10$ in the bivariate analyses were included in the multivariable logistic regression models examining selected intervention modality. A series of multivariable models were created with variables being excluded based on their bivariate significance until we arrived at the final parsimonious model. Analyses were conducted using SUDAAN 9.01 and SAS 9.1 statistical software accounting for the cluster design. Weighted, cluster-adjusted results are presented in the Results section and in Table 1.

Results

The sample was 59.3% female, had a mean age of 50.8 years ($SE=0.58$), and was racially/ethnically diverse, with 44.5% identifying as non-white (Table 1). Over half of participants reported having a college degree and most were comfortable using computers. Almost all owned a cell phone, and about one-third reported sending or receiving SMS 5+ times a week, although 38.9% reported never doing so.

Factors associated with selected modality

Twenty-eight percent of participants elected for SMS reminders, and 72% selected AVR reminders. In the bivariate analyses, age, computer comfort, frequency of internet use and frequency of sending/receiving SMS were associated with selection of reminder modality (Table 1). In the final multivariable logistic model, age [$\beta=-0.03$, $OR=0.97$, 95% $CI=(0.95, 0.99)$, $p<0.01$], computer comfort [very uncomfortable $\beta=-0.61$, $OR=0.54$, 95% $CI=(0.29, 1.01)$, $p\leq 0.05$ referent group = very comfortable], and frequency of sending/receiving SMS [never $\beta=-2.46$, $OR=0.09$, 95% $CI=(0.04, 0.16)$, $p<0.01$; 1–3 times/month $\beta=-0.970$, 95% $OR=0.38$, 95% $CI=(0.15, 0.93)$, $p=0.04$ referent group = 1–5 times/week] were associated with modality selection. Participants selecting SMS reminders were younger [mean age = 41.8 years ($SE=0.91$) vs. 54.2 years ($SE=0.66$)], more comfortable with computers, and/or sent or received SMS more often than participants opting for AVR. There were no significant interactions between age and computer comfort, or between age and frequency of sending/receiving SMS.

Discussion

Fewer than one-third of participants chose SMS over AVR as a prompting modality. To our knowledge, this is the first study to examine the association between participant-level factors and preferred reminder modality. Predictors of SMS preference included younger age, computer comfort, and use of SMS. The lack of association between perceived health or weight status and selected modality suggests that these technologies could be widely used across a range of interventions, and that the use of multiple modalities may be advantageous to maximize reach. Study limitations include a sample limited to patients with the ability to read and write English; the majority was well educated. However, the sample was relatively large racially/ethnically diverse.

Conclusion

Providing participants with an opportunity to self-select prompting modality may promote intervention engagement. Limiting reminders to AVR may inhibit intervention engagement by younger individuals and those who are more technologically savvy, as evidenced by frequency of sending/receiving SMS. Conversely, limiting reminders to SMS could preclude older individuals who are not adept with SMS. Both options should be offered to benefit as many individuals as possible.

Conflict of interest statement

The authors declare there are no conflicts of interest.

Table 1

Description of the Healthy Directions 2 (HD2) participants receiving electronic reminders, Boston, MA in 2009, and the bivariate and final multivariate models predicting selection of SMS^a reminders (sample n = 598, weighted sample^b n = 9695).

Socio-demographic characteristics	Sample	Analyses examining reminder selection	
		Bivariate analyses, OR (95% CI)	Final multivariate model, OR (95% CI)
Age (years) mean (SE ^c)	50.8 (0.58)	0.93 (0.92, 0.95) ***	0.97 (0.95, 0.99) ***
	Percent		
Sex			
Female	59.3	0.78 (0.54, 1.13)	
Male	40.6	1.00 (Referent)	
Race/Ethnicity			
Black	28.8	1.04 (0.67, 1.61)	
White	55.5	1.00 (Referent)	
Hispanic/Latino	8.4	1.50 (0.89, 2.55)	
Other (includes multiracial, Asian)	7.3	1.46 (0.71, 3.02)	
Education			
<High school	4.2	0.64 (0.30, 1.35)	
High school graduate/GED	12.4	0.63 (0.37, 1.08)	
Some college/2 year degree	22.5	1.15 (0.83, 1.59)	
≥ College degree	61.0	1.00 (Referent)	
Married or living with a partner			
Yes	65.4	1.00 (Referent)	
No	34.6	1.14 (0.72, 1.79)	
Household financial status			
Comfortable with some extras	46.4	1.09 (0.70, 1.68)	
Enough, no extras	27.9	0.97 (0.51, 1.83)	
Have to cut back	20.3	1.00 (Referent)	
Cannot make ends meet	5.5	0.67 (0.34, 1.33)	
Health status			
Perceived health			
Excellent/very good	53.5	1.00 (0.69, 1.45)	
Good	35.2	1.00 (Referent)	
Fair/poor	11.3	1.16 (0.59, 2.28)	
Weight status			
Healthy weight/underweight (<25.0 kg/m ²)	33.7	0.76 (0.47, 1.25)	
Overweight (25.0–29.9 kg/m ²)	33.5	1.20 (0.79, 1.83)	
Obese (30 + kg/m ²)	32.8	1.00 (Referent)	
Factors associated with technology use			
Frequency of internet use		***	
Never/1–3 times a month	12.6	0.20 (0.08, 0.51) **	
1–4 times/week	15.9	0.51 (0.32, 0.83) **	
5 + times/week	71.5	1.00 (Referent)	
Comfort-level with computers		***	**
Very uncomfortable	12.9	0.39 (0.21, 0.73) ***	0.54 (0.29, 1.01)*
Uncomfortable	6.9	0.20 (0.07, 0.58) ***	0.43 (0.12, 1.56)
Comfortable	27.1	0.80 (0.54, 1.20)	1.35 (0.80, 2.29)
Very comfortable	53.2	1.00 (Referent)	1.00 (Referent)
Frequency send/receive SMS messages		***	***
Never	38.9	0.06 (0.03, 0.11)***	0.09 (0.04, 0.16)***
1–3 times per month	14.9	0.30 (0.13, 0.72)**	0.38 (0.15, 0.93)**
1–5 times a week	13.8	1.00 (Referent)	1.00 (Referent)
5 + times/week	32.4	1.53 (0.82, 2.84)	1.36 (0.72, 2.55)

Note: Due to rounding, percent totals may not equal 100.

^aSMS = short message service.

^bAll analyses were weighted (n = 9695) due to study's cluster design with the primary sampling unit (cluster) being the primary care provider (PCP) and the secondary sampling unit being the patient.

^cSE = standard error of the mean.

* denotes p ≤ 0.05.

** denotes p < 0.05

*** denotes p ≤ 0.01.

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