The Association Between State-Level Health Information Exchange Laws and Hospital Participation in Community Health Information Organizations

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Abstract

Evidence suggests that health information exchange (HIE) is an effective strategy to improve efficiency and quality of care, as well as reduce costs. A complex patchwork of federal and state legislation has developed over time to encourage HIE activity. Hospitals and health systems have adopted various HIE models to meet the requirements of these statutes and regulations. Given the complexity of HIE laws, it is important to understand how these legal levers influence HIE engagement. We combined data from two unique data sources to examine the association between state-level HIE laws and hospital engagement in community HIEs. Our results identified three legal provisions of state laws (HIE authorization, financial & non-financial incentives, opt-out consent) that increased the likelihood of community HIE engagement. Other provisions decreased the likelihood of engagement. This analysis provides foundational evidence about the utility of HIE laws. More research is needed to determine causal relationships.

Introduction

Health information exchange (HIE) - patient data sharing across multiple health care settings - is a widely accepted strategy to improve the safety, efficiency, and quality of care[1-2]. This popularity is evidenced by a growing body of literature assessing the impact of HIE[3-5] as well as the proliferation of federal and state legislation (e.g., Health Information Technology for Economic and Clinical Health (HITECH) Act[6] and Medicare Access & CHIP Reauthorization Act[7]) emphasizing the importance of shared patient information. Indeed, numerous states have adopted a complex mix of legislation and regulations to encourage HIE activity among organizations and providers [8-10], including incentives for participation [11-13], privacy and security assurances [11,14], and governance rules [15,16]. However, HIE adoption and sustainability reflects organizational characteristics, technological capabilities, goals and priorities, and market demand[17]. Thus, the degree of flexibility and granularity of state HIE legislation could potentially encourage HIE engagement among some organizations, while having a chilling effect on others.

Legal scholars have examined laws and regulations as barriers and facilitators of health data sharing across health systems[18-21]. Some works suggest that changes to the legal environment for health information technology have encouraged intra-organizational meaningful use while discouraging HIE[18-19]. Others assert that delayed implementation of HIE is attributable to the sheer number and complexity of laws for HIE[20], lack of uniformity and incentives across jurisdictions[18], and the existence of stringent health information privacy regulations[21]. As legal frameworks for HIE governance continue to evolve, some barriers have been ameliorated[21]; however, policy variations across jurisdictions may result in HIE efforts being inadequately supported[10]. Studies have attempted to assess the impact of state-level HIE laws; however, most have mainly focused on specific statutes or regulations, such as governance structure of HIEs[14,15], privacy and confidentiality[16,17], and participation incentives and mandates[16,22,23]. Few studies have comprehensively assessed the impact of various laws on engagement in cHIOs. Therefore, it is unclear if a quantifiable association exists between the enactment and characteristics of such legislation and the likelihood of participation in health information exchanges.

The purpose of this study was to assess the association between state-level HIE legislation and hospitals' engagement in community health information organizations (cHIOs). We utilized a novel dataset that detailed hospital cHIO participation[19] and state-level legislation and regulations governing HIE[9]. Specifically, we were interested in the characteristics of HIE legislation and regulations that predict the likelihood of cHIO engagement. Moreover, we were able to control for organizational and market characteristics that influence organizations' decision-making but are less considered for the purposes of policymaking. These findings will inform state policymakers and health systems about the potential of legislation to influence HIE strategies and decision making among health care organizations.

Methods

This exploratory analysis utilized a cross-sectional design to assess the association between state-level laws governing health information exchange and hospital participation in cHIOs in 2016.

Data and Sample

The study sample included non-federal acute care hospitals located in a health care market with an operational cHIO. The primary dataset for this analysis was an inventory of operational cHIO in the US and all participating hospitals as of 2016[24]. This dataset was created using existing cHIO tracking surveys; lists of organizations supporting HIE; lists of entities with funding from the Office of the National Coordinator's (ONC) Health Information Exchange Grant Program; and primary data collection from cHIOs' publicly available websites. These data documented participation status only (either by the hospital or parent health system) and did not reflect level of usage or nature of engagement. Our second dataset was developed in a previous study that examined how states are using laws to address factors related to hospital and/or health system participation in cHIOs[10]. Following accepted policy surveillance research guidelines, researchers conducted a search of HIE related statutes and regulations using the Westlaw legal database. The dataset includes policies related to HIE governance, HIE participation and use, patient engagement, participation incentives and mandates, funding and sustainability, privacy, confidentiality, and security. For the purposes of this analysis, we limited to HIE statutes and regulations that were in effect as of June 7, 2016 and only included hospitals that reported whether they were participating in a cHIO in 2016. Lastly, hospital organizational characteristics and population statistics were incorporated into the merged dataset using data from the American Hospital Association (AHA) Annual Survey, the 2014 American Hospital Association HIT survey supplement, and the Area Health Resource Files. Our final study sample included 2029 hospitals across 48 states and DC.

Dependent variable

The primary outcome of interest was hospital participation (yes or no) in a cHIO as of spring 2016. Community health information organizations (cHIOs) represent the longest standing organizational approach to HIE in the US. cHIOs endeavor to facilitate information exchange across all providers within a given region and most align with broad community and public health benefits. Given that these state laws and regulations also specifically target population health outcomes, participation in this health information exchange approach was the most appropriate outcome for this analysis.

Independent variables

Determinants of interest included indicators of the presence of the following legal levers in a given state (as of June, 2016): 1) whether or not the state had enacted a law authorizing health information exchange (binary indicator) ; 2) whether states require providers to access and/or transmit HIE (binary indicator); 3) level of state implementation and/or long-term HIE funding (i.e. no funding offered, one type of funding; or multiple types of funding); 4) an ordinal variable that indicates whether or not a state's HIE law includes financial and/or non-financial incentives for cHIO engagement; and 5) a categorical variable that defines patient consent requirements (i.e. levels). At the hospital level, we controlled for organizational characteristics (e.g., hospital size, outpatient visits), market context (calculated using the Herfindahl-Hirschman index), and participation in enterprise HIE. Enterprise HIEs represent a health system-driven approach to HIE, where individual hospitals or health systems develop their own information exchange network to connect affiliated hospitals and physicians [18] on different electronic health records (EHRs).

Analysis

Frequencies, percentages, and means characterized the study sample. We conducted bivariate analyses using chi-square and t-tests, as appropriate, to examine the association between cHIO participation and independent variables. A binary logistic regression model described the relationship between hospital participation in a cHIO and HIE laws.

$$cHIOparticipation = \alpha + \beta_1 Authorization + \beta_2 Incentives + \beta_3 Funding + \beta_4 Consent + \beta_5 Mandate + \beta_6 Enterprise + \beta_7 Beds + \beta_8 Visits + \varepsilon$$

α is the point estimate for the intercept. β_1 tested whether laws authorizing health information exchange were positively associated with the likelihood that a hospital participated in a cHIO. β_2 tested the association between financial/non-financial incentives and cHIO engagement. β_3 tested the association between state funding for cHIOs and cHIO engagement. β_4 determined if patient requirements increased or decreased the likelihood that a hospital participated in a cHIO. β_5 tested the provider mandate for accessing and transmitting HIE data. β_6, β_7, and β_8

controlled for hospital enterprise HIE status, bed count, and annual outpatient visits, respectively. Finally, ε_{it} is the random error term.

Results

Our sample included 2,029 hospitals across 48 states plus the District of Columbia. Nearly half (45%) of the sample participated in an cHIO (see Table 1). A majority of hospitals had at least 100 staffed hospital beds (59.9%), an annual average of 142,394 outpatient visits (non-emergency), were located in highly competitive markets (40.3%), and had adopted an enterprise HIE (76.5%). With respect to legal levers, most hospitals were located in states that enacted statutes and regulations to authorize statewide HIE (60.8%) and designate state funding for community HIE (51.0%). Just under half of the hospitals in our sample were located in a state that offered at least one type of incentive (i.e., financial or non-financial) to organizations participating in cHIOs (49.5%).

Table 1. Descriptive Analysis of Hospitals in Study Sample (n=2,029)

	n	(%)
ORGANIZATIONAL CHARACTERISTICS		
Average # of Beds (S.D.)	204.2	(222.4)
Number of Beds		
≤ 25	296	14.6%
26-99	519	25.8%
100-249	627	30.9%
≥ 250	587	28.9%
Average # of Outpatient Visits (S.D.)	142,394.4	(264,487.0)
Market Competition		
Not Competitive	685	33.8%
Moderately Competitive	527	26.0%
Highly Competitive	817	40.3%
Enterprise HIE Status		
Yes	1,553	76.5%
No	476	23.5%
Community HIO Status		
Yes	931	45.9%
No	1098	54.1%
STATUTORY AND REGULATORY CHARACTERISTICS		
State Law Authorizing HIE		
Yes	1,234	60.8%
No	629	31.0%
Provider Mandate		
Yes	569	28.0%
No	1,449	71.4%
State Funding for HIE		
One Type of Funding	168	8.3%
Both Types of Funding	866	42.7%
No Funding	914	45.0%
State Incentives Supporting HIE		
One Type of Incentive	531	26.2%
Both Types of Incentives	474	23.4%
No	1,024	50.5%
Patient Consent Requirements		
Opt-Out	529	26.1%
Opt-In	488	24.1%
No Consent Requirements	704	34.7%

Note: ED visits excluded. Missing values (ambiguous laws) are excluded from count and percentage calculations.

In bivariate analyses (see Table 2) cHIO participation was associated with organizational factors and characteristics of state HIE laws. Hospitals with at least 250 staffed beds ($p < 0.001$) and with an enterprise HIE were more likely to participate in cHIOs (50.0 vs. 32.4%; $p < 0.001$). Hospitals located in states offering both types of incentives (i.e., financial and non-financial) were more likely to participate in cHIOs than those offering only one incentive (54.4% vs. 35.0%; $p < 0.001$) and those not offering any incentives (54.4% vs. 47.6%; $p < 0.001$). Hospitals subject to opt-out patient consent requirements were more likely to participate in cHIOs than hospitals in "opt-in" states (61.6% vs. 34.4%; $p < 0.001$). A larger proportion of hospitals in states without laws authorizing health information exchange (50.9% vs. 45.4%, $p = 0.025$), no provider mandate (48.4% vs. 39.5%, $p < 0.001$), and no state funding for HIE (52.3%; $p < 0.001$) report participating in cHIOs.

Table 2. Bivariate Analysis of Hospital Characteristics by Community HIO Status (n= 2,029)

	Community HIO (%)	No Community HIO (%)	*p*-value
ORGANIZATIONAL CHARACTERISTICS			
Average # of Beds (mean)	226.0	185.7	< 0.001
Number of Beds			< 0.001
≤25	49.3%	50.7%	
26-99	39.1%	60.9%	
100-249	42.1%	57.9%	
≥250	54.2%	44.4%	
Average # of Outpatient Visits (mean)	169,250	119,623	< 0.001
Market Competition			.244
Not Competitive	43.9%	56.1%	
Moderately Competitive	48.8%	51.2%	
Highly Competitive	45.7%	54.4%	
Enterprise HIE Status			< 0.001
Yes	50.0%	50.0%	
No	32.4%	67.6%	
STATUTORY AND REGULATORY CHARACTERISTICS			
State Law Authorizing HIE			.025
Yes	45.4%	54.6%	
No	50.9%	49.1%	
Provider Mandate			< 0.001
Yes	39.5%	60.5%	
No	48.4%	51.6%	
State Funding for HIE			< 0.001
One Type of Funding	39.9%	60.1%	
Both Types of Funding	36.8%	63.2%	
No Funding	52.3%	47.7%	
State Incentives Supporting HIE			< 0.001
One Type of Incentive	35.0%	65.0%	
Both Types of Incentives	54.4%	45.6%	
No Incentives	47.6%	52.4%	
Patient Consent Requirements			< 0.001
Opt-Out	61.6%	38.4%	
Opt-In	34.4%	65.6%	
No Consent Requirements	49.3%	50.7%	

Table 3 displays the factors associated with cHIO engagement. Controlling for other factors, hospitals in states that had adopted a law authorizing HIE had greater odds of participating in a cHIO (OR=2.81; p = 0.03) than hospitals located in states without a such a law. Additionally, we found that hospitals in states that provide both financial and nonfinancial incentives for cHIO (OR=4.19; p = 0.003) and only require "opt-out" consent were significantly more likely to report cHIO engagement (OR=2.98; p = 0.01). Legal levers that designated state funding for HIEs (OR=0.18; p < 0.001) and mandated that certain providers must access or transmit HIE data (OR=0.36; p = 0.04) were negatively associated with cHIO engagement. Hospitals with an enterprise HIE were significantly more likely to participate in a cHIO compared to hospitals without an enterprise HIE (OR=2.30; p < 0.001). Market competition, number of beds, and outpatient visits did not have a statistically significant relationship with cHIO engagement.

Table 3. Factors Associated with Participation in Community HIOs (n=2,029)

	Odds Ratio	*p*-value	95% Confidence Interval	
			Lower Limit	Upper Limit
ORGANIZATIONAL CHARACTERISTICS				
Number of Beds				
≤ 25	1.209	0.34	.815	1.794
26-99	.981	0.90	.728	1.321
100-249	.907	0.58	.636	1.294
≥ 250	[reference]	[reference]	[reference]	[reference]
Average # of Outpatient Visits	1.000	0.10	1.000	1.000
Market Competition				
Not Competitive	[reference]	[reference]	[reference]	[reference]
Moderately Competitive	.989	0.96	.655	1.492
Highly Competitive	.954	0.82	.629	1.447
Enterprise HIE Status				
Yes	2.303	< 0.001	1.596	3.323
No	[reference]	[reference]	[reference]	[reference]
STATUTORY AND REGULATORY CHARACTERISTICS				
State Law Authorizing HIE				
Yes	2.805	0.03	1.117	7.041
No	[reference]	[reference]	[reference]	[reference]
Provider Mandate				
Yes	.361	0.04	.137	.953
No	[reference]	[reference]	[reference]	[reference]
State Funding for HIE				.
Yes	.182	< 0.001	.084	.392
No	[reference]	[reference]	[reference]	[reference]
State Incentives Supporting HIE				
One Type of Incentive	1.039	0.94	.351	3.075
Both Types of Incentives	4.185	0.003	1.670	10.486
No	[reference]	[reference]	[reference]	[reference]
Patient Consent Requirements				
Opt-Out	2.982	0.01	1.312	6.779
Opt-In	.898	0.82	.356	2.264
No Consent Requirements	[reference]	[reference]	[reference]	[reference]

Discussion

Our analysis revealed that only three legal levers were positively associated with cHIO engagement: state authorization of health information exchange, offering both financial and non-financial incentives to participants, and allowing the exchange of health information for all patients, except those that opt-out. Notably, in bivariate analysis we found that slightly greater proportion of hospitals that participated in cHIOs were in states without laws authorizing a state health information exchange, but, controlling for all other factors, hospitals in states with an authorization law were more

likely to engage with cHIOs. This result could be due to the interaction between state and federal laws.[8,10] This is also interesting given that the federal Health Insurance Portability and Accountability Act (HIPAA) permits health information exchange under specific circumstances but allows states to enact more stringent constraints on information disclosure[25]. In fact, many states that authorize health information exchange also provide more stringent constraints on data sharing than required by HIPAA. Consequently, some state laws that define health information exchange authority could potentially limit engagement.

We determined that state funding for HIE, whether for implementation or long-term, was negatively associated with cHIO engagement. Some research has suggested that implementation and long-term funding is critical to the adoption and sustainability of health information exchange[26,27]. Our findings suggest that while funding may have a positive impact on cHIOs, it may have a chilling effect on hospital engagement. This could be attributed to the volatility of government funding mechanisms for HIEs[28] and the additional rules and guidelines that generally accompany government funding.

Interestingly, we found conflicting associations between hospital engagement in cHIOs and legal levers designed to address "critical mass deficiencies" by incentivizing participation.[10,12] Specifically, hospitals subject to state laws that included both financial and non-financial participation incentives were significantly more likely to engage in cHIOs, but hospitals in states that mandated specific providers to participate were less likely to engage. This could be attributable to the fact that the participation incentives are directed towards organizations while the mandates only impact individual providers.[10] Thus, if providers within the organization are already required to participate, there is less incentive for the organization to join.

Our results suggest that hospitals in states with "opt-out" legal provisions were significantly more likely to engage in cHIOs. This is consistent with previous research that states that opt-out patient consent is associated with more HIE engagement.[28] Moreover, those operating, and participating in cHIOs, tend to view opt-in as restrictive and a complication.[29] However, simply concluding states should pursue opt-out regulation is not a straightforward recommendation. Some research suggests that patient consent guidelines are only beneficial to HIE development and engagement when coupled with incentives[11]. Further, survey research suggests that patients may prefer opt-in models.[30]

Notably, we found that more than 75% of hospitals adopted enterprise HIEs but less than half participated in community HIEs. Yet, hospitals with eHIEs were significantly more likely to participate in cHIOs. Because the majority of eHIE hospitals were in states that authorized statewide health information exchange, we suspect that interoperability requirements may be crucial to a hospital's decision to engage in a cHIO or not. This would be consistent with previous studies that identify interoperability as a potential barrier to HIE adoption[3].

Limitations

Due to the nature of our data, we are only able to conduct a cross-sectional analysis. This prevents us from conducting a more robust analysis to establish a causal link between state-level HIE legal levers and hospital engagement in cHIOs. Additionally, we cannot control for unobservable factors at the state-level (i.e., other policies or initiatives) that may be driving hospital engagement. Finally, these state laws went into effect at different times and we expect a lag between the enactment of legislation and the outcome of interest. However, our data does not allow us to control for lagged effects. It is quite possible that hospitals in states that enacted laws in 2016, for example, may not have become participants until 2017.

Conclusion

The role of incentive and consent requirements can better inform future legislation aimed at strengthening the legal infrastructure to support cHIO implementation, engagement, and sustainability. These findings may be particularly useful for states that have not adopted legislation but may be considering doing so. However, more robust analyses are needed to determine if there is indeed a causal relationship between state-level HIE laws and cHIO participation.

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