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When Patient Activation Levels Change, Health Outcomes And Costs Change, Too

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ABSTRACT Patient engagement has become a major focus of health reform. However, there is limited evidence showing that increases in patient engagement are associated with improved health outcomes or lower costs. We examined the extent to which a single assessment of engagement, the Patient Activation Measure, was associated with health outcomes and costs over time, and whether changes in assessed activation were related to expected changes in outcomes and costs. We used data on adult primary care patients from a single large health care system where the Patient Activation Measure is routinely used. We found that results indicating higher activation in 2010 were associated with nine out of thirteen better health outcomes—including better clinical indicators, more healthy behaviors, and greater use of women's preventive screening tests—as well as with lower costs two years later. Changes in activation level were associated with changes in over half of the health outcomes examined, as well as costs, in the expected directions. These findings suggest that efforts to increase patient activation may help achieve key goals of health reform and that further research is warranted to examine whether the observed associations are causal.

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Patient engagement has become a central pillar of health policy. The Affordable Care Act emphasizes patient engagement and activation, with initiatives that focus on shared decision making, wellness, and self-management.^{1,2} Health care delivery systems, payers, foundations, and community organizations are making major investments in patient engagement programs.³⁻⁵

There is evidence that links better outcomes with more engaged and activated patients.⁶⁻¹³ However, there is limited evidence that increases in patient activation track with improvements in outcomes and lower costs.¹⁴⁻¹⁷ If current patient engagement initiatives are successful and more patients become better managers of their health and health care, will those changes yield improved health outcomes and reductions in cost?

In this analysis we begin to explore this question by examining the association between patient activation and outcomes over time and whether increases in activation levels are related to improved health outcomes and lower costs. If such associations were found, it would not imply that changes in patient activation caused the changes in outcomes. However, it would be consistent with that possibility and would indicate that further research is warranted to examine whether the association is causal.

Background

The Patient Activation Measure is the metric most often used to quantify a patient's "engagement," activation, or self-management capabilities. Designed to assess a person's knowledge, skill, and confidence related to managing his or

her health and health care, the measure is a thirteen-item scale that has proved to have strong psychometric properties.¹

The construct of activation is not condition specific, and the measure is not focused on a specific behavior. Thus, activation is broader than earlier concepts such as locus of control, self-efficacy, and readiness to change, which typically focus on changing one specific behavior. Activation is associated with a wider range of outcomes than these previous concepts.^{2,6}

There is a growing body of literature indicating that those patients who are more activated, as assessed by the Patient Activation Measure, make more effective use of health care resources and engage in more positive health behaviors compared to other patients.⁷ For example, patients with results on the measure that indicate higher activation are more likely to have a regular source of care, more likely to obtain preventive care, and less likely to delay getting care, compared to less activated patients.⁸ This is true after differences in sociodemographic factors and insurance status are controlled for. The Patient Activation Measure scoring system is discussed in detail below.

In addition, less activated patients are almost twice as likely as more activated patients to be readmitted to the hospital within thirty days of a discharge.⁹ More activated patients are more likely to ask questions in the medical encounter, seek out health information, and know about treatment guidelines for their condition.^{10,11}

Studies of the relationship between the Patient Activation Measure and health outcomes have been conducted in a variety of settings, with different population groups, and with patients who have different conditions. The majority of these studies are cross-sectional. However, there are some studies that follow patients over time and assess how well the Patient Activation Measure predicts future health outcomes and health behaviors.^{12,13} Finally, a growing number of interventional studies indicate that patient activation is changeable and that specific interventions designed to increase activation are able to do so.^{14–21}

An earlier large cross-sectional investigation of Patient Activation Measure scores and health-related outcomes derived from electronic health records found that the scores were significant predictors of clinical indicators such blood pressure, use of preventive screening services, unhealthy behaviors such as smoking and obesity, and use of costly care such as in-hospital or emergency department (ED) care.²² In a related study, patients at the lowest Patient Activation Measure level had predicted health care costs that were 8 percent higher than the costs of those at the highest level, after health care risk and demo-

graphic characteristics were controlled for.²³

In the current study we expanded on this earlier work to assess whether a patient's Patient Activation Measure score is associated with future outcomes and to examine what happens to quality and cost outcomes when a person's score changes. This is the largest longitudinal investigation to date to assess the relationship between patient activation levels and future health outcomes and cost. Furthermore, it is the first observational study to assess whether changes in Patient Activation Measure scores are related to changes in outcomes and the costs of care. The score changes took place within a delivery system where the patients received usual care. That is, there was no specific intervention designed to increase patient activation.

Study Data And Methods

We conducted a longitudinal study of primary care patients at Fairview Health Services, a large not-for-profit health care system with forty-four primary care clinics in Minnesota. Since 2010 Fairview has routinely collected Patient Activation Measure scores during primary care office visits. In 2010, 18 percent of adult patients completed the assessment; in 2011, 54 percent did so. In 2012, when Fairview implemented a policy to collect the scores only for new patients, those with a new diagnosis, and those with chronic conditions who were not meeting quality metrics, the rate dipped to 34 percent.

SAMPLE We examined two groups of adult Fairview patients. The first group had a baseline Patient Activation Measure score collected in 2010 and follow-up outcomes collected in 2012 ($n = 32,060$). The second group had two scores taken in two consecutive years, between 2010 and 2012 ($n = 10,957$). Sample sizes for specific analyses were often smaller, as indicated in the exhibits, because the dependent variables were applicable for subsets of patients.

INDEPENDENT VARIABLE *Patient activation*, which was assessed using the Patient Activation Measure, refers to having the knowledge, skill, and confidence to manage one's health and health care. The Patient Activation Measure consists of thirteen statements about managing one's health, such as "I am confident that I can tell a doctor my concerns, even when he or she does not ask." Respondents use a four-point Likert-type scale of agreement or disagreement to respond to each item. The items form an interval level, unidimensional, Guttman-like scale with strong psychometric properties.^{1,24}

The measure is scored on a scale from 0 to 100. Four levels of activation have been identified, which reflect a developmental progression from

being passive with regard to one's health to being proactive.²⁴ These patient activation levels are the independent variable in this study.

Level 1 (indicated by a score of 0.0–47.0) suggests that a person may not yet understand that the patient's role is important. Level 2 (47.1–55.1) indicates that a person lacks the confidence and knowledge to take action. Level 3 (55.2–72.4) indicates that a person is beginning to engage in recommended health behaviors. And level 4 (72.5–100) indicates that a person is proactive about health and engages in many recommended health behaviors.

DEPENDENT VARIABLES We examined thirteen health-related outcomes across four areas: clinical indicators, healthy behaviors, preventive screening, and avoidance of costly utilization. The clinical indicators examined were hemoglobin A1c, high-density lipoprotein (HDL), low-density lipoprotein (LDL), serum triglycerides, systolic blood pressure, diastolic blood pressure, and a measure of depression severity commonly known as the PHQ-9 (Patient Health Questionnaire-9). Healthy behaviors were not being a current smoker and not being obese (that is, having a body mass index of less than 30). For preventive screening, we used two cancer screening measures for women: the Pap smear and mammography. For avoidance of costly utilization, we examined having no ED visits and not having been hospitalized in the calendar year of observation. All of the outcome variables were dichotomous. For the clinical indicators, we determined whether values were in the "normal" range according to widely used cutoff points.^{25–28}

Our measure of cost of care was total annual medical charges from Fairview, which included inpatient and outpatient care, ED, and pharmacy costs. Medical charges do not include the negotiated discounts that health insurance companies pay for medical services. However, they have the benefit of being consistent across insurance providers and are often used a proxy for medical costs.^{23,29,30}

ANALYSES To examine the relationships between activation level in 2010 and outcomes in 2012, we used multivariate regression models (bivariate versions of all analyses are available upon request from the authors). The models controlled for differences in patient age, sex, mean income for ZIP code (transformed by natural logarithm), and number of the following chronic conditions: asthma, diabetes, hypertension, congestive heart failure, coronary artery disease, hyperlipidemia, and chronic obstructive pulmonary disease. For utilization (ED visits and hospitalizations) and costs, we also controlled for the percentage of total medical charges that were billed by the Fairview system (hospital costs

and total costs, respectively, since our medical charge data were only from Fairview). Data from one large insurer were used to compute the percentage of total medical charges at the clinic level that were from Fairview. All models were adjusted for clustering of patients by primary care provider.

For the health-related outcomes, we developed logistic regression models, since all of the outcomes were dichotomous. For costs, we used an ordinary least squares linear regression model with a log transformed dependent cost variable. We then developed predicted costs at each level of activation. To interpret predicted costs, we transformed costs back from log dollars to dollars using the Duan smear factor.³¹

To examine whether changes in Patient Activation Measure level over one year were associated with changes in outcomes, we first determined whether people remained at a given level or moved to a higher or lower level. Specifically, we categorized people into one of seven groups. From highest to lowest activation, these groups consisted of people who were at level 4 in both time periods, at 3 and then at 4, at 3 in both time periods, at 4 and then at 3, at 1 or 2 and then at 3 or 4, at 3 or 4 and then at 1 or 2, and at 1 or 2 in both time periods. We combined some levels (typically levels 1 and 2) because of small numbers.

We then developed multivariate regression models with the independent variable being the categorization of the patient's Patient Activation Measure change in the seven groups described above. The dependent variables were the health and cost outcomes at follow-up. The models controlled for the patient's dependent variable value at baseline (for example, whether or not the patient was in the normal range at baseline) and for the factors in the previous models. Again, the models were adjusted for clustering by primary care provider.

LIMITATIONS This study's findings are limited by several factors. The study was conducted within one large delivery system in Minnesota, so its findings might not be generalizable to other more diverse settings. Furthermore, as the online Appendix shows,³² the patients who completed the Patient Activation Measure at Fairview were not entirely representative of all Fairview patients: They were somewhat older, had higher chronic illness burden, and resided in lower-income ZIP codes. In addition, patients who had two Patient Activation Measure scores collected had even higher rates of chronic conditions, in part because of how the scores were collected starting in 2012.

It is also important to note that the Patient Activation Measure scores and clinical indica-

tors were obtained during the same calendar year (for example, baseline or follow-up year). However, we did not have an exact date within the year for either the score or the clinical indicator. Thus, although both might have been measured in 2010, we did not know which came first or exactly when they were measured.

Our data were also limited in that we had medical charge data from Fairview, not the actual amounts paid to providers. Additionally, we controlled for patients' health status using the number of seven key chronic conditions a patient had. Unfortunately, we did not have a more comprehensive severity measure. Finally, it is possible that the associations we observed reflected the influence of another unmeasured factor that was related to both the Patient Activation Measure level and the outcomes.

Study Results

The study samples were disproportionately female (60–64 percent; for descriptive statistics on the samples, see the Appendix).³² Approximately half of the patients in each sample were age fifty-one or older. On average, patients had approximately one chronic disease. Patient activation

levels were very comparable across the samples, with approximately four out of five patients in the top two levels of activation. This positive skew is consistent with national data on patient activation.⁵

In multivariate regression analysis, higher baseline activation levels were predictive of better outcomes two years later for nine health indicators (Exhibit 1). Specifically, a higher level in 2010 was related to greater odds of having HDL, triglycerides, and PHQ-9 in the normal range; not smoking or being obese; having had the preventive cancer screening tests for women (Pap smear and mammography); and not having costly utilization (ED visit or hospitalization) in 2012.

The relationships suggested a dose-response association. In other words, the greater the activation level, the greater the odds of a positive outcome. The odds ratios were almost always lowest for level 1, generally slightly higher for level 2, and higher (and sometimes not significantly different from the level 4 reference group) for level 3. For example, compared to the reference group (level 4), the odds ratios for having HDL in the normal range were 0.66 for level 1, 0.69 for level 2, and 0.84 for level 3 (Exhibit 1).

The predicted average per capita costs in 2012 were the same (\$6,719) for patients at levels 3 and 4 in 2010 (Exhibit 2). The costs were 12 percent higher for patients at level 2 and 8 percent higher for those at level 1.

Among people with two Patient Activation Measure scores, there was considerable change in the level from one year to the next (data not shown). Fifty-eight percent stayed at the same level in the two consecutive years. Of the 42 percent who did not, 12 percent moved from level 4 to level 3, while 9 percent moved in the reverse direction. There was a similar pattern for moving in and out of lower levels, with 12 percent moving from levels 1 or 2 to levels 3 or 4, and 9 percent moving in the other direction.

Exhibit 3 shows the results of the multivariate analyses that examined changes in Patient Activation Measure levels over one year and follow-up health outcomes, after baseline outcomes and other factors were controlled for. People who were at the lowest levels in both periods had significantly lower odds (0.74–0.31) of having positive outcomes for seven of the thirteen health outcomes (HDL, serum triglycerides, PHQ-9, not smoking, not being obese, having no ED visits, and having no hospitalizations), compared to those who remained at level 4 in both periods. People who dropped to low levels (1 or 2) from high levels (3 or 4) had significantly lower odds of positive health outcomes for five of the thirteen measures, compared to those who

EXHIBIT 1

Relationship Between Patient Activation Measure Levels And Health Outcomes Two Years Later, Odds Ratios

Outcomes in 2012 (number of patients)	2010 Patient Activation Measure level ^a		
	1	2	3
CLINICAL INDICATORS IN NORMAL RANGE			
Hemoglobin A1c (5,547)	0.92	0.79**	0.85**
High-density lipoprotein (14,106)	0.66****	0.69****	0.84****
Low-density lipoprotein (14,531)	0.97	0.97	0.96
Serum triglycerides (14,058)	0.76****	0.77****	0.88****
Systolic blood pressure (25,224)	1.03	0.91**	0.93**
Diastolic blood pressure (25,224)	0.94	0.96	0.96
PHQ-9 (7,294)	0.45****	0.60****	0.80****
HEALTHY BEHAVIORS			
Not a current smoker (25,522)	0.64****	0.65****	0.81****
Not obese (25,358)	0.62****	0.62****	0.79****
PREVENTIVE SCREENINGS			
Pap smear (14,848)	0.65****	0.83****	0.96
Mammography (8,180)	0.63****	0.81**	0.89
AVOIDANCE OF COSTLY UTILIZATION			
No ED visits (32,060)	0.72****	0.79****	0.95
No hospitalizations (32,060)	0.79****	0.86**	0.98

SOURCE Authors' analysis of data from Fairview Health Services. **NOTES** The exhibit shows odds ratios. For example, a person with a Patient Activation Measure level of 3 (the levels are described in the text) has significantly lower odds of not being obese than a person with a level of 4. Level 4 is most activated and is the reference group (odds ratio = 1.00). Factors that were controlled for were age, sex, number of chronic conditions, the natural logarithm of income, and—for costly utilization measures—the clinic-level percentage of hospital costs that were from within Fairview. Results were adjusted for clustering by provider. PHQ-9 (Patient Health Questionnaire-9) is a measure of depression severity. ^aLevel 4 activation is the reference group. ***p* < 0.05 *****p* < 0.01 ******p* < 0.001

remained at level 4. There were also three significant differences between those who remained at level 4 and those who dropped from 4 to 3.

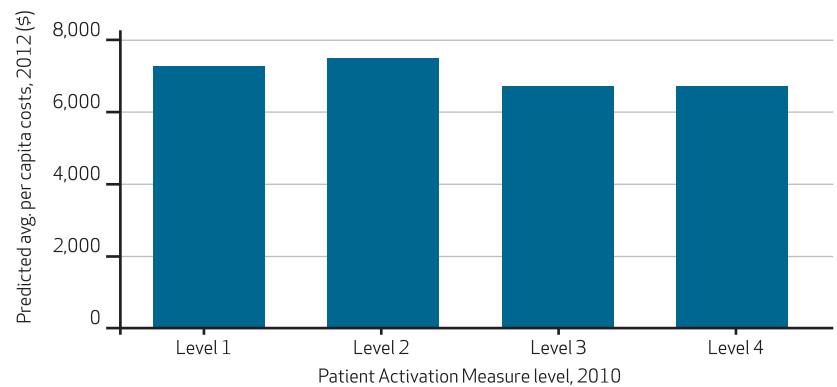
A similar pattern appears in the results for change in Patient Activation Measure level and billed costs (Exhibit 4). The lowest average per capita cost (\$6,411) was predicted for patients who were at level 4 in both periods. Costs were significantly higher for all but the next-most-activated group (those who went from level 3 to level 4). For instance, people who moved from 4 to 3 had projected costs that were 14 percent higher than those who remained at 4. Those who moved from 3 or 4 to 1 or 2 had projected costs that were 27 percent higher than those of the lowest-cost group, and those who remained in 1 or 2 had costs that were 31 percent higher than those of the lowest-cost group.

Discussion

The findings show that baseline Patient Activation Measure levels are related to clinical, behavioral, and utilization outcomes two years later, as well to future health care costs. After age, sex, number of chronic conditions, and income were controlled for, more activated patients were significantly more likely than less activated patients to have HDL, serum triglycerides, and PHQ-9 in

EXHIBIT 2

Predicted Average Per Capita Costs In 2012, By Patient Activation Measure Level In 2010



SOURCE Authors' analysis of data from Fairview Health Services. **NOTES** Patient Activation Measure level 1 is least activated (measure levels are described in the text). Factors that were controlled for were the indicator at baseline and patient age, sex, number of chronic conditions, the natural logarithm of income, and the percentage of clinic-level costs that were from within Fairview. Results were adjusted for clustering by provider.

the normal range; to be nonsmokers; and not to be obese. More activated patients were also significantly more likely than less activated patients to have obtained cancer screening tests (Pap smears and mammography), and they were significantly more likely to not have a hospitalization or ED visit two years after the Patient

EXHIBIT 3

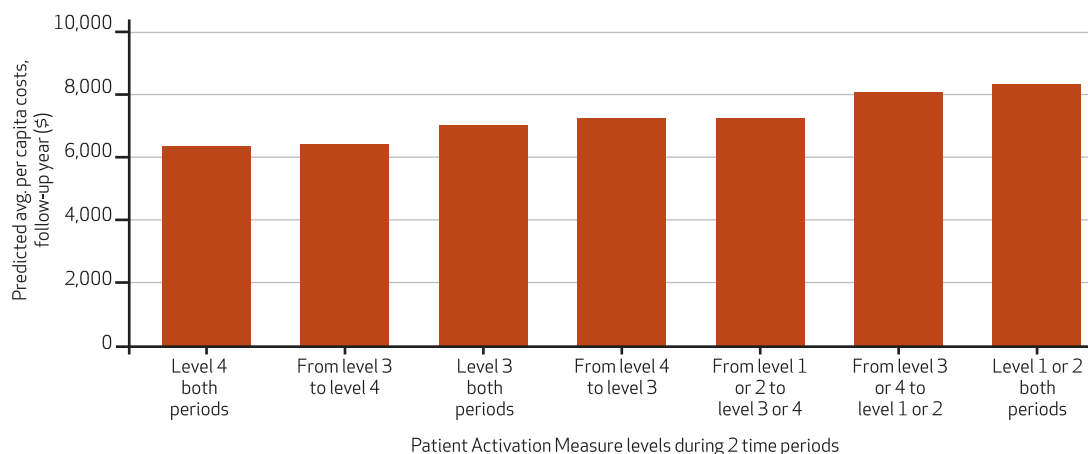
Relationship Between Patient Activation Levels At Two Time Periods And Follow-Up Health Outcomes, Odds Ratios

Outcome in follow-up year (number of patients)	Patient Activation Measure levels in two time periods ^a					
	Incr. from 3 to 4	Remained at 3	Decr. from 4 to 3	Incr. from 1 or 2 to 3 or 4	Decr. from 3 or 4 to 1 or 2	Remained at 1 or 2
CLINICAL INDICATORS IN NORMAL RANGE						
Hemoglobin A1c (1,778)	1.36	1.53**	0.89	0.88	0.80	0.84
High-density lipoprotein (5,386)	0.81	0.81**	0.93	0.73**	0.72***	0.70**
Low-density lipoprotein (4,425)	1.09	1.16	1.09	1.12	1.49***	0.96
Serum triglycerides (1,789)	0.76	0.78	0.84	0.66**	0.69	0.60**
Systolic blood pressure (10,897)	0.93	0.93	1.07	0.96	0.88	1.08
Diastolic blood pressure (10,897)	1.00	0.91	1.02	0.95	0.91	0.95
PHQ-9 (2,030)	0.66**	0.74	0.61**	0.48****	0.27****	0.31****
HEALTHY BEHAVIORS						
Not a current smoker (10,769)	0.99	0.92	0.98	0.90	0.71	0.74**
Not obese (10,804)	0.88	0.72***	0.75**	0.63***	0.69**	0.53****
PREVENTIVE SCREENINGS						
Pap smear (5,300)	0.90	1.13	0.92	0.85	1.07	0.69
Mammography (2,956)	1.04	0.96	0.83	1.05	1.19	0.88
AVOIDANCE OF COSTLY UTILIZATION						
No ED visits (10,927)	0.87	0.87	0.73***	0.70****	0.73***	0.65****
No hospitalizations (10,927)	0.98	0.82	0.78	0.79	0.72**	0.72**

SOURCE Authors' analysis of data from Fairview Health Services. **NOTES** The exhibit shows odds ratios. For example, a person with a Patient Activation Measure level of 1 or 2 (the lowest levels of activation, further described in the text) in two consecutive years in the period 2010–12 has the smallest chance of having high-density lipoprotein in the normal range. People who were at level 4 in both time periods are the reference group (odds ratio = 1.00). Factors that were controlled for were the indicator at baseline and patient age, sex, number of chronic conditions, the natural logarithm of income, and—for costly utilization measures—the clinic-level percentage of hospital costs that were from within Fairview. Results were adjusted for clustering by provider. PHQ-9 (Patient Health Questionnaire-9) is a measure of depression severity. ^aRemained at level 4 is the reference group. ** $p < 0.05$ *** $p < 0.01$ **** $p < 0.001$

EXHIBIT 4

Predicted Average Per Capita Costs In Follow-Up Year, By Change In Patient Activation Measure Levels During Two Time Periods



SOURCE Authors' analysis of data from Fairview Health Services. **NOTES** Patient Activation Measure level 1 is least activated (measure levels are described in the text). Levels were collected in two consecutive years in the period 2010–12. Factors that were controlled for were the indicator at baseline and patient age, sex, number of chronic conditions, the natural logarithm of income, and the percentage of clinic-level costs that were from within Fairview. Results were adjusted for clustering by provider.

Activation Measure level was collected. Furthermore, patients at higher levels (3 or 4) had projected costs that were 8 percent lower than those at level 1 and 13 percent lower than those at level 2 (Exhibit 2).

The findings also show that when Patient Activation Measure levels change, health outcomes tend to change in the same direction, and costs follow as predicted. Of note, costs were significantly higher for those who dropped a level over one year and significantly lower for those who increased a level, compared to those who stayed at the same level. For instance, people who dropped from level 4 to level 3 had predicted costs that were 14 percent higher than those who stayed in level 4. Conversely, those who went from 3 to 4 had projected costs that were 9 percent lower than those who remained at 3.

We found that the association between activation and outcomes is lasting and that when the Patient Activation Measure level moves, outcomes move in the expected direction. Future research is needed to establish whether or not the association represents a causal relationship. If it does, improving activation could have important implications.

For instance, if the 3,021 people who dropped from level 4 to level 3 had stayed in level 4, the annual charges would have been \$2.6 million

less, given the difference in predicted costs for the two groups. These projections are based upon the sample of patients with two Patient Activation Measure scores at Fairview, who—as noted above—were not representative of all patients in Fairview, or of US patients more broadly. Future work should examine more generalizable samples.

Conclusion

This is the largest observational study to examine the relationship between Patient Activation Measure levels and outcomes over time, and to assess whether outcomes change when these levels do. We found that levels were related to many outcomes over time and that changes in levels were related to changes in the expected direction in several of the outcomes studied, including cost.

Accountable care organizations and other delivery systems are seeking to restrain costs and improve outcomes. The findings reported here do not prove causality. However, they do suggest that delivery systems might wish to investigate the value of supporting patient activation as a potential pathway to these goals. Future research is needed to assess whether delivery system initiatives aimed at increasing patient activation provide a return on their investments. ■

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