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Motivational interviewing-based health coaching as a chronic care intervention

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Abstract

Objective To evaluate the impact of motivational interviewing-based health coaching on a chronically ill group of participants compared with non-participants. Specifically, measures that could be directly attributed to a health coaching intervention on chronic illness were assessed.
Design Quasi-experimental study design.
Setting A large medical university in the north-west United States.
Methods One hundred and six chronically ill programme participants completed a health risk survey instrument prior to enrolment and again at approximately 8 months. Outcomes were compared with 230 chronically ill non-participants who completed the survey twice over a similar time frame. Inverse probability of treatment weights were used in conjunction with the propensity score to correct for selection bias.
Results Compared with non-participants, programme participants improved their self-efficacy ($P = 0.01$), patient activation ($P = 0.02$), lifestyle change score ($P = 0.01$) and perceived health status ($P = 0.03$). Fewer participants increased their stages of change risk over time than non-participants ($P < 0.01$), and more participants decreased their stages of change risk over time than non-participants ($P = 0.03$).
Conclusion These results support motivational interviewing-based health coaching as an effective chronic care management intervention in impacting outcome measures that could also serve well as a proxy in the absence of other clinical or cost indices.

Introduction

Today, chronic diseases such as cardiovascular disease, cancer and diabetes are among the most prevalent, costly and preventable of all health problems in the USA [1–3]. A 2007 report estimated the total impact of these diseases on the economy to be $1.3 trillion annually and growing [3]. Not only are these conditions the leading causes of mortality, they are also responsible for a significant proportion of health care costs, absenteeism and lost productivity in the workplace [3,4], contributing to an escalating burden on employers.

There is ample evidence that optimizing lifestyle behaviours is a key factor in both prevention and management of chronic illness [1–3]. Although public health efforts have been successful in increasing the knowledge and awareness of healthy guidelines and recommended practices, the average American has found them difficult to follow [1,2]; thus a current billion dollar health and disease management (DM) industry has emerged to assist individuals in managing their disease [5].

Despite the fact that the Disease Management Association of America and major US-based DM organizations claim to emphasize lifestyle management as the foundation to successful DM programmes [6], there is little evidence to suggest that these programmes are in fact: (1) incorporating behaviour change methodologies into their interventions; (2) systematically changing participants' health behaviours; or (3) achieving outcomes that can be causally associated with the intervention [7].

Instead, high-salaried health care professionals (such as registered nurses, pharmacists and doctors), without appropriate instruction in psychosocial models, are employed to use their clinical training to prescribe and instruct. Notably, behaviour change theories and models have evolved, moving health education interventions away from the traditional information-based and advice-giving model to one that embraces and addresses the complex interaction of motivations, cues to action, perception of benefits and consequences, environmental and cultural influences, expectancies, self-efficacy, state of readiness to change, ambivalence and implementation intentions.

Without proper guidance, medically trained personnel may assume an approach that is authoritarian, confrontational, forceful or guilt-inducing. There is evidence that such attitudes will not only limit progress, but is actually correlated with negative behavioural and clinical outcomes [8]. Additionally, a negative cycle can be initiated, as indicated by a study where higher patient resistance to quitting smoking led to an increase in confrontational and other negative behaviours in health professionals attempting to promote behaviour change [9].

While interventions vary across settings, most DM programmes typically include several of the following components: health risk assessments (HRA), educational mailings, presentations and workshops, online programmes, biometric screenings, case management, and, increasingly, health coaching. In the context of this article, health coaching is defined as a behavioural health intervention that facilitates participants in establishing and attaining health-promoting goals in order to change lifestyle-related behaviours, with the intent of reducing health risks, improving self-management of chronic conditions and increasing health-related quality of life [10,11].

Motivational interviewing (MI) is the only health coaching technique to be fully described and consistently demonstrated as causally and independently associated with positive behavioural outcomes [10]. MI is a directive (goal-oriented), client-centred counselling style for helping clients to explore and resolve ambivalence about behaviour change [12]. The MI approach has been incorporated across diverse populations, settings and health topics. Its efficacy was first demonstrated in the treatment of addictions, such as illegal drugs and alcoholism. Continued research and two recent meta-analyses that include rigorous methodology have solidified this client-centred approach [13,14]. MI has since been shown to be effective in improving general health status or well-being, promoting physical activity, improving nutritional habits, encouraging medication adherence and managing chronic conditions such as hypertension, hypercholesterolemia, obesity and diabetes [15].

In the current study we evaluated the impact of MI-based health coaching on a chronically ill subset of employees at a large medical university in the north-west USA. We specifically assessed measures that could be directly attributed to a health coaching intervention on chronic illness: self-efficacy for managing chronic illness, patient activation, stage of readiness to change, lifestyle change and perceived health status. We hypothesized that chronically ill employees who participated in the MI-based health coaching programme would show significant improvement in these measures compared with non-participants. Findings from this study should help inform the type of intervention and outcomes suitable to a chronically ill cohort in an employer-based programme.

Methods

Setting

The present study was conducted at Oregon Health and Science University (OHSU), a large medical centre in the Pacific Northwest that employs over 12 000 workers. In 1998, OHSU established an employee wellness programme (EWP), focused on evidence-based prevention methods. The programme is made available to over 9000 employees as part of their benefits package, and includes targeted communications, HRA, biometric screenings, chronic DM, support groups, health coaching and other related offerings.

Intervention

Starting in May 2007, the EWP began administering a new HRA developed by health care researchers and behavioural specialists with the additional focus on chronic disease. Along with typical HRA questions, it queries about the presence of chronic illnesses and utilizes several existing validated survey instruments within the overall assessment including: (1) self-efficacy for managing chronic illness [16] which assesses the participant's confidence that he or she can successfully manage his or her chronic condition; (2) the EuroQol 5 dimensions (EQ-5D) index score and visual analogue scale (VAS) [17] which assesses health status and perceived health respectively; and (3) the patient activation measure (PAM) [18] which measures the participant's empowerment (knowledge, skills, beliefs and confidence) to partner with their provider to manage their health. The HRA also includes a set of questions that facilitates the participant's self-assessment of 10 common health behaviours. Last, it includes a brief intervention to identify and address the lifestyle management area of greatest need, based on the MI technique and the stages of change model [19].

Employee data were combined with biometric screening data when available, and at-risk employees were identified and stratified into four risk tiers. Variables used for this risk identification and stratification process include: clinical data outside recommended range or indicating metabolic syndrome; perceived health status; tobacco use; chronic illness paired with either low self-efficacy or patient activation; and multiple risk factors using lifestyle, utilization, absenteeism and productivity data. Employees in all four risk tiers were proactively invited to enrol in the health coaching programme using a robust prompting system with multiple touch points and communication channels, including postcard, email and phone outreach. Enrolment rates of 50% of the at-risk population were achieved.

The health coaching programme utilized primarily telephonic communications, with face-to-face sessions provided upon request. The initial session lasted 30–40 minutes and subsequent follow-up sessions lasted 10–20 minutes. Follow-up sessions were scheduled based on participant's risk profile, needs and interests. Whereas sessions were not limited, the average number of sessions was three. A dedicated coach model based on the MI technique was used, as described above. All coaches were rated as proficient in MI by an independent coder trained in using the MI treatment integrity coding system [20]. A risk profile of the participant was used to create a menu of options (including an 'other' category) from which the participant could choose an area to discuss with the coach. Per the MI model, information and advice-giving were de-emphasized by default to efforts to increase intrinsic motivation, self-efficacy, patient activation and readiness to change.

Study population

As illustrated in Fig. 1, of the approximately 8500 employees who were eligible for the EWP, 3832 (45%) took the HRA at least once between 1 May 2007 and 30 July 2008. One thousand and seven-

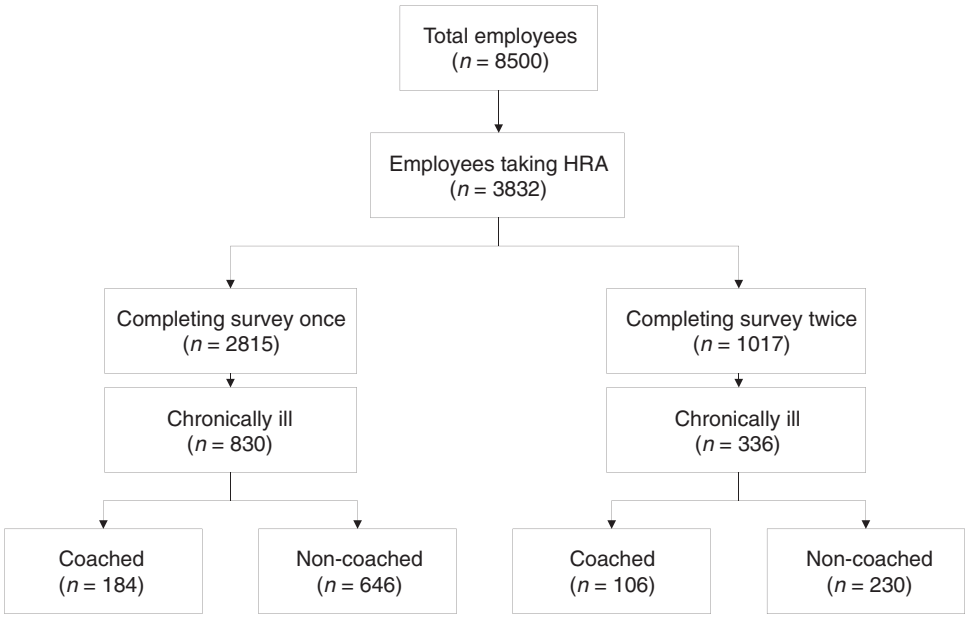

Figure 1 Study population.

teen individuals took the survey twice, of which 33% had reported to have one or more chronic illnesses. As mentioned above, although the health coaching programme has a 50% enrolment rate, the current study focuses on this subset of individuals who were chronically ill and had taken the survey at least twice. More specifically, we compared outcomes between the 106 individuals with a chronic illness who had participated in the health coaching programme and taken the survey twice to the 230 individuals with a chronic illness who chose not to participate but also took the survey twice.

Outcomes

The primary outcomes variables measured in this study were: self-efficacy for managing chronic illness; PAM; and perceived global health status (reported on the EQ-5D as a VAS) score. Secondary outcome variables were: self-assessment of most important behaviour change for participant's health or quality of life; and risk status in this identified area based on readiness to change.

Outcomes were calculated using a differences-in-differences (DID) estimator. That is, we modelled the treatment effect by estimating the difference with outcome scores in the second survey period minus the baseline score (first survey) for both participants and non-participants, and then compared the difference between the two groups (treated as panel data). A positive value for the DID estimate indicates that the programme participant group had an increase in the outcome variables greater than the non-participant group, and a negative value indicates that the non-participants had an increase in scores greater than participants. Using this approach, the outcome measures can be described as the 'net change in self-efficacy, PAM, health status, and most important behaviour change of participants over non-participants'. The DID strategy ensures that any variables that remain constant over time (but are unobserved) that are correlated with the selection decision and the outcome variable will not bias the estimated effect [21].

A secondary analysis assessed the change in risk status of the most important behaviour change area between participants and non-participants based on the readiness to change model. Individuals categorizing themselves as being in the *pre-contemplative*, *contemplative* or *preparation* stages are classified as being 'at risk', while those considering themselves in the *action* stage were classified as 'not at risk'.

Analytic approach

Given this was an observational study with the potential for selection bias, we adjusted for group differences and allowed for causal inference using a three-step process: propensity score estimation, inverse probability of treatment weighting (IPTW) and statistical analysis.

In the first step, we modelled the selection process by estimating the propensity score for each individual in the study population. The propensity score, defined as the probability of assignment to the treatment group conditional on observed covariates (i.e. independent variables) [22], was derived from a logistic regression equation that reduces each participant's set of characteristics to a single score. We used boosted logistic regression [23] to estimate the propensity score because of its greater accuracy over standard linear models. Regression boosting, commonly referred to as multiple additive regression trees, is a general, automated, data-adaptive modelling algorithm that can estimate the non-linear relationship between the outcome variable (in this case, treatment assignment) and a large number of covariates including multiple level interaction terms [24]. A total of 60 independent variables were included in the model including: age; gender; job category; self-management level of nine lifestyle and health behaviours; presence and count of up to 10 chronic illnesses; body mass index

(BMI); EQ-5D scores which include physical and mental functional score and perceived global health status; PAM; self-efficacy for chronic illness; and readiness to change risk.

In the next step, each individual in the study population was assigned a weight based on their programme participation status and on their estimated propensity score. The weight is the inverse probability of the individual's treatment assignment, thus participants are given a weight of 1/(propensity score) and non-participants are given a weight of 1/(1 – propensity score) [25]. The IPTW framework eliminates imbalances between groups on pre-intervention characteristics, thereby allowing unbiased estimation of treatment effects.

Statistical comparisons between cohorts on baseline characteristics were performed using *t*-tests for independent samples and chi-squared statistics for non-continuous variables. Receiver operator characteristics analysis [26] was used to compare the accuracy of the boosted regression model with standard logistic regression in estimating the propensity score. Outcome measures were estimated using ordinary least squares regression applying the IPTW as weights. Robust standard errors [27] were generated to produce conservative confidence intervals for the weighted regression models estimates. Further, given that analyses were conducted on multiple outcomes, we used the Bonferroni 'step-down' correction approach [28] to adjust for the inflated risk of committing a type I error. All analyses in the current paper were performed using Stata (version 10.0) software (Statacorp, College Station, TX, USA). Given space limitations, readers are referred to Linden and Adams [29] for a more comprehensive discussion of the analytic methods employed in this study.

Results

Baseline characteristics

Compared with non-participants at baseline (Table 1), programme participants were generally older, were more overweight and had less confidence in their ability to manage their chronic condition (self-efficacy). Additionally, they had lower patient activation, were less ready to change their key behavioural risk and had a lower overall health status. Regarding the type of chronic illnesses, participants were more likely to have an addiction, asthma or coronary artery disease compared with non-participants.

A concern that is always present in analyses of small samples is whether those individuals under study adequately represent the population from which they were drawn. We conducted comparisons on baseline characteristics between programme participants and non-participants who took the HRA twice to their respective cohorts who took the survey only once (data not shown). No significant differences were found on any baseline characteristic between cohorts (e.g. non-participants taking the survey only once vs. non-participants taking the survey twice, etc.). While this finding does not ensure that the subset of individuals in this study represents a random draw of chronically ill persons not included in the study, it does provide us with some confidence that the 336 chronically ill individuals under study are similar to the 830 chronically ill individuals who took the survey only once (together representing approximately 30% of all people taking the survey and 14% of the overall population).

Propensity score model and IPTW

The boosted logistic regression provided superior predictive accuracy across the entire range of propensity scores than the standard logistic regression (area under the curve was 97.4% and 87.4% for boosted regression and standard logistic regression respectively). The boosted regression created 384 regression trees in the iterative process suggesting that a large number of multiple level interaction terms were identified. The four independent variables that explained the most variation in the propensity score (either alone or as a component of one or more interaction terms) were: baseline self-efficacy (15%), BMI (10%), age (7%) and PAM (7%). All remaining independent variables explained less that 5% of the overall variation in propensity scores. The IPTW reduced imbalances between groups on all baseline characteristics presented in Table 1 (data available upon request from first author).

Outcomes

All primary outcomes were significantly associated with programme participation and remained so after statistical adjustment (Table 2). The non-participant group showed a non-statistically significant increase of 1.17 points on their PAM scores (scored from 0 to 100, with a higher score indicating better patient activation), while the participant group improved by 4.57 points ($P = 0.02$). On average, the non-participant group showed a slight, but non-statistically significant decrease in their self-efficacy scores by –0.21 points, while programme participants increased their self-efficacy by 0.65 points ($P = 0.01$) (scored from 0 to 10 with higher scores indicating better self-efficacy). Non-participants showed slight improvements (non-statistically significant) in their perceived global health status while programme participants reported an increased health status of 3.6 points ($P = 0.03$) (scored from 0 to 100 with higher scores indicating better health status).

Table 3 provides the change in self-assessment score of most important behaviour change by topic area for programme participants and non-participants (scored from 0 to 10 with higher scores indicating better lifestyle management). On average, non-participants showed a non-statistically significant increase of 0.66 points, whereas participants increased their score by 1.40 points ($P = 0.01$). Some topic area scores had significantly better improvement (e.g. tobacco use) with others showing no improvement (e.g. weight management).

Table 4 illustrates the four possible scenarios of change in risk as classified by the readiness to change model, for participants compared with non-participants. As mentioned above, readiness to change was assessed on the most important area of behaviour change as identified by the participant. Fewer participants ($P < 0.01$) increased their risk over time than non-participants (10% vs. 23% for participants and non-participants respectively). Conversely, more participants ($P = 0.03$) decreased their risk over time than non-participants (34% vs. 23% for participants and non-participants respectively). All outcomes remained statistically significant (ranging from $P = 0.029$ to $P = 0.038$) even after using the Bonferroni stepdown correction [28] for multiple comparisons.

Table 1 Baseline characteristics of chronically ill participants and non-participants of a health coaching programme*

Variable	Programme participation		*P*-value**
	Yes (*n* = 106)	No (*n* = 230)	
Days between surveys	228 (9.9)	234 (5.9)	0.61
Age in years	42.7 (1.1)	39.9 (0.8)	0.03
Female	83.9	83.0	0.83
Job category			
Education/research	19.8	22.3	0.61
Administration/management	60.4	40.6	<0.01
Health care professional	16.0	31.0	<0.01
Other	3.8	6.1	0.38
Topic area scores (0–10)			
Alcohol or drugs	9.2 (0.2)	9.4 (0.1)	0.24
Depression	7.0 (0.2)	7.0 (0.1)	0.04
Nutritional choices	6.4 (0.2)	7.2 (0.1)	<0.01
Physical activity	5.5 (0.2)	6.7 (0.2)	<0.01
Sleep	5.7 (0.2)	6.5 (0.1)	<0.01
Social support	7.0 (0.2)	8.2 (0.1)	<0.01
Stress management	6.3 (0.2)	7.0 (0.1)	<0.01
Tobacco use	8.3 (0.3)	9.6 (0.1)	<0.01
Weight management	4.9 (0.3)	6.1 (0.2)	<0.01
Chronic illness			
Addictions	12.3	3.5	<0.01
Asthma	23.6	35.2	0.03
Coronary artery disease	5.7	1.3	0.02
Chronic obstructive pulmonary disease	0.0	0.4	0.50
Chronic pain	28.3	20.4	0.11
Diabetes type I	3.8	2.2	0.40
Diabetes type II	8.5	5.2	0.25
Congestive hearth failure	0.0	0.4	0.50
Mental health	34.9	34.8	0.98
Other chronic illness	31.1	30.9	0.96
#Chronic illnesses per person	1.5 (0.6)	1.3 (0.3)	0.06
Body mass index	30.6 (0.8)	27.0 (0.4)	<0.01
Self-efficacy (0–10)	7.2 (0.2)	8.5 (0.1)	<0.01
Patient activation measure (0–100)	68.1 (1.4)	76.6 (0.9)	<0.01
Global health status (0–100)	71.7 (1.5)	79.1 (0.8)	<0.01
At risk (readiness to change)	69.8	54.8	<0.01

*Variables followed with value in parentheses are continuous with standard errors, and categorical variables are expressed as percentages.
***t*-test for continuous variables and chi-squared test for categorical variables.

Table 2 Comparison of unadjusted and adjusted estimated treatment effects of health coaching on the differences-in-differences scores for patient activation measure (PAM), self-efficacy for chronic illness and global health status

Variable	Unadjusted				IPTW adjusted*			
	Control**	Tx***	SE	*P*-value	Control**	Tx***	Robust SE	*P*-value
PAM	0.69	4.73	1.51	<0.01	1.17	4.57	1.94	0.02
Self-efficacy	–0.32	0.94	0.21	<0.01	–0.21	0.65	0.25	0.01
Global health status	1.06	3.45	1.44	0.02	0.82	3.60	1.64	0.03

*Inverse probability of treatment weighted, controlling for baseline characteristics.
**Intercept representing non-participants change score. None of the outcomes were statistically significant <0.05.
***Beta value for the programme participation variable.
SE, standard error.

Table 3 Change in self-assessment score of most critical behaviour change by topic area

	Non-participants ($n = 230$)			Participants ($n = 106$)			
Topic area	*N*	Mean	SE	*N*	Mean	SE	*P*-value*
Alcohol or drugs	6	1.33	1.48	0			
Depression or anxiety	19	0.58	0.45	4	0.75	1.11	
Nutritional choices	19	0.32	0.32	11	1.27	0.38	
Physical activity	64	0.67	0.27	30	1.27	0.46	
Sleep	30	0.63	0.37	13	1.00	0.55	
Social support	9	0.56	0.50	5	1.40	1.44	
Stress management	25	0.08	0.31	6	1.67	1.17	
Tobacco use	3	3.67	1.76	9	5.56	1.24	
Weight management	55	0.85	0.22	28	0.46	0.51	
Total	230	0.66	0.13	106	1.40	0.27	0.01

**P*-value is inverse probability of treatment weighting adjusted.
SE, standard error.

Table 4 Change in risk strata (based on readiness to change model)*

Strata change	Participants ($n = 106$)	Non-participants ($n = 230$)	*P*-value
No risk to no risk	21%	22%	0.77
No risk to risk	10%	23%	<0.01
Risk to no risk	34%	23%	0.03
Risk to risk	36%	31%	0.41

*Risk: pre-contemplation, contemplation, preparation stages; No risk: action stage.

Discussion

The results of the present study indicate that MI-based health coaching is an effective intervention for increasing self-efficacy, activation and perceived global health status in a chronically ill cohort, as well as leveraging state of readiness to change in the most important lifestyle area. These outcomes are even more compelling when the brevity of the intervention is considered. Participants themselves determined the number of coaching sessions they would undergo, averaging only three sessions during the study period. Moreover, regression analysis failed to find an association between the number of health coaching sessions and any of the dependent variables for the 106 participants in the intervention (data not shown).

We hypothesize that the success of the intervention was caused more by the MI technique used than by simply using the health coaching intervention. The MI approach differs greatly from the traditional health education model used frequently in most DM approaches [10]. In a traditional DM model, a nurse relies on information-sharing, advice-giving and scare tactics as the core of the interaction with the member. The member is given a care plan, developed without his or her input, and the expert (nurse) dictates what should be done and what behaviour changes undertaken. Conversely, an interaction based on MI is shaped by an understanding of what triggers change [12]. The member's risk profile is completed by evoking facts and perceptions from the member. The care plan is a collaborative process whereby the coach and member identify a health goal(s) together and agree upon a concrete and realistic plan to reach this goal.

Confidence in the MI outcomes is strengthened by the fact that a recent randomized clinical trial demonstrated significant multiple behaviour changes at 6 months for MI coaching for health promotion compared with a less intensive health risk intervention [30]. Given the time constraints on the MI coaching (three sessions for 20–45 minutes), the focus had to be on a particular target behaviour chosen by each participant.

How can multiple behaviours be changed even when all the behaviours for each participant are not being treated? Prochaska *et al.* [30] identified several hypotheses, one of which is especially relevant for MI. This hypothesis assumes that treating a higher-order construct, like motivation, may link treatment to lower-order constructs, like specific behaviours. Psychology generally assumes that behaviour change is construct-driven. Most interventions are designed for specific concrete behaviours; however, MI is designed to treat a number of higher-order constructs, like motivation.

MI also engenders a focused exploration on the higher-order construct of ambivalence and other barriers that prevent people from acting on treatment guidelines and making lifestyle changes. The coaches facilitate the strengthening of the client's belief about the importance of the change and their ability to successfully accomplish it. Here self-efficacy is another higher-order construct that is being addressed. By evoking change talk about the targeted behaviour, state of readiness and commitment strength for the change is increased [8,12]. The resulting intrinsic motivation empowers them to carry through with their intentions, whereby patient activation [18], yet another higher-order construct, is engendered. In turn, this empowerment leads to actual lifestyle changes and improved health status. See the Appendix for a comparison between traditional DM and an MI-based health coaching approach.

The outcome measures used in the current study have been shown to have direct associations with clinical outcomes and health care utilization and costs. For example, Bodenheimer *et al.* [31] performed a comprehensive review of the effectiveness of self-management programmes in which self-efficacy is the primary psychosocial construct. The authors found that patient education programmes teaching self-management skills are more effective than information-only patient education in improving clinical outcomes, such as blood pressure and blood glucose

levels, and reducing medical costs across a variety of chronic conditions.

Patient activation has been associated with self-management behaviours, medication adherence and health care utilization. In a recent study, Hibbard *et al.* [32] found that a positive change in activation was associated with positive changes in the following self-management behaviours: daily consumption of five servings of fruits and vegetables; performing tasks needed to manage chronic condition; following a regular exercise programme; and following a regular stress management programme. In a follow-up to this study, researchers demonstrated an inverse association between patient activation and length of stay during hospitalization and inpatient admissions after emergency department visits (J.H. Hibbard *et al.*, Unpublished).

C.L. Roumie *et al.* (Unpublished) found that patient activation scores were directly associated with self-reported medication adherence for 4106 hypertensive participants. In a study of diabetics, Mosen *et al.* [33] found that patient activation scores were associated with both non-disease specific outcomes – higher use of self-management services, higher performance of self-management behaviours, higher medication adherence and higher quality of life – and with diabetes specific outcomes – lower emergency room and hospitalization use.

Perceived health has been shown to be an accurate predictor of individuals' medical expenditures. Fleishman *et al.* [34] found that the short form (SF)-12 health status questionnaire improved the prediction of subsequent medical expenditures, with the single general health status question (which asks the participant to rate their own health) performing almost as well as the full SF-12.

Taken together, the literature suggests that the positive changes noted on these measures in the current evaluation may be associated with better clinical and economic outcomes over time. The advantage of using these proxy measures is that programme success can be measured and reported in a more abbreviated time period as compared with tracking claims and utilization data.

As with any observational study design, selection bias remains the primary threat to internal validity. This is apparent by the differences noted between participants and non-participants on baseline characteristics. Given this, we used the propensity score to adjust for pre-programme characteristics and used the IPTW method to assume the counterfactual. These methods increase our confidence in the results; however, unknown sources of bias may still remain – possibly influencing the treatment group differentially than controls. It is also possible that this group of participants and non-participants were dissimilar to chronically ill individuals who did not complete the HRA. We found them to be comparable to a larger group of individuals who took the HRA only once. However, this does not ensure that they are comparable to those who never took the survey at all. As sample sizes increase because of completion of a second survey, a future study will be conducted to determine whether the results found here will continue to hold true. Additionally, it will be critical to follow the current cohorts longitudinally to determine whether treatment effects are maintained.

Conclusions

This study evaluated the impact of MI-based health coaching on a chronically ill group of employees at a large worksite. Compared with non-participants, participants increased their self-efficacy, patient activation and perceived health status while reducing their behavioural risks. These results support MI-based health coaching as an effective chronic care management intervention and the choice of outcome measures that could serve well as a proxy in the absence of other clinical or cost indices.

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Appendix The following table provides a comparison of traditional DM with an MI-based health coaching approach

	DM approach	MI-based approach
Identification/ stratification/enrolment into programme	Identified and stratified based on claims-based predictive model. Untrained enrolment personnel call individual to request their participation in the programme.	Identified by combination of claims, pharmacy and health risk assessment data. First session scheduled at client's convenience. Coach has access to risk profile developed from all data, including the self-reported data from the survey.
Care/action plan and opening session	Care plan based on claims data and assessment questionnaire. Nurse calls member and generally asks more close-ended questions. Provides education with assumption that member does not have the education already. Does not elicit readiness to change nor address self-efficacy or activation. Uses information and advice-giving model to inform member what action should be taken.	Coach takes time to explain the objectives of the programme and elicits questions or concerns from client. Asks open-ended questions about what client already knows about diabetes management and elicits how she has tried to manage her diabetes. Establishes rapport with client by avoiding judgment, expressing empathy for the challenges of managing her diabetes, and providing affirmations for the self-care practices that she has been able to enact. Assesses readiness to change in various behaviour risk areas and addresses self-efficacy and activation. Identified goals and develop concrete plans or action plan in collaborative fashion.
Follow-up sessions and progress	Nurse calls member once every 3 months, on average. Call consists of going over same information and informing member of self-management tasks that s/he should be completing.	Follow-up sessions are scheduled based on client need and readiness to change. Generally at least three sessions completed by end of second month. Client helps set goals each time based on importance and confidence, along with plan to reach them. Emphasis placed on identifying social support, building self-efficacy and activation, and eliciting change talk to strengthen commitment strength to plan.
Outcomes	A year later, member generally still at-risk. Member stays enrolled in programme and nurse continues to call every 3 months.	A year later, member has improved health status and clinical outcomes. Client has long-term plan to continue self-management of condition.

DM, disease management; MI, motivational interviewing.