Patient Engagement Functionalities in U.S. Hospitals: Is Early Adoption Associated With Financial Performance?

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EXECUTIVE SUMMARY

U.S. hospitals are in various stages in their adoption of health information technology (HIT) with patient engagement functionalities. The Health Information Technology for Economic and Clinical Health Act of 2009 allocated $30 billion to incentivize the adoption and use of HIT. This study aims to identify hospital characteristics of early patient engagement functionality adoption and compare the financial performance of groups of hospitals that offer these functionalities according to Rogers' adopter categories. The combined data from the American Hospital Association Annual Survey and Information Technology Supplement, Centers for Medicare & Medicaid cost reports, and Health Resources & Services Administration Area Health Resource Files from 2008 to 2013 yielded a sample of 696 unique acute care hospitals. Three adopter categories—early adopters, early majority, and late majority—were created. Generalized estimating equations were used to examine the financial performance (operating margin, return on assets, total margin, operating expenses, revenue per inpatient day) across the adopter types. Compared to early adopter hospitals, operating margins were lower for early majority hospitals ($\beta = -.407$, $p < .05$) and late majority hospitals ($\beta = -.608$, $p < .05$). Moreover, compared to early adopter hospitals, late majority hospitals exhibited significantly lower operating revenue ($\beta = -.087$, $p < .01$) and operating expenses ($\beta = -.064$, $p < .01$) per inpatient day. No significant relationships were observed when comparing these groups based on total margin and return on assets. Hospital administrators should consider the positive financial outcomes associated with early adoption of patient engagement functionalities in the decision-making process.

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INTRODUCTION

Recent legal and environmental developments have been creating challenges to the financial stability of U.S. hospitals. In response, hospitals carefully examine the financial impact of legislation. For many hospitals, adopting health information technology (HIT) with patient engagement functionalities has been a response to the meaningful use requirement of the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009, which provided financial incentives for adoption. A core function of meaningful use of HIT is the engagement of patients and their families in their care. Prior to passage of the HITECH Act, however, a few hospitals had already adopted technologies with these patient engagement functionalities, thereby positioning themselves to take full advantage of the incentive program. We consider these hospitals to be at the forefront of such innovations, and they may have influenced policy formation. They are labeled as "early adopters" because they may have played a key role in accelerating the diffusion of HIT to facilitate patient engagement (Rogers, 2003).

There have been increasing amounts of research and discussion on the use of HIT to facilitate patient engagement (Ackerman et al., 2017; Kelly, Hoonakker, & Dean, 2017; Otte-Trojel, de Bont, Rundall, & van de Klundert, 2016; Pavliscsak et al., 2016; Toscos et al., 2016). As a starting point in facilitating patient engagement, HIT functionalities should allow patients to view, download, and transmit their health information as required for meaningful use. Examples of these functionalities include appointment scheduling, medication refills, communication with providers, peer support, and customized interventions (Cobb, Graham, Bock, Papandonatos, & Abrams, 2005; Walker, Sieck, Menser, Huerta, & Scheck McAlearney, 2017; Weingart, Rind, Tofias, & Sands, 2006). Walker et al. (2017) provide a more comprehensive list of these patient engagement functionalities.

Significance of Study

Although some researchers have investigated patient engagement functionalities, to the best of our knowledge, none has compared the financial performance of hospitals at various adoption stages of patient engagement functionalities. Therefore, this study examines the financial performance of adopter groups of patient engagement HIT functionalities based on when they adopted patient engagement functionalities. This study aims to inform managers and policymakers who are interested in adopting patient engagement functionalities by highlighting characteristics of those hospitals at the forefront of patient engagement innovation. To this end, the following research questions are examined:

1. What are the organizational characteristics of early adopters of patient engagement functionalities (i.e., hospitals that adopted functionalities prior to the HITECH Act)?
2. Are early adopters of patient engagement functionalities associated with better financial performance when compared to later adopters?

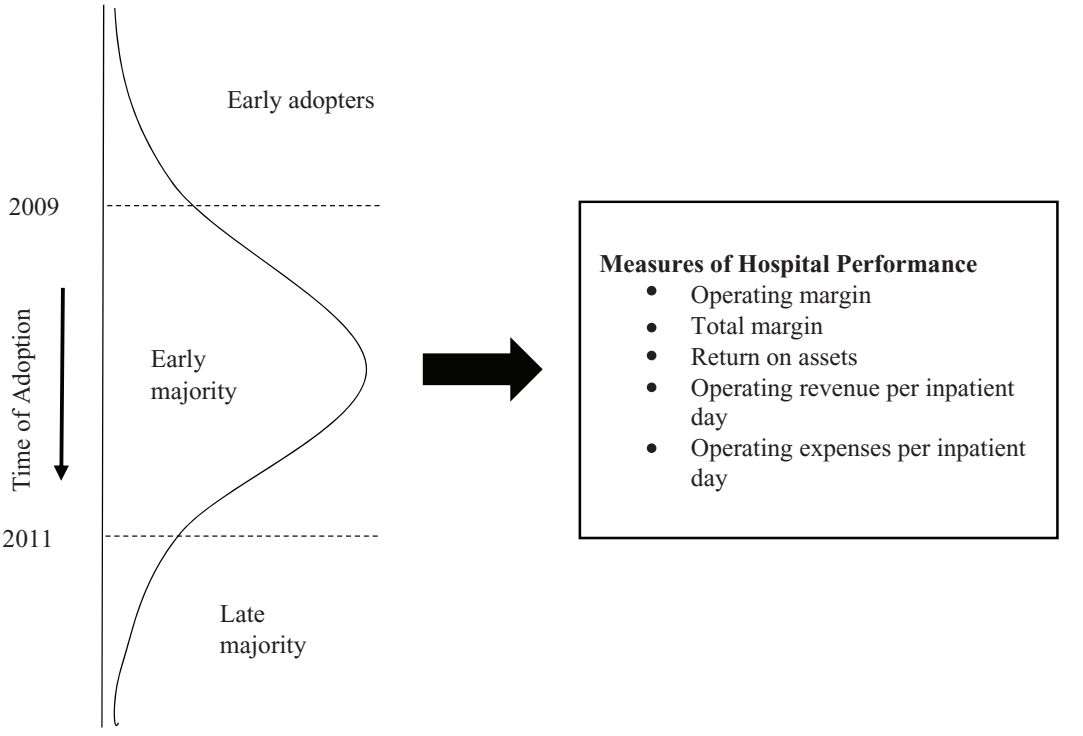
BACKGROUND AND CONCEPTUAL FRAMEWORK

In this study, the term "innovativeness" refers to how quickly an organization

adopts an innovation and is dependent on the organization's culture as well as on its knowledge reserves (Dosi, 1988; Nelson & Winter, 2009). There are five adopter groups, based on their ability to innovate (Rogers, 2003). The first group includes the innovators, making up about 2.5% of the population. These organizations exhibit a venturesome behavior. They are frequently willing to take risks and play a gatekeeping role in the flow of new ideas into the system. The second group includes early adopters, making up 13.5% of the population. They are opinion leaders and are respected in their markets. They serve as role models for others and frequently influence others to adopt an innovation. The third group is the early majority, which takes longer to consider an innovation before adopting. Late majority, the fourth group, will adopt an innovation as an economic necessity and/or because of increasing peer pressure. Early and late majority groups each make up 34% of the population. The fifth group includes the laggards. They make up about 16% of the population and are the last in a market to adopt an innovation because they first want to be sure that it will not fail.

Building upon Rogers' work, this study classifies hospitals into adopter groups based on their time of adoption of patient engagement functionalities (Figure 1). Early adopters were conceptualized to comprise those that were among the first to adopt an innovation (Rogers, 2003; Rogers &

FIGURE 1
Conceptual Framework of Hospital Groups and Financial Performance



Shoemaker, 1971). They are also described as having distinguishing characteristics from the others (Berwick, 2003; Rogers, 2003). Therefore, early adopters here are those hospitals that adopted HIT with patient engagement functionalities prior to 2009.

In addition, the literature suggests that organizations that are among the first to adopt innovations possess unique cultures and capabilities (Hurley & Hult, 1998; Meeus, Oerlemans, & Hage, 2001). These capabilities, born out of the organization's ability to learn and apply such learning, have been shown to be related to better performance (Argyris & Schon, 1996; Schroeder, Bates, & Junttila, 2002; Senge, 1990). Consistent with these studies is a resource-based view of the firm (Barney, 1991; Grant, 1996; Penrose, 1959; Rumelt, 1984; Teece & Pisano, 1994; Wernerfelt, 1984), which suggests that organizations in an industry have different resources, and these resources (either tangible or intangible) may not be perfectly mobile across these organizations and therefore may not be easily replicated by others. Early adopter organizations may be able to leverage unique capabilities to ensure performance. Hence, it is proposed that early adopters possess certain inimitable resources that enable them to achieve better financial performance and a stronger competitive advantage compared to later adopters. These capabilities allow an organization to adapt to its changing business environment (Teece, Pisano, & Shuen, 1997). Because these capabilities are frequently replicated, transferred, or redeployed to sustain or extend the organization's performance in current or new markets (Teece et al., 1997), it is anticipated that these capabilities would be readily available to the organization and would not be reserved solely for the adoption of patient engagement HIT functionalities. Therefore, it is important to determine if earlier adopters of patient engagement HIT functionalities are associated with better overall financial performance compared to their counterparts who were later adopters.

METHODS

Study Setting and Data Sources

The unit of analysis for this study consisted of acute care hospitals located in the United States not owned by the federal government. Longitudinal data of 2008–2013 from four secondary data sources—the American Hospital Association (AHA) Annual Survey of Hospitals and Information Technology (IT) Supplement, Centers for Medicare & Medicaid Services (CMS) cost reports, and the Area Health Resource File (AHRF)—were merged and analyzed.

Data on hospital characteristics were obtained from the AHA's Annual Survey, with data on hospitals' adoption of functionalities for patient engagement obtained from the IT Supplement. The CMS cost reports are a consistent and standard source of financial information used for health research purposes. They contain provider information such as facility characteristics, utilization data, cost and charges by cost center (in total and for Medicare), Medicare settlement data, and financial statement data. Lastly, the AHRF was used to assess county-level information about a hospital's geographic location. Hospitals from these four datasets were merged using their Medicare provider number. Hospitals that did not match across all four datasets were removed.

This resulted in a sample of 696 hospitals. Because we considered a 6-year period, we had a total of 4,176 hospital-year observations.

Dependent Variables

Hospital Financial Performance

This study operationalized organizational performance using financial measures. These included total margin, operating margin, and return on assets (ROA) because they were found to be the predominant profitability measures in healthcare (Devaraj & Kohli, 2003; McCracken, McIlwain, & Fottler, 2001). These measures were frequently calculated the same way as in other fields (McCracken et al., 2001), by using the information provided in the CMS cost reports. Operating margin took into account hospital revenue from direct patient care only (operating income) and excluded nonoperating sources of income or expenses such as government appropriations, philanthropy, endowments, grants, investments, gift shops, and all other expenses or revenues not related to patient care.

ROA referred to the profitability of a hospital relative to its assets. Because HIT investments typically constitute a large part of a hospital's capital assets, ROA reflected how efficient an organization was in generating income using assets and investments while controlling expenses (Langland-Orban, Gapenski, & Vogel, 1996). Total margin was calculated by using the overall hospital revenue from both direct patient- and non-patient care income, including investments, public appropriations, and donations.

It should be noted that operating margin was deemed to be a better measure of sustainable profitability because it looked at operating income instead of income from other sources (Gapenski, 2005). Total margin and ROA were assessed, even though they did not necessarily provide pure comparisons between not-for-profit and for-profit hospitals because they included income from other sources. Operating revenues per inpatient day and operating expenses per inpatient day, which were components of these profitability measures, were also included as measures of financial performance because they allowed a separate glimpse of the inpatient expense and revenue sides.

Independent Variables

Adopter Groups

The adopter groups were determined by examining the AHA Annual Survey IT Supplement. Three adopter groups—early adopters, early majority, and late majority—were extracted based on when they adopted at least one patient engagement functionality.

Early adopters adopted at least one patient engagement functionality by 2008, before passage of the HITECH Act. Early majority hospitals adopted at least one patient engagement functionality by 2011 to meet meaningful use Stage 1. The remaining hospitals were the late majority. These hospitals did not adopt any patient engagement functionalities by 2011. These three groups are mutually exclusive of each other. Innovator and laggard groups were not created for this study because of data restrictions. Specifically, the AHA started collecting data on patient engagement functionality adoption in 2008, making it difficult to establish when the very first functionalities were adopted and which hospitals could be considered innovators.

Also, because adoption is ongoing, it is difficult to establish which hospitals are laggards.

Control Variables

Several control variables were identified based on items that may be associated with the adopter group, the number of patient engagement functionalities adopted, or hospital financial performance based on similar research findings (Asagbra, Burke, & Liang, 2018; Fendrick, Escarce, McLane, Shea, & Schwartz, 1994; Fonkych & Taylor, 2005; Goetz Goldberg, 2012; Kimberly & Evanisko, 1981; Kruse, DeShazo, Kim, & Fulton, 2014; Mick, 1990). The control variables included hospital size, system affiliation, ownership type, teaching status, location, Medicare managed-care penetration rate, competition, and per capita income. Additionally, case mix index (CMI) was added to the final model to control for patient case severities and hospital reimbursement rates. Higher CMI values suggested a higher complexity of inpatient services and conversely a higher reimbursement rate from Medicare.

Analytic Strategy

The descriptive statistics for the independent, control, and dependent variables were analyzed to determine the variability of each, to test the assumptions of the regression model, and to test for outliers in the data. Log transformations using natural log were performed for per capita income, operating revenues, and operating expense to normalize their values. Bivariate analyses were also performed to test for multicollinearity among the variables. A paired sample *t*-test was used to perform pre–post analyses to determine how the financial measures changed for each hospital adopter type from the beginning of the study in 2008 to the end of the study in 2013.

The association between hospital adopter types and financial performance (operating margin, ROA, total margin, operating expenses, revenue per inpatient day) was examined using generalized estimating equations with an identity link function and independence correlation structure to account for the clustering effects at hospital levels (Zeger & Liang, 1986). The quasi-likelihod under the independence model criterion was used to determine that the independence correlation structure was the best working correlation structure for the analyses (Cui, 2007; Gosho, 2014; Pan, 2001). The SPSS software program Version 23 was used for data management. The Stata Version 14 was used to perform the analyses.

FINDINGS

First, a comparison between the hospitals included in the study and those hospitals excluded is presented in Table 1. The comparison allowed for the objective interpretation of the results. The comparison was based on organizational and environmental factors noted earlier in the Control Variables section. There were 2,534 excluded hospitals resulting in 15,204 hospital-year observations and 696 study hospitals resulting in 4,176 hospital-year observations. The results of the chi-square test and independent sample *t*-test revealed a significant difference between study and excluded hospital characteristics. In summary, the study hospitals were more likely to be larger, not-for-profit, teaching, system-affiliated, urban hospitals that are in more competitive, higher per capita, and

TABLE 1
Characteristics of the Study and the Excluded Hospitals

Hospital-Year Characteristics	Study Hospitals *N* (%)	Excluded Hospitals *N* (%)	Chi-Square	Independent Samples *t*-Test Pooled
Ownership				
Not-for-profit	3,929 (94.09)	11,498 (75.63)	687.62*	N/A
For-profit	247 (5.91)	3,706 (24.38)		
System membership				
No	1,720 (41.19)	4,768 (31.36)	142.08*	N/A
Yes	2,456 (58.81)	10,436 (68.64)		
Teaching status				
Nonteaching	3,689 (88.34)	14,515 (95.47)	292.21*	N/A
Teaching	487 (11.66)	689 (4.53)		
Hospital size				
M (*SD*)	233.29 (228.42)	176.26 (184.77)	N/A	16.74*
Range	4–2,396	1–2,364		
Location				
Rural	1,419 (33.98)	4,353 (61.12)	41.45*	N/A
Urban	2,757 (66.02)	2,769 (38.88)		
Herfindahl–Hirschman Index (HHI)				
M (*SD*)	0.75 (0.21)	0.78 (0.30)	N/A	−8.67*
Per capita income				
M (*SD*)	$37,353.98 ($5,808.51)	$35,889.25 ($6,138.21)	N/A	9.96*
Medicare managed-care penetration rate				
M (*SD*)	19.56 (9.57)	18.60 (9.56)	N/A	1.49*
Functionality score				
M (*SD*)	2.97 (2.80)	N/A	N/A	N/A

Note. *$p < .05$.

higher Medicare managed-care penetration environments.

Second, analyses of the study sample were performed and the results presented. To address our first research question, Table 2 shows the descriptive statistics of organizational and financial characteristics of hospitals classified as early adopter, early majority, or late majority. There were 786 (18.82%) hospital-year observations for early adopter, 2,820 (67.53%) for early majority, and 570 (13.65%) for late majority. Table 2 also shows that early-adopter hospitals have higher total margins, operating margins, and ROA compared to early majority hospitals and late majority hospitals. Conversely, early majority hospitals show higher operating revenue per inpatient day and operating expense per inpatient day compared to

TABLE 2
Descriptive Statistics of the Organizational and Financial Characteristics of Hospital Adopter Groups

	Early Adopter	Early Majority	Late Majority
Organizational characteristics			
Total *N* (%)	786 (18.82)	2,820 (67.53)	570 (13.65)
Location	Rural: 32.44% Urban: 67.56%	Rural: 33.19% Urban: 66.81%	Rural: 40% Urban: 60%
Ownership	Not-for-profit: 97.58% For-profit: 2.42%	Not-for-profit: 92.94% For-profit: 7.06%	Not-for-profit: 94.91% For-profit: 5.09%
System membership	Yes: 65.27% No: 34.73%	Yes: 58.87% No: 41.13%	Yes: 49.65% No: 50.35%
Teaching status (*N*)	Teaching: 20.23% Nonteaching: 79.77%	Teaching: 10.35% Nonteaching: 89.65%	Teaching: 6.32% Nonteaching: 93.68%
Mean size	295.48	226.4	181.64
Financial characteristics			
Total margin mean (*SD*)	2.06 (4.00)	1.82 (4.26)	1.56 (4.08)
Operating margin (*SD*)	0.38 (4.39)	–0.11 (4.35)	–0.44 (4.25)
Return on assets (*SD*)	2.29 (4.02)	1.86 (4.12)	1.74 (5.28)
Operating revenue/ inpatient day (*SD*)	$5,945.70 ($2,988.96)	$6,333.09 ($6,812.09)	$5,763.93 ($3,300.23)
Operating expense/ inpatient day (*SD*)	$5,941.69 ($2,940.91)	$6,563.91 ($13,818.92)	$5,874.66 ($3,439.50)

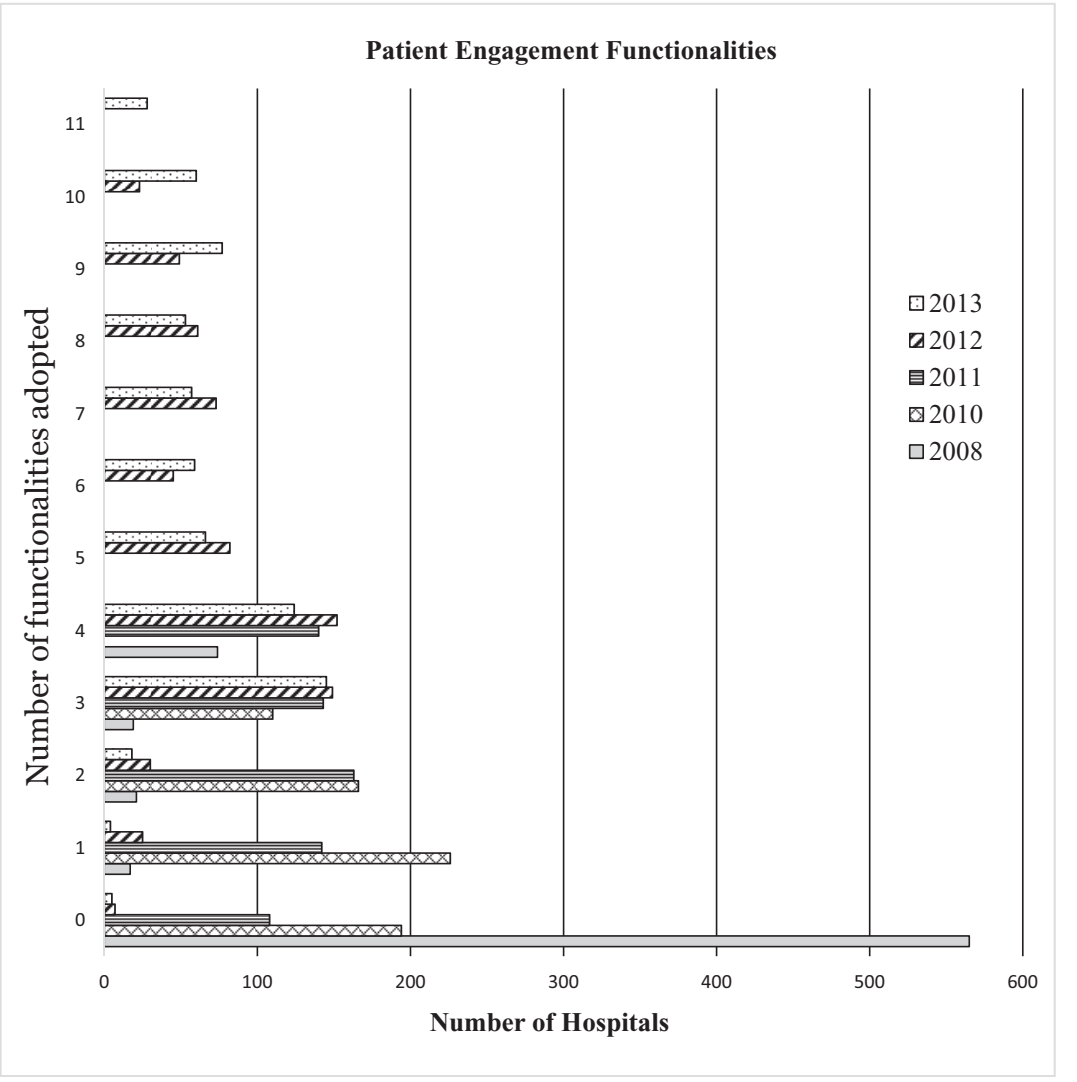
both early adopter hospitals and late majority hospitals.

Figure 2 shows the change in the number of hospitals and their functionality scores across years 2008–2013. This figure indicates variation in the data and shows the progression of patient engagement functionality adoption over time. For example, of the 696 hospitals sampled in 2008, 565 had no patient engagement functionalities and 74 had four patient engagement functionalities. In 2013, most hospitals had three or more patient engagement functionalities. Also in 2013, the most-adopted functionality included in the study granted patients access to an electronic copy of their record upon request within three business days. The least adopted functionality allowed patients to submit self-generated data (Figure 3).

The results of the pre–post analyses shown in Table 3 indicate that there were statistically significant increases in ROA and operating revenue per inpatient day from 2008 to 2013 across adopter types. No significant difference in operating margin between 2008 and 2013 was observed across adopter types. However, the findings of the pre–post analyses across adopter types were mixed for total margin and operating expense per inpatient day.

The results of the generalized estimating equation models are presented in Table 4. In addressing our second

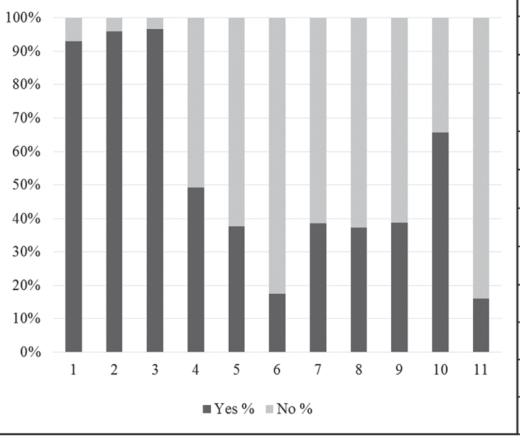
FIGURE 2
Change in Number of Hospitals and Their Functionality Scores Across Fiscal Years



Source: American Hospital Association Annual Survey and Information Technology Supplement.

research question, it was found that early adopter hospitals were associated with better financial performance compared to the other adopter groups. Our findings supported this for operating margin and operating revenue per inpatient day, but not for total margin or ROA. Early majority and late majority hospitals had significantly less operating margin ($\beta = -0.407$, $p < .05$; $\beta = -0.608$, $p < .05$, respectively) compared to early adopter hospitals. Late majority hospitals also had significantly less operating revenue per inpatient day ($\beta = -0.087$, $p < .01$) and operating expense

FIGURE 3
Hospital Adoption of Patient Engagement Functionalities by 2013



	List of Patient Engagement Functionalities Adopted in 2013	Yes *N* (%)	No *N* (%)
1	Patients access to self-specific education resources	647 (93.0%)	49 (7.0%)
2	Patients access to electronic copy of their discharge instructions upon request	668 (96.0%)	28 (4.0%)
3	Patients access to electronic copy of their record upon request within 3 business days	673 (96.7%)	23 (3.3%)
4	Patient can view information from their health/medical record online	342 (49.1%)	354 (50.9%)
5	Patient can download information from their health/medical record	262 (37.6%)	434 (62.4%)
6	Patient can electronically send care/referral summaries to a third party	121 (17.4%)	575 (82.6%)
7	Patient can request an amendment to change/update their health/medical record	268 (38.5%)	428 (61.5%)
8	Patient can request refills for prescriptions online	259 (37.2%)	437 (62.8%)
9	Patient can schedule appointments online	270 (38.8%)	426 (61.2%)
10	Patient can pay bills online	457 (65.7%)	239 (34.3%)
11	Patient can submit self-generated data	112 (16.1%)	584 (83.9%)

TABLE 3
Pre–Post Analysis of Adopter-Type Financial Performance

Adopter Type	Financial Measures	2008 *M* (*SD*)	2013 *M* (*SD*)	*p* -Value
Early adopter	Total margin	0.58 (3.99)	2.31 (3.76)	.001
	Return on assets	0.65 (4.40)	2.54 (3.73)	.000
	Operating margin	0.62 (4.40)	–0.01 (4.79)	.185
	Operating expense/ inpatient day	$5,161.90 ($2,238.81)	$6,931.76 ($3,532.73)	.000
	Operating revenue/ inpatient day	$5,153.20 ($2,200.17)	$6,858.98 ($3,663.45)	.000
Early majority	Total margin	0.76 (4.67)	1.92 (3.95)	.000
	Return on assets	0.79 (4.27)	2.36 (4.04)	.000
	Operating margin	–0.07 (4.46)	–0.27 (4.20)	.457
	Operating expense/ inpatient day	$6,297.96 ($25,313.36)	$7,392.30 ($7,470.10)	.235
	Operating revenue/ inpatient day	$5,397.68 ($6,598.81)	$7,282.91 ($7,877.17)	.000
Late majority	Total margin	0.57 (3.94)	1.57 (4.52)	.109
	Return on assets	–0.46 (4.23)	1.55 (4.89)	.001
	Operating margin	–0.61 (4.52)	–0.54 (4.26)	.904
	Operating expense/ inpatient day	$4,981.54 ($2,674.20)	$6,732.47 ($4,028.69)	.000
	Operating revenue/ inpatient day	$4,845.36 ($2,518.51)	$6,515.40 ($3,860.49)	.000

TABLE 4
Generalized Estimating Equation To Analyze Association Between Adopter Groups and Hospital Financial Performance

	Total Margin β	Operating Margin β	Return on Assets β	Ln Operating Revenue/ Inpatient Day β	Ln Operating Expense/ Inpatient Day β
Independent variables					
Early majority	−0.065	−0.407*	−0.248	−0.002	0.012
Late majority (ref: early adopter)	−0.225	−0.608*	−0.280	−0.087**	−0.064**
Control variables					
Size	0.002**	0.001	0.002**	−0.001**	−0.001**
Nonsystem member (ref: system member)	0.046	−0.549**	−0.113	0.017	0.040**
For-profit (ref: not-for-profit)	−0.148	0.541***	−0.871**	−0.161**	−0.231**
Nonteaching (ref: teaching)	0.075	0.469***	0.253	−0.226**	−0.250**
Rural (ref: urban)	−0.022	−0.034	−0.203	0.248**	0.258**
Ln per capita income	0.843***	−0.817***	0.484	0.475**	0.481**
Medicare managed-care penetration rate	−0.001	−0.023**	−0.006	0.005**	0.005**
HHI	0.679*	0.587***	0.491	0.167**	0.125**
CMI	1.012**	2.382**	1.007*	0.429**	0.364**

Note. CMI = case mix index; HHI = Herfindahl–Hirschman Index; Ln = natural logarithm.
*$p < .05$, **$p < .01$, ***$p < .10$.

per inpatient day ($\beta = -0.064$, $p < .01$) when compared to early adopter hospitals. Furthermore, when compared to the early majority hospitals and late majority hospitals, early adopter hospitals did not show a statistically significant difference in total margin and ROA.

DISCUSSION AND PRACTICE IMPLICATIONS

This study explored the association between early adoption of patient engagement functionalities and the financial performance of U.S. hospitals. It used a longitudinal sample of 4,176 hospital-year observations from 2008 to 2013 (2009 data on patient engagement functionalities were treated as missing because none were collected for the year). A hospital's innovativeness is considered here to have been ingrained in its culture and, as such, determines the hospital's unique capabilities and reserves that consequently predict its competiveness and success in its market. These ingrained unique capabilities and knowledge reserves give early adopters a competitive advantage, which allows them to be more successful than their counterparts.

The findings from the generalized estimating equation models indicated that when compared to the other hospital adopter groups, early adopter hospitals

showed better financial performance than early majority and late majority hospitals when the operating margin is measured. Early adopter hospitals generated a little more than 40 cents more profit for each dollar of operating revenues per inpatient day compared to early majority hospitals, and a little more than 60 cents more profit for each dollar of operating revenues per inpatient day compared to late majority hospitals. This finding is particularly interesting because operating margin has typically been considered as a better measure of a provider's sustainable profitability than the total margin (Gapenski, 2005), which indicates nonsignificant differences among adopter groups.

In addition, it was found that early adopters of patient engagement HIT functionalities were also associated with 8.7% more operating revenues per inpatient day and 6.4% more operating expenses per inpatient day compared to late majority hospitals. No statistically significant differences in operating revenue per inpatient day and operating expenses per inpatient day were observed between early adopter hospitals and early majority hospitals. These measures were included in this study to observe the effects of adopter categories on the expense and revenue side. More simply, early adopter hospitals generated a little under 9 cents more in operating revenue for each inpatient day and just over 6 cents more in operating expenses for each inpatient day compared to late majority hospitals. Therefore, it may be said that early adopters have more resources devoted to their operations and capture more income from operating activities than do late majority hospitals.

While nonsignificant results were obtained for operating revenue per inpatient day and operating expenses per inpatient day when early adopters were compared to early majority hospitals, their trending and a significant operating margin indicated that early adopter hospitals were more efficient in using their operating revenue to generate income compared to early majority hospitals. Moreover, income from outpatient operations may be responsible for the significant differences in operating margin not accounted for by the operating revenue per inpatient day and operating expenses per inpatient day.

No significant differences in ROA and total margin between early adopters and later (early majority and late majority) adopters were observed. Total margin and ROA accounted for both patient-related revenues and operating expenses as well as other revenues and expenses such as grant income, charitable contributions, and losses on assets included in the "other income" section of the Medicare Cost Report Statement of Revenues and Expenses. ROA measured a hospital's ability to use its assets to generate income, and total margin measured a hospital's ability to control its expenses. However, a hospital will typically show positive ROA and/or total margin regardless of its operating income if its nonoperating income is large enough. The differences seen between early adopters and their later adopter counterparts in operating margin (profits from patient-related activities) may be associated with their unique innovative cultures and knowledge reserves that allowed for the adoption of HIT offering patient engagement functionalities. These differences were not

readily seen in total margin and ROA as a result of "other incomes."

Although some of the increases in operating revenues may come as a result of the incentives received from CMS as hospitals strive to meet more meaningful use requirements, studies have argued that HIT adoption is significantly related to reduction in operating costs (Amarasingham, Plantinga, Diener-West, Gaskin, & Powe, 2009; Chen et al., 2003). Moreover, others have suggested that HIT adoption improves patient revenues (Mildon & Cohen, 2001; Schmitt & Wofford, 2002). Because a hospital's margin is related to its costs and revenues, it may be said that a hospital that experiences a decrease in costs and/or an improvement in revenues should also experience an increase in margins. If these costs are specifically related to its operations, then—taking into account operating expenses and patient revenues—its operating margin should increase. The findings of this study suggest that early adoption of patient engagement functionalities is associated with a hospital's patient-related income and, subsequently, its operating margin.

According to Peteraf and Barney (2003), resource-based theory focuses on efficiency-based differences. Previous studies have suggested that organizations that are able to learn and apply their learning will gain better performance and a competitive advantage (Argyris & Schon, 1996; Schroeder et al., 2002). Therefore, according to the findings in this study, early adopters of patient engagement HIT functionalities are significantly different from the other adopter groups because of their ability to learn and apply their unique capabilities to improve efficiency. This may be evident in their ability to reduce cost and improve revenues in their inpatient and outpatient settings, which invariably will have a positive impact on their operating margins. The theory may also explain why early adopter hospitals were among the first to adopt innovations such as patient engagement HIT functionalities that appear to have more impact on the operating margin, which measures efficiency.

Study Limitations

Although this study provides valuable insights for healthcare managers and researchers, it has some limitations. First, the sample used in the analysis was limited to hospitals that responded to the AHA Annual Survey IT Supplement, so results may not be generalizable to all medical and surgical hospitals in the United States. Second, data from CMS cost reports were used to calculate the measures of profitability operationalized as hospital financial performance. These data only include information for hospitals that provide care to Medicare beneficiaries, which may also compromise data generalizability (Kane & Magnus, 2001). Conversely, given that almost all acute care facilities serving adults accept Medicare, this concern may have been lessened. Third, control variables, including geographic location, per capita income, and Medicare managed-care penetration rate, which were used to assess the hospital's market area, were obtained from the AHRF. Although the AHRF is arguably the best resource of its type, the county is its unit of analysis, which precludes analysis on smaller markets. Finally, the use of secondary data is a limitation. All the data in this study were derived from

surveys. There are always control issues and potential transcription problems with secondary data that necessitate careful review. However, the secondary data used here are widely employed in healthcare research.

CONCLUSION

A higher degree of innovation at a hospital is associated with better operating margins but not necessarily total margins or ROA. A culture of innovation, however, allows hospitals to gain benefits from patient revenues and cost efficiencies. As evidenced by higher operating margins, early adopters will seek out strategies to improve their efficiency-based performance to achieve a competitive advantage over later adopters. This impact may not extend to total margin or ROA. Therefore, as more data become available, it would be of interest to determine how innovation is associated with other measures of financial performance not measured here. Additionally, it would be useful to determine if there is any association between the number of patient engagement HIT functionalities adopted and financial performance.

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PRACTITIONER APPLICATION: Patient Engagement Functionalities in U.S. Hospitals: Is Early Adoption Associated With Financial Performance?

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Since passage of the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009, few studies have considered whether its incentives for health information technology (HIT) adoption have affected financial performance for early adopters. Asagbra, Zengul, and Burke answer a critical question in their study that healthcare executives ask before making substantial capital investment decisions to improve patient engagement: Should they invest in HIT now or wait until the return on investment (ROI) is proven by other hospitals?

Although the study did not positively correlate early adopters with improvements on return on assets (ROA), the authors did find that early adopters saw improved operating margins and operating revenue and overall reduced operating expenses in comparison to early majority and late majority adopters. This is encouraging news, and it will serve to arm chief information officers (CIOs) with proven data from nearly 700 hospitals to justify board or executive leadership approval of HIT investments, particularly in areas involving patient engagement.

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