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The Effect of Telephone v. Print Tailoring for Mammography Adherence

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Abstract

Objective—The purpose of this intervention was to increase mammography adherence in women who had not had a mammogram in the last 15 months.

Methods—A prospective randomized intervention trial used four groups: (1) Usual Care, (2) Tailored telephone counseling, (3) Tailored print, (4) Tailored telephone counseling and print. Participants included a total of 1244 women from two sites—a general medicine clinic setting serving predominately low-income clientele and a Health Maintenance Organization (HMO). Computer-tailored interventions addressed each woman's perceived risk of breast cancer, benefits and/or barriers and self efficacy related to mammography screening comparing delivery by telephone and mail.

Results—Compared to usual care all intervention groups increased mammography adherence significantly (odds ratio 1.60 to 1.91) when the entire sample was included.

Conclusions—All interventions groups demonstrated efficacy in increasing mammography adherence as compared to a usual care group. When the intervention analysis considered baseline stage, pre contemplators (women who did not intend to get a mammogram) did not significantly increase in mammography adherence as compared to usual care.

Practice Implications—Women who are in pre contemplation stage may need a more intensive intervention.

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Keywords

Mammography; Screening; Intervention; Tailored Intervention

1. Introduction

Breast cancer morbidity and mortality presents a significant challenge in our health care system; in the United States alone it is estimated that more than 212,920 breast cancer cases will be diagnosed in 2006 and that 40,970 females will die of breast cancer, with older women being at greatest risk.[1]. Although many new treatments are prolonging life, our greatest hope still lies in discovering breast cancer at an early stage when the disease is almost 95% curable. Regular mammography screening facilitates early stage diagnosis, which, in turn, contributes to mortality reduction. To date, our most effective weapon is annual mammography screening, with increased screening contributing to the encouraging recent decrease in breast cancer mortality [2].

Although evidence for mortality reduction from regular mammograms has recently been revisited, studies have shown mortality decreases of up to 30% in women 50 or over who are routinely screened [3,4]. There is mounting evidence that annual screening is likely the optimal schedule [5,6], especially for women in their forties [7,8]. Mammography screening starting at age 40 is strongly supported by the National Cancer Institute (NCI), the Centers for Disease Control and Prevention, and the American Cancer Society (ACS). Despite these recommendations, recent data from the Center for Health Statistics indicate that, depending on race and economic status, only 55% to 72% of women report a mammogram in the last 2 years [9]. Many have been screened at some point but are not being adherent with repeat mammography [10]. It is important to identify acceptable and effective methods by which women can be encouraged to obtain this important health screening service at regular intervals.

The Transtheoretical Model (TTM) considers both history of targeted behaviors and intentions regarding future behavior, viewing health behavior change on a continuum wherein the individual moves from not considering a health behavior to adopting and then maintaining the behavior [11]. The decisional balance component of the model is defined as the assessment by an individual of benefits (pros) of a health action relative to barriers (cons). Changing or initiating a health action usually involves a gradual change in this decisional balance. The TTM can serve as a guide for delivering health messages appropriate for an individual's stage of behavior adoption, with the goal of moving people along the continuum of change toward action and, ultimately, maintenance of the behavior. The TTM has been applied to mammography screening and has guided a number of effective mammography promoting interventions [12–17]. The Health Belief Model, which has also guided mammography interventions, proposes that perceived susceptibility (risk), benefits, barriers, and self-efficacy for behavior change influence whether a person engages in a health promotion behavior [18–20].

Among the most promising health behavior interventions are tailored approaches to deliver information or change strategies intended to reach one specific person, based on characteristics that are unique to that person, related to the outcome of interest, and have been derived from an individual assessment [21–23]. Results of several studies suggest that tailoring interventions to both HBM constructs and stage of mammography adoption (based on TTM) enhances intervention effectiveness leading to increased mammography use [14,17,23–26]. Further, there is some evidence that combining tailored telephone and print interventions are more effective than print alone.

In this study, we employed a factorial design to compare intervention effects among four groups: women receiving tailored print interventions by mail; tailored counseling by telephone; both mailed tailored print and tailored telephone counseling; or usual care. Participants were members of a managed health care plan or patients of a low-income, university-affiliated primary health care clinic, both in the Midwestern United States. All participants entered the study as non-adherent for mammography. For analyses among the four groups reported here, we used electronic records data to compare mammography adherence post intervention (see Hypothesis 1, below) and self-report data to compare forward mammography stage movement (Hypothesis 2, below).

1.1. Hypotheses

1. At 4 months post-intervention, there will be a significant difference in mammography adherence rates between women in 1) Usual care, 2) Tailored telephone counseling, 3) Tailored print, and 4) Tailored telephone counseling and tailored print. Intervention effectiveness will vary (through confounding or interaction) by initial mammography stage, age, income, education, marital status, and race.
2. Women in the intervention groups will demonstrate a significantly greater increase, compared to usual care, in forward stage movement (precontemplation to contemplation, contemplation to action, or precontemplation to action) from baseline to 2 months post follow up.

2. Methods

Participants were enrolled in a longitudinal intervention study to increase mammography use. We recruited 1244 participants from two sites—a university-affiliated general medicine clinic setting serving predominately low-income clientele in St. Louis, MO and a Health Maintenance Organization (HMO) comprised mainly of enrollees in Indianapolis, IN from 09/01/96 to 11/30/02. Study participants' mean age was 66; 54% were African American and 44% Caucasian. Demographic variables did not differ by intervention group. Following receipt of an initial letter and brochure describing the study, trained research assistants contacted the women and collected data via Computer Assisted Telephone Interviews. Participants were randomly assigned to one of four study groups: 1) usual care, 2) tailored telephone counseling, 3) tailored print, or 4) tailored print and telephone counseling. Data collection interviews, conducted at baseline and at 2 months, included questions regarding HBM constructs and stage of mammography adoption. Data regarding mammography use and stage of adoption were collected via self report (Hypothesis 2); mammography use was further verified through audit of medical records at 4 months post-intervention. In this report, we rely on mammography adherence data obtained through medical records for looking at adherence (hypothesis 1), self report data at the 2 month interview are used for hypothesis 2, which assesses stage of readiness to change.

2.1. Measures

Measures assessing beliefs and knowledge had been well tested in previous work and continued to demonstrate good reliability and validity in this study [27,28].

Mammography adherence—All study participants were non-adherent at baseline (i.e., no reported mammogram in the previous 15 months). Post-baseline, women were categorized as adherent if they had a mammogram between intervention and 4 months post-intervention.

Stages of mammography adoption—Stages of mammography adoption were determined via algorithms using responses from a series of questions at 2 month interview and based on widely used definitions developed via the NCI consortium (B. Rimer, personal communication, 1996). At 2 months post-intervention, respondents were classified as: 1) Precontemplation: Never had a mammogram or had a mammogram but not currently adherent; not planning on having one in next 12 months; 2) Contemplation: Never had a mammogram or had a mammogram but not currently adherent; planning on having one in next 12 months; 3) Action: Had a mammogram within the last 12 months. (Due to eligibility criteria, no women were in this stage at baseline.)

2.2. Intervention

Computer-tailored interventions addressed each woman's perceived risk of breast cancer, benefits and/or barriers related to screening and self-efficacy for obtaining mammography, and her knowledge of the mammography procedure. Based on the theoretical models described previously and our past research, we developed messages for perceived risk, benefits, barriers, and self-efficacy and for procedural knowledge specific to an individual's responses in the baseline interview. Messages were also developed to assess family history, age, and stage of adoption. The tailored interventions were aimed at helping the woman move forward from her baseline stage of mammography adoption toward adherence to screening guidelines.

The tailored print and telephone interventions, described previously [29,30] included a mailed tailored print intervention that included a physician-signed cover letter and a one-to-three page newsletter with color graphics and text. The cover letter addressed the woman's age, family history, and stage of mammography adoption. The first page of the newsletter included tailored information addressing the participant's perceived risk, benefits and barriers to mammography and self efficacy as assessed in the baseline interview. The second newsletter page addressed self-efficacy and was included only for women whose self efficacy scores were low; the third newsletter page, with graphics and text about how to arrange for a mammogram, was included only for women who had not had a previous mammogram. For the telephone intervention, trained counselors used a tailored printed guide generated by the tailoring program to deliver the same information contained in the print intervention. Telephone counselors deviated from content in the tailored printed counseling guide only when participants asked specific questions. Telephone counselors received intensive training to be able to answer common questions about breast cancer and screening; however, they were cautioned not to give medical advice but to refer the participant to their regular health care provider. Questions most often asked included the cost of a mammogram and whether insurance covered the test. All other questions from participants reported in evaluations by counselors had to do with the specific tailored information provided during the call.

Women in the combination group (Group 4) received the mailed print letters followed by a telephone counselor's call within a week of the mailing. Interventions for each participant were created via a computer tailoring program developed by People Designs, Inc. (Durham, NC).

2.3. Statistical Methods

Descriptive statistics of baseline measures were calculated for the four study groups. To check the balance of the characteristics across groups, we used the Kruskal-Wallis Test for continuous variables and the Chi-square test for categorical variables. To test intervention effects for Hypothesis 1, we performed logistic regression to predict the binary outcome of 4 month post-intervention mammography adherence from the 4 study groups while adjusting for the covariates of baseline stage (pre-contemplation or contemplation), age, income, education, marital status, employment, race, and study site. Four-month follow-up was selected because this allowed time for a woman to schedule and obtain a mammogram following the

intervention; our previous research had shown greatest intervention effect sizes between 4 to 6 months post intervention [31]. For logistic regression, we reported adjusted odds ratios with 95% profile-likelihood confidence intervals and p-values from likelihood ratio chi-square tests. We also tested the eight interactions important for the purposes of this study: between group membership and covariates. We used the Bonferroni correction to adjust alpha ($.05 / 8$ interactions = .00625) for multiple tests of interactions. To investigate whether the interventions moved women forward in their stage of mammography adoption (Hypothesis 2), we first classified each women as having or not having advanced in stage (e.g., remained in the same stage or moved backward, post-intervention). We then constructed a multiple logistic regression model to predict the binary stage movement from the independent variables listed in Hypothesis 1. Because stage could be calculated only from self-report data, 2 month post-intervention data were used.

3. Results

There were no significant differences in demographic characteristics across groups at baseline.

3.1. Hypothesis 1

At 4 months post-intervention, there will be a significant difference in mammography adherence rates between women in 1) Usual care, 2) Tailored telephone counseling, 3) Tailored print, and 4) Tailored telephone counseling and Tailored print. Intervention effectiveness will vary (through confounding or interaction) by initial mammography stage, age, income, education, marital status, and race.

Mammography adherence by group is demonstrated in Table I. Results for hypothesis 1 indicate that all intervention groups were significantly different than usual care on mammography adherence. Group 4 demonstrated the strongest effect (Table II, $p = .001$), Group 3 a somewhat lower effect (Table II, $p = .006$), and Group 2 (Table II, $p = .021$) the least significant difference.

Age was entered in the logistic regression model as three categories because the relationship between age and adherence was non-linear. Education was entered as a continuous variable (highest grade), because a priori theory and previous experience with these data suggested more information was gained than from categorical education. After controlling for each other and for study group (Table II), marital status, employment, race, site, income, and age had no independent significant effects on adherence. The effect for education approached significance (Table II, $p = .081$). Baseline mammography stage was highly predictive ($p < .0001$) of 4-month adherence, controlling for other covariates (Table II).

The logistic regression model in Table II includes only main effects, because none of the eight interactions between group and other covariates were significant beyond the Bonferroni-corrected alpha of .006. However, the interaction between group and marital status (living with partner vs. living alone) for predicting 4-month adherence was significant before Bonferroni correction ($p = .041$); therefore we also reported these exploratory but quite interesting results (Table III). For women living alone, 4-month adherence rate, after adjusting for these other covariates, was significantly greater for the tailored print (Group 3; OR = 1.8, $p = .011$) and tailored print plus phone (Group 4; OR = 2.5, $p < .0001$) groups, compared to usual care (Group 1). However, for women living with a partner, adherence rate was significantly greater for the tailored phone group (Group 2) compared to usual care (OR = 2.2, $p = .034$, Table III). The sample size was smaller, and thus statistical power was lower, for those living with a partner ($n = 331$) than for those living alone ($n = 812$).

Although the overall interaction between baseline mammography stage and group did not reach significance ($p = .085$), the interaction between baseline stage and a pair-wise group effect [telephone plus print (Group 4), vs. usual care (Group 1)] was significant ($p = .029$). To further explore this interaction, we ran the logistic regression model separately for baseline precontemplators and contemplators (Table III). Findings, displayed in Table III, show that intervention effects among contemplators were similar to effects for the whole sample (e.g., significant effects for all three interventions, compared with usual care). However, among women who entered the study as precontemplators, none of the interventions had effects significantly greater than usual care. It should be noted that the power of the statistical tests was lower for the precontemplator model ($N = 269$) than for the contemplator model ($N = 874$). Also of note, the magnitude of association for telephone (Group 2) versus usual care (Group 1) was just as strong ($OR = 1.6$) for precontemplators as for contemplators (Table III).

3.2. Hypothesis 2

Women in the intervention groups will demonstrate a significantly greater increase, compared to usual care, in forward stage movement (precontemplation to contemplation, contemplation to action or precontemplation to action) from baseline to 2 month post follow up.

The interview data obtained by telephone at 2 months allowed us to assess an individual's stage of mammography adherence after the intervention. Because the stage data were self reported, their validity was dependent on subjects' honest and correct reporting. Overall the proportion of subjects who moved forward one stage were similar between precontemplators and contemplators. Specifically, 43% of the precontemplators had moved to contemplation or action, and 50% of the contemplators had moved to action by 2 months. However, relatively few baseline precontemplators moved by two full stages to action (16%) Results from the logistic regression model in Table IV show that all interventions were effective (compared to usual care) in moving women forward in mammography stage (vs. same or backward). However, the combination of tailored telephone and print (Group 4) had the largest effect ($p = .0003$, Table IV).

The interaction between group and baseline stage on the outcome of stage movement from baseline to the 2-month follow-up approached significance ($p = .057$). Therefore, we re-ran the logistic model separately for baseline precontemplators and contemplators (Table V). Among baseline contemplators, forward stage movement was significantly greater for all intervention groups (Groups 2, 3, and 4) compared to usual care (Table V). Consistent with results observed for 4-month adherence using medical record adherence data, the strongest effect on adherence for baseline contemplators was tailored telephone plus print ($p < .0001$). Among the precontemplators, the 2-month self-report data on stage I in Table V are also consistent with 4-month adherence results. Specifically, no intervention effect was found for precontemplators.

4. Discussion and Conclusion

4.1. Discussion

In this study, over half of participants were low-income and African American; none had received a mammogram during the 15 months prior to study entry, although the great majority of women (89%) had been screened sometime in the past. It was our intent to determine the most efficacious tailored intervention and also to address potential covariates and interactions that might influence intervention effects.

After adjusting for demographic variables, adherence in all intervention groups were significantly different from usual care. An interesting interaction occurred between living

status and intervention. For women living alone, print alone and print plus telephone (Group 3 and 4) were most effective, but for women who were living with a partner, the telephone intervention alone was significant. Perhaps women living alone had more time to carefully consider printed material.

Women were categorized at baseline as precontemplators (those who indicated no intent to get a mammogram) and contemplators (those who intended to obtain one). Whereas no intervention had a significant effect on precontemplators, all interventions had significant effects those who entered the study as contemplators. This finding could be due to the large number of contemplators; however, it is also possible that precontemplators require a stronger intervention than those provided in our experimental groups. Indeed, our previous research has indicated that, depending on baseline stage, a more intensity intervention is needed to move women toward action [32].

In hypothesis 2, we also considered stage movement by intervention. That is, baseline precontemplators could move to contemplation (1 stage) or to Action (2 stages), post-intervention. Contemplators could become actors, or women could remain in their current baseline stage. Analyses controlling for covariates showed that all intervention groups moved women forward in stage. However, some differences emerged when considering stage movement (hypothesis 2) as opposed to actual adherence (Group 3) (Table III).

Limitations—Because women who entered the study knew that it involved mammography screening, the possibility of a Hawthorne effect was present in self-report stage data analyzed for Hypothesis 2. However, the fact that findings from these self-report stage data followed a trend similar to the trend demonstrated for Hypothesis 1, which relied on electronic records data, lends support for their validity.

4.2. Conclusion

For contemplators, the combination of telephone and print was clearly the most effective intervention for promoting both 2-month stage movement (OR = 2.5, $p < .0001$, Table II) and 4-month adherence (OR = 2.1, $p = .0003$, Table V). It appears that adding the printed material to the phone messaging had an additive effect. These findings are similar to those of Rimer and colleagues [16,26] who found that tailored print plus phone was more effective than usual care but differs in that we found those receiving print alone were more likely than the usual care group to have mammograms post-intervention.

4.3. Practice Implications

Results of this research may not be applicable to all women. The study participants for this report were part of care plans that covered mammography and thus the cost barrier was removed. However, the interaction between intervention and site was not significant adherence ($p = .34$) or stage movement ($p = .49$) suggesting generalizability of the findings to other geographic regions. Further, although all women involved in this study were non-adherent upon entry, they may have been more open to mammography rescreening than those who declined participation. With these caveats in mind, our results clearly support the value of conceptualizing mammography adherence along a continuum of stage (Tables 4 & 5.). When analyses were completed separately for women who were in precontemplation at baseline versus those in contemplation, a difference became apparent. For baseline precontemplators intervention was effective. This may mean that a more intensive interaction is needed for women not even contemplating having mammograms. Or, it may simply be easier to move women one stage than two stages - no matter what type of intervention. But, even contemplators in our study were more likely to have progressed to action if they received the combined phone and print intervention. We did not find that contemplators needed a lower-intensity intervention

– only that a higher-intensity intervention had more effective results among contemplators than precontemplators. Hence, what the minimal intervention needed for change remains elusive. Clinical implications are that a woman in the precontemplation stage may need one or more clinic visits to move along to contemplation and then to action. It also appears easier to move women in contemplation forward than those in precontemplation (Table V). Partin and Slater (2003) report that the initial stage of adherence can be very important in selecting the interventions needed to move women to adherence [10]. Given that most women have now had mammography screening at least once, it is especially important to look at reasons why women do not continue with annual screening. Future research should also consider the different types of interventions that may be needed for those in different stages. For women in precontemplation, a more intense intervention or repeat interventions may be needed.

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References

1. Jemal A, et al. Cancer statistics, 2004. *CA: a cancer journal for clinicians* 2004;54(1):8–29. [PubMed: 14974761]
2. American Cancer Society. Breast cancer facts & figures 2001–2002. American Cancer Society; Atlanta: 2003. p. 23
3. Olsen O, Gotzsche PC. Cochrane review on screening for breast cancer with mammography. *Lancet* 2001;358:1340–42. [PubMed: 11684218]
4. Feig SA, Hendrick RE. Radiation risk from screening mammography of women aged 40–49 years. *Journal of the National Cancer Institute Monographs* 1997;22:119–124. [PubMed: 9709287]
5. McCarthy E, et al. Mammography use, breast cancer stage at diagnosis, and survival among older women. *Journal of American Geriatric Society* 2000;48(10):1226–1233.
6. Blanchard K, et al. Mammographic screening: patterns of use and estimated impact on breast carcinoma survival. *Cancer* 2004;101(3):495–507. [PubMed: 15274062]
7. White E, et al. Biennial versus annual mammography and the risk of late-stage breast cancer. *Journal of the National Cancer Institute* 2004;96(24):1832–9. [PubMed: 15601639]
8. Buist DS, et al. Factors contributing to mammography failure in women aged 40–49 years. *J Natl Cancer Inst* 2004;96(19):1432–40. [PubMed: 15467032]
9. Centers for Disease Control and Prevention. Mammography. 2003
10. Partin MR, Slater JS. Promoting repeat mammography use: insights from a systematic needs assessment. *Health Education and Behavior* 2003;30(1):97–112. [PubMed: 12564670]
11. Prochaska, JO.; Redding, CA.; Evers, KE. The Transtheoretical Model and stages of change. In: Glanz, K.; Lewis, FM.; Rimer, BK., editors. *Health Behavior and Health Education*. Jossey-Bass Publishers; San Francisco, CA: 1997. p. 60–84.
12. Champion VL. Development of a benefits and barriers scale for mammography utilization. *Cancer Nursing* 1995;18(1):53–59. [PubMed: 7866977]
13. Clark MA, et al. The effect of a stage-matched and tailored intervention on repeat mammography(1). *American Journal of Preventive Medicine* 2002;22(1):1–7. [PubMed: 11777672]
14. Skinner CS V, Strecher J, Hospers H. Physicians' recommendations for mammography: Do tailored messages make a difference? *American Journal of Public Health* 1994;84:43–9. [PubMed: 8279610]
15. Rimer B, Lipscomb J. Enhancing the use of mammography: effectiveness and cost. *Effective Clinical Practice* 2000;3(5):205–252. [PubMed: 11185325]
16. Rimer BK, et al. Effects of a mammography decision-making intervention at 12 and 24 months. *American Journal of Preventive Medicine* 2002;22(4):247–257. [PubMed: 11988381]
17. Rakowski W, et al. Increasing mammography among women aged 40–74 by use of a stage-matched, tailored intervention. *Preventive Medicine* 1998;27(5 Pt 1):748–56. [PubMed: 9808807]
18. Janz NK, Becker MH. The Health Belief Model: A decade later. *Health Education Quarterly* 1984;11(1):1–47. [PubMed: 6392204]

19. Becker, MH. The Health Belief Model and personal health behavior. Becker, MH., editor. San Francisco: Society for Public Health Education; 1974. p. 150
20. Rosenstock IM. Adoption and maintenance of lifestyle modifications. *American Journal of Preventive Medicine* 1988;4(6):349–352. [PubMed: 3228532]
21. Kreuter, MW., et al. Tailoring health messages: customizing communication with computer technology. Mahwah: Lawrence Erlbaum Associates; 2000.
22. Skinner CS, Arfken CL, Sykes RK. Knowledge, perceptions, and mammography stage of adoption among older urban women. *American Journal of Preventive Medicine* 1998;14(1):54–63. [PubMed: 9476836]
23. Champion VL, Huster G. Effect of interventions on stage of mammography adoption. *Journal of Behavioral Medicine* 1995;18(2):169–187. [PubMed: 7563045]
24. King ES, et al. Promoting mammography use through progressive interventions: Is it effective? *American Journal of Public Health* 1994;84(1):104–106. [PubMed: 8279593]
25. Lipkus IM, et al. Can tailored interventions increase mammography use among HMO women? *American Journal of Preventive Medicine* 2000;18(1):1–10. [PubMed: 10808977]
26. Rimer BK, et al. The short-term impact of tailored mammography decision-making interventions. *Patient Education & Counseling* 2001;43(3):269–85. [PubMed: 11384825]
27. Champion VL, Skinner CS, Foster JL. The effects of standard care counseling or telephone/in-person counseling on beliefs, knowledge, and behavior related to mammography screening. *Oncology Nursing Forum* 2000;27(10):1565–1571. [PubMed: 11103375]
28. Skinner CS, et al. Racial and educational differences in mammography-related perceptions among 1,336 nonadherent women. *Journal of Psychosocial Oncology* 2002;20:1–18.
29. Ryan GL, et al. Examining the boundaries of tailoring: the utility of tailoring versus targeting mammography interventions for two distinct populations. *Health Education Research* 2001;16(5): 555–66. [PubMed: 11675803]
30. Champion VL, et al. Comparison of tailored mammography interventions at two months post intervention. *Annals of Behavioral Medicine* 2002;24(3):211–218. [PubMed: 12173678]
31. Champion V, et al. Comparison of tailored interventions to increase mammography screening in nonadherent older women. *Preventive Medicine* 2003;36(2):150–8. [PubMed: 12590989]
32. Saywell RM Jr, et al. The cost effectiveness of 5 interventions to increase mammography adherence in a managed care population. *Am J Manag Care* 2003;9:33–44. [PubMed: 12549813]

Table 1

Cross-classification Table of Randomized Group by Four Month Adherence

Group	Usual Care (1)	Phone (2)	Print (3)	Phone + Print (4)	Total
Non-adherence (column %)	226 (77%)	223 (71%)	224 (68%)	200 (65%)	873 (70%)
Adherence (column%)	68 (23%)	91 (29%)	105 (32%)	108 (35%)	372 (30%)
Total	294	314	329	308	1245

Table 2
Predictors of Four Month Adherence, Using Binary Logistic Regression (N = 1143)

Predictor	Adjusted Odds Ratio	95%	CI	LRT p-value
Group 2 (Phone) vs. 1 (Control)	1.596	1.074	2.383	.021
Group 3 (Print) vs. 1 (Control)	1.709	1.162	2.526	.006
Group 4 (Phone + Print) vs. 1 (Control)	1.914	1.302	2.830	.001
Stage: Precontemplators vs. Contemplators	0.157	0.096	0.244	< .0001
Education (highest grade)	1.043	0.995	1.094	.081
Marital Status: Partner vs. Alone	1.119	0.813	1.537	.488
Employed: Yes vs. No	0.959	0.678	1.356	.815
Caucasian vs. African American & Other	1.002	0.713	1.406	.992
Site: Indianapolis vs. St. Louis	1.383	0.925	2.068	.113
Income Level (\$15,000 or more)	1.188	0.812	1.735	.375
Age: 50–64 vs. Over 74	0.835	0.554	1.261	.389
Age: 65–74 vs. Over 74	1.192	0.788	1.809	.406

Legend: CI = profile-likelihood confidence interval.

Other likelihood ratio tests (LRT): overall Group effect, $p = .006$; Group 2 vs. Group 3, $p = .719$; Group 2 vs. Group 4, $p = .337$; Group 3 vs. Group 4, $p = .537$.

Table 3

Interaction Between Randomized Group and Marital Status, and Between Randomized Group and Baseline Stage, on 4 Month Adherence

Predictor	Odds Ratio	Living Alone (N = 812)		LRT p-value	Odds Ratio	Living With Partner (N = 331)		LRT p-value
		95% CI				95% CI		
Group 2 vs. 1	1.464	0.899	2.400	.126	2.159	1.059	4.475	.034
Group 3 vs.1	1.847	1.152	2.990	.011	1.548	.782	3.104	.211
Group 4 vs.1	2.516	1.581	4.053	< .0001	0.999	.491	2.036	.997

Predictor	Odds Ratio	Precontemplators (N = 269)		LRT p-value	Odds Ratio	Contemplators (N = 874)		LRT p-value
		95% CI				95% CI		
Group 2 vs. 1	1.646	0.510	5.831	.407	1.585	1.042	2.422	.031
Group 3 vs.1	1.397	0.435	4.906	.578	1.711	1.139	2.584	.01
Group 4 vs.1	0.549	0.076	2.719	.475	2.104	1.406	3.172	.0003

LRT = likelihood ratio tests. Other LRT for Living Alone: overall group effect $p = .0009$; Group 2 vs. Group 3, $p = .313$; Group 2 vs. Group 4, $p = .017$; Group 3 vs. Group 4, $p = .159$.

Other LRT for Living With Partner: overall group effect, $p = .093$; Group 2 vs. Group 3, $p = .334$; Group 2 vs. Group 4, $p = .032$; Group 3 vs. Group 4, $p = .201$.

Other LRT for Precontemplators: overall group effect, $p = .495$; Group 2 vs. Group 3, $p = .763$; Group 2 vs. Group 4, $p = .149$; Group 3 vs. Group 4, $p = .224$.

Other LRT for Contemplators: overall group effect, $p = .003$; Group 2 vs. Group 3, $p = .705$; Group 2 vs. Group 4, $p = .154$; Group 3 vs. Group 4, $p = .284$.

Legend: CI = profile-likelihood confidence interval. Group: 1= usual care, 2 = telephone, 3 = print, 4 = telephone and print. A separate binary logistic regression model was used for each of four subgroups. All odds ratios and p-values were adjusted for covariates listed in Table II.

Table 4
Predictors of Forward Stage Movement From Baseline to 2 Months Post Intervention (N = 957)

Predictor	Adjusted Odds Ratio	95% CI Lower	95% CI Upper	LRT P-value
Group 2 vs. 1	1.514	1.046	2.195	.028
Group 3 vs. 1	1.546	1.088	2.203	.015
Group 4 vs. 1	1.949	1.355	2.815	.0003
Education (highest grade)	0.996	0.951	1.042	.857
Marital Status: Partner vs. Alone	1.098	0.803	1.502	.559
Employed: Yes vs. No	0.657	0.462	0.930	.018
Caucasian vs. Other	0.658	0.468	0.923	.015
Site: Indianapolis vs. St. Louis	1.303	0.876	1.944	.192
Income Level (\$15,000 or more)	1.277	0.885	1.846	.191
Age: 50–64 vs. Over 74	1.297	0.881	1.862	.197
Age: 65–74 vs. Over 74	1.697	1.160	2.492	.006

LRT = likelihood ratio tests. Other LRT: overall group effect, $p = .003$; Group 2 vs. Group 3, $p = .910$; Group 2 vs. Group 4, $p = .195$; Group 3 vs. Group 4, $p = .213$.

Legend: CI = profile-likelihood confidence intervals. We used binary logistic regression to model forward stage movement (versus the same or backward). Group: 1 = usual care, 2 = telephone, 3 = print, 4 = telephone and print.

Table 5
Interaction Between Randomized Group and Baseline Stage on Forward Stage Movement

Predictor	Odds Ratio	Precontemplators (N = 219)			Odds Ratio	Contemplators (N = 738)		
		95% CI		LRT p-value		95% CI		LRT p-value
Group 2 vs. 1	0.777	0.357	1.671	0.519	1.960	1.277	3.023	0.002
Group 3 vs.1	1.240	0.603	2.559	0.559	1.654	1.100	2.496	0.016
Group 4 vs.1	0.895	0.394	2.010	0.788	2.467	1.627	3.767	< .0001

Other LRT for Precontemplators: overall group effect, $p = .699$; Group 2 vs. Group 3, $p = .248$; Group 2 vs. Group 4, $p = .750$; Group 3 vs. Group 4, $p = .443$.

Other LRT for Contemplators: overall group effect, $p = .0002$; Group 2 vs. Group 3, $p = .435$; Group 2 vs. Group 4, $p = .299$; Group 3 vs. Group 4, $p = .059$.

Legend: CI = profile-likelihood confidence interval Group: 1= usual care, 2 = telephone, 3 = print, 4 = telephone and print. A separate binary logistic regression model was used for each baseline stage. The event modeled was forward stage movement (versus the same or backward). All odds ratios and p-values in Table V were adjusted for covariates listed in Table IV.