Repeated automated mobile text reminders for follow-up of positive fecal occult blood tests: Do they work?

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Abstract

Background: Fecal occult blood tests are recommended by the US Preventive Services Task Force as a screening method for colorectal cancer, but they are only effective if positive results are followed by colonoscopy. Surprisingly, a large proportion of patients with a positive result do not follow this recommendation.

Objective: To examine the effectiveness of a short message service in increasing adherence to colonoscopy follow-up after a positive Fecal occult blood test.

Methods: This randomized controlled trial was conducted with patients who had positive colorectal cancer screening results. Randomization was stratified by residential district and socioeconomic status. Subjects in the control group (n = 232) received routine care that included an alert to the physician regarding the positive Fecal occult blood test result. The intervention group (n = 238) received routine care and three short message service reminders to visit their primary care physician. Adherence to colonoscopy was measured 120 days from the positive result. Physicians of the study patients completed an attitude survey regarding FOBT as a screening test for colorectal cancer. The intervention and control groups were compared using chi-squared for discrete variables. Logistic regression was used to calculate odds ratios and 95% confidence intervals for performing colonoscopy within 120 days, adjusting for potential confounders of age, gender, socioeconomic status, district, ethnicity, intervention group and physician's attitude.

Results: Patients in the intervention group had significantly better adherence to colonoscopy within 120 days of a positive Fecal occult blood test than the control group did (70% vs. 47%, P<.0001). After adjusting for all potential confounders, the likelihood of having a colonoscopy was 2.5 times higher in the intervention group than in the control group (P=.001).

Conclusions: A short message service reminder is an effective, simple and inexpensive method for improving adherence among patients with positive colorectal screening results. This type of intervention could also be evaluated for other types of screening tests.
**Trial Registration:** This study was approved by the Meuhedet Institutional Review Board on May 20, 2015 (IRB; trial reference number: 02-20-05-15). ClinicalTrials.gov Identifier: NCT02534142. Submitted on August 27, 2015. 


**Keywords:** Cancer screening; Positive colorectal cancer screening; SMS, Text reminder, Colonoscopy, Adherence; Fetal occult blood test; Patient-physician relationship
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Introduction

Colorectal cancer (CRC) is a major cause of morbidity and mortality throughout the world. It is the second most common malignant disease in Israel [1, 2], with 90% survival when it is identified early and immediate surgical intervention performed. In Israel, the screening policy for average-risk individuals ages 50 to 75 years is an annual Fecal occult blood test (FOBT) [3]. A positive FOBT requires immediate follow-up with colonoscopy and surgery should be performed when CRC is found. A delay in follow-up significantly undermines the benefits of CRC screening, including incidence, mortality, life-years saved, and net costs of screening [4-7]. Recommendations regarding the time between a positive result and colonoscopy vary between countries, ranging between 30 and 180 days [8-13]. In Israel, the Ministry of Health guidelines define the waiting period as 90 days [3, 14]. However, 40% to 60% of individuals who undergo FOBT screening do not continue with follow-up after a positive result [7, 15, 16].

Barriers to follow-up after a positive FOBT have been identified in the literature [17-22] and are divided into four general groups based on whether they are related to patients, physicians, providers, or information technology [23-25]. Intervention programs have been developed to target each of these groups [26]. Patient-targeted interventions include educational strategies, peer counselors or navigators, reminders, and coupons. The interventions were effective for short-term but not long-term, follow-up. Several studies have described interventions aimed at increasing follow-up rates and showed mixed results [13, 19, 27-40]. When the patient and physician’s relations are good and based on clear communication and trust, the patient will be more likely to adhere to and fulfill the physicians’ instructions [41, 42].
Few studies have examined the effectiveness of short message service (SMS) as an intervention tool within community medical settings.

Although many studies have been published on patient interventions to increase follow-up after a positive FOBT, to the best of our knowledge, no studies have yet used SMS technology to increase adherence to recommendations for CRC screening follow-up after a positive FOBT. Therefore, the present study examined the effectiveness of sending mobile text messages via SMS to patients as an automated tool to increase adherence to colonoscopy follow-up and to examine the influence of the physician's attitude towards FOBT as a screening test for CRC and patient adherence to follow-up.

Methods

This study was conducted between January 2016 and March 2017 in Meuhedet, one of four Health Maintenance Organizations in Israel. It insures and provides care for 1.2 million members. The current rate of colorectal screening among 180,000 members ages 50 to 75 years is 60%, similar to the Israeli population. In 2016, the rate of follow-up colonoscopy after a positive FOBT in Meuhedet was 41%. The study was approved by the Meuhedet Institutional Review Board (trial reference number: 01-023-03-16).

Study population

A total of 609 patients from Meuhedet who had a positive FOBT in 2016 were randomized to intervention and control groups; 290 (47.6%) were included in the control group and 319 (52.4%) in the intervention group. The inclusion criteria were 50-75 years-of-age and agreeing to receive SMS texts from Meuhedet. By Israeli law, health messages via SMS may only be sent to members who actively agree to receive them. The exclusion criteria were personal history of CRC, colonoscopy 2 years before the positive FOBT, or diagnosis with any type of cancer during the study period. Fifty-two (18%) patients were excluded from the control group, 20 because of family history of CRC, 2 died during the study, 16 had an oncology diagnosis and 14 had a colonoscopy prior to the positive FOBT. Eighty-seven
(27.2%) patients were excluded from the intervention group, 26 because of family history of CRC, 6 had an oncology diagnosis, 12 had a colonoscopy prior to the positive FOBT, and 43 refused to receive SMS after the initial approval or they were unable to receive SMS although they agreed to receive it.

Physicians
A total of 326 physicians were included in the study. They had given participants (control and intervention groups) a referral for FOBT during 2016 and were employees of Meuhedet. If the referring physician was not available, we contacted the patient's primary care physician. Physicians no longer working at Meuhedet, were excluded from the study. All the primary care physicians were notified about the study.

Study variables
The independent variables were intervention group, gender, age, SES, ethnicity, district and the physician's attitude towards FOBT as a reliable screening test for CRC. The dependent variable was adherence to colonoscopy within 120 days after a positive FOBT.

Study protocol
Routine care for the control and intervention groups included an automated computer alert in the patient's electronic medical record (EMR) to the patient's physicians regarding the positive FOBT, with no indication of whether the patient had already visited the physician after the positive result. The automated alert was sent to the physicians the moment the lab released the positive result. Each patient in the intervention group also received an automated text message up to a week after the positive FOBT result. The text read: "Hello. There is a lab test result ready for you. Contact your physician for an explanation of the findings." Two additional automated text message reminders were sent to the patient at 2 weeks and 1 month reading, "Hello, This is a reminder. It is essential that you contact your physician if you have not already done so." As the SMS messages were sent automatically
to a randomly selected population, the patients in the control group were not aware of the intervention. Physicians were blinded regarding which of their patients were in either group.

With no indication of whether the patient underwent colonoscopy, 120 days after the positive FOBT, a sample of physicians (for both the control and intervention group) answered a telephone survey regarding attitude toward FOBT as a screening test for CRC. We focused on whether FOBT is a reliable screening test for CRC and whether the physicians recommend a repeat FOBT after positive FOBT, instead of follow-up such as colonoscopy (Figure 1). Physicians who stated that FOBT is not a reliable screening test for CRC or reported that they would advise the patient to repeat the FOBT instead of sending the patient for a colonoscopy, were considered as having a negative attitude towards FOBT.

Data sources
Positive FOBT results were obtained from Meuhedet's Central Laboratory. Patients’ demographic and clinical characteristics including gender, age, district, SES, and ethnicity were obtained from the EMR. Text messages were sent to patients via InforUMobile software, Ltd. (https://sms.inforu.co.il), with a track whether the SMS was received or rejected.

Statistical analysis
Based on statistical analysis of the Meuhedet patient database, approximately 41% of patients with a positive FOBT undergo colonoscopy within 120 days. To have an 80% chance of detecting a 20% effect of the intervention as significant (1-sided, 5% level), a sample of 77 is required in each group. Our group was larger than this.

Randomization was stratified by district and SES derived from the member's home address and based on the Israeli Census Bureau locality definitions [43]. SES levels ranged from 1 (low) to 20 (high). We compared demographic variables between the intervention and control groups using chi-squared for discrete variables. Logistic regression was used to calculate odds ratios (ORs) and 95% confidence intervals (CIs) for the rate of colonoscopy within 120
days of receiving a positive FOBT result, adjusting for main potential and variables found to be significantly related to adherence in univariate analysis.

Data were analyzed using IBM SPSS statistics software (version 24.0, for Windows). *P*-values <.05 were considered significant for all analyses.

**Results**

Patient characteristics are presented in Table 1. A total of 470 eligible patients were randomized 232 (49.36%) in the intervention group and 238 (50.64%) in the control group. Gender rates were similar between the intervention and control groups, and the groups were ethnically similar. Geographic dispersion was also similar. Most participants were from the South district and the fewest from the North district. In both groups, most participants were in SES levels 9-13, but this value was missing for 56 (11.9%) patients.

**Table 1: Patient Characteristics**

<table>
<thead>
<tr>
<th><strong>P-value</strong></th>
<th><strong>Intervention group</strong> N=232 (%)</th>
<th><strong>Control group</strong> N=238 (%)</th>
<th><strong>Characteristic</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.256</td>
<td>(52.2) 121</td>
<td>(52.5) 125</td>
<td>Gender</td>
</tr>
<tr>
<td></td>
<td>(47.8) 111</td>
<td>(47.5) 113</td>
<td>Male</td>
</tr>
<tr>
<td>0.910</td>
<td>(19.5) 45</td>
<td>(17.2) 41</td>
<td>Age group</td>
</tr>
<tr>
<td></td>
<td>(16.8) 39</td>
<td>(16.8) 40</td>
<td>50-55</td>
</tr>
<tr>
<td></td>
<td>(22.8) 53</td>
<td>(26.5) 63</td>
<td>55-59</td>
</tr>
<tr>
<td></td>
<td>(28.4) 66</td>
<td>(27.7) 66</td>
<td>60-64</td>
</tr>
<tr>
<td></td>
<td>(12.5) 29</td>
<td>(11.8) 28</td>
<td>65-69</td>
</tr>
<tr>
<td></td>
<td>(19.5) 45</td>
<td>(17.2) 41</td>
<td>70-75</td>
</tr>
<tr>
<td>0.118</td>
<td>(97.8) 227</td>
<td>(99.6) 237</td>
<td>Ethnicity</td>
</tr>
<tr>
<td></td>
<td>(2.2) 5</td>
<td>(0.4) 1</td>
<td>Jewish</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other</td>
</tr>
<tr>
<td>0.362</td>
<td>(42.7) 99</td>
<td>(34.9) 83</td>
<td>National District</td>
</tr>
<tr>
<td></td>
<td>(21.1) 49</td>
<td>(25.2) 60</td>
<td>South</td>
</tr>
</tbody>
</table>

8
The association between patient characteristics and adherence to colonoscopy within 120 days after a positive FOBT result is presented in Table 2 for the entire cohort (n=470). Gender rates were similar. Adherence rates were higher in the Central and North districts compared to the South and Jerusalem districts. Adherence rates were higher among those in the 50-59 and 70-75 age groups and in higher SES levels. The adherence rates to colonoscopy within 120 days of a positive FOBT were higher among patients who had physicians with a positive attitude towards FOBT than among those with physicians who stated a negative attitude towards the FOBT (66% vs. 45.7%, p=0.018).

Table 2. Rate of adherence within 120 days after a positive FOBT

<table>
<thead>
<tr>
<th>Variable</th>
<th>Did not adhere to colonoscopy</th>
<th>Adhered to colonoscopy</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N= 195 (41.49%)</td>
<td>N= 275 (58.51%)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td>0.256</td>
</tr>
<tr>
<td>Male (N=246)</td>
<td>96 (39)</td>
<td>150 (61)</td>
<td></td>
</tr>
<tr>
<td>Female (N=224)</td>
<td>99 (44.2)</td>
<td>125 (55.8)</td>
<td></td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td>0.91</td>
</tr>
<tr>
<td>50-54 (N=86)</td>
<td>35 (40.7)</td>
<td>51 (59.3)</td>
<td></td>
</tr>
<tr>
<td>55-59 (N=79)</td>
<td>32 (40.5)</td>
<td>47 (59.5)</td>
<td></td>
</tr>
<tr>
<td>Age Group</td>
<td>Positive (%)</td>
<td>Negative (%)</td>
<td>P-value</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------</td>
<td>--------------</td>
<td>---------</td>
</tr>
<tr>
<td>60-64 (N=116)</td>
<td>49 (42.2)</td>
<td>67 (57.8)</td>
<td>49 (42.2)</td>
</tr>
<tr>
<td>65-69 (N=132)</td>
<td>56 (42.4)</td>
<td>76 (57.6)</td>
<td>56 (42.4)</td>
</tr>
<tr>
<td>70-75 (N=57)</td>
<td>23 (40.4)</td>
<td>34 (59.6)</td>
<td>23 (40.4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>District</th>
<th>Positive (%)</th>
<th>Negative (%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>South (N=182)</td>
<td>79 (43.4)</td>
<td>103 (56.6)</td>
<td>79 (43.4)</td>
</tr>
<tr>
<td>Jerusalem (N=109)</td>
<td>51 (46.8)</td>
<td>58 (53.2)</td>
<td>51 (46.8)</td>
</tr>
<tr>
<td>Center (N=96)</td>
<td>33 (34.4)</td>
<td>63 (65.6)</td>
<td>33 (34.4)</td>
</tr>
<tr>
<td>North (N=83)</td>
<td>32 (38.6)</td>
<td>51 (61.4)</td>
<td>32 (38.6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SES</th>
<th>Positive (%)</th>
<th>Negative (%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-8 (N=33)</td>
<td>18 (54.5)</td>
<td>15 (45.5)</td>
<td>18 (54.5)</td>
</tr>
<tr>
<td>9-13 (N=238)</td>
<td>100 (42)</td>
<td>138 (58)</td>
<td>100 (42)</td>
</tr>
<tr>
<td>14-20 (N=143)</td>
<td>58 (40.6)</td>
<td>85 (59.4)</td>
<td>58 (40.6)</td>
</tr>
<tr>
<td>Missing (N=56)</td>
<td>19 (33.9)</td>
<td>37 (66.1)</td>
<td>19 (33.9)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physician' attitude (not incl. 144 missing)</th>
<th>Positive (%)</th>
<th>Negative (%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive attitude (N=291)</td>
<td>99 (34.0)</td>
<td>192 (66.0)</td>
<td>99 (34.0)</td>
</tr>
<tr>
<td>Negative attitude (N=35)</td>
<td>19 (54.3)</td>
<td>16 (45.7)</td>
<td>19 (54.3)</td>
</tr>
</tbody>
</table>

Data are presented as number of participants (%)

The intervention group was significantly more likely to have a colonoscopy within 120 days than the control group was (P<.0001, Figure 2).

Figure 2: Rates of adherence to colonoscopy within 120 days of a positive FOBT
Logistic regression was performed to determine whether colonoscopy rates differed between groups after adjusting for intervening variables. The likelihood of adherence to colonoscopy was 2.5 higher in the intervention group after adjusting for confounding factors (95%CI: 1.47-4.24; p=0.001). Regarding physician’s attitude towards FOBT as a screening test, the likelihood of adherence to colonoscopy was 2.7 higher among patients who had a physician with a positive attitude toward FOBT vs. a negative attitude (95%CI: 1.25-5.83; p=0.012) (Table 3).

**Table 3. Multivariate analysis of colonoscopy rates**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds ratio</th>
<th>95% Confidence interval</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>Intervention vs. Control</td>
<td>2.50</td>
<td>1.47</td>
<td>4.24</td>
</tr>
<tr>
<td>Age</td>
<td>1.01</td>
<td>.970</td>
<td>1.04</td>
</tr>
<tr>
<td>Female vs. Male</td>
<td>0.77</td>
<td>0.47</td>
<td>1.27</td>
</tr>
<tr>
<td>SES</td>
<td>1.01</td>
<td>.93</td>
<td>1.10</td>
</tr>
<tr>
<td>South District</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion

The effectiveness of mass cancer screening programs may be compromised by lack of follow-up of abnormal findings. Incomplete follow-up with colonoscopy is a significant problem that has been studied extensively. Here, we have shown that sending SMS reminders to patients following a positive FOBT is an effective way to increase adherence rates to follow-up colonoscopy.

Several studies evaluated ways to increase adherence to FOBT follow-up. Most focused on physician and practice interventions. In a trial performed by Humphrey et al. [23], notifications to the gastroenterology clinic and the use of a standard workflow for creating patient appointments led to a 31% increase in diagnostic evaluation. Myers et al. [44] showed that one-on-one physician training, audit and feedback (physicians received lists of their patients with incomplete diagnostic evaluations) resulted in improved completion of diagnostic testing. Singh et al. [45] assessed a clinic-based quality improvement activity that included provider education, a positive FOBT registry and feedback. They found it significantly decreased the time to colonoscopy referral and completion and increased colonoscopy completion by 18.75%. In the current study, we found for the first time that physicians’ attitudes towards FOBT have a major influence on rates of colonoscopy after positive FOBT. Therefore, we recommend that additional education for physicians regarding FOBT.
Sending SMS reminders to patients following a positive FOBT is an effective method of increasing colonoscopy rates.

Studies addressing patient interventions have used letters, e-mails, telephone calls, and nurse navigators. Mailed invitations were found to be as effective as telephone reminders and increased follow-up rates by approximately 30% in an Italian study,[39]. In a Scottish study, a reminder phone call that included making an appointment for colonoscopy increased adherence by 4.67% [13]. In a British study aimed at minority populations, the study nurse called patients repeatedly, invited them to the clinic and scheduled a colonoscopy appointment for each one. This intervention increased follow-up by 8.4% [38]. All these interventions were found to be effective but are extremely labor intensive and time-consuming. Our study increased adherence in the intervention group by 49.6% using a simple, inexpensive means of communication.

Few studies have examined the effectiveness of SMS as an intervention tool within community medical settings. Changing technology and patient preferences with regard to contact communication should be considered when determining future interventions to improve usage and effectiveness. A study conducted in Korea using SMS reminders for colonoscopy preparation for patients who already had a scheduled colonoscopy. The SMS group was better prepared for the colonoscopy using the Ottawa Bowel Preparation Scale ($P < .001$) [46]. A study conducted in Lebanon [47] compared the effect of three types of patient reminder systems on adulthood Streptococcus pneumonia immunization in a primary care setting. One group received short phone calls, the second group was sent a text via SMS, and the third group received e-mails. Text messages were somewhat effective, increasing vaccination by 7.2%, as compared to 16.5% with phone calls and 5.7% in the email group. In contrast, an Australian study [48] used text message reminders to improve hepatitis B vaccination among high-risk sexual health center attendees and found that it was not an effective intervention. A literature review examining the effect of SMS and e-mails to improve diabetes management showed that simple phone call, letter or SMS reminders can
have a positive impact on clinical and behavioral outcomes [49]. A systematic review [50] indicated that text messaging interventions improved patients’ medication adherence rate. Text messaging was most helpful for patients with HIV, asthma, diabetes, schizophrenia, and heart disease. In a review of the factors associated with non-adherence to oral antiplatelet therapy in acute coronary syndrome and interventions that modify these factors, only reminder-based interventions, including SMS, had consistently beneficial impacts on adherence outcomes at 3 and 12 months [51]. In a randomized controlled trial designed to assess the effects of SMS reminders on adherence to a healthy diet, medication and smoking cessation among adult patients with cardiovascular disease, researchers found that SMS was effective in improving adherence to a healthy diet and medication, but not smoking cessation. The study concluded that further research is needed to confirm the effectiveness of SMS [52]. A different study [53] reported increased success with smoking cessation among patients attending control visits as a result of scheduled clinic appointments following SMS reminders. The smoking cessation rate was 24% in patients who did not respond to SMS reminders at all, and 28.6% (n=28) in patients answering any SMS at least once (P=.001).

In the present study, age, gender, SES, and geographic location were not significantly associated with adherence to follow-up of positive FOBT results. Increasing age was previously associated with lack of follow-up in some studies [38], but not in others [20]. In the intervention group, adherence rates were higher in people 60 to 64 years of age, whereas in the control group, higher adherence rates were found in individuals 50 to 54 years of age. Similar to our findings, several studies did not find strong associations between gender and complete diagnostic follow-up [20, 28, 54]. However, others suggested that women are less likely than men are to undergo follow-up testing [24, 55, 16]. In our study, we found a difference between genders in the intervention group. This may mean that the intervention is more effective among males. Another interesting finding was the positive association between SES and adherence. It is possible that the selection of patients who agreed to have text messages sent to them created a biased sample of individuals who are more
technologically advanced and better educated. However, this does not affect the study results, as by law SMS reminders can only be sent to those who agreed to receive them.

There is no consensus in the literature regarding the definition of a “reasonable” follow-up interval after an abnormal screening result for CRC. Some investigators found that follow-up intervals of up to 3 months may not affect overall survival from breast or CRC, whereas others have shown that women who wait more than 30 days for evaluation after the detection of breast cancer are more likely to experience cancer recurrence or death. Targeted interventions may help reduce these delays, should involve the local community and be related to each aspect of the barriers contributing to delays in follow-up. Several European countries with strong primary healthcare systems, such as the United Kingdom and Denmark, have developed organized cancer screening systems to reduce the time for diagnosis and treatment of cancer. National fast-track referral guidance was also introduced. Suspicion of cancer leads to prompt referral of the patient to a specialist for assessment and initiation of a progressive diagnostic program within a limited time frame. Our findings indicate that SMS reminders are an effective strategy to increase rates of colonoscopy and should be adopted widely.

The physician plays a role in a patient’s decisions regarding follow-up tests. Trust in the physician and good communication between the patient and physician will influence the adherence rates of patients after a positive FOBT. In the present study, 95% of the physicians declared that FOBT is a reliable screening test for CRC and that they will not advise their patients to undergo the FOBT again to ensure that the positive result is reliable. The physician’s attitude towards FOBT as a screening test significantly influences the patient’s adherence to colonoscopy.

Due to recent developments making digital communication within the healthcare sector readily available and inexpensive, text reminders could potentially be implemented in other areas. The finding of a large increase in follow-up after a positive FOBT illustrates the need
to further investigate different aspects of SMS usage, such as patient age, gender, the type of action they aim to increase, and the wording of the message.

A limitation of this study is that only patients who agreed to receive text messages were included in the study, which created a biased population in terms of age, cultural beliefs, and SES. An additional limitation is that SES was measured using zip code rather than a direct measure, and for 56 participants the SES was missing.

In conclusion, this study is the first to directly evaluate SMS reminders for improving colonoscopy follow-up among Israeli CRC screening program participants following a positive FOBT. We have shown that a simple, inexpensive intervention for patients improves colonoscopy follow-up after a positive FOBT. It is important to maximize the potential of these findings by increasing the acceptance of text messages within the population and to examine their use in other screening programs. The physician's attitude towards FOBT as a screening test significantly influences patient adherence to colonoscopy. Therefore, further work needs to be done among physicians to increase adherence.

List of Abbreviations

CI - Confidence Interval
CRC - Colorectal Cancer
EMR - Electronic Medical Record
FOBT - Fecal Occult Blood Test
IRB - Institutional Review Board
OR - Odds Ratio
SES - socioeconomic status
SMS - short mobile message service
**Conflict of interest:** None

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Data statement**

The research data is confidential. The datasets used during the current study are available from the corresponding author on reasonable request.

**Acknowledgement:** We would like to thank Prof. Haim Reuveni for his help throughout the research process.

This study was written as a PhD thesis at Bar Ilan University, Public Health and Health Systems Management Program, Department of Management, under the direction of Racheli Magnezi, PhD, MBA, MHA and Prof. Haim Reuveni. The study was approved on February 23, 2016.
References


