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The Relationship between Quality Improvement and Health Information Technology Use in Local Health Departments

Abstract

This research examined if there is a relationship between engagement in quality improvement (QI) and health information technology (HIT) for local health departments (LHDs) controlling for workforce, finance, population, and governance structure. This was a cross-sectional study that analyzed data obtained from the Core questions and Module 1 in the NACCHO 2010 Profile of LHDs. Descriptive statistics, bivariate analyses, and logistic regression analyses were conducted. Findings suggest that LHD engagement in QI has a relationship with utilization of HIT including electronic health records, practice management systems, and electronic syndromic surveillance systems. This study provides baseline information about the HIT use of LHDs. LHDs and their system partners (hospitals, federally qualified health centers, and primary care providers) that utilize HIT as part of their QI decision making may have an easier time of using data to support evidence-based decision making and implementing the provisions of the Patient Protection and Affordable Care Act of 2010 in order to achieve population health for all.

Keywords

quality improvement, health information technology

Cover Page Footnote

Data for this study was obtained from the National Association of County and City Health Officials—NACCHO (2010). National Profile of Local Health Departments Survey, (2010): Core and Module 1. Obtained (12/11/12) from NACCHO. The Centers for Disease Control and Prevention and the Robert Wood Johnson Foundation provided funding for the 2010 Profile Study.

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The Institute of Medicine stated in its 2001 report, *Crossing the Quality Chasm: A New Health System for the 21st* Century, that information technology (IT) is essential for the achievement of substantial quality improvement (QI). IT was also recommended as a tool to support evidence-based decision making and improving access to data.[1] Additionally, the Turning Point Initiative's guide *From Silos to Systems: Using Performance Management to Improve the Public's Health* points out that while performance improvement (including QI) is "hardly new" to public health, one of the lessons learned is that information and management systems are essential to manage performance.[2] The establishment of the Public Health Accreditation Board (PHAB) in 2011 demonstrates the sustained momentum for QI in public health as accreditation is inherently a QI process. One prerequisite for PHAB accreditation is conducting a Community Health Assessment (CHA).[3] Conducting a CHA is a data driven process in which health information technology (HIT) could be an immensely useful tool.

HIT presents opportunities for disease surveillance at the local level, and more effective communication with local public health agency partners and the community. Furthermore, the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 specifically addresses the potential for electronic health records to improve the quality of health care including "promoting coordination of health care and improving the continuity of health care among health care providers, by reducing medical errors, by improving population health, by reducing health disparities, by reducing chronic disease, and advancing research and education." Additionally, it may also be used for biosurveillance and public health.[4]

A preliminary literature review revealed that very little research to date has been conducted to examine if HIT is used as a tool for improving quality in public health agencies. This study provides baseline information on LHDs from 2010 prior to the launch of PHAB and HIT infrastructure funding. This study explores the relationship between engagement in QI and HIT use in LHDs.

METHODS

The National Association of County and City Health Officials (NAACHO) 2010 National Profile of Local Health Departments Survey Core Questions and Module 1 was utilized for this study. Out of the 2656 LHDs that completed the entire survey, 625 LHDs answered the Core questions and Module 1. LHDs received either Core Only or Core plus one of the two modules through stratified random sampling without replacement, using population size of the jurisdiction served by the LHD to define the strata. Module 1 contains a set of questions on QI activities and HIT use. Only LHDs that had completed Module 1 were included in this study. We selected the question on characterization of current QI activities. This question originally included four response choices; however, we recoded this question into a dichotomous variable with LHDs implementing formal QI activities either agency-wide or in specific programmatic or functional areas coded as "yes" and LHDs not involved in any formal QI activities coded as "no." The question on LHDs level of

awareness or activity for certain HIT areas were also recoded into dichotomous variables with LHDs who chose investigating or have investigated, planning to implement, or have implemented coded as "yes" and LHDs that chose no activity in this area or not applicable are coded as "no." Our LHD governance classifications were obtained from the Association of State and Territorial Health Officials (ASTHO) Profile of 2011 convention for governance for each state including: centralized, largely centralized, shared, largely shared, mixed, decentralized, and largely decentralized.

Using SPSS 19.0, we employed descriptive, bivariate and simple and multiple logistic regression analyses. Descriptive statistics for all variables were calculated. To build logistic regression models, the appropriate transformations on continuous variables were necessary to optimize the model predictiveness. There were three independent continuous variables, total population, total expenditures, and total FTEs, which were log transformed to achieve a better fit. Bivariate analyses were conducted relating HIT to QI and potential confounders. Any potential confounder yielding a p-value above 0.20 was not considered in multivariate modeling. Multivariate analyses were conducted relating HIT to QI, while adjusting for potential confounders chosen by backwards elimination. This was accomplished using logistic regression and a significance threshold of 0.05.

RESULTS

Table 1 summarizes the descriptive statistics conducted for all variables. The most common HIT that LHDs use is immunization registry followed by electronic health records.

Table 2 shows the odds ratios and 95% confidence intervals from the simple and multiple logistic regression models. Table 2 highlights statistically significant relationships between HIT use (i.e. electronic health records, immunization registry, etc.), engagement in QI activities, and potential cofounders. There were several statistically significant relationships between engagement in current QI activities and use of certain HIT controlling for potential cofounding variables. Those LHDs who engaged in current QI activities were 1.69 times more likely to use electronic health records (95% CI: 1.024, 2.788), 1.99 times more likely to use practice management systems (95% CI: 1.194, 3.339), and 2.21 more likely to use electronic syndromic surveillance systems (95% CI: 1.394, 3.517).

TABLE 1: DESCRIPTIVE STATISTICS OF QUALITY IMPROVEMENT

	Electronic Health Records	Regional Health Information Exchanges	National Health Information Network	Immunization Registry	Practice Management System	Electronic Syndromic Surveillance System	Formal QI Activities in the Past Year
Yes n (%)	337 (65.60)	174 (35.50)	91 (18.40)	455 (88.70)	146 (29.10)	304 (59.50)	255 (48.90)
No n (%)	177 (34.40)	330 (65.50)	403 (81.60)	58 (11.30)	355 (70.90)	207 (40.50)	267 (51.10)

Full-Time Equivalents (FTEs)		Total Population		LHD Total Expenditures Most Recent Completed Fiscal Year		Governance n (%)	
Mean	118.76	Mean	223,111.72	Mean	19,847,360.39	Centralized	25 (4.70)
SD	486.66	SD	669,315.70	SD	1.17E+08	Largely centralized	32 (6.00)
Q1	9.00	Q1	21,221.00	Q1	754,980.25	Shared	35 (6.60)
Me	24.00	Me	51,595.00	Me	2,541,445.50	Largely shared	14 (2.60)
Q3	70.79	Q3	168,894.00	Q3	7,887,150.75	Mixed	36 (6.80)
Min	0.00	Minimum	552.00	Min	16,000.00	Decentralized	371 (69.90)
Max	6,543.00	Maximum	10,111,065.00	Max	1,685,451,713	Largely decentralized	18 (3.40)

Abbreviations: SD – Standard Deviation; Me – Median; Min – Minimum; Max – Maximum

TABLE 2: SIMPLE AND MULTIPLE LOGISTIC REGRESSION ANALYSES OF LHD'S USE OF HEALTH INFORMATION TECHNOLOGY

	Odds Ratio (95% CI)											
	Electronic Health Records[i] (ref.=No) Yes		(Regional) Health Information Exchanges[i] (ref.=No) Yes		National Health Information Network[i] (ref.=No) Yes		Immunization Registry[i] (ref.= No) Yes		Practice Management System[i] (ref.= No) Yes		Electronic Syndromic Surveillance System (ref.= No) Yes	
	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted
Engage in Current QI Activities[ii] (ref.=No) Yes	2.62 (1.79, 3.8)***	1.69 (1.02, 2.79)**	2.17 (1.49, 3.16)***	1.44 (0.88, 2.35)	1.45 (0.91, 2.29)	1.18 (0.66, 2.11)	3.05 (1.64, 5.65)***	1.88 (0.86, 4.12)	2.77 (1.85, 4.16)***	2.00 (1.19, 3.34)***	2.28 (1.59, 3.29)***	2.21 (1.39, 3.52)***
Ln Total Population	1.61 (1.41, 1.85)***	+	1.62 (1.41, 1.85)***	+	1.40 (1.20, 1.63)***	1.62 (1.14, 2.30)***	1.50 (1.24, 1.82)***	+	1.49 (1.30, 1.70)***	+	1.39 (1.23, 1.57)***	1.36 (1.02, 1.81)**
Ln Total Expenditures	1.93 (1.63, 2.28)***	+	1.68 (1.45, 1.94)***	+	1.24 (1.07, 1.44)***	0.82 (0.60, 1.13)	1.66 (1.34, 2.05)***	+	1.62 (1.40, 1.87)***	0.73 (0.38, 1.41)	1.30 (1.15, 1.47)***	0.60 (0.32, 1.12)
Ln Total FTEs	2.00 (1.69, 2.36)***	2.03 (1.65, 2.49)***	1.81 (1.55, 2.11)***	1.88 (1.55, 2.28)***	1.25 (1.07, 1.46)***	+	1.91 (1.51, 2.40)***	1.71 (1.28, 2.29)***	1.68 (1.45, 1.95)***	2.40 (1.12, 5.16)**	1.41 (1.24, 1.61)***	1.65 (0.85, 3.21)
Centralized (ref. =No) Yes	4.05 (1.20, 13.73)**	2.87 (0.60, 13.47)	0.95 (0.40, 2.26)	+	2.33 (0.97, 5.63)*	+	3.17 (0.42, 23.91)	+	1.39 (0.60, 3.23)	+	1.29 (0.54, 3.10)	+

Largely Centralized (ref.= No)Yes	1.37 (0.62, 3.02)	+	0.25 (0.09, 0.74)**	0.08 (0.02, 0.35)***	0.46 (0.14, 1.54)	0.29 (0.07, 1.25)*	0.67 (0.25, 1.81)	+	0.34 (0.12, 1.00)**	0.22 (0.06, 0.77)**	0.87 (0.42, 1.79)	+
Shared (ref.= No)Yes	4.38 (1.52, 12.62)***	+	2.12 (1.07, 4.24)**	0.51 (0.21, 1.26)	1.21 (0.51, 2.88)	+	0.99 (0.34, 2.90)	+	2.47 (1.23, 4.94)**	0.87 (0.35, 2.20)	2.43 (1.08, 5.45)**	2.17 (0.60, 7.95)
Largely Shared (ref. =No)Yes	0.94 (0.31, 2.86)	+	0.51 (0.14, 1.85)	+	0.73 (0.16, 3.33)	+	0.76 (0.17, 3.48)	+	1.08 (0.33, 3.57)	+	0.79 (0.26, 2.38)	+
Mixed (ref.= No)Yes	0.65 (0.32, 1.30)	+	0.90 (0.43, 1.89)	+	0.62 (0.21, 1.80)	+	4.60 (0.62, 34.28)	3.80 (0.43, 33.37)	0.87 (0.40, 1.91)	+	1.33 (0.65, 2.74)	+
Decentralized (ref. =No)Yes	0.54 (0.36, 0.82)***	+	1.05 (0.70, 1.57)	+	0.79 (0.49, 1.29)	+	0.17 (0.32, 1.18)	2.22 (0.94, 5.28)*	0.83 (0.55, 1.26)	+	0.70 (0.47, 1.03)*	+
Largely Decentralized (ref. =No) Yes	1.88 (0.61, 5.78)	+	2.22 (0.79, 6.24)	+	4.71 (1.61, 13.80)***	+	+	+	1.48 (0.53, 4.15)	+	1.38 (0.51, 3.73)	+

+the risk factor not included in the final multiple logistic regression model, *P<0.10, ** p<0.05, ***p<0.01

i. "Yes" – investigating or have investigated, planning to implement, have implemented
"No" – no activity in this area, not applicable

ii. "Yes" – has implemented a formal quality improvement program agency-wide, formal quality improvement activities are being implemented in specific programmatic or functional areas
"No"- quality improvement activities are informal or ad hoc in nature, or not currently involved in quality improvement activities

IMPLICATIONS

This study shows baseline information on LHD engagement in QI and HIT use. There appears to be a relationship between engagement in current QI activities and HIT use. Our analyses revealed a positive association between engagement in QI activities and use of electronic health records, practice management systems, and electronic surveillance systems. Those LHDs that are actively participating in QI activities and utilizing HIT may be more likely to use a data driven approach to evidence based decision making and QI processes. Additionally, LHDs that utilize HIT and QI processes may be more likely to implement a QI focus to improve use of HIT.

Future studies should explore how HIT is used in QI decision-making. This could include investigating if there is a connection between engaging in HIT supported QI activities and improved health outcomes, evidence based decision making, and resource allocation. If possible, replicating this study using the next NACCHO Profile data would lend support to any findings through a longitudinal analysis. Additionally, exploring specific QI activities such as Root Cause Analysis, Plan-Do-Check-Act, Balanced Scorecard, Baldrige Performance Excellence Criteria, Lean, Six Sigma and their relationship with HIT utilization is a logical next step. As LHDs begin exploring public health accreditation, HIT use may be a powerful tool for engagement in the QI process. A better understanding of the interrelationships between certain LHD activities may provide valuable information to LHDs in their program and systemic planning efforts. By engaging in HIT, LHDs may fulfill some the aims put forth by the US Department of Health and Human Services Public Health Quality Forum (PHQF). The PHQF has identified six priority areas for improvement of quality in public health, including population health metrics and information technology, and evidence-based practices, research and evaluation.[5]

SUMMARY BOX:

What is Already Known about This Topic? Past research has examined the benefits of engaging in QI and HIT in public health agencies and discussed the relationship between the two on a theoretical level; however, there is a dearth of research examining this relationship through quantitative analysis.

What is Added by this Report? This study presents the results of a cross-sectional study using the NACCHO 2010 Profile Study of LHDs (Core and Module 1) that examines the relationship between engaging in QI and HIT in LHDs through descriptive statistics, bivariate analysis, and regression analyses, controlling for potential confounders. Statistically significant results are reported for three HIT uses: electronic health records, practice management systems and electronic syndromic surveillance systems.

What are the Implications for Public Health Practice, Policy, and Research? This study provides baseline information on the relationship between engaging in QI and HIT in LHDs and sets the foundation for longitudinal analysis. Future studies should examine how HIT is used in QI decision making in local public health agencies.

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