Improving the Outcomes of Disease Management by Tailoring Care to the Patient's Level of Activation

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Objective: To determine whether an approach that assesses patient capabilities for self-management and then tailors coaching support based on this assessment would be more effective in improving outcomes than the usual disease management approach.

Study Design: A quasi-experimental pre–post design was used, with an intervention group coached with a tailored approach and a control group coached in the usual way.

Methods: Data derived from telephonic coaching and from archival utilization data were used in the analysis. Differences in activation scores, clinical indicators, and utilization rates between intervention and control group members were assessed. Propensity scores were used to weigh the data and equalize baseline differences between the intervention and control groups. Analysis of variance repeated measures were used to examine changes over time. This analytic approach assessed whether individual changes over time in the intervention group were significantly different from individual changes over time in the control group.

Results: Overall, the findings showed a consistent picture that indicated a positive impact of the tailored intervention. Activation scores increased, clinical indicators improved, and utilization rates declined to a greater extent in the intervention group than in the control group.

Conclusion: The findings suggest that tailoring coaching to patients' activation level and using the same metric to track progress improves the outcomes of disease management.

(Am J Manag Care. 2009;15(6):353-360)

For author information and disclosures, see end of text.

The evidence for the cost-effectiveness of disease management (DM) programs is mixed.[1-3] One of the main pathways by which DM programs are thought to influence outcomes is through their support for patient self-management. In a recent meta-analysis assessing the efficacy of the various interventions used in DM, patient education was found to have a significant, albeit moderate, positive impact on health outcomes.[4] Based on these findings, identifying approaches that boost the impact of patient education may be a promising direction for improving the outcomes of DM.

Most patient education programs assume that giving information to patients translates into patient gains in knowledge and skill. This assumption is rarely tested. Thus, a key factor assumed to influence outcomes, gains in patient capabilities, remains unexamined and unmeasured in DM assessments. Further, because patient capabilities for self-management go unmeasured, systematically tailoring education and support to patients' level of knowledge and skill is not possible. What results is a "one size fits all" approach that often fits no one.

The purpose of this study was to determine whether the outcomes of DM could be improved by customizing education and support to the individual patient's level of activation (knowledge, skill, and confidence regarding the management of one's own health and healthcare). Would an approach that tailors support for self-management be more effective in improving outcomes than the generalized approach typically used in DM? The research addresses one of the central elements of DM, support for patient self-management, and assesses whether systematic measurement and tailoring can improve patient self-management capabilities and in turn the outcomes of DM. Does tailoring patient care plans based on the Patient Activation Measure (PAM) result in gains in activation, improvements in clinical indicators, and lower healthcare utilization, compared with patients receiving usual DM support?

BACKGROUND ON ACTIVATION

The PAM was designed to assess an individual's knowledge, skill, and confidence with respect to managing his or her health.[5] Based on responses to the 13-item scale, each person is assigned an "activation score."[6] The PAM has been shown to be a valid measure that predicts a range of health behaviors. For example, indi-

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The findings suggest that tailoring coaching to patients' activation level and using the same metric to track progress would improve both the outcomes and the efficiency of disease management programs.

- Patients who received coaching tailored to their individual level of activation showed greater improvement in their biometrics and in their adherence to recommended regimens, and showed greater reductions in hospitalizations and in emergency department use than did patients coached in the usual way.
- Coaches who systematically assess patients' knowledge, skill, and confidence for self-management can be more targeted and efficient in allocating their time and effort.

viduals identified as highly activated according to the measure are more likely to obtain preventive care (eg, health screenings, immunizations) and to exhibit other behaviors known to be beneficial to health. These include maintaining good diet and exercise practices; self-management behaviors (eg, monitoring, adherence to treatment); and health information seeking.[5-10] More importantly, recent studies show that activation is changeable, and that increases in activation are followed by improvements in several health-related behaviors and health outcomes.[8,9] A prospective study of diabetes patients showed that PAM scores predicted hospitalizations and glycemic control 2 years into the future.[9]

The research suggests that activation is developmental and that people pass through 4 different levels of activation on their way to becoming effective self-managers:

- Level 1: Patients tend to be overwhelmed and unprepared to play an active role in their own health.
- Level 2: Patients lack knowledge and confidence for self-management.
- Level 3: Patients are beginning to take action, but lack confidence and skill to support behaviors.
- Level 4: People have adopted many of the behaviors to support their health, but may not be able to maintain them in the face of life stressors.

METHODS

Tailoring Individual Care Plans to Activation Levels

The intervention was conducted within the LifeMasters DM program (LifeMasters, Irvine, CA). Intervention coaches used baseline PAM scores to segment patients into the 4 levels of activation. Coaches were trained and provided guidelines to customize telephone coaching based on the activation level. The behaviors encouraged for each activation level were based on empirical data indicating what is realistic at a particular level of activation.[11,12] The goal was to ask patients to do things that they could succeed at, thereby allowing them to begin to build confidence in their ability to manage their health.[13]

Coaches working with patients at level 1 were trained to build patient self-awareness and understanding of behavior patterns, which are important foundations for tackling further competencies in later steps. At level 2, coaches worked with patients to make small changes in their existing behaviors, such as reducing portion sizes at meals, taking the stairs at work, and reading food labels at the grocery store.

At level 3, coaches focused on the adoption of new behaviors (eg, 30 minutes of exercise 3 times a week) and the development of problem-solving skills. At level 4, coaches worked with patients on relapse prevention and handling new or challenging situations as they arise.

Coaches serving the control group did not have access to their patients' PAM scores and were not trained in interpreting and using the PAM score for coaching.

Intervention Design

A quasi-experimental pre–post design was used, with an intervention group consisting of the coaches and their patients based in 1 call center and the control group consisting of the coaches and their patients based in a different geographically separate call center of the LifeMasters program. LifeMasters selected the 2 call centers for the study out of 4 potential sites, based on the similarity of their nurse coaches' tenure and years of experience.

The preintervention period was for 1 year before implementation, and the postintervention period was for the 6 months after implementation.

The intervention was tested against "usual DM coach support," which focuses on providing education to program participants and identifying and intervening in potentially acute situations to avoid hospitalizations and emergency department (ED) visits. Thus, we tested whether the intervention group achieved health and utilization outcomes significantly better than those in the group that received the usual coaching approach.

Unexpected issues arose with regard to data availability. A large client of LifeMasters decided to bring their DM services in-house, affecting a large number of the patients: 25% of the participants from the intervention group (1047 of 4254) and 93% of the control group participants (1548 of 1668). Although these members participated in the LifeMasters program during the study period, their utilization data were not available for inclusion in the analysis. To compensate for the loss in the control group, 906 new control group members were selected from the same control group call center for a

total control group of 2574. The new control group members were chosen by matching individuals pairwise with intervention group members on age, sex, number of months coached, and primary diagnosis. The PAM data on these newly added control participants were not available.

Over the course of the study other availability issues emerged regarding the utilization data. Three other vendors supplied utilization data for their patients, but only for the preintervention period or the postintervention period. This lack of data was for all their members, so selection bias should be less of an issue. Of the 1026 control group members for whom we should have had utilization data (120 from the original control group and the added 906 new control members), we obtained preintervention and postintervention utilization data for 62% (n = 635). Similarly, in the intervention group, among those who were expected to have data available, we only received utilization data in the preintervention and postintervention periods for 79% (n = 2529). The missing cases were treated as missing data in the utilization analysis only. Those who did not have utilization data were not dropped from the other analyses as long as they remained in the LifeMasters program.

Because utilization data were not available for all the study participants, we conducted an analysis to determine whether the participants for whom we had utilization data were different from those for whom we did not have data. Demographic characteristics and baseline clinical indicators were similar for both the control and intervention group participants with and without utilization data.

Study Population

Table 1 shows the characteristics of the participants. Characteristic distributions are shown both with and without propensity score weights. There are no significant differences between the groups in terms of age or whether they screened positive for depression. There are differences, however, in the distributions of primary diagnoses. Those in the control group had 2 more months of coaching, more participants whose conditions had a high severity rating, and on average had slightly more comorbidities. No significant differences remained after the propensity weights were added.

Patient Data

Patients self-reported results of self-monitoring and clinical indicators such as blood pressure, low-density lipoprotein (LDL) cholesterol levels, and their glycosylated hemoglobin (A1C) levels. All patients are screened for possible depression through the use of the Patient Health Questionnaire-2.

The PAM data were collected via the phone from both intervention and control group participants. There was an attempt to repeat the PAM every 2 to 3 months; however, only a subset of participants completed 3 PAM surveys over the study period (n = 245 intervention; n = 112 control).

Outcome Variables

Utilization variables included office visits, ED visits, and hospital admissions. Each variable represented a count of the events per month. Data were included only when participants had data in both the preintervention and postintervention periods. A severity rating, based on the claims data, was used in the analysis as a control variable.

Clinical indicators include both biometric variables and variables reflecting adherence to medical recommendations.

Biometric variables were A1C levels for those with a diagnosis of diabetes; LDL cholesterol levels for those with diabetes, coronary artery disease (CAD), or congestive heart failure (CHF); and blood pressure for those with a diagnosis of CAD, CHF, diabetes, or hypertension.

Medication and immunization adherence was measured by patient reports of:

- Aspirin antiplatelet therapy (diabetes and CAD).
- Antilipidemic therapy (CAD).
- Beta-blocker therapy (CAD, CHF).
- Angiotensin-converting enzyme inhibitor or angiotensin II receptor blocker therapy (CHF).
- Influenza immunization (all).

Analysis

Analysis of variance repeated measures was used when examining the changes in clinical indicators and in assessing changes in utilization over time. This analytic approach examined changes in the individual over time and assessed whether within-individual changes in the intervention group were significantly different from within-individual changes in the control group. Thus, the analysis compared the trajectory of change for those in the intervention group with the trajectory of change for those in the control group. This analytic approach reduced the need to control for multiple factors, because most of the characteristics of the individual remained fixed and changes that were observed could be attributed to differing external factors (eg, the intervention). However, because there were some key differences at baseline between the control group and the intervention group, we constructed propensity weights to equalize the 2 groups using baseline characteristics.

The propensity weight was calculated by conducting a logistic regression model predicting one's membership in the intervention group. The variables that were used in this model included a log transformation of healthcare utilization (ED, inpatient, and office visits), the number of chronic condi-

Table 1. Intervention and Control Group Characteristics at Baseline: Unweighted Data and Data Weighted by Propensity Score Shown[a]

Characteristic	Control Group		Intervention Group	
	Unweighted (n = 2574)	Weighted[b] (n = 1332)	Unweighted (n = 4254)	Weighted[b] (n = 1874)
Average age, y	61.9	63.3	60.7	61.6
Male, %	50.1	44.1	51.0	49.6
Positive depression screen, %	27.4	24.6	28.6	27.7
Primary diagnosis, %				
Asthma	1.7	17.5	2.3	20.0
CAD[c]	12.2	53.5	32.1	54.2
CHF[c]	43.2	22.9	11.6	28.2
COPD	1.2	18.0	6.4	16.7
Diabetes	41.1	60.7	41.9	53.1
Number of months coached[c]	20.1	26.3	18.4	23.1
Number of conditions[c]	2.7	2.6	2.6	2.6
Severity level high[c]	91.6	57.7	75.2	69.6

CAD indicates coronary artery disease; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease.
[a]Differences between intervention and control groups at baseline were not significantly different for the weighted data (significant differences were only for the unweighted data at baseline with analysis of variance).
[b]Propensity weights were developed based on a logistic regression model that included diagnoses (asthma, CAD, COPD, diabetes, CHF, hypertension), severity score, number of months coached in the preintervention period, number of comorbidities, and preintervention utilization rates.
[c]$P < .000$.

tions, severity level, months coached in the preintervention period, and primary diagnosis. Each case was then weighted with the inverse of the predicted probability of being in their actual group (either intervention or control). The effect of the weight is that individuals with a high predicted probability of membership in their actual group based on their health characteristics had comparatively low weights. Conversely, individuals with a low predicted probability of membership in their actual group (ie, who were not characteristic of enrollees in their group) received proportionally higher weights in analyses. Table 1 shows the participant characteristics both before and after data are weighted.

We defined the intervention period in 2 ways. For the analysis that involved the claims data we used the date of the first PAM score as the beginning of the intervention (mostly March and April of 2007). For the matched control group, for whom no PAM scores were available, we used the date of the first PAM score of the person in the intervention group to whom a control individual was matched as the intervention start date. Baseline claims were for the year prior to the intervention and for the months that followed through October 2007.

For the clinical indicators, we often had only 1 data point in 2006 and 1 in 2007. Thus, the analysis examined change from 2006 to 2007.

RESULTS

Changes in Activation

Patients in the intervention group had statistically significant gains in their activation scores over the intervention period, however, the control group did not. From baseline to the second PAM score, the gain observed for the intervention group was 2.5 points; the gain for the control group was 1.8 points ($P < .05$). Among those who had 3 PAM scores, the intervention group showed a 4.6 point gain in activation, whereas the control group had a 2.6 point gain ($P < .001$) (Figure 1).

Using repeated measures analysis of variance and controlling for baseline PAM scores, we observed a significantly greater increase in PAM scores in the intervention group compared with the control group ($F = 12.5$, $P < .01$).

Use of the PAM Information

We also assessed how the coaches used the PAM information to allocate the time they spend with patients (Figure 2). We observed that the coaches spent more time with low-activated patients than did control coaches, who spent the same amount of time with patients regardless of activation level. This suggests that the coaches were using the PAM data to differentially allocate their time based on the participant's

need for support. Using the PAM score to allocate time with participants was not an element of the intervention, but naturally emerged among the intervention coaches.

Changes in Clinical Indicators

Analysis of the clinical indicators data showed a trend toward improved biometrics among the intervention group (Table 2). The repeated measures analysis, which controlled for baseline biometrics, indicated a significant improvement in diastolic blood pressure and in LDL cholesterol levels among the intervention group that was significantly greater than that seen in the control group. No differences in A1C levels or systolic blood pressures were observed, although A1C levels were reduced for both groups.

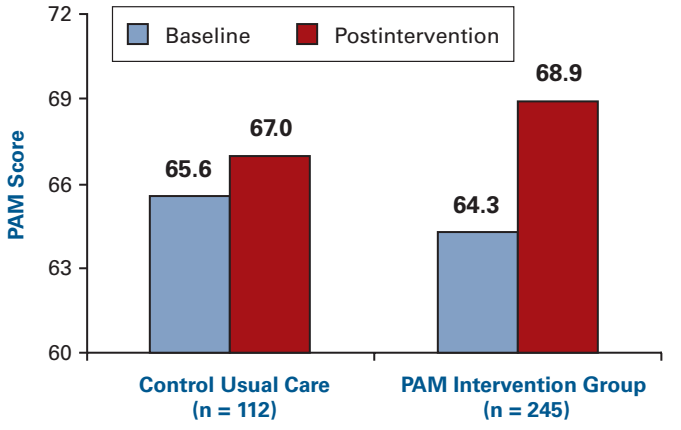
Adherence

The findings (Table 3) indicate that in most cases the intervention group increased in their adherence to recommended immunizations and drug regimens to a greater degree than the control group. This was true for all the medication adherence variables and for getting influenza vaccine.

Changes in Utilization

The average monthly rates of doctor office visits, ED visits, and hospital admissions are shown in Table 4. The results indicate that, after weighting the data with the propensity score, there was a significantly greater decline in the rates of inpatient admissions and ED use in the intervention group than in the control group. The rate of change for doctor office visits did not differ by group.

Figure 1. Tailored Coaching Versus Usual Care Coaching: Change in PAM Score Over 6 Months[a]



PAM indicates Patient Activation Measure.
[a]Only those with 3 PAM scores were included. Analysis of variance repeated measures showed that gains in activation were significantly greater in the intervention group than in the control group ($P < .001$).

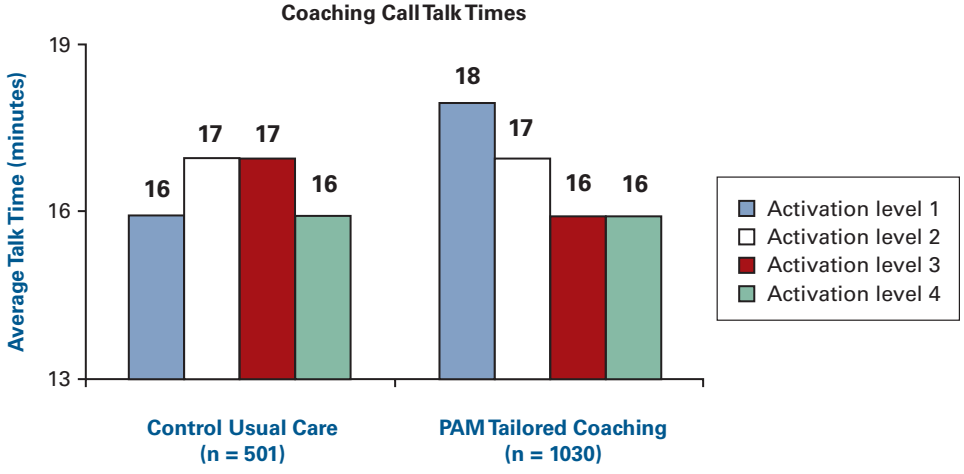
DISCUSSION

This study assessed whether tailored coaching would yield substantial improvements in patient activation, clinical measures, and utilization outcomes over outcomes observed in patients coached with the usual DM support.

Overall the findings showed a consistent picture indicating a positive impact from the tailored DM intervention. Clinical indicators improved, utilization declined, and activation scores increased to a greater extent in the intervention group than in the control group. All trends appear to be consistent and in the same direction across the study outcomes.

The amount of change observed in the study may appear small. For example, intervention members gained an average of 4.6 points on the PAM scale (a theoretical 0-100 scale), whereas the control group gained an average of only 1.4 points. Research indicates that a difference of 4 points on the PAM scale is meaningful, because 4 points often is the

Figure 2. Talk Times in the Intervention and Control Groups[a]



PAM indicates Patient Activation Measure.
[a]*Source:* LifeMasters, Irvine, CA. The difference between the 2 groups was significant at $P < .05$.

Table 2. Changes Over Time in Clinical Indicators Among Intervention and Control Group Patients

Indicator	Mean Value		Significance of Interaction of the Intervention and Repeated Measure
	Preintervention Period 2006	Postintervention Period 2007	
A1C			
Control (n = 726)	764.6	709.6	F = 2.100, *P* = .148
Intervention (n = 840)	703.4	692.3	
BP systolic, mm Hg			
Control (n = 1733)	126.5	126.7	F = .643, *P* = .423
Intervention (n = 1708)	126.4	126.2	
BP diastolic, mm Hg			
Control (n = 1944)	72.8	72.5	F = 4.440, *P* = .035
Intervention (n = 2137)	73.8	72.7	
LDL cholesterol, mm Hg			
Control (n = 543)	85.8	87.1	F = 10.902, *P* = .001
Intervention (n = 665)	86.2	81.9	

A1C indicates glycosylated hemoglobin; BP, blood pressure; LDL, low-density lipoprotein.

Table 3. Changes Over Time in Adherence to Recommended Treatments Among Intervention and Control Group Patients

Treatment	Mean Value, %		Significance of Interaction of the Intervention and Repeated Measure
	Preintervention Period 2006	Postintervention Period 2007	
Influenza vaccine (all chronic conditions)			
Control (n = 2494)	57.2	61.6	F = 25.82, *P* = .000
Intervention (n = 3483)	53.1	64.6	
ASA antiplatelet therapy (CAD)			
Control (n = 1329)	83.5	84.1	F = 42.48, *P* = .000
Intervention (n = 1774)	83.2	89.8	
ASA antiplatelet therapy (diabetes)			
Control (n = 2165)	68.5	58.1	F = 67.99, *P* = .000
Intervention (n = 3022)	70.7	71.3	
Antilipidemic therapy (CAD)			
Control (n = 2165)	72.6	73.5	F = 22.96, *P* = .000
Intervention (n = 3022)	70.2	75.6	
Beta-blocker (CAD/CHF)			
Control (n = 1294)	79.5	78.7	F = 11.57, *P* = .000
Intervention (n = 1506)	76.4	79.0	
ACEI/ARB (CHF)			
Control (n = 1177)	80.1	78.3	F = 3.90, *P* = .048
Intervention (n = 692)	79.1	79.9	

ACEI indicates angiotensin-converting enzyme inhibitor; ARB, angiotensin II receptor blocker; ASA, aspirin; CAD, coronary artery disease; CHF, congestive heart failure.

Table 4. Changes in Utilization Rates Over Time Among Intervention and Control Group Patients

Type of Utilization	Mean Rate (Counts per Month)		Significance of the Intervention and Repeated Measure
	Preintervention Period 2006	Postintervention Period 2007	
Inpatient admissions per month			
Control (n = 635)	.04	.04	F = 18.7, *P* <.001
Intervention (n = 2529)	.06	.04	
Emergency department visits per month			
Control	.05	.06	F = 14.6, *P* <.001
Intervention	.09	.07	
Office visits per month			
Control	.97	.92	F = 3.0, *P* = .08
Intervention	1.14	1.04	

difference between the average score of individuals who engage in any of a number of healthy behaviors and those who do not.[11,12,14]

Similarly, the intervention group showed an average of 0.02 fewer hospital stays per month in the postintervention period compared with the preintervention period. An equal decline was observed for ED visits. This magnitude of a shift in utilization from the preintervention period to the postintervention period is meaningful in terms of costs. Based on cost figures derived from the claims data used in this study, a decline of 0.02 average hospital admissions translates into a savings of $145 per person per month (based on an average cost of $7259 for a hospital admission). Similarly, the average 0.02 ED visit reduction would yield an average savings of $11 per person per month (based on an average ED cost of $545).

The findings suggest that systematically measuring and tailoring coaching to patients' activation level would improve the outcomes of DM. The results show that tailoring produced better outcomes than were achieved with the usual approach to coaching. Tailoring also could improve efficiency by directing resources (coach talk time) to the patients at a lower activation level.

There are, however, study limitations that must be considered. There are no full data on any of the variables measured in the study. It is possible that some systematic bias resulted from these missing data. Further, it was not feasible to randomly assign individual participants to intervention and control conditions, leaving open the possibility that differences that were observed were a result of some unmeasured differences that were not captured in the propensity weight.

It took longer than anticipated for the coaches to be trained and fully adopt the intervention, resulting in a shortened time frame for the intervention itself. That may mean the groups did not have sufficient time for the full effects of the intervention to appear. Further, the cost of implementing the intervention was not measured or included in the analysis. These costs ultimately must be considered in weighing the benefits of the intervention.

A final limitation is that it was not possible to document the fidelity of the intervention. Coaches became adept with the intervention approach at different rates. Some became adept early on and fully embraced the method; others took more time. Becoming skilled in the PAM coaching approach was still ongoing during the intervention period.

These limitations are not unusual in studies taking place in real-world settings, where there is less control and where the chances for unexpected challenges to emerge are maximized. Results must be viewed within the context of these limitations.

Even with the limitations and challenges, LifeMasters and their coaching staff found the intervention to work well for their program. They are in the planning stages of rolling it out to all their call centers, where the PAM will be used to tailor coaching and to track progress for all enrolled participants.

Because this is a single study in a single setting, it will be important to replicate these findings in other settings and with different populations. It will be particularly important to utilize designs and study approaches that seek to overcome the limitations in this current study.

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Funding Source: Funding for this study was provided by the Health Industry Forum at Brandeis University, Waltham, MA.

Author Disclosure: Dr Hibbard serves as a consultant and reports an ownership interest in Insignia Health, the company that markets the Patient

Activation Measure described in this study. Mr Tusler reports serving as a statistical consultant to Insignia Health. Dr Greene reports no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

Authorship Information: Concept and design (JHH); acquisition of data (JHH, MT); analysis and interpretation of data (JHH, JG, MT); drafting of the manuscript (JHH, JG); critical revision of the manuscript for important intellectual content (JG); statistical analysis (JG, MT); and administrative, technical, or logistic support (MT).

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