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INFRASTRUCTURAL MECHANISMS LEADING TOWARD PRO-ACCOUNTABLE CARE ORGANISATION ORIENTATION: A SURVEY OF HOSPITAL MANAGERS

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Abstract

Organisations across the country are transforming the way they deliver care, in ways similar to the accountable care organisation (ACO) model supported by Medicare. ACOs modalities are varying in size, type, and financing structure. Little is known about how specific infrastructural mechanisms influence hospital managers' pro-ACO orientation. Using an electronic-survey of hospital managers, this study explores how pro-ACO orientation, as a latent construct, is captured from the perceptions of hospital managers; and identify infrastructural mechanisms leading to the formation of pro-ACO orientation. Of the total hospital respondents, 58% are moving toward the establishment of ACOs; 56% are planning to join in the next two years; 48% are considering joining ACOs; while 25% had already participated in ACOs during 2012. Urban hospitals are more likely than rural hospitals to be engaged in ACO development. The health provider network size is one of the strongest indicators in predicting pro-ACO orientation.

Keywords

pro-accountable care organisation orientation; pro-ACO orientation; infrastructural mechanisms; health care networks; hospital affiliation with rural health clinics; contextual influences on ACO development

1 Introduction

Hospitals in the USA are constantly evolving and transforming from a free-standing facilities to organized delivery systems or integrated care delivery networks. Under the current health care reform venue, accountable care organisation (ACO) is an alternative delivery system that establishes partnerships among health care providers to coordinate and

deliver efficient and affordable care, assumes joint accountability for improving quality and slowing cost growth, emphasizes patient-centered care to achieve optimal population health outcomes, and adopts innovative care managements for both acute and chronic care problems (AHA, 2010; Audet et al., 2012; Ballard, 2012; Fisher et al., 2009) The overall growth rate of ACOs is relatively slow; less than 300 ACOs involving 5,800 acute care hospitals currently exist (Muhlestein et al., 2012). However, we may anticipate that this rate of growth accelerates after the 2012 Presidential Election.

Although it is known that ACO modalities vary in size, type and financing structure contingent upon their geographic region, rural-urban location, provider network, health information technology adoption and other market forces, little is known about how infrastructural mechanisms (such as health provider networks, system integration, clinical information integration, organisational social capital, and market competition) may influence hospital managers' pro-ACO orientation. Thus, This is why it is imperative for health planners and policy decision makers to understand how organisational and contextual factors can be assessed and used as predictors of the pro-ACO orientation and the future growth of ACOs in the USA.

The purpose of this study is to:

1. explore how pro-ACO orientation, as a latent construct, is captured from the perceptions of hospital managers
2. identify infrastructural mechanisms leading to the formation of pro-ACO orientation.

This study is part of a parent study funded by the National Institute on Minority Health and Disparities (NIMHD), which explores ACO participation and other contributors to the performance of Rural Health Clinics (RHCs) of the DHHS's Region 4 (eight states of the Southeastern US). The organisational research framework developed by the study team was used to guide the selection of study variables.

2 Related research

The US health systems are evolving from free-standing facilities to organised delivery systems such as integrated care delivery networks (Lee and Wan, 2002; Shortell et al., 1993; Wan et al., 2002). The recent development of medical homes and accountable care organisations exemplifies not only structural changes in the delivery of personal care, but also calls for formalizing and aligning financial incentives to enhance the performance of health care organisations. Specific mechanisms may include leadership, networks, teamwork and organisational social capital, HIT adoption and diffusion, quality monitoring and reporting, patient education, and fiscal and administrative integrity (AHA, 2010; Robert Wood Johnson, 2012; Issel, 2010). Although the mechanisms for establishing and implementing successful ACOs have been mentioned in several publications (AHA, 2010; Fisher et al., 2009; McClellan and Fisher, 2010; Shortell and Casalino, 2010), the relative contribution of each mechanism to ACO participation has yet to be explored. By determining the relative contribution of each mechanism, the potential growth of ACOs could be evaluated.

The following research highlights six specific infrastructural mechanisms leading to the pro-ACO orientation and, in turn, fostering the adoption of ACOs as an alternative to improving access, containing costs, and strengthening the quality of care in the USA.

The first of these mechanisms is the partnership between physicians and other providers that is essential to the success in building strong health care networks (McClellan and Fisher, 2010; MedPac, 2009; Shortell and Casalino, 2010). Organisation strategy literature (Wang et al. 2001) suggests that an integrated care delivery system requires that hospital collaborative establish both forward integration (e.g., to establish acute care, sub-acute care, and long-term care linkages) and backward integration (e.g., to build a strong relationship with primary care physicians and multi-specialists in acute care settings). The health care network size is indicative of how formalized partnerships are established (Wan and Wang, 2003).

Second, HIT infrastructure is a pivotal mechanism for improving clinical care coordination, reducing medical errors, avoiding patient safety issues, monitoring and reporting quality indicators, and enhancing patient-physician communication (Bates and Bitton, 2010). Health care reform has promoted the meaningful use of health information technology, particularly through the use of electronic medical records, (EMRS) clinical decision support systems, and other HIT infrastructures. Robert Wood Johnson Foundation (2012) released a new report on HIT in the US which points out the inadequacy of current meaningful use regulation in supporting the needs of an ACO or a primary care-oriented medical home. It further noted that HIT functionalities have to be improved in order to meet required ACO processes.

Third, system integration is an ideal type or utopia in health care management. Wan et al. (2002) and Lin and Wan (2001) have demonstrated that few hospitals or health care systems are considered as fully integrated care systems (IDSs). The integration could be manifested at the organisational structure, financial and fiscal management, clinical information sharing and use, and market strategy levels. Many so called “IDS” are in form and structure only, and their clinical care and information are not yet well integrated. Clinical integration will require more than meaningful use of health information technology (HIT) and information exchange (Robert Wood Johnson Foundation, 2012; Tello-Leal et al 2012). To improve the delivery system, health informatics integration is needed (Wan, 2006; Cortese and Smoldt, 2007). Furthermore, the current view on integration in ACOs is that the integration is not only a structural change, but also a cultural change (Kreindler et al 2012).

Fourth, organisational social capital is centered on the ability of building a strong organisational infrastructure that fosters the development of positive work climates, mutual support, and cohesion within a hospital or health care organisation. Shotell and Casalino (2010) and Miller (2009) stress the importance of teamwork in the formation of ACOs. Lin and Wan (2008) note that the resourcefulness and solidarity of organisational members may lead to better satisfied employees and productive work relationships.

Fifth, ACOs are chartered to provide coordinated clinical care for a targeted minimum patient population. Remote areas and many rural areas may not be able to establish and sustain the operation of a viable ACO in their vicinity. Thus, the size of service area or

location reflects the demand for care. The rural-urban location, as a contextual variable, is also referred to as one of the societal determinants of medical care utilization in the literature (Andersen and Newman, 1973).

Sixth, the financing mechanism for implementing an effective and efficient ACO is less understood as compared to other structural and process mechanisms. Many scholars have noted the experimental nature of financing mechanism that may facilitate or impede the development of bundle payments (Miller, 2009; MedPac, 2009; AHA, 2010; McClellan et al, 2010). Since innovations in financing ACOs are still in a developmental stage, they are hard to decipher by reviewing Center for Medicare and Medicaid Services (CMS) reports or other documents.

In addition to the infrastructure related variables, we also include a covariate, the propensity score for adopting ACOs in a state where the facility is located.

In summary, limited empirical information has been documented in the literature or in scientific reports regarding how to configure the efficiency and effectiveness of healthcare delivery systems. Thus, the investigation of mechanisms for enhancing the structure and function of an ACO is certainly needed. The present study is an attempt to explore specific organisational or infrastructural mechanisms that may facilitate the adoption of ACOs as an alternative or innovative delivery modality in the USA.

3 METHODS

- *Survey:* An electronic-survey of hospital managers, identified by the Health Information Management System Society (HIMSS) was conducted to elicit hospital managers' views on the benefits and barriers to participation in ACOs. The survey was distributed during August-September, 2012 through Qualtrics. 10% of a random sample from 4,000 acute care hospitals was drawn. We received a total of 97 responses from 400 different facilities. However, thirteen incomplete cases were excluded from the analysis. After eliminating incomplete cases, only 84 respondents, representing 84 different hospitals, were included in this analysis. The response rate of usable survey responses is 21%.

The survey tool contains numerous questions covering several Likert-scale measures of the theoretical constructs such as

1. knowledge about ACOs, the commitment to develop a strategic plan for ACOs, willingness to participate in ACOs, perceived benefits and drawbacks of ACO participation, and organisational social capital
2. organisational care delivery structure in terms of system's integration and networks formed with other health care organisations
3. HIT infrastructure in terms of EMR usage
4. contextual factors such as size and urban location.

Each theoretical construct was developed and validated, using confirmatory factor analysis to determine its construct validity. Specific indexes or scales were

constructed. The survey reliability was not validated by the test-retest approach. However, the reliability of respondents is based on the consistency of responses for each study scale used in the investigation. Cronbach's alpha coefficients, reported in Table 1, show that internal consistency or reliability is relatively high and acceptable. Although the survey includes several financial management-related questions pertaining to ACOs, missing data on the financial mechanism for implementing ACOs prevented us from using these variables in the analysis.

- *Measurement of the pro-ACO Orientation as a Latent Construct:* Previous research on the willingness to participate or join ACOs relies on a single question. Thus, the construct validity and reliability could not be ensured. For the present study, a series of five questions pertaining to the predisposition of joining ACOs in the present and future as viewed by the respondents were asked. The cluster of positive responses to the ACO participation is operationally defined as the pro-ACO orientation. A series of dummy variables were generated from the responses to the questions, with affirmative responses coded 1 and negative responses coded 0:

1. Is your health facility or organisation moving toward the establishment of an ACO [ToACO]?
2. Is your facility an ACO [Now_ACO]?
3. In the future, is your facility going to be an ACO [F_ACO]?
4. Is your facility planning to join an ACO within the next two years [P_ACO]?
5. Does your facility have a strategic plan to join an ACO [SP_ACO]?

A latent endogenous variable, [Pro-ACO orientation], was constructed and validated by confirmatory factor analysis.

- *Measurement of Predictors:* The infrastructural mechanisms for ACOs are generally identified from following specific variables
1. the variety of hospital or provider network affiliations (ranging from 0 to 8)
 2. EMR system functionalities or usage level (ranging from 0 to 5)
 3. clinical and information system integration (ranging from 0 to 5)
 4. organisational social capital (a summated scale of six Likert-scale items ranging from 6 to 24)
 5. the demand for health services reflected by rural-urban location (urban coded 1 and rural coded 0).

Detailed instruments and measurements are presented in Table 1.

- *Propensity score matching and analysis* was performed using the propensity score derived from logistic regression of high-expected ACO adoption rate on eight ecological variables (propensity to join ACOs at the state level). Because certain organisational and community characteristics such as large hospitals and integrated

care delivery systems (IDSs) in metropolitan areas are more likely to form organisational alliances and develop diversification strategies, it is necessary to perform propensity score analysis to eliminate potential biased selection factors such as the uninsured (X_1), the aged population (X_2), region IV (X_3), urban population size (X_4), physician-population ratio (X_5), health information technology adoption (X_6), disparities index (X_7), and social capital indicator in the state where hospital managers work (X_8). The likelihood of having a high expectation to be involved with ACOs, a dummy dependent variable (1= high presence with two or more ACOs operated in a state in 2012 and 0= no or low presence with less than two ACOs in a state), is estimated from eight ecological and contextual variables in the propensity score analysis, using the software from R-project.Org with the subroutine of Matchit (Ho et al., 2007). This open-source software is relatively easy to use and accessible from many universities. The list of X-variables was developed from the literature which specified that location and organisational contextual characteristics may influence the propensity to establish ACOs at the state level. The propensity score matching and analysis technique offers a state-level adjuster to be included in the predictive equation for pro-ACO orientation.

- *Analytical Approach:* The unit of analysis is “individual facility”, using structural equation modeling. The organisational analysis is performed in two parts:
 1. the measurement of pro-ACOs perception as a latent variable
 2. analysis of the structural relationships between the predictors and pro-ACOs orientation with the propensity score of high-expectation for adopting ACOs in each state as a covariate.

The overall model fit statistics are presented to assess the adequacy of the proposed measurement and structural models of pro-ACO orientation.

4 Findings

4.1 Descriptive Analysis

This research reports on organisational infrastructures that may influence the pro-ACO orientation as viewed from the perspective of hospital managers in varying levels. There were 84 respondents (41 hospital CEOs, COOs, CIOs and facility managers; 8 medical directors; 14 clinical managers; and 21 mid-level managers) to the survey, representing independent acute care hospitals located in 52 rural areas and 38 urban areas. Only 15% of the respondents were from Region IV (the geographic area that is the focus of the parent study). Among the Region IV respondents, 12.5% were from urban hospitals compared to 17.3% from rural hospitals. Because ACOs are relatively concentrated in urban areas, it is important to identify urban-rural differences within three specific indicators of infrastructural mechanisms. Table 2 summarizes the means and standard deviations of these indicators by the hospital urban-rural location. It is interesting to note that no statistically significant urban-rural differences in the means are observed for the infrastructural mechanisms characterized by system integration, EMR use level, and RHCs affiliates. The number of health networks formed by hospitals and their RHC affiliates are slightly larger in

rural than urban hospitals (with a statistically significant difference at 0.05 or lower level). The results showed a disproportionate number of rural hospitals (40%) with a RHC affiliate than that of urban hospitals (3%).

Of the total respondents, 58% (48) reported that they are moving toward the establishment of ACOs and having a strategic plan for joining ACOs; 56% are planning to join ACOs in next two years; 48% are considering joining ACOs; and 25% had already participated in ACOs during 2012. The mean differences in five indicators of pro-ACO orientation between urban and rural hospitals are presented in Table 2. The only statistically significant difference in the percentage distributions between urban and rural hospitals is found in ToACO, which indicated that 75% of urban and 48% of rural hospitals are moving toward establishment of ACOs.

4.2 Measurement model of pro-ACO orientation

The five indicators of pro-ACO orientation are positively related to each other. This measurement model with a latent construct was validated in confirmatory factor analysis (Wan, 2002). The relative importance of each indicator for sharing the common variance in the latent construct is presented in the following order:

1. currently in an ACO [Now_ACO] with a highest factor loading of 0.82
2. will join an ACO [F-ACO] with a loading of 0.74
3. with a strategic plan for joining an ACO [SP_ACO] with a loading of 0.64
4. has a plan to join an ACO in next two years [P_ACO] with a loading of 0.59
5. is moving to develop an ACO [ToACO] with a loading of 0.42.

This measurement model is well fitted to the data as shown in its goodness of fit statistics (chi-square =9.67 with 4 degrees of freedom, $p=0.05$; GFI = 0.96; AGFI = 0.85; CFI = 0.96; RMSEA = 0.13). The overall reliability (Cronbach's alpha) of these five indicators is 0.79.

4.3 Predictive model of Pro_ACO orientation with five infrastructural mechanisms and the propensity score as a covariate

The regression analysis of Pro_ACO orientation, a latent endogenous variable, is performed with five infrastructural mechanisms as predictors, in combination with a contextual covariate (the propensity score for high expectation of ACO adoption by state) as an adjuster, using structural equation modeling with maximum likelihood estimations of parameters (Figure 1). Only health network size (standardized regression coefficient = 0.35) is positively and statistically significantly related to the pro-ACO orientation, whereas the propensity score of high-expectation of ACO adoption (standardized regression coefficient = -0.29) in the state where a hospital is located is negatively and statistically significant related to the pro-ACO orientation. The five predictors and the propensity score account for 27% of the total variance in pro-ACO orientation (Table 3). The likelihood for an urban hospital to have a pro-ACO orientation is higher than a rural hospital. However, the regression coefficient (standardized coefficient = 0.20) reaches statistical significance at 0.10 level. Other infrastructural mechanisms such as system integration, EMR use level, and

organisational social capital exert a negligible influence on the endogenous latent variable. The goodness of fit statistics for both the measurement model and the structural equation model combined show a reasonable fit to the data (having a Chi-square value of 57.12 with 41 degrees of freedom, $p = 0.05$; GFI = 0.89; AGFI = 0.83; CFI = 0.91; and RMSEA = 0.07).

5 Implications and discussion

Urban hospitals are more likely than rural hospitals to be engaged in ACO development as shown by four of the five indicators of pro-ACO orientation. However, urban-rural location of the study hospitals is not as important as the variety of health networks established by hospitals in accounting for the variation in pro-ACO orientation. Thus, network affiliation is one of the strongest indicators of infrastructural mechanisms for predicting pro-ACO orientation. This major finding reveals that health network size may be an important prerequisite for establishing or joining ACOs, irrespective of other infrastructural mechanisms. Organisational development through diversifying healthcare network alliances and affiliations is essential to foster the implementation and growth of ACOs. EMR usage level, clinical and information system integration, and organisational social capital fail to reach statistical significance in explaining the variability in pro-ACO orientation. This specific finding may suggest that little variation exists in the hospitals studied in terms of the measures of EMR use, HIT system integration, and organisational social capital. The relatively homogenous characteristics of the study sample may explain the weak predictive power of these infrastructural mechanisms.

The theoretical construct of pro-ACO orientation is a useful concept to be considered in the observation of ACO development and growth in the ever evolving health care industry. The proposed measurement model has been systematically validated and used as an endogenous latent variable in this study. Its usefulness remains to be further demonstrated if we were to collect the second-wave data from the same panel. Thus, we would be able to use the pro-ACO orientation as a predictor variable of the actual development or participation in ACOs in the future. Furthermore, it would be possible to identify how the variability in each infrastructural mechanism can explain its direct causal effect and indirect causal effect (via the pro-ACO orientation) on actual ACO participation in the future.

This exploratory study has several limitations. First, the study sample is relatively small. Thus, the generalizability of the results may be limited. Second, the inclusion of multi-levels of hospital managers may generate varying responses since they may have different perceptions on strategic matters. Third, only managers from acute care hospitals were considered in the study. The survey questionnaire did not include the questions on ownership and bed size. No facility identifiers were compiled in the survey. Thus, there is no way to merge personal responses with the hospital ID. These two organisational variables may have an indirect influence on ACO orientation, however. This could limit the generalisation of results to varying size of the facility and type of ownership. Fourth, rural hospitals are less prepared to establish ACOs as compared to urban hospitals because of the lack of adequate health network size and managerial experience. The relatively high percentage of urban hospitals (75%) and rural hospitals (48%) are working toward developing or joining ACOs is very telling, however. Should this study be replicated by the

American Hospital Association in its annual survey of all hospitals, it would offer more insightful information about how hospital administrators are responding to the evolving trend in ACO development and innovation. Fifth, although this empirical study is theoretically grounded from an organisational perspective, several unknown factors such as bed size, ownership, financial viability, team building capabilities, physician-hospital partnerships, adaptability to health reforms, and leadership are not included in this investigation. Future studies should strengthen the longitudinal study design, using a mixture of quantitative and qualitative approaches. In doing so, the dynamic forces influencing the development and implementation of ACOs could be better understood.

6 Conclusions

The variety of health network affiliations established by a hospital, a proxy indicator of network size, is the most influential explanatory variable among the five infrastructural mechanisms leading to the pro-ACO orientation. It is important to note that network size is a necessary but not sufficient condition for establishing or joining ACOs. However, hospital administrators have to set a high priority in formalizing health alliances and partnering with other health care professionals and providers in order to navigate hospital strategies for the forward and backward integration of service networks, as noted in the related research literature (Wang et al. 2001). An accelerated growth rate of ACOs in the US may be anticipated as the result of re-election of President Obama. The negative relationship between the propensity score and the pro-ACO orientation is not surprising since higher growth tends to occur in the states that have experienced no or less growth of ACOs. For instance, in early 2012, Florida had the largest number (27) of ACOs in place among the fifty states. Consequently, other states that were less prepared for ACO implementation before 2012 may be expected to speed up their adoption of ACOs in the future.

Finally, one might question the sustainability of ACOs in the USA. The ultimate test of ACOs is their ability to reduce health disparities, improve population health, and contain costs. A system-level change will require the consideration of contextual factors influencing the transformation in health care (Best et al 2012). Innovative research is urgently needed to demonstrate how the growth of ACOs facilitates the achievement of these goals in the health care delivery system (Issel, 2012).

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Figure 1.
Infrastructural mechanisms leading to pro-ACO orientation with the propensity score as a covariate (see online version for colours)

Table 1

Summary statistics of the measurement scales used

Variable*	Items/ Measurement Scale (code)	Mean	SD	Cronbach's Alpha Coefficient
Health network affiliations	Yes (1) or No (0) <ul style="list-style-type: none"> Affiliated with other hospital (s) Affiliated with a federally qualified health center Affiliated with a RHC Affiliated with a primary care physician group Affiliated with specialist groups Affiliated with skilled nursing facilities Affiliated with home health agencies or hospice care facilities Affiliated with sub-acute and post-acute care facilities (e.g., rehabilitation facilities, nursing homes) 	2.42	2.17	0.86
EMR usage	Yes (1) or No (0) <ul style="list-style-type: none"> Does your health facility or organization have an established EMR? Does your facility's system support both a total paperless function and a hybrid function where the contents of the EMR can be printed for inclusion in the paper chart? Does the system interface with a variety of digital and analog dictation systems? Does the system include automatic translation of codes to data? For example: ICD-9-CM? Does the system support the HIPAA standards for electronic transactions? 	3.46	1.64	0.79
HIT system integration	Yes (1) or No (0) <ul style="list-style-type: none"> The system has the capability to submit diagnostic test orders based on input from different care providers. The system has the capability to print orders for manual transmission. The system has the capability to fax orders. The system accepts orders from multiple locations. The system has the capabilities to share results with different health care providers. 	3.44	1.82	0.85
Organisational social capital	Likert Scale (1= strongly disagree through 4 = strongly agree) <ul style="list-style-type: none"> Fully trust each other in the workplace (1–4) Share a same vision (1–4) Collectively solve problems (1–4) Do teamwork (1–4) We interpret workplace events and experiences similarly. (1–4) Interact socially outside workplace(1–4) 	18.44	2.94	0.85

Table 2

Means and standard deviations of infrastructural mechanisms and pro-ACO orientation indicators for 84 facilities or hospitals

Variable	Urban		Rural		F- value
	Mean	SD	Mean	SD	
Infrastructural mechanisms: range					
RHC affiliation (RHCs): 0–1	0.03	0.18	0.40	0.50	16.72 *
Health network affiliations (networks): 0–8	1.78	2.42	1.90	2.25	4.63 *
EMR level (EMR): 0–5	3.56	1.99	3.40	1.71	0.18
HIT system integration (SI): 0–5	3.16	1.33	3.62	1.90	1.27
Organizational social capital (OSC): 10–24	17.78	2.76	18.51	3.00	2.15
Pro-ACO orientation indicators: range					
ToACO: 0–1	0.75	0.44	0.48	0.50	6.20 *
Now_ACO: 0–1	0.31	0.47	0.21	0.41	1.07
F_ACO: 0–1	0.47	0.51	0.48	0.51	0.01
P_ACO: 0–1	0.53	0.51	0.58	0.50	0.16
SP_ACO: 0–1	0.66	0.48	0.52	0.51	1.51

Notes:

* Statistically significant at 0.05 or lower level.

Table 3

Summary statistics from regression analysis of the pro-ACO orientation (latent Vvariable) by infrastructural mechanisms and a covariate (p-Score)

Predictors	Standardized regression coefficient	Unstandardized regression coefficient	Standard error	T-value
Measurement mode of the latent endogenous variable				
ToACO	0.42	1.00		
Now_ACO	0.82	1.76	0.50	3.52 *
F_ACO	0.76	1.86	0.54	3.47 *
P_ACO	0.61	1.77	0.46	3.22 *
SP_ACO	0.59	1.43	0.32	4.48 *
Pro-ACO orientation predicted by				
Health network affiliations	0.35	0.03	0.01	2.50 *
EMR use level	-0.04	-0.01	0.02	-0.35
HIT system integration	0.16	0.02	0.02	1.17
Organisational social capital	0.05	0.00	0.08	0.44
Urban location	0.20	0.80	0.05	1.65
Propensity Score	-0.29	-0.26	0.12	-2.23 *
R-square	0.27			

Note:

* Statistically significant at 0.05 or lower level.

Goodness of fit statistics for the model includes:

1. Chi-square= 57.12 with 41 degrees of freedom and P=0.048
2. GFI = 0.89, AGFI =0. 83, and CFI = 0.91
3. RMSEA = 0.07.