Original Article

EndCancer: development and pilot testing of multimedia recruitment for a text message campaign to increase cancer screening

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Background: Colorectal cancer (CRC) is the second leading cause of cancer mortality in the US but is preventable with timely colonoscopy screening. Although CRC incidence and mortality have been decreasing and screening rates increasing, southeastern Coloradans in particular remain in great need of CRC screening. Media outreach campaigns have previously proven successful in this region, and local clinical partners expressed interest in text messaging and social media community outreach.

Methods: The Colorado Cancer Screening Program partnered with the Colorado Cancer Coalition and two community health centers to develop theory-based text messages to encourage cancer screening behavior. Participants were recruited into this text message program through 4 weeks of radio advertisements, locally-posted flyers, and 12 weeks of social media messaging asking community members to text a key word or enter their phone number online to receive additional information about cancer screening.

Results: Facebook advertisement proved to be the most successful in engaging community members in the outreach campaign with over 22,600 exposed to ads. Radio and print advertisements were less successful than previous campaigns suggested. Theory-based text messages were effective in maintaining interest in the topic of cancer screening. Ninety-six percent of text message participants remained enrolled through receipt of all CRC messages.

Conclusions: The EndCancer campaign provides evidence of strategies that can be used to reach hard-to-reach and hard-to-screen populations in need of CRC screening. Engagement was high with Facebook ads, and those who viewed ads clicked through to the sign-up page, an indication of intent to enroll. Given the promising results of engagement with Facebook ads among the target demographic, social media marketing may prove a successful avenue to enroll hard-to-reach populations into cancer screening educational initiatives.

Keywords: Texting; cancer screening; rural communities; social media

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Introduction

Colorectal cancer (CRC) is the second leading cause of cancer mortality in the United States, but it is preventable with timely screening (1). Screening average risk individuals starting at age 50 increases survivorship and decreases late stage diagnosis (2). Although CRC incidence and mortality have been decreasing and screening rates increasing, the incidence rate in Colorado remains at 34.1 cases per 100,000 people (3). In an effort to increase awareness and screening rates, the American Cancer Society spearheaded an initiative known as 80% by 2018 with a goal to increase screening rates across the United States to 80% by the end of 2018. Despite Medicaid expansion through the Affordable Care Act increasing access to low or no-cost colonoscopies for medically underserved Coloradans, Colorado's CRC screening rates among the Medicaid population remain near 55% (4).

Within Colorado, rural communities have lower screening rates than the state average, with particularly low screening rates, high CRC incidence, and high CRC mortality in the rural southeastern Colorado (5). This region, locally known as the Arkansas Valley and San Luis Valley, has a higher percentage of their residents living in poverty (2), has a large Hispanic population (4), and faces disparities in CRC incidence and mortality as compared to the rest of the state. Community clinic data suggest community members place a low priority on preventive health services and those newly insured are not seeking preventive care (6). The Colorado Cancer Screening Program and the Colorado Cancer Coalition saw a significant need for an educational outreach campaign to collaborate with community clinics and address the low screening rates via a pilot innovative text-message and social media outreach campaign.

Known formerly as the Colorado Colorectal Screening Program, the Colorado Cancer Screening Program (CCSP) is a statewide program that partners with designated safety net hospitals and clinics to offer no-cost patient navigation services for medically underserved Coloradans in need of CRC screening. For over 10 years, as the Colorado Colorectal Screening Program, CCSP provided no-cost screening colonoscopies and patient navigation (7). With the implementation of Medicaid expansion and the Patient Protection and Affordable Care Act, CCSP shifted its focus in 2018 to focus solely on patient navigation, aligning more closely with other cancer screening programs in the state (breast, cervical, lung, and family history screening). CCSP collaborates with community partners to align efforts to increase awareness and screening among medically underserved populations facing disparities in CRC outcomes. CCSP's target population is individuals from 50 to 64 years old, aiming to increase on-time screening among those who can benefit most from CRC screening (8).

CCSP's previous outreach campaigns have included direct mailings, radio advertisements, and television ads. Television ads were beyond budget and not likely to reach this intended audience, but direct mailings and radio are relatively inexpensive options that had been successful in increasing participating clinics' screening rates in the past (9). Considering CCSP's prior success, The Community Guide's recommendation of multicomponent interventions, and interest in text messaging outreach from participating Federally-Qualified Health Centers (FQHCs) and project partners, this project incorporated radio and small print media into an innovative text message and social media outreach campaign designed to increase awareness of CRC screening and direct community members to contact their local health care provider.

Mobile phone technology has been leveraged to improve health and encourage healthy behaviors through applications, the internet, and sensors. Specifically, the use of text messaging has been found to address health concerns through educational messages, personalized health prevention interventions, and self-management of diseases. One of the major benefits of text messaging is its reachability and usability. Over 90% of the global population and 80% of the rural population have access to a mobile network (10). Text messaging provides an opportunity to simultaneously reach multiple rural communities. Studies around the world have shown text messaging interventions to be both time and cost effective, with the potential for success as a stand-alone or multicomponent intervention (11).

The use of text messaging for health promotion is a new and innovative strategy in the field of public health with substantive promise (10). This is the first known application of mHealth text messaging that focuses on cancer screening prevention in rural communities. Systematic reviews of these interventions and methodological characteristics show promising results in the utilization of mobile devices to deliver health messages (11). However, certain limitations exist, such as not being able to engage those with lower literacy or who suffer from low vision, and messages being subject to misinterpretation (10). Despite evidence that theory guided text-messages have been shown to have the strongest and most effective methods for behavioral change,

theory is used inconsistently in message design (12).

Project partners believed an innovative multi-media campaign could engage the newly insured and encourage health-seeking behaviors. The goal of this project was to pilot test a text message-based multimedia campaign to: (I) increase awareness of and need for CRC screening in the San Luis Valley and Arkansas Valley of Southeastern Colorado and (II) increase access and connection to primary care services. CRC screening uptake among non-adherent populations requires additional education, support, and coaching that can be initiated via text message and completed with patient navigation in the primary care setting. Anticipating that some participants in the text campaign will be up-to-date or not eligible for CRC screening, we wanted to ensure these individuals are also connected to primary care.

Methods

Partners

This multicomponent intervention was coordinated by CCSP in collaboration with two FQHC systems, the Colorado Cancer Coalition ("Coalition"), the Comprehensive Cancer Unit at the Colorado Department of Public Health and Environment, and the mHealth Impact Lab at the Colorado School of Public Health.

In addition to overall project coordination, CCSP staff were responsible for creating the radio ad scripts, flyers, and Facebook messages, programming the text messages and conducting a preliminary evaluation of the results. CCSP facilitated all strategy calls with project partners, with the Coalition providing critical support.

The Coalition designed a logo for the campaign and created a campaign website, which included an enrollment page, survivor stories, cancer data, screening guidelines (breast, cervical, and colorectal) and information for contacting patient navigators. Additionally, the Coalition created graphics that clinics could use to promote the campaign through their social media sites. In March, the Coalition lead a targeted advertising campaign through Facebook to increase the visibility of Facebook ads in Southeast Colorado. Finally, the campaign was shared via the Coalition's contact list to raise awareness of the campaign throughout the state.

Staff from the Comprehensive Cancer Unit participated in the strategy calls and assisted with marketing the campaign to partners.

Clinic leadership and patient navigators from the participating FQHCs guided all content development, assisted with marketing the campaign, and provided valuable community insights.

Text message development and programming

CCSP built upon the Integrated Theory of mHealth model in developing the text message constructs. This theory emphasizes constructs of access and engagement alongside behavioral and psychological perspectives to maximize impact (13). In creating this mHealth intervention, CCSP utilized well-known constructs of behavior change including knowledge, attitudes, norms, and self-efficacy. These constructs each address unique levels of the ecological model, acknowledging the influence of relationships and environmental factors on health.

Text messages created for this campaign were written concisely, without multimedia, minimized medical terminology and jargon which simplified translation into Spanish. These messages could be sent and received over SMS and included web links to additional information and resources. To target engagement, Berger's STEPPS were used to create content that conveyed not only facts but also emotions through stories of survivors. These survivor stories are essential to make content appealing and "contagious," creating a message that resonates with the audience and evokes a personal response (14).

Figure 1A provides an example of a message designed to elicit an emotional response using a relatable story and a call to action, highlighting two of Berger's steps (stories and emotions). Berger's "practical value" step is demonstrated in *Figure 1B*: by including useful information and resources, this text message is easily shareable with others.

Participants enrolled into the campaign by texting "ENDCANCER" to a shortcode (i.e., "12345") or by providing their phone number in the online web platform. Participants were placed into 1 of 5 groups based upon their responses to a series of nine opt-in questions (*Table 1*). Each group received tailored text messages based upon their age, screening status, and connection to a medical home. Participants who did not respond to all opt-in questions were enrolled in the "50+Home+No Screen" group. Once placed into a group, participants received an average of 14 messages over the course of 3 weeks. After a 1-week break, participants received 10–12 similarly structured messages promoting breast and cervical cancer screening. These messages provided linkages to participating clinics'

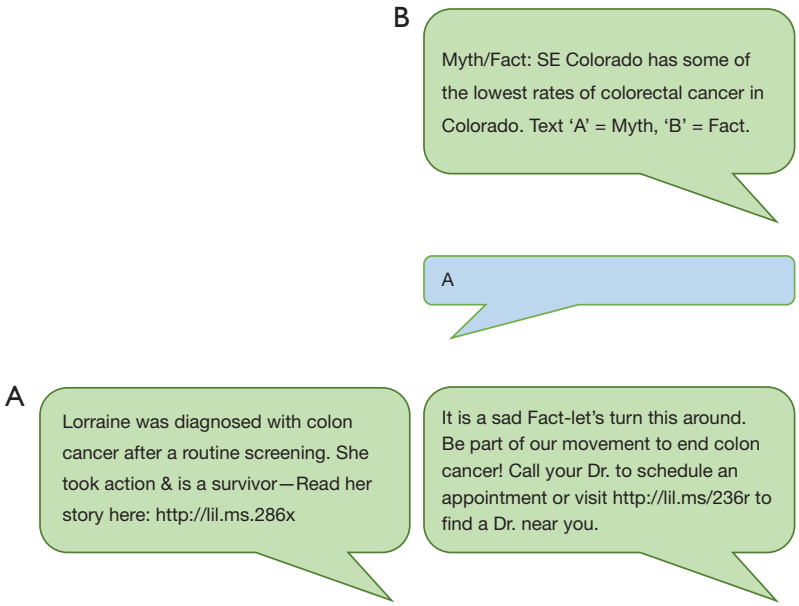

Figure 1 Example text messages sent to EndCancer participants. (A) Text message designed using Berger's "stories" and "emotions"; (B) text message designed using Berger's "practical value".

Table 1 Tailored text message groups

Group	Description
50+ Screen	Individuals who are age 50 or older, have a medical home, and are up-to-date on CRC screening
50+ No home	Individuals who are age 50 or older who do not have a medical home
50+ Home + No screen	Individuals who are age 50 or older, have a medical home, but are not up-to-date on their CRC screening
Under 50 No home	Individuals who are under the age of 50 and do not have a medical home
Under 50 Home	Individuals who are under the age of 50 and have a medical home

patient navigators or other Colorado community health centers, as well as information and resources hosted on the Coalition's EndCancer website. The use of branching logic enabled participants to receive messages specific to their preferred language (English or Spanish) and location (San Luis Valley, Arkansas Valley, or neither), based on the preference indicated in the opt-in questions.

The CCSP and mHealth Impact Lab teams researched texting platform options, identifying whether their attributes and functionality would allow for the tailoring, bi-directionality, and branching logic designed within the text message flow. Upland Software's Mobile Messaging (15) was identified as the option best suited to the needs of the EndCancer Campaign.

Pilot testing of the message flow as well as successful programming of branching logic and tailoring was conducted by CCSP and Coalition project team members. Branching logic testing occurred iteratively during the programming phase. Pilot testing of the final enrollment message flow and functionality was conducted by five members of the project team who enrolled using multiple "personas" to test all response combinations.

Radio, Facebook, and web recruitment

Thirty-second radio ads played on local radio stations across the San Luis Valley, Arkansas Valley (La Junta) and Lamar areas over the course of 4 weeks (2 weeks on, a 1-week break, followed by 2 weeks of airing). The radio ads prompted listeners to enroll in a text messaging campaign to receive more information about colorectal, breast, and cervical cancer screening, and to contact their local clinic about screening. Additional, simultaneous messaging (flyers and social media posts) was distributed via clinic websites and Facebook pages, clinic lobby and waiting rooms, and community bulletin boards at forty local businesses. These

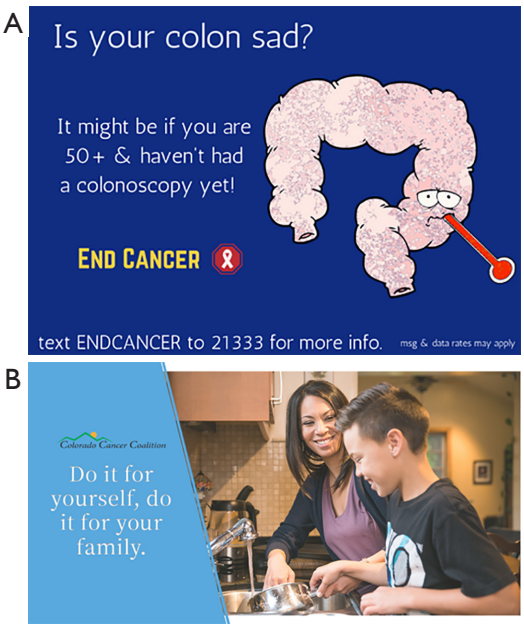

Figure 2 Example advertising designed to recruit EndCancer text message participants. (A) Example graphic used by participating clinics in their Facebook posts; (B) example graphic used in paid Facebook advertisements.

messages included information about the importance of screening and details on how to enroll in the text message campaign.

At the conclusion of the radio ads, enrollment in the text messaging campaign was much lower than anticipated. Therefore, the project team re-evaluated outreach strategies, revamping the clinics' Facebook messaging to include more provocative graphics and expediting a Facebook ad campaign targeted geographically towards those in southeastern Colorado. See *Figure 2A* for a graphic used by participating clinics and *Figure 2B* for an example paid advertisement. Facebook was selected for a few specific reasons: (I) clinic partners and the Coalition all had established Facebook pages and (II) the Facebook advertising platform allows for narrowing audience by ZIP code and other factors, which were vital to reaching the campaign's target audience.

In March 2018, the project team contracted with a local media company to run a series of targeted Facebook advertisements. These advertisements utilized various graphics and text ads to drive traffic to the campaign website as well as encourage people to enroll in the campaign. These ads included the text enrollment information and were "clickable", directing users to an online text message enrollment form. A total of 10 different ads were created, each targeting individuals 18 years and older living within the geographic area of the Arkansas Valley and San Luis Valley. To capitalize on the end of CRC awareness month (March), these Facebook ads were live from March 26 through April 30 for a total of 36 days, beginning 7 weeks after the last radio ad.

Analysis

Evaluation indicators focused on process outcomes of reach for radio ads, Facebook posts and ads, and clinic-based flyers. Evaluation of the text campaign included indicators of reach, dose delivered, dose received, and behavioral outcomes (link clicks within text messages and engagement with the EndCancer website). Radio reach was estimated based upon the 2010 Census population estimate for the fifteen-county region of the San Luis Valley and Arkansas Valley. Reach for Facebook posts and ads were collected through Facebook Ads Manager, and reach for flyers placed in clinics was pulled from the clinics' electronic health records by querying the number of unique patient/client visitors during the campaign. Text message enrollment and engagement data was collected through the Mobile Messaging platform and exported to MS Excel before importing to R for analysis using the dplyr (16) and psych (17) packages. Engagement with cancer screening education and resources was tracked using the Mobile Messaging link tracking feature. Finally, engagement with EndCancer web pages was assessed using Google Analytics data.

Results

Total project cost is estimated at $15,000: $10,000 for media buys (radio and Facebook) as well as $5,000 text message consultation. Additionally, a variety of in-kind support was provided by project team members. In-kind support included text message programming, website content development and programming, text message delivery (estimated at $1.50/participant), clinic marketing and patient navigation support.

Beginning in early January and lasting for four weeks, an average of 47 radio ads aired each week on six separate stations throughout the San Luis Valley and Arkansas Valley, including two Spanish-language stations. EndCancer campaign messaging was shared on the two clinics' Facebook pages over the course of 12 weeks, averaging

Table 2 Reach, impressions, and engagement statistics for clinic Facebook posts

	Post total reach (average # individual people who saw each post)	Post total impressions (average # total views of each post)	Engaged users (average # people who like, comment, reacted, shared each post)
Clinic Facebook posts (January through March)	248	400	8

Table 3 Reach, impressions, engagement, and link click statistics for paid Facebook advertisements

	Total reach (# people who saw each ad)	Total impressions (# views of each ad)	Shares (# shares of each ad)	Likes (# likes of each ad)	Reactions (# reactions each ad)	Comments (# comments each ad)	Link clicks (# clicks each ad)
Total, all ads	78,253	427,789	60	22	4,915	19	3,361
Average per campaign	19,563	106,947	15	6	1,229	5	840

about one weekly post for clinic 1 and twice per week for clinic 2. Clinic 1 posted 16 unique messages while clinic 2 posted 22 unique messages. The Coalition placed ten unique Facebook ads within four campaigns that were continuously posted over 5 weeks.

The messaging posted to clinic Facebook pages had an average impression of 400 per post, while the ads had an impression rate of an average of over 106,947 per ad campaign within the ZIP code areas for our campaign (see *Tables 2,3*). Given the small population in this region, just under 114,000 individuals, these impressions are notable. However, the uptake to enroll in the campaign was slower than anticipated. Data from Facebook Analytics suggests there was a barrier to campaign enrollment once people clicked through ads and arrived at the campaign enrollment landing page. Facebook ads were clicked, directing people to the web opt-in, 3,361 times, but only 2 individuals enrolled in the campaign using this landing page. This analysis focuses on the engagement with online content, with some reach and dose delivered data on those who enrolled in the text message campaign.

A total of 28 people enrolled in the text message campaign. Four of these participants dis-enrolled within 48 hours—it appears they mistakenly enrolled in the campaign by mistyping a similar keyword and had un-enrolled within 1 week of enrollment. These four individuals were dropped from analysis because they did not respond to the opt-in questions. Of the remaining 24 participants, 95.8% received all CRC messages. The only individual to opt out before receiving all CRC messages was enrolled in the "Under 50 Home" group and opted out after responding to all opt-in messaging and receiving two CRC-focused messages. Three additional participants opted-out during the breast and cervical messaging, with 20 (83.3%) of participants receiving all tailored messaging for CRC, breast, and cervical cancer screening.

The average age of participants was 48 years with a range from 27 to 64 years old. Fifteen participants (62.5%) indicated they had a doctor they have visited within the last year and just one person (aged 50 years or older) indicated they had not been screened for CRC. No participants indicated they heard about the text message campaign on the radio and only one person each enrolled from seeing a flyer or Facebook post. The remaining participants indicated they heard about the campaign from a friend or family member (8 people), "other" (6 people), or did not respond to the question (11 people). Five participants enrolled via the web enrollment form (i.e., did not text the keyword), suggesting they heard about the campaign via a Facebook post because the weblink was only available through Facebook.

Only six participants (25%) lived in the target geographic area, three each in the San Luis Valley and Arkansas Valley. None of these individuals were in need of screening (either because they were up-to-date or because they were younger than 50 years old), so no text message participants were referred directly to patient navigators at EndCancer collaborating clinics. However, all participants received information and links to lists of community health centers throughout Colorado.

Mobile Messaging link tracking data indicated that seven unique users clicked one or more of the links included in the text messages and 9 of the 16 (56.3%) unique links were clicked for a total of 22 total link clicks. Breast and cervical cancer-related resources included in the text messages received more clicks than CRC-focused resources. The sample size of participants who clicked links is insufficient to make strong conclusions, but data does demonstrate that people do follow weblinks and this is a worthwhile strategy to pursue in future text message campaigns.

Google Analytics demonstrates that 34% of the 2,461 page views of the webform opt-in were from IP addresses registered within the target area. An additional 13% of the page views originated from IP addresses registered to the cities of Denver, Aurora, or Glendale, of which a substantial, but unknown, portion are from EndCancer project team staff testing the pages and sharing with colleagues. Of the 2,461 opt-in page views, only 147 (5.97%) occurred organically through clinics' Facebook ads or links in online newspaper articles. The remaining 94.03% of the webform opt-in page views occurred after Facebook ads we placed. This striking contrast in web traffic indicates that Facebook ads were substantially more impactful in reaching and engaging the target demographic as compared to organic web and Facebook posts. Unlike link clicks originating from text messages, total page views for CRC-focused resources were more than double that of breast and cervical cancer-related resources (414 page views as compared to 139 page views).

Once people landed on the opt-in page, 97.7% dropped off, meaning they left the site, and 2.2% clicked through to a different page. The Coalition home page was the second page most visitors traveled to, followed by the EndCancer Home page. Of those who landed on the Colorectal Cancer Survivor Stories page, 97.3% dropped off and 2.7% clicked through to another page in the campaign. The high drop-off rate suggests the campaign landing pages were not working as designed. Or, alternatively, the traffic that we reached through our digital marketing was not the target demographic for our campaign.

Conclusions

The EndCancer project team learned many valuable lessons in designing and implementing this multimedia text message campaign. First, successful execution of this dynamic campaign was dependent upon excellent communication and collaboration amongst all project partners. Radio and newspaper advertisements were not as successful in encouraging text message campaign enrollment as anticipated. Brainstorming new engagement opportunities led to more rigorous Facebook advertising, and the focus shifted to understanding the best way to encourage enrollment in a health-related text message campaign. The limited success with radio and newspaper, combined with promising Facebook advertisement results, suggests greater emphasis placed on social media marketing may engage more people in future campaigns.

There was limited enrollment in the text message campaign, but those enrolled were engaged, as demonstrated by continued response to text messages that asked questions and clicking provided links. Engagement with Facebook posts suggests a more dedicated social media presence, including community advocates and leaders to build a local coalition of advocates, may prove successful in the future. With ever increasing utilization of social media, it seems plausible that people will not respond to an online campaign unless there is a real-world individual or group who can endorse it. Medical communities have a substantial advantage here in as much as they enjoy a high degree of credibility and trust among patients (18). Thus, having them endorse and promote social media campaigns may facilitate their spread.

The EndCancer campaign was not able to break through a barrier that all CRC outreach campaigns face: people do not want to talk about their colon. Although re-branded images were well received among representatives of the local community, people were not signing up for the campaign in the numbers anticipated. Additionally, text message participants clicked on links providing breast and cervical cancer education more often than they clicked on CRC links.

Nevertheless, the EndCancer campaign provides evidence of strategies that can be used to reach hard-to-reach and hard-to-screen populations in need of CRC screening. This campaign demonstrates that outreach approaches that were successful 3 to 5 years ago may not have the same impact in today's social media environment. The Community Guide recommends small media outreach (19) and has determined there to be insufficient evidence for mass media (20); however, it has not conducted an evaluation of social media outreach strategies. Engagement with the EndCancer campaign was high with Facebook ads, and those who viewed ads clicked through to the sign-up page, an indication of intent to enroll. Given the promising results of engagement with Facebook ads among

the target demographic, social media marketing may prove a successful avenue to enroll hard-to-reach populations into cancer screening educational initiatives. These strategies should be further tested and researched in a campaign that incorporates social media at the outset.

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Footnote

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

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