Published in final edited form as:

Jt Comm J Qual Patient Saf. 2019 September ; 45(9): 620–628. doi:10.1016/j.jcjq.2019.06.004.

Federally Qualified Health Center Strategies for Integrating Care with Hospitals and Their Association with Measures of Communication

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Abstract

Background: Federally qualified health centers have aligned clinical services and systems with local hospitals, but little is known about the specific care integration strategies health centers use or their impact on care. We examined the use of strategies by health centers to integrate care with hospitals and emergency departments (EDs) and their association with performance on measures of health center–hospital communication.

Methods: We administered a web-based survey to health center medical directors in 12 states and Washington, DC in 2017. The survey collected ten self-reported measures of communication between health centers and hospitals/EDs and the extent to which health centers used different strategies to improve care integration. We examined health center and market characteristics that predict higher vs. lower integration activity and used logistic regression to assess the relationship between integration activity and communication.

Results: Between 56 and 81 percent of health centers participated in quality improvement projects, health promotion initiatives, guideline alignment, or executive meetings with hospitals; far fewer established notification agreements regarding hospital/ED utilization. Health centers that were larger, were located in rural areas or states with Medicaid accountable care programs, reported fewer staff shortages, and had fewer minority patients were associated with greater integration activity. Higher levels of integration activity were associated with better performance on most communication measures in both inpatient and ED settings ($p < 0.05$). Integration activity was not associated with health centers' receipt of notifications after patients' ED visits.

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Conflicts of Interest: The authors report no conflicts of interest.

Conclusion: Health centers differ in the use of strategies to integrate care with hospitals. Overall, integration activity is associated with better communication.

Keywords

federally qualified health center; integration; communication

INTRODUCTION

Improving communication between hospitals and primary care providers remains challenging in the fragmented US health care system. Many hospitals are taking steps to improve care transitions for their patients—especially complex patients who are frail or have one or more social risk factors, such as unstable housing or limited social support.^{1–3} These patients may need tailored discharge planning, high levels of follow-up care, and ongoing monitoring to lower their risk for being readmitted or experiencing adverse health outcomes.^{4–6} Despite these efforts by hospitals and their partners and despite the implementation of value-based purchasing initiatives such as Medicare’s Hospital Readmission Reduction Program, readmission rates remain persistently high.^{7–9}

Federally qualified health centers, hereafter referred to as health centers, are primary care providers that serve a large proportion of patients with significant clinical and social service needs. Health centers receive enhanced reimbursements from Medicare and Medicaid for providing care to medically underserved populations, and many receive grant funding from the Health Resources and Services Administration (HRSA) Health Center Program to support the delivery of services. Prior studies have described collaborations between health centers and hospitals to align services and infrastructure to better meet the needs of their patients.

Examples of these collaborations include health-IT focused efforts, such as using shared electronic health records (EHRs) and electronic notification systems to promote coordinated care and track referrals across care settings.^{10,11} In addition, to reduce inappropriate use of the emergency department (ED) and to improve continuity of care, hospitals have implemented programs to redirect patients seeking care at EDs and to refer patients who receive inpatient services to primary care providers, including health centers, for their ongoing care needs.¹⁰ Many health centers are also participating in Medicare or Medicaid accountable care organization (ACO) programs that encourage greater coordination between primary and acute care providers to meet quality and spending targets. Numerous prior studies have shown that improved communication between hospitals and outpatient providers, through the use of tools such as discharge summaries and other forms of health information exchange, is associated with lower rates of hospital readmissions.^{12–15}

Despite the potential benefits, health centers often face barriers working with hospitals—including safety net hospitals.¹⁶ First, as a condition of receiving grant funding from HRSA, health centers must be governed by a board with high levels of community representation. As a result, few health centers and hospitals are owned by a common corporate entity, which could make it difficult to align operations. Second, while health centers are focused on providing comprehensive primary care for primarily indigent populations, hospitals

generally serve a more economically diverse population.¹⁷ These distinct patient populations may cause hospitals and health centers to prioritize different goals.^{10,16} In addition, their orientation toward preventive care and acute care, respectively, may result in misaligned financial incentives between health centers and hospitals when both participate together in risk-based payment arrangements. Finally, health centers and hospitals may not have the infrastructure or resources to participate in costly initiatives designed to improve care such as health information exchange (HIE) or hiring care coordination staff.^{16,17} Although health centers were early adopters of EHRs, the lack of a shared EHR platform or the limited ability to exchange clinical data can pose a barrier to coordination between health centers and hospitals given the importance of timely data for post-discharge care planning.^{18–20}

In the face of these potential barriers, little is known about the prevalence of different care integration strategies used by health centers and how these strategies are affecting the delivery of care. In this paper, we examine the prevalence of five distinct strategies used by health centers to integrate care with hospitals and EDs using a survey of health center medical directors in 12 states and Washington, DC. Consistent with previous studies, we define *integration* as the alignment of core functions or clinical processes, such as strategic planning, quality improvement, and protocols or practice guidelines, with the goal of achieving more coordinated care.²¹ We hypothesized that these system-level integration strategies would translate to improved coordination between health centers and hospitals during routine patient care. We measure one key domain of care coordination—communication between hospitals and health centers, which includes notifications of admissions or discharges, the extent of sharing of discharge summaries, and the timeliness and completeness of these reports. Identifying and expanding the use of effective care integration strategies could help both health centers and hospitals achieve reductions in readmissions and better performance in other value-based payment models that are expanding across the country.

METHODS

Study Sample

We administered a web-based survey to medical directors at all 407 HRSA-funded health centers in 12 states (CA, CO, IL, LA, ME, MN, NJ, OR, UT, VT, WA, and WI) and DC during summer 2017. States were purposefully sampled to include those with active Medicaid ACO programs in early 2017, which we hypothesized would provide significant variability in health centers' use of care integration strategies. We supplemented this sample with a small number of other states to improve geographic diversity—including states that expanded Medicaid under the Affordable Care Act and those that did not. Contact information and characteristics of health centers were obtained from HRSA either directly or through HRSA's Universal Data System (UDS) database. The study was approved by our organization's institutional review board.

Survey Development

The medical director survey included items that assessed the use of care integration strategies and measures of communication that were taken from existing surveys^{22–25} or

created de novo based on a literature review and interviews with health center directors, state primary care associations (PCAs), and subject matter experts to inform item development. (All survey items included in the analysis are listed in Table 1). Care integration strategies covered both functional integration (strategic planning, quality improvement, and health promotion initiatives) and clinical integration strategies (use of notification agreements relating to hospital/ED utilization and practice guideline alignment).²¹ The survey was part of a larger effort to describe the landscape of health center care integration activities involving hospitals, specialty practices, and social service organizations. The draft survey instrument was shared with PCAs in all sample states, and comments were provided by six PCAs. Three cognitive interviews were conducted with health center medical directors in states outside of our sample to refine the survey before it was administered. The survey was designed to be completed in less than 30 minutes, and we offered a \$50 gift card as an incentive for participating. After four weeks, we increased the incentive to \$100 to improve the response rate.

Variable Construction

Ten survey items were used to create dichotomous dependent variables that measured health center reports of communication with hospitals and EDs. Five of these items measured whether health centers “often” or “always” reported: (1) being notified when a patient was admitted, (2) being notified after a patient was discharged, (3) receiving a discharge summary, (4) receiving a discharge summary that had all needed information, and (5) receiving a discharge summary in a timely manner. (See Table 1 for the full text of each item). The remaining five items were analogous but focused on communication between health centers and EDs. For all ten variables, the reference group included health centers that reported “never,” “rarely,” or “sometimes” for each item. The items were dichotomized based on the distribution of responses.

We constructed 6 explanatory variables describing strategies used by health centers to achieve functional and clinical integration with the hospitals and EDs to which patients from the health center’s largest practice site were most likely to go for care. Four dichotomous variables were constructed to identify health centers that had done the following in the past two years: (1) participate in quality improvement projects with the hospital, (2) participate in health promotion initiatives with the hospital, (3) align practice guidelines or care protocols with the hospital, and (4) participate in joint meetings with hospital leadership. (See Table 1 for the full text of each item). Each of these four items were dichotomized (“never” vs. “rarely,” “sometimes,” “often,” or “always”) due to the large percentage of “never” responses. Two other variables identified health centers that had agreements in place with hospitals regarding the timely notification of hospital admissions and ED visits.

We constructed a composite measure of health centers’ hospital/ED care integration activity using a one-factor confirmatory factor analysis. The survey items included in the composite are identified in Appendix 1 (available in online article). These items identified health centers that engaged in the following activities: participating in QI projects, health promotion initiatives, and joint leadership meetings with hospitals; aligning practice guidelines; and establishing agreements about care transitions. We found adequate model fit

as assessed by the comparative fit index, or CFI (0.984) and the root mean square error of approximation, or RMSEA (0.078). For the CFI, values greater than 0.90 indicate an acceptable fit to the data, with a higher value indicating better fit.²⁶ For the RMSEA, lower values indicate better fit, and values less than 0.08 are considered an indicator of good fit.²⁷

Additional survey items provided information on the characteristics of CHCs, such as if the CHC reported “often” or “always” experiencing financial challenges; a chaotic environment; shortages of physicians, other clinicians, and non-clinical staff; turnover of physicians and other clinical staff; or competition for patients, physicians, and other clinicians. For each characteristic, the analysis reference group included CHCs responding “never,” “rarely,” or “sometimes.”

Using HRSA’s 2017 Uniform Data System, we obtained additional health center characteristics: number of patients; percent of patients that were minority, uninsured, or homeless; patient income; number of primary care and enabling service providers per 10,000 patients; rural vs. urban location; number of service delivery sites; and patient-centered medical home recognition status.²⁸ Of note, these are organization-wide rather than site-level characteristics because the characteristics of individual service delivery sites are not available in the data. The 2011–2015 American Community Survey’s 5-year pooled files were used to derive a six-item composite measure of neighborhood socioeconomic status for the primary care service area (PCSA) in which a plurality of a health center’s patient population lives.²⁹ This measure was used as a proxy for the socioeconomic status of the PCSA in which each health center’s largest site is located, which is not identified in the UDS.

Statistical Analysis

We estimated the frequency of use of each integration strategy and the frequency or mean of health center and market characteristics by tertile of a health center’s overall integration activity. We then used logistic regression to assess the relationship between integration tertile and the ten communication measures. Finally, we used logistic regression to assess the relationship between the use of individual strategies and each communication measure. All regression models adjusted for patient, organizational, and market characteristics that were statistically significant at the 0.10 level in bivariate analyses. Analyses were performed using Stata 15 (StataCorp).

RESULTS

Of the 407 health centers invited to participate, 219 (53.8 percent) responded to the survey. Respondents provided services to a median of 12,447 patients annually, of which 22 percent were uninsured and 39 percent were racial or ethnic minorities (Table 2). The average health center operated 8 delivery sites, and three-quarters reported that at least one of their sites had achieved patient-centered medical home recognition. Nearly 40 percent of health centers were located in rural areas. Between 40% and 60% of health centers reported different types of staff shortages or turnover of clinical and non-clinical staff; and nearly 60% reported competition for their clinical staff from other providers or hospital systems in their local market.

Health centers differed in their use of strategies to integrate care with hospitals and EDs (Table 3). Among the strategies assessed, nearly 81 percent of health centers participated in joint meetings with hospital leadership, and roughly 61 to 62 percent participated in quality improvement projects or aligned practice guidelines or care protocols with hospitals. Only 34 percent of health centers established agreement that included timely notification of hospital admissions by their patients, and a slightly lower percentage had agreements in place regarding timely notification of ED visits. Among health centers that did not have either of these agreements in place, 56 percent had tried to engage hospitals to develop them.

Health centers that were larger—in terms of both number of patients served and number of service sites—and that had higher staffing levels were more likely to report higher integration activity (Table 4). In addition, markets that were reported as being more competitive or that were in states with active Medicaid ACO programs were associated with higher integration activity. In particular, health centers reporting that competition for physician or non-physician clinical staff often or always affected patient care were 10 to 15 percentage points more likely to be in the highest integration tertile than the lowest. Similarly, health centers located in Medicaid ACO states were 15 percentage points more likely to be in the highest integration tertile. Meanwhile, a greater share of minority patients, chaotic practice environments, and staff shortages predicted lower health center/hospital integration activity.

Figure 1 displays estimates of the association between levels of care integration activity and five self-reported health center/hospital communication measures. Across four of the five measures, health centers in the highest tertile of integration activity were associated with significantly higher performance on each measure compared to health centers in the lowest tertile. The largest differences we observed were in the frequency with which health centers receive discharge summaries from hospitals when needed (38 percentage point difference between highest and lowest tertiles), followed by the completeness of hospital discharge summaries (22 percentage point difference). Health centers in the highest tertile were also more likely to be notified of hospital admissions both while the patient is in the hospital and following discharge compared to health centers with the lowest levels of integration activity (21 and 19 percentage point difference, respectively).

We also found large differences between health centers when examining their reports of communication with hospital EDs (Figure 2). The largest differences were in the rates with which health centers receive discharge summaries from EDs (23 percentage point difference between the highest and lowest tertiles). We found similar differences in the timeliness and completeness of discharge summaries (21 and 20 percentage point differences, respectively). We found no statistically significant differences in health centers' receipt of notifications following ED visits by their patients, and only 11 percent of health centers overall reported receiving real-time notification of ED visits by their patients.

Finally, we examined the association between specific health center/hospital care integration strategies and performance on communication measures (Appendices 3 and 4). Our limited sample size and the high correlation between some strategies limits our ability to derive firm conclusions based on these associations, so we view these results as exploratory.

Nevertheless, we found that participating in joint meetings with hospital leadership was associated with higher levels of communication while the use of notification agreements governing hospital utilization was not. By contrast, health centers that developed notification agreements relating to ED visits were more than twice as likely to report consistently receiving notifications about their patients' ED visits after they occurred. None of the health center or market characteristics that we examined were independently associated with communication levels across multiple communication measures.

DISCUSSION

In a sample of over 200 health centers from 12 states and DC, we found variation in the use of strategies by health centers to integrate care with hospitals and EDs. Health center size and staffing levels and features of local health care markets, including provider competition and payment reform activity, were positively associated with higher integration activity. Overall, higher levels of integration activity were associated with reports of better communication between health centers and both hospitals and EDs, although integration activity was not associated with health centers' receipt of notifications following ED visits. While our ability to explore associations for individual strategies was limited, we found that participating in joint meetings with hospital leadership and establishing agreements to notify health centers about their patients' ED visits were reported as effective while the use of notification agreements around hospitalizations was not.

In many vertically integrated health systems, established protocols and performance measurement systems may provide the necessary infrastructure to ensure coordination between hospitals and primary care providers around care transitions.³⁰ However, requirements associated with federally qualified health center designation, such as governance by an independent, community-based board, may limit opportunities for consolidation between health centers and health systems under common ownership. Health centers may therefore lack an operational framework for their care coordination efforts and require formal agreements with hospitals that may or may not achieve their intended goals. We found that system-level integration of selected functions and processes between hospitals and health centers is associated with better communication during episodes of acute care involving health center patients. However, a large number of health centers reported trying and failing to establish notification agreements, which suggests an opportunity for primary care associations, hospital associations, and other stakeholders to come together to support the development of these agreements. In addition, our results suggest that health centers might need additional support to develop or improve systems alerting their patients about a recent ED visit as even the most highly integrated health centers rarely reported receiving these notifications. Expanding the use of shared electronic health record systems between health centers and hospitals or improving health information exchange capabilities could promote better communication.^{10,11}

Financial incentives might be necessary to create the impetus for further integration in the coming years—particularly for health centers whose care is least integrated with their local hospitals currently. Prior case studies of health center/hospital collaborations note that the involvement of a health plan, an ACO contract, or a capitated payment model was a key

driver of greater collaboration between health centers and hospitals.¹⁷ The spread of ACO models in state Medicaid programs provides new incentives for health centers to work with partners to improve the health and reduce excess spending for their attributed populations. States have implemented ACO models in which health plans or even entire regions are the primary unit of accountability, which may be more compatible with health center governance requirements. Implementing strategies to integrate services across primary care and hospital settings will be critical to achieving success in these payment models. Our study is one of the first to show that Medicaid ACO programs may be a catalyst for greater health center/hospital integration.

Limitations

Limitations of our study include its cross-sectional design, which makes it impossible to determine whether the care integration strategies examined resulted in better communication or providers that were already working collaboratively were more likely to pursue these strategies. Second, despite extensive external review and feedback by more than a dozen subject matter experts, we likely did not capture the full breadth of strategies health centers are using to integrate care with hospitals, and for each of the strategies examined, we lack detail on their focus and intensity. We also lack information about the characteristics of the hospitals most frequently used by each health center's largest site and other contextual information that could help in the interpretation of these findings. Third, despite a response rate of nearly 54 percent, which is high for busy primary care practices that often operate at low margins with staffing shortages, respondents might not reflect the entire spectrum of care integration activity involving health centers and hospitals. While this may be a concern, our sample exhibits considerable variation in the use of strategies suggesting a diverse sample of health centers. Finally, as we used a convenience sample of states, our results may not be nationally representative, and as we asked respondents about their largest practice site, the results might not be representative of all a health center's sites.

The communication measures we used in this study are self-reported. Although these measures were elicited prior to questions relating to care integration strategies to minimize the risk of bias, future research should use more objective measures, such as utilization (e.g., hospital readmissions) and patient experiences of their care during care transitions, which might provide a more objective measure of communication as well as other aspects of care coordination. In addition, a better understanding of how the payment and delivery context influences the use of strategies and potentially modifies their effectiveness could identify specific strategies that are contextually appropriate and that can support health centers and hospitals in achieving more effective coordination. Future research in this area should explore differences between urban and rural health centers and the unique care integration experiences and challenges in each setting.

CONCLUSIONS

Federally qualified health centers differ in their use of strategies to integrate care with hospitals in their communities. Health center size and location in either rural or competitive markets is positively associated with integration activity. Overall, higher levels of care

integration activity are associated with better communication during and after inpatient stays and ED visits. Given that many health centers report low levels of integration activity and the absence of consolidation as an available strategy for organizing care delivery locally, new payment models may be needed to create additional incentives for health centers and hospitals to achieve greater coordination.

Funding:

This work was supported through the RAND Center of Excellence on Health System Performance, which is funded through a cooperative agreement (1U19HS024067-01) between the RAND Corporation and the Agency for Healthcare Research and Quality. The content and opinions expressed in this publication are solely the responsibility of the authors and do not reflect the official position of the Agency or the US Department of Health and Human Services.

Appendix

Appendix 1.

Survey Items Used to Examine Health Center Integration with Hospitals and EDs

Survey items	Response options	Variable construction	Included in integration composite measure
Hospital communication with health centers			
If patients at your largest site are admitted to the hospital, how often is your health center...	Never, Rarely, Sometimes, Often, Always	Dichotomous variable ("often/always" vs. "never/ rarely/ sometimes")	
Notified <i>while</i> the patient is still in the hospital?			
Notified <i>after</i> the patient has been discharged?			
Sent a discharge summary or report from the hospital?			
How often does the hospital discharge summary provide all the information necessary for appropriate follow up care?	CHC never receives discharge summary, Never, Rarely, Sometimes, Often, Always	Dichotomous variable ("often/always" vs. "never receives/ never/ rarely/ sometimes")	
How often does your health center receive the discharge summary from the hospital when you need it?	CHC never receives discharge summary, Never, Rarely, Sometimes, Often, Always	Dichotomous variable ("often/always" vs. "never receives/ never/ rarely/ sometimes")	
ED communication with health centers			
If patients at your largest site have an ED visit, how often is your health center:	Never, Rarely, Sometimes, Often, Always	Dichotomous variable ("often/always" vs. "never/ rarely/ sometimes")	
Notified while the patient is still in the ED?			
Notified <i>after</i> the patient has been discharged from the ED?			
Sent a discharge summary or report from the ED?			

Survey items	Response options	Variable construction	Included in integration composite measure
How often does the discharge summary or report provide all the information necessary for appropriate follow up care?	CHC never receives discharge summary, Never, Rarely, Sometimes, Often, Always	Dichotomous variable ("often/always" vs. "never receives/never/rarely/sometimes")	
How often does your health center receive the discharge summary from the ED when you need it?	CHC never receives discharge summary, Never, Rarely, Sometimes, Often, Always	Dichotomous variable ("often/always" vs. "never receives/never/rarely/sometimes")	
Health centers' integration with hospitals and EDs			
During the past 2 years, how often has your health center...	Never, Rarely, Sometimes, Often, Always	Dichotomous variable ("never" vs. "rarely/sometimes/often/always")	
Participated in quality improvement projects with that Hospital?			X
Participated in health promotion initiatives (e.g., hypertension awareness) with that hospital?			X
Aligned your health center's practice guidelines or care protocols with those in use by that hospital?			X
Participated in joint meetings of your health center's and hospital's leadership to discuss shared goals?			X
Does your health center have a written or verbal agreement with the hospital or ED where patients from your largest site are most likely to receive care that includes expectations for care management during transitions?	Yes, No	6 survey items were combined into a count of the number of items that were included in agreements (range = 0–6)	X
Among sites that have a verbal or written agreement with the hospital or ED that includes expectations for care management during transitions...	Yes, No	Dichotomous variable (yes vs. no)	
Agreement includes expectations about: timely notification of hospital admissions. timely notification of ED visits.			
Has your health center tried to engage hospitals to develop agreements regarding care transitions?	Yes, No	Dichotomous variable (yes vs. no)	
Characteristics of CHCs			
Please indicate how often the following factors impact your health center's ability to care for its patients.	Never, Rarely, Sometimes, Often, Always, Not applicable	Dichotomous variable ("often/always" vs. "never/rarely/sometimes")	
Chaotic environment within your health center			
Financial challenges at your health center			
Physician staff shortages			

Survey items	Response options	Variable construction	Included in integration composite measure
Non-physician clinical staff shortages (e.g., navigators, coaches)			
Non-clinical staff shortages (e.g., navigators, coaches)			
Physician turnover			
Non-physician clinical staff turnover			
Please indicate how often the following factors impact your health center's ability to care for its patients.	Never, Rarely, Sometimes, Often, Always, Not applicable	Dichotomous variable ("often/always" vs. "never/rarely/sometimes")	
Medicaid patients			
Privately insured patients			
Physicians			
Non-physician clinical staff (e.g., advanced practice clinicians, nurses)			

Appendix 2.

A Comparison of Characteristics of Health Center Respondents and Non-Respondents

Health center characteristics	Respondents		Non-respondents		p value
	Mean	N	Mean	N	
Patients served, n	22,732	212	23,726	195	0.735
Patients' income as a percent of Federal Poverty Guideline					
100%	49.8	212	50.1	195	0.900
101–150%	12.9	212	12.9	194	0.975
151–200%	5.7	212	5.6	194	0.720
>200%	6.8	212	6.4	192	0.601
Unknown	24.8	212	25.2	195	0.858
Uninsured patients, %	21.6	212	22.7	195	0.402
Homeless patients, %	3.9	210	4.5	185	0.415
Minority patients, %	39.0	212	40.1	195	0.701
Service delivery sites, n	7.8	212	8.0	195	0.835
Primary care FTE per 10,000 patients	10.0	212	9.7	195	0.677
Enabling service FTE per 10,000 patients	5.5	212	4.8	195	0.458
Adults without high school diploma, %	18.6	212	19.8	193	0.241
Male unemployment rate, %	9.2	212	9.8	193	0.107
Median annual household income, \$	49,196	212	48,522	193	0.606
Households below poverty line, %	20.0	212	20.9	193	0.242
Households with children headed by a woman, %	13.0	212	13.7	193	0.226
Households receiving public assistance, %	4.4	212	4.7	193	0.332
PCMH recognition for one or more sites, %	75.5	212	72.3	195	0.467
Rural location, %	37.7	212	35.9	195	0.701
Medicaid expansion status	90.1	212	87.2	195	0.353

Health center characteristics	Respondents		Non-respondents		p value
	Mean	N	Mean	N	
Region		212		195	0.665
Midwest	17.9		17.0		
Northeast	9.9		12.3		
South	10.9		8.0		
West	61.3		54.7		

Note. The statistical significance of differences in characteristics between health center respondents and non-respondents was assessed using chi-square tests for categorical variables and t-tests for continuous variables.

Appendix 3:

Association Between Care Integration Strategies and Health Center/Hospital Communication Measures

	Notified while patient in hospital (n=217)	Notified after hospital discharge (n=217)	Receive a discharge summary from the hospital (n=217)	Hospital discharge summary has all needed information for follow-up care (n=208)	Receive discharge summary from hospital when needed (n=209)
	OR (SE)	OR (SE)	OR (SE)	OR (SE)	OR (SE)
Strategies					
Agreement that includes timely notification of hospital admissions	1.24 (0.40)	1.80 (0.60)	1.40 (0.47)	1.03 (0.34)	1.02 (0.34)
Participate in QI or health promotion initiative or alignment of guidelines with hospital	1.36 (0.56)	1.29 (0.50)	0.58 (0.24)	1.60 (0.64)	3.31** (1.50)
Joint meetings with hospital leadership	2.73* (1.32)	1.44 (0.61)	3.46** (1.58)	1.50 (0.67)	2.44 (1.27)
Health center and market characteristics					
Often/Always a chaotic environment in health center	0.53 (0.22)	0.47 (0.18)	0.76 (0.30)	0.42* (0.17)	0.44 (0.20)
Service delivery sites	0.98 (0.02)	0.99 (0.02)	0.99 (0.02)	0.98 (0.02)	0.97 (0.02)
Minority patients	0.99 (0.01)	0.98* (0.01)	0.98** (0.01)	0.99 (0.01)	0.98 (0.01)
Rural location	0.82 (0.34)	0.45 (0.20)	1.02 (0.43)	1.73 (0.71)	0.80 (0.34)
Primary care FTE per 10,000 patients	1.06* (0.03)	1.05 (0.03)	1.02 (0.03)	0.98 (0.03)	1.02 (0.03)
Neighborhood SES composite measure	0.81 (0.18)	0.79 (0.16)	0.97 (0.20)	0.94 (0.19)	0.89 (0.20)

^aDue to high correlation among these three items, they were included in the model as a single variable.

Appendix 4:**Association Between Care Integration Strategies and Health Center/Emergency Department Communication Measures**

	Notified while patient in ED (n=217)	Notified after ED visit (n=217)	Receive a discharge summary from the ED (n=217)	ED discharge summary has all needed information for follow-up care (n=195)	Receive discharge summary from ED when needed (n=195)
	OR (SE)	OR (SE)	OR (SE)	OR (SE)	OR (SE)
Strategies					
Agreement that includes timely notification of ED visits	1.03 (0.51)	2.11* (0.73)	1.19 (0.42)	1.16 (0.39)	0.85 (0.31)
Participate in QI or health promotion initiative or alignment of guidelines with hospital ^a	3.53 (2.75)	1.12 (0.45)	2.03 (0.85)	1.27 (0.51)	2.26 (1.03)
Joint meetings with hospital leadership	0.64 (0.45)	1.33 (0.60)	1.61 (0.76)	1.56 (0.72)	2.7 (1.46)
Health center and market characteristics					
Often/Always a chaotic environment in health center	0.37 (0.30)	0.56 (0.23)	0.85 (0.35)	0.80 (0.33)	0.37* (0.19)
Service delivery sites	0.93 (0.04)	0.97 (0.02)	0.97 (0.02)	0.96* (0.02)	0.98 (0.02)
Minority patients	1.00 (0.01)	0.99 (0.01)	0.97** (0.01)	0.99 (0.01)	0.99 (0.01)
Rural location	0.74 (0.46)	0.80 (0.34)	1.41 (0.59)	1.14 (0.47)	1.66 (0.72)
Primary care FTE per 10,000 patients	1.04 (0.04)	1.04 (0.03)	1.01 (0.03)	0.96 (0.03)	0.98 (0.03)
Neighborhood SES composite measure	0.99 (0.31)	0.68 (0.15)	1.01 (0.22)	1.11 (0.24)	0.86 (0.21)

^aDue to high correlation among these three items, they were included in the model as a single variable.

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Figure 1: Performance on Health Center/Hospital Communication Measures, by Level of Integration Activity

For each measure, performance is displayed using three bars, which correspond to mean scores for health centers in each of the three tertiles of integration activity.

Note: Models adjusted for number of service delivery sites, percent minority patients, rural location, primary care full time equivalents per 10,000 patients, neighborhood socioeconomic status, and chaotic environment in health center.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ relative to the lowest tertile.

Figure 2: Performance on Health Center/Emergency Department Communication Measures, by Level of Integration Activity

For each measure, performance is displayed using three bars, which correspond to mean scores for health centers in each of the three tertiles of integration activity.

Note: Models adjusted for number of service delivery sites, percent minority patients, rural location, primary care full time equivalents per 10,000 patients, neighborhood socioeconomic status, and chaotic environment in health center.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ relative to the lowest tertile

Table 1.
Survey Items Used to Assess Health Center/Hospital Integration Strategies and to Measure Communication

*

Hospital communication with health centers	
•	If patients at your largest site are admitted to the hospital, how often is your health center...
–	Notified while the patient is still in the hospital?
–	Notified after the patient has been discharged?
–	Sent a discharge summary or report from the hospital?
•	How often does the hospital discharge summary provide all the information necessary for appropriate follow-up care?
•	How often does your health center receive the discharge summary from the hospital when you need it?
ED communication with health centers	
•	If patients at your largest site have an ED visit, how often is your health center:
–	Notified while the patient is still in the ED?
–	Notified after the patient has been discharged from the ED?
–	Sent a discharge summary or report from the ED?
•	How often does the discharge summary or report provide all the information necessary for appropriate follow-up care?
•	How often does your health center receive the discharge summary from the ED when you need it?
Health centers' integration with hospitals and EDs	
•	During the past 2 years, how often has your health center...
–	Participated in quality improvement projects with that hospital?
–	Participated in health promotion initiatives (e.g., hypertension awareness) with that hospital?
–	Aligned your health center's practice guidelines or care protocols with those in use by that hospital?
–	Participated in joint meetings of your health center's and hospital's leadership to discuss shared goals?
•	Does your health center have a written or verbal agreement with the hospital or ED where patients from your largest site are most likely to receive care that includes expectations for care management during transitions?
–	Among sites that have a verbal or written agreement with the hospital or ED that includes expectations for care management during transitions...
♦	Agreement includes expectations about timely notification of hospital admissions.
♦	Agreement includes expectations about timely notification of ED visits.

* Health centers were queried about strategies used to enhance care integration between their largest service delivery site (e.g., clinic) and the hospital from which patients at that service delivery site receive the majority of their care.

ED, emergency department.

Table 2:
Characteristics of Health Center Survey Respondents

*

	Mean [†]	Number of respondents
Health center characteristics		
Patients served, n	12,447	212
Uninsured patients, %	21.6	212
Patient income as a percent of Federal Poverty Guideline, %		
100%	49.8	212
101–150%	12.9	212
151–200%	5.7	212
> 200%	6.8	212
Unknown	24.8	212
Homeless patients, %	3.9	210
Minority patients, %	39.0	212
Service delivery sites, n	7.8	212
PCMH recognition for one or more sites, %	75.5	212
Primary care FTE per 10,000 patients	10.0	212
Enabling service FTE per 10,000 patients	5.5	212
Shortage of physicians, %	59.6	208
Shortage of non-physician clinical staff, %	46.9	209
Shortage of non-clinical staff, %	40.1	207
Physician turnover, %	40.2	209
Non-physician clinical staff turnover, %	44.5	209
Chaotic environment in health center, %	18.2	212
Financial challenges at health center, %	38.6	207
Market characteristics		
Rural location, %	37.7	212
Competition for Medicaid patients, %	20.2	208
Competition for privately insured patients, %	32.3	198
Competition for physicians, %	59.3	209
Competition for non-physician clinical staff, %	59.3	209
Medicaid expansion state, %	90.1	212
State operates Medicaid accountable care program	31.1	219
Service area socioeconomic status		
Adults without high school diploma, %	18.4	219
Male unemployment rate, %	9.1	219
Median annual household income, \$	49,396	219
Households below poverty line, %	19.9	219
Households with children headed by a woman, %	12.9	219
Households receiving public assistance, %	4.4	219

* CHCs were surveyed in the following states: California, Colorado[†], District of Columbia, Illinois, Louisiana, Maine[†], Minnesota[†], New Jersey[†], Oregon[†], Utah[†], Vermont[†], Washington, and Wisconsin. States indicated with a double dagger are those that operated Medicaid Accountable Care Organization (ACO) programs during the survey fielding period.

[†] Means are reported with the exception of number of patients served for which the median is reported.

FTE, full-time equivalent; PCMH, patient-centered medical home.

Appendix 2 compares the characteristics of survey respondents and non-respondents. No significant differences were observed.

Table 3:
Health Centers' Use of Strategies to Integrate Care with Hospitals and Emergency Departments

Strategy*	Percentage of health centers	Number of respondents
Participate in quality improvement projects with hospital	60.7	214
Participate in health promotion initiatives with hospital	56.3	213
Align practice guidelines or care protocols with those in use by hospital	62.4	213
Participate in joint meetings with hospital leadership	80.8	213
Notification agreements		
Establish agreement that includes timely notification of hospital admissions	34.3	213
Establish agreement that includes timely notification of ED visits	30.5	213
Tried to engage hospital to develop agreement about care transitions but unsuccessful [†]	56.3	103

* Health centers were queried about strategies used to enhance care integration between their largest service delivery site (e.g., clinic) and the hospital from which patients at that service delivery site receive the majority of their care.

[†] This question was asked only of respondents reporting that no agreements were in place relating to care transitions.

Table 4:
Predictors of Integration Activity, by Integration Tertile

	N	Lowest integration tertile (%)	Middle integration tertile (%)	Highest integration tertile (%)
Health center characteristics				
Patients served, n	208	21,560	23,380	28,210
Minority patients, %	208	66.5	62.3	53.0
Service delivery sites, n	208	7.9	8.2	9.5
Primary care FTE per 10,000 patients, n	208	8.9	9.3	10.3
Shortage of non-clinical staff, %	205	47.1	42.0	30.9
Chaotic environment in health center, %	208	26.1	17.4	10.3
Market characteristics				
Competition for physicians, %	207	53.6	60.9	63.8
Competition for non-physician clinical staff, %	207	50.7	60.9	65.2
Medicaid ACO state, %	208	24.6	31.9	40.0
Rural location, %	208	30.4	36.2	47.1

Note: Bivariate associations between each characteristic and integration tertile are displayed.