Care Coordination for the Chronically Ill: Understanding the Patient's Perspective

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Objective. To identify factors associated with perception of care coordination problems among chronically ill patients.

Methods. Patient-level data were obtained from a random-digit dial telephone survey of adults with chronic conditions. The survey measured respondents' self-report of care coordination problems and level of patient activation, using the Patient Activation Measure (PAM-13). Logistic regression was used to assess association between respondents' self-report of care coordination problems and a set of patient characteristics.

Results. Respondents in the highest activation stage had roughly 30–40 percent lower odds of reporting care coordination problems compared to those in the lowest stage ($p < .01$). Respondents with multiple chronic conditions were significantly more likely to report coordination problems than those with hypertension only. Respondents' race/ethnicity, employment, insurance status, income, and length of illness were not significantly associated with self-reported care coordination problems.

Conclusion. We conclude that patient activation and complexity of chronic illness are strongly associated with patients' self-report of care coordination problems. Developing targeted strategies to improve care coordination around these patient characteristics may be an effective way to address the issue.

Key Words. Chronic disease, quality of care/patient safety (measurement), patient assessment/satisfaction

Chronic disease remains a substantial and persistent burden on patients and providers of health care in the United States. Chronically ill patients often have multiple conditions that require a well-coordinated system of care across multiple providers in different settings (Vogeli et al. 2007). Pham et al. (2007) have found that a typical Medicare beneficiary sees two primary care physicians and five specialists per year, whereas those with particularly complex conditions may see up to 16 different physicians per year.

Much of the existing literature related to care coordination has focused on physicians. Indeed, physicians do play a central role and can either facilitate or hamper the exchange of necessary information—between physicians and hospitals (Kripalani et al. 2007), between primary care physicians (PCPs) and specialists (O'Malley and Cunningham 2009), and between physicians and patients (Bell et al. 2001; Alexander, Casalino, and Meltzer 2003). However, the reality is that physicians' ability to coordinate care is likely to be influenced by characteristics of their patients, for example, type and severity of illness, skills and aptitude to self-coordinate, and so on.

In this article, we shift focus away from physicians and instead turn our attention to the role of patients. More specifically, we aim to provide answers to the following questions: (1) Are certain types of patients more likely to experience and report care coordination problems than others? and (2). Are there mutable patient characteristics that are amenable to interventions designed to enhance patients' ability to self-manage? We answer these questions by using a large survey of chronically ill patients and examine the relationship between patients' own perception of care coordination problems and a set of patient characteristics. We are aware of only two other studies (O'Malley and Cunningham 2009; Hawley et al. 2010) that have analyzed the relationship between patient characteristics and patient assessment of care coordination. Our study is unique in that we use self-reported care coordination problems among chronically ill adult patients as the primary outcome variable and include a measure of patient activation as an observable patient characteristic.

CONCEPTUAL FRAMEWORK

Measuring Problems in Care Coordination

The Agency for Healthcare Research and Quality (AHRQ) defines care coordination as “[t]he deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient’s care to facilitate the appropriate delivery of health care services. Organizing care involves the marshalling of personnel and other resources needed to carry out all

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required patient care activities, and is often managed by the exchange of information among participants responsible for different aspects of care" (McDonald et al. 2007).

PCPs are clearly in the position to serve as care coordinators (Bodenheimer 2008). The Institute of Medicine, however, states that one of the roles of PCPs is "developing a sustained partnership with patients and practicing within the context of family and community" (Donaldson et al. 1996). Accordingly, we argue that the patient is also in a unique position to assess, as well as to influence, the coordination of care he or she receives (Hawley et al. 2010). In fact, AHRQ suggests that patients are "potentially the only 'common thread' linking interdependent clinicians and settings and may represent the only perspective (and data source) from which coordination of care may be measured" (McDonald et al. 2007). Furthermore, using patients' perception of care to assess health care quality is well aligned with growing efforts to promote patient-centered care. Thus, we focus on patients' perceived problems in care coordination as the main variable of interest for our analysis.

An important limitation of using patient perception to assess care coordination is the fact that much of the coordination happens "behind the scenes" without patients' explicit awareness of it. This means that patients are typically unable to assess coordination until they encounter care that falls short of their expectations, or they experience unanticipated adverse health events that they deem to be preventable had proper care coordination taken place. There are two important implications from this fact. First, patients are more likely to give reliable assessments of care coordination if they are asked about problems, rather than about successes. Second, patients' experience with the health care system is an important factor in determining patients' ability to accurately attribute certain quality gaps to poor care coordination. As such, our study focuses on chronically ill adult patients who are likely to have the exposure to and experience with the health care system to accurately assess care coordination problems. Nevertheless, we are unable to provide any conclusive link between perceptions of care coordination problem and actual problems experienced by patients. Therefore, any attempts to draw inferences about actual care coordination problems based on the findings of this analysis should be done with caution.

Theoretical Framework

We derive our empirical model from Andersen's behavioral framework (Andersen 1995) for health care use, which was adopted by AHRQ to

specifically describe the care coordination behaviors of both patients and providers (McDonald et al. 2007). Note that our purpose of using this model is not necessarily to establish the chain of causal links among different factors that contribute to patients' perception of care coordination problems. Rather, we apply this framework to help identify and conceptually organize the factors associated with perceived care coordination problems. The goal is to identify a set of observable patient characteristics that capture the behaviors, skills, resources, and attitudes that would either help or hinder patients from obtaining the care coordination they need.

In this framework, there are three components: predisposing characteristics, enabling resources, and need for coordination. "Predisposing characteristics" imply that some patients "might be more or less predisposed to coordinate care based on their own attitudes toward or knowledge about their role in coordinating care. The idea behind *predisposing characteristics* is that they are not easily altered" (McDonald et al. 2007). The predisposing characteristics thus include age, gender, race, education, and family structure, as well as employment status and income. Previous studies have suggested that older patients may in fact report fewer problems in their health care because clinicians may spend more time communicating with them (Hargraves et al. 2001). Other studies (Schillinger et al. 2002; Paasche-Orlow et al. 2005; Howard, Sentell, and Gazmararian 2006;) have demonstrated that lower health literacy, particularly among poor minority populations, is likely to contribute to lower self-management skills that lead to worse health outcomes.

In addition, we consider patient activation as a predisposing characteristic, because an individual's organizational and self-lobbying capabilities are also likely to be an important contributor to care coordination. Activated patients believe that they "have important roles to play in self-managing care, collaborating with providers, and maintaining their health. They know how to manage their condition and maintain functioning and prevent health declines; and they have the skills and behavioral repertoire to manage their condition, collaborate with their health providers, maintain their health functioning, and access appropriate and high-quality care" (Hibbard et al. 2004).

It is not clear a priori whether higher levels of activation would be associated with a higher or lower probability of reporting care coordination problems. One may expect that more engaged patients would be more sensitive to problems in care coordination; those who are more knowledgeable and skilled in their own care may be more likely to notice and report when needed services and care are not delivered. At the same time, they may also be more likely to take actions to either resolve or prevent coordination problems,

hence reporting fewer problems in the end. Mosen et al. (2007) have shown that the more activated patients are more likely to report a greater degree of patient satisfaction. This may be because they are able to get what they need from the health care system and the providers they use. Therefore, higher patient activation may also be associated with a lower likelihood of reporting care coordination problems.

“Enabling resources” refer to those factors that “reflect the availability and access to the requisite information systems, organizational structures, or productive relationships with others providing care to the same patients” (McDonald et al. 2007). Enabling resources therefore include physician practices’ infrastructure for enhanced communication and information exchange, such as electronic medical records. Thus, certain health care market conditions — for example, presence of large integrated health care delivery systems — influence providers’ ability to coordinate care and thus patients’ perceptions. Unfortunately, our data do not allow us to explicitly capture these specific physician practice characteristics and market-level factors in our analysis. However, as we discuss below, we do observe the geographical location of the patients. This allows us to control for the community-level variation in terms of the enabling resources at the market level.

At the patient level, the patient’s health insurer can be an important resource for obtaining well-coordinated care. Health insurers process claims, establish provider networks, employ care coordinators, and often implement disease management programs. Therefore, health insurers may be in a position to impact not only the exchange of information but also the patient-provider interactions that influence coordination. For example, disease and case management programs often include telephonic coaching for complex cases. These coaches may help prepare patients to act as more effective partners in care coordination by reminding patients to bring their medication lists and immunization cards with them on a visit to their physicians, for instance.

Having a regular provider or a usual source of care is also likely to affect the patients’ ability to obtain well-coordinated care. Both patients and providers are likely to benefit from repeated interactions with each other by accumulating knowledge about the types and quantities of health care services needed, delivered, and received. Not having a regular provider, or having multiple regular providers, is therefore likely to contribute to missed opportunities for treatments as well as duplicate and unnecessary tests and procedures.

“Need for Coordination” is a latent construct that captures each patient’s particular health care needs and determines the degree to which the

patient requires well-coordinated care. Thus, a patient's complexity of illness is likely to contribute to poor coordination. If an individual has multiple chronic diseases or is generally in poor health, he or she may need care from multiple providers, increasing the odds of care coordination problems. Types and combinations of illnesses may also be important determinants of perceived care coordination problems. For example, a patient with diabetes is likely to require a more complex set of tests and appointments than another patient with only hypertension who may only require a regular prescription for an antihypertensive drug and a statin. Moreover, those who have had their conditions for longer periods may have learned to better manage their conditions.

Similarly, those requiring multiple hospitalizations or numerous outpatient visits — which we expect to be positively correlated with the patients' complexity — may also be more prone to care coordination problems. Of course, it is possible that poor care coordination may contribute to increased hospitalization and office visits; unfortunately, it is not possible to establish the direction of causality in our analysis. Alternatively, hospitalizations and visit frequencies may capture patients' access to health care services rather than complexity, in which case we would not expect to observe a significant association.

DATA

Our data come from the Aligning Forces for Quality (AF4Q) Consumer Survey, which was collected to facilitate the evaluation of the AF4Q project. For a complete description of the AF4Q project, see Painter and Lavizzo-Mourey (2008) and Hurley et al. (2009). The Consumer Survey is a random-digit dial phone survey of the chronically ill population, administered between June 2007 and May 2010. The sample consists of adults (i.e., 18 years of age and older) with one or more of five chronic diseases (asthma, diabetes, hypertension, heart disease, and depression) residing in 17 communities that received the AF4Q grants; that is, Seattle, Detroit, Memphis, the state of Minnesota, Western New York, Western Michigan, the state of Wisconsin, the state of Maine, Humboldt county (CA), South Central Pennsylvania, Cincinnati, Cleveland, Kansas City, Willamette Valley (OR), Albuquerque, Boston, and Indianapolis. For comparison purposes, the sample also contains a randomly selected group of chronically ill patients residing outside the 17 AF4Q communities. The survey asks questions about health care utilization, self-

management of chronic disease, consumer engagement, and awareness and use of health care provider quality information.

Eligible respondents were identified via a 5-minute screener interview which collected information on the respondents' basic demographic characteristics, such as age, gender, race/ethnicity, and education, along with the presence of the five chronic conditions. Once determined to be eligible, the respondent was offered a \$20 incentive for completing the full survey. The overall response rate for the survey was 27.6 percent using the AAPOR (American Association of Public Opinion Research) method of response rate calculation or 45.8 percent using the CASRO (Council of American Survey Research Organizations) method. See Martsolf et al. (2011) for a comparison of these methods.

Given the relatively low response rates, non-response bias might be a concern. Existing literature suggested, however, that low response rates do not necessarily imply high degrees of non-response bias (Groves 2006). Nevertheless, we specifically compared several estimates from the AF4Q Consumer Survey against those from the 2008 National Health Interview Survey (NHIS) in terms of respondents' demographic characteristics and prevalence of comparable chronic conditions, because NHIS has achieved a 90 percent response rate and is thus less likely to be subject to non-response bias. Weights were applied to match the distribution of the AF4Q survey data to that of the general US population in 2008 in terms of age, gender, race, education, and income. We found negligible differences between the weighted estimates from the AF4Q survey and the corresponding estimates from NHIS and therefore concluded that non-response bias, if any, is likely to be minimal.

Variables

The dependent variable is the following survey question: "In general, do you think that coordination among all of the different health care professionals that you see is....?" Respondents are able to answer "major problem," "minor problem," or "not a problem at all." This survey item has been used previously in a different survey (Kaiser Family Foundation 2008). Nevertheless, given the self-reported nature of the variable, it is likely to be subject to limitations including, but not limited to, recall bias. Moreover, because the survey focused on the direct and personal experiences with the health care system as reported first-hand by the patient, the dependent variable does not reflect the view of the caregiver (i.e., friends or family members providing day-to-day

assistance to the patient), if one existed, even though the caregiver might be in a good position to assess care coordination problems.

To measure each patient's activation level, we use the Patient Activation Measure (PAM 13) developed by Hibbard et al. (2004). This 13-item instrument is a psychometric tool that measures the latent construct of "patient activation," which captures the degrees to which patients have the beliefs, knowledge, and skills to "manage their condition(s), collaborate with their providers, maintain their health functioning, and access appropriate and high-quality care." Based on the PAM score, we assign each respondent to one of four "stages" of activation where the first stage corresponds to the lowest level of activation and the fourth stage corresponds to the highest level (Hibbard et al. 2005).

As noted above, our data do not include the relevant market-level factors that systematically affect the ability of patients and providers to coordinate care effectively. Furthermore, the AF4Q communities presumably differ from one another in terms of health care utilization and practice patterns, as documented by Fisher et al. (2003a,b). To account for these differences, we include a set of binary indicator variables (i.e., market fixed effects) to represent the 17 AF4Q communities, with the national comparison sample (i.e., respondents residing in non-AF4Q communities) serving as the referent. For Minnesota, we assign a different indicator variable for those residing in the Twin Cities area to explicitly recognize the fact that the market conditions of the large urban Twin Cities area are different from the rest of the state.

Because those who report higher satisfaction with their providers may also be less likely to report any problem with their care coordination, our dependent variable may be simply capturing respondents' overall satisfaction with their providers. Therefore, we also control for respondents' overall satisfaction with their health care providers. The survey asks the respondents to rate their satisfaction with providers on the scale of 0–10, with 0 representing the lowest level of satisfaction. Presumably, this variable is endogenously related to respondents' views on care coordination (i.e., poor care coordination is likely to lead to lower satisfaction rating of providers). As such, as described below, we estimate an alternative logistic regression model in which this satisfaction variable is omitted and then compare the results.

In addition, we also include as a covariate in our logistic regression model the respondents' self-rated health status variable to further control for any differences among our respondents in terms of their underlying health conditions. Previous studies have demonstrated that such a subjective

measure of self-health is predictive of patients' use of health services and outcomes (Miilunpalo et al. 1997; McGee et al. 1998).

METHODOLOGY

Given the discrete and ordered nature of our dependent variable, an ordered probit or logit regression model is appropriate. However, because less than 10 percent of the respondents responded "major problem," we collapse this response category with the "minor problem" category to create a binary indicator that equals 1 if respondents reported any care coordination problem and zero otherwise. To assess the association between this dependent variable and the set of patient characteristics identified above, we perform a series of multivariate logistic regression analyses.

In total, we estimate four models. The first model includes all the patient characteristics listed above as covariates. In the second and third models, we omit PAM and provider satisfaction variables as covariates, respectively. The rationale is that, because PAM and provider satisfaction ratings may be endogenous (i.e., there may be unobserved patient characteristics affecting both the dependent variable and these covariates), this endogeneity bias might affect coefficient estimates on other covariates. Lastly, those respondents who reported having depression only are excluded from the sample to examine whether our results are being driven by these respondents. We expect these patients to be systematically different from other patients; presumably, not only are they less prone to actual care coordination problems compared to others with more complex conditions, but they also are less likely to give a positive response to the dependent variable just because of their condition.

We use unweighted data to obtain these estimates because the regression models already include all the demographic variables typically used to calculate the weights (age, gender, race, education, and income) as covariates. To account for any heteroscedasticity that may lead to incorrect estimation of the standard errors, we report the Huber-White robust standard errors (White 1980).

RESULTS

As shown in Table 1, about 27 percent of the respondents reported that care coordination is either a major (9 percent) or a minor (18 percent) problem.

Table 1: Descriptive Statistics* (N = 10,038)

	<i>Freq</i>	<i>SD</i>		<i>Freq</i>	<i>SD</i>
CC Is a Problem	27%		II. Enabling resources		
I. Predisposing characteristics			Insurance type		
Respondent is male	32%		Private insurance only	33%	
Race/Ethnicity			Medicare only	6%	
White, non-Hispanic	60%		Medicare + private	20%	
Black, non-Hispanic	26%		Medicaid	3%	
Hispanic	9%		Dual eligible	11%	
Other	5%		Uninsured	6%	
Years of education (mean)	13.8	(3.1)	Other	21%	
Age (mean in years)	58.2	(15.2)	Regular provider		
No. of people in household	2.3	(1.4)	Has regular doctor	94%	
PAM			No regular doctor	6%	
Stage 1	7%		Multiple regular doctors	1%	
Stage 2	19%		III. Need for coordination		
Stage 3	34%		Chronic conditions		
Stage 4	41%		Hypertension only	30%	
Employment status			Diabetes only	7%	
Employed full-time	31%		Heart disease only	3%	
Employed part-time	10%		Asthma only	6%	
Unemployed	4%		Depression only	13%	
Other	55%		Disabled	8%	
Household income			2 chronic conditions	29%	
< \$10,000	10%		3+ chronic conditions	13%	
\$10,000–\$19,999	18%		Length of time with chronic condition [†]		
\$20,000–\$29,999	14%		Less than 2 years	14%	
\$30,000–\$49,999	17%		3–5 years	14%	
\$50,000–\$74,999	15%		5+ years	72%	
\$75,000–\$100,000	8%		Experience with health care services (mean)		
> \$100,000	9%		No. of provider visits in	2.0	(6.1)
Don't know	4%		3 months		
Refused	5%		No. of ER visits in 12 months	0.8	(2.0)
			No. of hospitalizations in	0.4	(4.1)
			12 months		
			Provider satisfaction (0–10)	8.3	(1.8)
			Health status		
			Poor	8%	
			Fair	27%	
			Good	40%	
			Very good	21%	
			Excellent	5%	

*Unweighted estimates shown.

[†]For respondents with multiple conditions, the condition with the longest length of illness was considered.

The average age of the respondents was about 58 years old, with 40 percent of the respondents being non-White minorities due to the oversample of the minority population in the survey. The sample also had relatively high proportion of women (68 percent) and retired persons (classified under the “Other” employment status category).

The majority of the respondents had been chronically ill for more than 5 years (72 percent), with about 42 percent reporting more than two chronic conditions. Among those with two chronic conditions, the combination of diabetes plus hypertension was the most common (39 percent), followed by the combinations of hypertension plus heart disease (17 percent) and hypertension plus depression (16 percent). Among those with three chronic conditions, the combination of diabetes, hypertension, and heart disease was the most common (34 percent), followed by the combination of diabetes, hypertension, and depression (23 percent).

Table 2 contains the results from our four logistic regression models. Because respondents could refuse to answer any particular question, some variables have missing values. Thus, all observations with missing values are excluded, resulting in a final sample size of 9,257 out of the overall sample size of 10,038. Overall, the estimates remain consistent across all four models, suggesting that the full model estimates (Model 1) are generally robust to inclusion of the potentially endogeneous explanatory variables — particularly the PAM variable — and exclusion of the depression-only respondents. Only the coefficient estimates on the education variable seem sensitive to exclusion of the provider satisfaction rating variable. Age and self-reported health status are consistently and significantly associated with reports of care coordination problem across all models, whereas race/ethnicity, employment status, household size, and number of visits to health care providers are consistently not significantly associated.

In all models in which PAM was included as a covariate, PAM is a consistent and significant predictor of perception of care coordination problem. In particular, respondents in the highest activation stage (Stage 4) have about 30–40 percent lower odds of reporting care coordination problems compared to those in the lowest stage. Furthermore, omission of the PAM variable as covariates yields virtually identical coefficient estimates on other covariates, as can be seen by comparing Model 1 against Model 2. Moreover, those respondents who reported having multiple chronic conditions are consistently more likely to report care coordination problems across all models. In models in which the respondents with depression only were included (Models 1–3), these respondents appear to be more likely to report coordination problems

Table 2: Logistic Regression Results (Odds Ratios)[†]

	<i>Model 1: Full</i>	<i>Model 2: PAM Omitted</i>	<i>Model 3: Satisfaction Rating Omitted</i>	<i>Model 4: Depression Only Omitted</i>
I. Predisposing characteristics				
Race/ethnicity				
White, non-Hispanic	(referent)	(referent)	(referent)	(referent)
Black, non-Hispanic	0.946	0.960	0.901	0.903
Hispanic	0.979	0.990	0.900	0.912
Other	0.990	0.990	0.981	0.998
Education				
Less than high school	(referent)	(referent)	(referent)	(referent)
High school graduate	0.805**	0.811*	0.913	0.775**
Associate's degree	0.967	0.970	1.151	0.954
Bachelor's degree	1.007	1.013	1.276**	0.976
Graduate degree	1.170	1.157	1.434***	1.048
Age category				
<30	(referent)	(referent)	(referent)	(referent)
30–39	0.933	0.903	0.965	1
40–49	0.854	0.835	0.832	0.952
50–59	0.761*	0.748**	0.699***	0.859
60–69	0.633***	0.615***	0.534***	0.721*
70–79	0.553***	0.550***	0.420***	0.604**
80+	0.384***	0.389***	0.324***	0.437***
Gender				
Female	(referent)	(referent)	(referent)	(referent)
Male	1.097	1.103*	1.100*	1.082
Household size				
1	(referent)	(referent)	(referent)	(referent)
2	0.909	0.915	0.908	0.892
3	1.034	1.049	1.058	1.013
4+	0.844*	0.857*	0.896	0.840*
Patient activation measure				
Stage 1	(referent)	(referent)	(referent)	(referent)
Stage 2	0.756**		0.756***	0.699***
Stage 3	0.786**		0.656***	0.725***
Stage 4	0.699***		0.567***	0.648***
Employment status				
Employed full-time	(referent)	(referent)	(referent)	(referent)
Employed part-time	1.023	1.012	0.969	0.963
Unemployed	1.120	1.123	1.118	1.14
Other	1.122	1.115	1.074	1.06
Household income				
<\$10,000	(referent)	(referent)	(referent)	(referent)
\$10,000–\$19,999	0.990	0.998	0.939	0.926
\$20,000–\$29,999	1.048	1.052	0.983	1.013

continued

Table 2. *Continued*

	<i>Model 1: Full</i>	<i>Model 2: PAM Omitted</i>	<i>Model 3: Satisfaction Rating Omitted</i>	<i>Model 4: Depression Only Omitted</i>
\$30,000–\$49,999	0.864	0.863	0.791**	0.776*
\$50,000–\$74,999	1.007	1.008	0.905	0.959
\$75,000–\$100,000	1.005	1.007	0.860	0.930
> \$100,000	1.197	1.191	1.024	1.121
Don't know	0.985	0.977	0.825	0.967
Refused	0.989	0.948	0.834	0.977
II. Enabling resources				
Insurance type				
Private insurance only	(referent)	(referent)	(referent)	(referent)
Medicare only	0.936	0.945	0.892	0.972
Medicare + private	0.930	0.931	0.894	0.941
Medicaid	0.777	0.777	0.779*	0.792
Dual eligible	0.829	0.837	0.810*	0.867
Uninsured	0.997	0.993	1.092	0.985
Other	0.883	0.875	0.945	0.956
Regular provider				
Has regular doctor	(referent)	(referent)	(referent)	(referent)
No regular doctor	1.063	1.075	1.384***	1.067
Multiple regular doctors	0.964	0.959	1.123	0.975
III. Need for coordination				
Chronic conditions				
Hypertension only	(referent)	(referent)	(referent)	(referent)
Diabetes only	1.090	1.091	1.100	1.106
Heart disease only	1.156	1.176	1.076	1.160
Asthma only	1.182	1.148	1.240**	1.211
Depression only	1.283***	1.302***	1.350***	
Disabled	1.199*	1.192*	1.160	1.163
2 chronic conditions	1.264***	1.278***	1.234***	1.274***
3+ chronic conditions	1.393***	1.396***	1.267***	1.408***
Length of time with chronic condition				
Less than 2 years	(referent)	(referent)	(referent)	(referent)
3–5 years	1.065	1.068	1.054	1.076
5+ years	1.143	1.14	1.154*	1.154
Experience with health care provider(s)				
No. of visits to provider in 3 months	1.004	1.007	1.005	1.001
No. of visits to ER in 12 months	1.009	1.009	1.022	1.009
No. of hospitalizations in 12 months	1	0.998	0.995	1.001
Provider satisfaction rating	0.660***	0.652***		0.649***

continued

Table 2. *Continued*

	<i>Model 1: Full</i>	<i>Model 2: PAM Omitted</i>	<i>Model 3: Satisfaction Rating Omitted</i>	<i>Model 4: Depression Only Omitted</i>
Health status				
Poor	(referent)	(referent)	(referent)	(referent)
Fair	0.740***	0.734***	0.734***	0.743***
Good	0.626***	0.617***	0.557***	0.628***
Very good	0.551***	0.535***	0.447***	0.563***
Excellent	0.491***	0.478***	0.367***	0.499***
N	9,257	9,257	9,318	8,157

**p*-value < 0.1.

***p*-value < 0.05.

****p*-value < 0.001.

†Also includes 18 indicator variables to capture AF4Q market fixed effects relative to the non-AF4Q comparison group (not shown).

than those with hypertension only. On the other hand, those who are older, in higher self-rated health status, or reported higher satisfaction with their providers are significantly less likely to report coordination problems.

Our results also suggest that race/ethnicity, employment and insurance status, income, and length of illness are not significantly associated with perception of care coordination problems. Not having a regular doctor and higher education levels are significantly associated with greater odds of reporting problems only in the model that excludes the provider satisfaction rating variable (Model 3), suggesting that presence of a regular doctor and education levels might be correlated with patients' provider satisfaction ratings.

As noted above, our models also include market fixed effects to capture the market-level differences among the AF4Q communities. The coefficient estimates on these variables (not shown) suggest that respondents in one community, West Michigan, were significantly less likely to report care coordination problems than those in the national comparison group, whereas those in other AF4Q communities were no more or less likely to report problems relative to those in the national comparison group.

It is possible that the preponderance of insignificant estimates in Table 2 might be due to a multicollinearity problem. To examine this issue, we have calculated the variance inflation factor (VIF) by regressing each of the covariates on all other covariates. We find that the mean VIF was 2.43 with the maximum of 9.18 in the full model, suggesting that multicollinearity was unlikely to be a problem (Chatterjee and Hadi 2006).

DISCUSSION

The main goal of this analysis is to provide a different view of the problem of care coordination, that is, from the perspective of patients. Given the increasing importance of providing care for patients with complex diseases and chronic conditions, our findings may be useful for thinking about efficient strategies and interventions to reduce care coordination problems that often lead to lower quality care. Our analyses have identified several observable patient characteristics that are predictive of a patient's self-reported care coordination problems. For instance, our study shows that those patients who are more activated (as measured by PAM) are less likely to report coordination problems, presumably because such patients are more likely to be better self-managers of their own care. In addition, our results suggest that patients with more complex chronic conditions would benefit from increased efforts to better coordinate care. Our results confirm that patients with three or more chronic conditions have roughly 25–40 percent greater odds of reporting care coordination problem than those who have a single condition (i.e., hypertension only). Comorbidity presents challenges not only to the providers but also to the patients in marshalling their efforts to obtain well-coordinated care.

We also find a consistent pattern in which patients appear to become gradually less likely to report care coordination problems as they get older, even when controlling for provider satisfaction ratings. This is consistent with the expectation that older patients may have gained the necessary experience and skills to effectively navigate through a complex care delivery system and, therefore, report fewer problems in their care coordination. As noted earlier, it may be that older patients in fact experience fewer problems in their health care because clinicians are likely to spend more time communicating with them (Hargraves et al. 2001).

The nonsignificant findings in our results are also informative. For example, the results suggest that minority patients are just as likely as their White counterparts to report care coordination problems, whereas those who have less income are also just as likely to report problems as those who have higher income. The same is true for those with different insurance types and employment status. This suggests that, if efforts to improve care coordination were to be focused on particular subsets

of the population, targeting those with these characteristics may not be the most efficient or productive strategy.

Instead, our findings indicate that segmenting the patient population by clinical profile and activation level may allow for a more targeted use of care coordination support and ultimately a more efficient use of resources. To the extent that patient activation is predictive of whether a patient is more or less likely to experience actual care coordination problems, care providers — whether health plan-trained case managers or primary care physicians — may be better able to channel their resources to focus on those patients who are likely to be less prepared and less able to overcome their own care deficits.

Although patient activation is not readily observable, our results argue for a potential application of the PAM instrument in primary care settings to identify such patients who are likely to face care coordination problems (Hibbard et al. 2005). Previous studies have suggested that patient activation is mutable and that increased activation is associated with improved self-management behaviors (Hibbard et al. 2007). There are also some early indications that certain targeted efforts to help patients enhance their self-management skills can significantly increase their PAM scores and move them to higher levels of activation (Hibbard, Greene, and Tusler 2009; Deen et al. 2010; Frosch et al. 2010). Nevertheless, it is still unclear as to what specific community-wide interventions might help patients become more engaged and how to execute them on a wider scale (Hurley et al. 2009).

In this study, we used one specific approach to measuring care coordination problems. However, even though we were able to obtain a substantial sample size of a targeted population who would presumably be aware of and sensitive to care coordination issues, our empirical model was able to account for only a small fraction of the variation in our dependent variable (pseudo $R^2 = 0.135$). Although this was partly due to our data limitations, it might also be due to less than perfect match between our conceptual framework and the dependent variable that we have chosen to use.

Moreover, we have found that depression-only patients are more likely to report problems than hypertension-only patients. This may reflect different perceptions of care coordination problems between these two patient groups rather than any real difference in the actual problems. If so, a different method of measuring care coordination problems — perhaps one that does not rely on patient self-reports — may be necessary for those patients with depression.

Measurement of care coordination is an evolving field. Currently, the Care Coordination Measures Atlas (sponsored by AHRQ) lists 61 different measures of care coordination (McDonald et al. 2010), including the Consumer Assessment of Healthcare Providers and Systems (CAHPS) measures of care coordination. The usefulness of each of these measures obviously depends on the intended purposes. Nevertheless, the sheer number of different care coordination measures available today illustrates the critical need for a valid and reliable measure with practical use in patient care settings.

In developing a care coordination measurement strategy relevant for policy, a measure must not only be valid but also sensitive to changes, simple to implement, and readily interpretable. The main advantage of directly asking patients to assess care coordination is that it is a simple strategy that gets at the heart of the matter and can be readily understood by all stakeholders. However, additional research is needed to determine whether such a strategy provides enough sensitivity to detect significant changes that point to the most effective interventions.

REFERENCES

- Alexander, G. C., L. P. Casalino, and D. O. Meltzer. 2003. "Patient-Physician Communication about Out-of-Pocket Costs." *Journal of American Medical Association* 290 (7): 953–8.
- Andersen, R. M.. 1995. "Revisiting the Behavioral Model and Access to Medical Care: Does It Matter?" *Journal of Health and Social Behavior* 36 (1): 1–10.
- Bell, R. A., L. R. Kravitz, D. Thom, E. Krupat, and R. Azari. 2001. "Unsaid but Not Forgotten: Patients' Unvoiced Desires in Office Visits." *Archives of Internal Medicine* 161: 1977–84.
- Bodenheimer, T.. 2008. "Coordinating Care — A Perilous Journey through the Health Care System." *New England Journal of Medicine* 358 (10): 1064–71.
- Chatterjee, S. and A. S. Hadi. 2006. *Regression Analysis by Example*. 4th ed. New York: Wiley.
- Deen, D., W. H. Lu, L. Santana, and M. R. Gold. 2010. "Asking Questions: The Effect of a Brief Intervention in Community Health Centers on Patient Activation." *Patient Education and Counseling* 84 (2): 257–60.
- Donaldson, M. S., K. D. Yordy, K. N. Lohr, and N. A. Vanselow eds. 1996. *Primary Care: America's Health in a New Era*. Committee on the Future of Primary Care, Institute of Medicine. Washington, DC: National Academy Press.
- Fisher, E. S., D. E. Wennberg, T. A. Stukel, D. J. Gottlieb, F. L. Lucas, and E. L. Pinder. 2003a. "The Implications of Regional Variations in Medicare Spending. Part 1: The Content, Quality, and Accessibility of Care." *Annals of Internal Medicine* 138: 273–87.

- . 2003b. "The Implications of Regional Variations in Medicare Spending. Part 2: Health Outcomes and Satisfaction with Care." *Annals of Internal Medicine* 138: 288–98.
- Frosch, D. L., D. Rincon, S. Ochoa, and C. M. Mangione. 2010. "Activating Seniors to Improve Chronic Disease Care." *Journal of the American Geriatrics Society* 58 (8): 1476–503.
- Groves, R. M.. 2006. "Nonresponse Rates and Nonresponse Bias in Household Surveys." *Public Opinion Quarterly* 70 (5): 646–75.
- Hargraves, J. L., I. B. Wilson, A. Zaslavsky, C. James, J. D. Walker, G. Rogers, and P. D. Cleary. 2001. "Adjusting for Patient Characteristics When Analyzing Reports from Patients about Hospital Care." *Medical Care* 39 (6): 635–41.
- Hawley, S. T., N. K. Janz, S. E. Lillie, C. R. Fries, J. J. Griggs, J. J. Graff, A. S. Hamilton, S. Jain, and S. J. Katz. 2010. "Perceptions of Care Coordination in a Population-Based Sample of Diverse Breast Cancer Patients." *Patient Education and Counseling* 81: S34–40.
- Hibbard, J. H., J. Greene, and M. Tusler. 2009. "Improving the Outcomes of Disease-Management by Tailoring Care to the Patient's Level of Activation." *American Journal of Managed Care* 15 (6): 353–60.
- Hibbard, J. H., J. Stockard, E. R. Mahoney, and M. Tusler. 2004. "Development of the Patient Activation Measure (PAM): Conceptualizing and Measuring Activation in Patients and Consumers." *Health Services Research* 39 (4p1): 1005–26.
- Hibbard, J. H., E. R. Mahoney, J. Stockard, and M. Tusler. 2005. "Development Testing of a Short Form of the Patient Activation Measure." *Health Services Research* 40 (6p1): 1918–30.
- Hibbard, J. H., E. R. Mahoney, R. Stock, and M. Tusler. 2007. "Do Increases in Patient Activation Result in Improved Self-Management Behaviors?" *Health Services Research* 42 (4): 1443–63.
- Howard, D. H., T. Sentell, and J. A. Gazmararian. 2006. "Impact of Health Literacy on Socioeconomic and Racial Differences in Health in an Elderly Population." *Journal of General Internal Medicine* 21 (8): 857–61.
- Hurley, R. E., P. S. Keenan, G. R. Martsolf, D. D. Maeng, and D. P. Scanlon. 2009. "Early Experiences with Consumer Engagement Initiatives to Improve Chronic Care." *Health Affairs* 28 (1): 277–83.
- Kaiser Family Foundation. 2008 Update on Consumers' Views of Patient Safety and Quality Information: Summary & Chartpack. The Henry J. Kaiser Family Foundation [accessed on March 5, 2012]. Available at: <http://www.kff.org/kaiser-polls/7819.cfm>
- Kripalani, S., F. LeFebvre, C. O. Phillips, M. V. Williams, P. Basaviah, and D. W. Baker. 2007. "Deficits in Communication and Information Transfer between Hospital-Based and Primary Care Physicians." *Journal of American Medical Association* 297 (8): 831–41.
- Martsolf, G. R., R. Schofield, D. Johnson, and D. Scanlon. 2011. "Buyer Beware: Calculating Response Rates in Random Digit Dial Health Surveys." Unpublished manuscript The Pennsylvania State University, University Park.

- McDonald, K. M., V. Sundaram, D. M. Bravata, R. Lewis, N. Lin, S. Kraft, M. McKinnon, H. Paguntalan, and D. K. Owens. 2007. "Care Coordination." In: *Closing the Quality Gap: A Critical Analysis of Quality Improvement Strategies*, Vol. 7, Technical Review 9 (Prepared by the Stanford University-UCSF Evidence-based Practice Center under contract 290-02-0017). AHRQ Publication No. 04(07)-0051-7. Rockville, MD: Agency for Healthcare Research and Quality.
- McDonald, K. M., E. Schultz, L. Albin, N. Pineda, J. Lonhart, V. Sundaram, C. Smith-Spangler, J. Brustrom, and E. Malcolm. 2010. Care Coordination Atlas Version 3 (Prepared by Stanford University under subcontract to Battelle on Contract No. 290-04-0020). AHRQ Publication No. 11-0023-EF. Rockville, MD: Agency for Healthcare Research and Quality.
- McGee, D. L., Y. Liao, G. Cao, and R. S. Cooper. 1998. "Self-reported Health Status and Mortality in a Multiethnic US Cohort." *American Journal of Epidemiology* 149 (1): 41–46.
- Miilunpalo, S., I. Vuori, P. Oja, M. Pasanen, and H. Urponen. 1997. "Self-Rated Health Status as a Health Measure: The Predictive Value of Self-Reported Health Status on the Use of Physician Services and on Mortality in the Working-Age Population." *Journal of Clinical Epidemiology* 50 (5): 517–28.
- Mosen, D. M., J. Schmittiel, J. Hibbard, D. Sobel, C. Remmers, and J. Bellows. 2007. "Is Patient Activation Associated with Outcomes of Care for Adults with Chronic Conditions?" *The Journal of Ambulatory Care Management* 30 (1): 21–29.
- O'Malley, A. S., and P. J. Cunningham. 2009. "Patient Experience with Coordination of Care: The Benefit of Continuity and Primary Care Physician as Referral Source." *Journal of General Internal Medicine* 24 (2): 170–7.
- Paasche-Orlow, M. K., K. A. Riekert, A. Bilderback, A. Chanmugam, P. Hill, C. S. Rand, F. L. Brancati, and J. A. Krishnan. 2005. "Tailored Education May Reduce Health Literacy Disparities in Asthma Self-Management." *American Journal of Respiratory and Critical Care Medicine* 172: 980–9.
- Painter, M. W., and R. Lavizzo-Mourey. 2008. "Aligning Forces for Quality: A Program to Improve Health and Health Care in Communities Across the United States." *Health Affairs* 27 (5): 1461–1463.
- Pham, H. H., D. Schrag, A. S. O'Malley, B. Wu, and P. B. Bach. 2007. "Care Patterns in Medicare and Their Implications for Pay for Performance." *New England Journal of Medicine* 356: 1130–9.
- Schillinger, D., K. Grumbach, J. Piette, F. Wang, D. Osmond, C. Daher, J. Palacios, G. D. Sullivan, and A. B. Bindman. 2002. "Association of Health Literacy with Diabetes Outcomes." *Journal of American Medical Association* 288 (4): 475–82.
- Vogeli, C., A. E. Shields, T. A. Lee, T. B. Gibson, W. D. Marder, K. B. Weiss, and D. Blumenthal. 2007. "Multiple Chronic Conditions: Prevalence, Health Consequences, and Implications for Quality, Care Management, and Costs." *Journal of General Internal Medicine* 22 (3): 391–39.
- White, H.. 1980. "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity." *Econometrica* 48: 817–838.

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.

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