California Hospitals 2010: EHR Adoption, Meaningful Use, and Health Information Exchange

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The findings in this report are those of the authors and do not necessarily represent the views of the California Department of Health Care Services.

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Introduction and Background

The Centers for Medicare and Medicaid Services (CMS) has established the Electronic Health Records (EHR) Incentive Program to provide incentive payments to eligible professionals, eligible hospitals, and critical access hospitals as they adopt, implement, upgrade, or demonstrate meaningful use of certified EHR technology. Of interest in this report is the Medicaid EHR Incentive Program for acute care hospitals in the state of California. To qualify for Medi-Cal (that is, Medicaid in California) Stage 1 EHR incentive payments, hospitals must meet 19 of 24 meaningful use objectives; including 14 required core objectives and five of 10 possible menu objectives.[3] (Table 1) Some 242 (55%) of 435 California hospitals may be eligible for Medi-Cal incentive payments based on their Medi-Cal discharge volumes and other eligibility factors.[4]

The Office of Health Information Technology (OHIT) in the California Department of Health Care Services (DHCS) has responsibility for developing goals and metrics for the EHR Incentive Program, establishing policies and procedures, and implementing systems to disburse, track, and report the incentive payments. OHIT has contracted with Drs. Diane Rittenhouse and Robert Miller at the University of California, San Francisco, to produce this report on the baseline level of adoption of EHR and progress towards meeting meaningful use objectives and implementing health information exchange (HIE) capabilities in California's acute care non-federal hospitals.

Jha et al. (2010) have reported on national progress toward meeting meaningful use objectives, using data from the American Hospital Association.[5] In this report, we examine California data from the American Hospital Association and the California Office of Statewide Health Planning and Development to determine progress toward meeting meaningful use objectives and achieving health information exchange in California hospitals. We focus our analysis on measures of the 12 core and 4 menu meaningful use objectives that are available in the American Hospital Association dataset (Table 1). Data on the remaining objectives are not available for several reasons, including that the AHA survey pre-dates the federal definition of meaningful use.

Table 1: Meaningful Use Core and Menu Objectives

Core Objectives	Menu Objectives
• Record key demographics • Maintain up-to-date problem list • Maintain active medication list • Record vital signs • Record smoking status • Maintain comprehensive list of allergies • Use computerized provider order entry (CPOE) for medications • Implement at least 1 of 6 clinical decision rules • Implement drug-drug and drug-allergy interaction checks • Report Hospital Quality Alliance (HQA) and Physician Quality Reporting Initiative (PQRI) quality measures • Give patients electronic copy of health information • Discharge summaries • Capability to electronically exchange key clinical information among providers of care and patient authorized entities* • Protect electronic health information in EHR through appropriate technical capabilities*	• Laboratory reports • Perform medication reconciliation • Record advanced directives • Summary care record for relevant transitions in care • List of patients by specific conditions* • Drug formulary checks* • Patient-specific education resources* • Capability to electronically submit immunization data* • Capability to electronically submit laboratory results to public health agencies* • Capability to electronically submit syndromic surveillance data to public health agencies*

NOTE: *Not included in the 2009 AHA Annual Survey IT Supplement.
SOURCE: Eligible Hospital and CAH Meaningful Use Table of Contents; Core and Menu Set Objectives.[3]

Methods

Data Sources

American Hospital Association Data. The American Hospital Association (AHA) has conducted its national Annual Survey since 1946.[6]This survey contains hospital-specific data items on 60,000+ hospitals and 450+ health care systems, including more than 700 data fields covering organizational structure, personnel, hospital facilities and services, and financial performance. The AHA releases the Annual Survey in October.

The 2009 AHA Annual Survey Information Technology Supplement was conducted in March – September 2010 in conjunction with the 2010 AHA Annual Survey.[7] The IT Supplement was mailed separately to hospitals around the country. All hospitals were also given the opportunity to complete the IT Supplement electronically online. The AHA EHR Adoption Database (released in 2011) includes more than 120 data fields from the 2009 AHA Annual Survey IT Supplement, including measures of EHR adoption, meaningful use, and health information exchange data. (See Appendix 2 for the AHA Annual Survey IT Supplement Questionnaire.) The IT Supplement was fielded prior to the federal government's issuance of the final rule on meaningful use objectives in June 2010. Although it does not include data on every meaningful use objective, it provides the most complete national data available on EHR adoption, meaningful use, and health information exchange for U.S. hospitals.

Nationally, over 3,600 hospitals responded to the IT Supplement. In California, the sampling frame consisted of 419 hospitals, of which 205 responded (a 48.9% response rate). In order to achieve the highest possible response rate, AHA contacted non-responders at least four times after the initial mailing, by mail, email and phone.

California Office of Statewide Health Planning and Development Data. The Healthcare Information Division at the Office of Statewide Health Planning and Development (OSHPD) collects and releases numerous datasets regarding health care providers in California, including annual financial data for California hospitals.[9] The financial data from 2009-2010 was the most recent data available at the time of this report; it included no information on EHR adoption, meaningful use, or health information exchange capabilities.[10] The OSHPD variables used in this report are listed in Table 2.

Table 2: Descriptive Variables on California Hospitals from OSHPD Data

Variable:	Variable Description:
Ownership	**Ownership categories:** • Non-Profit • Investor • City/County • District
Type of Care	**Type of Care categories:** • General • Children's
Type of Hospital	**Type of Hospital categories:** • Comparable • Kaiser • Long term care emphasis • Other non-comparable
Teaching or Small/Rural Hospital	**Categories:** • Teaching • Small/Rural • Neither
Total Licensed Beds	Total number of licensed beds
Acute Care Beds	Total number of acute care beds
Total Discharges	Total number of discharges
Medi-Cal Discharges	Total number of discharges with Medi-Cal as payer

Sampling Frame for Data Analyses

Each hospital participating in a Centers for Medicare & Medicaid Services (CMS) program is assigned a CMS Certification Number (CCN). In order to create a single dataset for this analysis, we matched the hospitals in the AHA and OSHPD databases using their respective CMS Certification Numbers (CCNs). Among other functions, the CCN is used for submitting and reviewing the hospital's cost reports. Because some hospitals had different CCNs in the AHA and OSHPD datasets, we manually matched those California hospitals without perfect CCN (N=52).

After creating a single merged dataset, we selected acute care non-federal hospitals if their CCNs were in the range specified for acute care hospitals (0001-0879, 1300-1399) or if they were labeled as children's hospitals; we excluded state-owned hospitals.[11] The source of the remaining data figures and tables in this report is the single merged dataset.

Response Rates and Weighting Considerations

The final sampling frame included 342 California acute care non-federal hospitals, of which 182 responded to the AHA survey, yielding a 53.2% response rate. Response rates varied according to major hospital characteristics (Table 3); they were particularly low for investor-owned hospitals and small hospitals with less than 99 licensed beds. We found statistical differences between responders and nonresponders with respect to ownership. Nonresponders were much more likely to be investor-owned and less likely to be non-profits. Respondents were more likely to have 400+ licensed beds, and less likely to have 99 or fewer beds. There were lesser differences with respect to licensed acute care beds.

Table 3: Hospital Response Rates (N=342 hospitals)

Response Rate and Number of Responses by Category

Ownership:		
Non-Profit	57.2%	(N=115)
Investor	37.7%	(N=29)
District	64.4%	(N=29)
City/County	47.4%	(N=9)
Type of Hospital:		
Small/Rural	62.1%	(N=36)
Teaching	65.2%	(N=15)
Neither	50.2%	(N=131)
Type of Care:		
General	54.3%	(N=175)
Children's	45.5%	(N=5)
Size (licensed beds):		
0-99 beds	43.4%	(N=33)
100-199 beds	47.9%	(N=46)
200-399 beds	54.5%	(N=60)
400+ beds	71.7%	(N=43)
Size (acute care beds):		
0-99 beds	46.2%	(N=49)
100-199 beds	49.5%	(N=45)
200-399 beds	58.0%	(N=65)
400+ beds	69.7%	(N=23)

Because of the differing response rates according to hospital category, we used weights that took into account type of ownership (that is, non-profit-, investor-, and district-owned) and bed size. Since results using weighted data did not yield significantly different results from the unweighted data, we only included results that used unweighted data. See Appendix 3 for details on the weighting process.

Variables

Meaningful Use Objectives and Measures. The 12 meaningful use core objectives listed in Table 1 were used to assess the extent of meaningful use objectives attained in each hospital. We created a Meaningful Use Core Objectives Index (what we refer to in the tables and figures as the "MU score") for each hospital by summing the number of meaningful use core objectives achieved by that hospital. The meaningful use score for each hospital ranged from 0 to 12 points.

Because some core meaningful use objectives were much harder to achieve than others, we highlight progress in meeting the computerized provider order entry (CPOE) objective. Whereas some hospitals have long recorded key demographics and maintained active medication lists using older hospital clinical and administrative information systems, fewer hospitals have implemented CPOE. Compared to other most other capabilities, CPOE requires more modern electronic health record software products, is technically more challenging (e.g., they must have real-time access to numerous types of data), and require substantial provider/staff training and changes in workflow. In the AHA Annual Survey IT Supplement, respondents were given six answer choices to the question of whether they had CPOE for medications. We collapsed the six response choices into three categories: "Implemented" (fully implemented across all units; fully implemented in at least one unit); "Likely to implement" (beginning to implement in at least one unit; have resources to implement in the next year); and "Unlikely to implement" (do not have resources but considering implementing; not in place and not considering implementing).

Health Information Exchange. To assess the extent of HIE capabilities adopted in each hospital, we used a HIE AHA Annual Survey Information Technology Supplement question that reads: "Does your hospital electronically exchange any of the following patient data with any of the providers listed below? (Check all that apply)" Respondents were asked about five types of patient data (patient demographics, clinical care record, laboratory results, medication history, and radiology reports). that could be shared with four types of providers: 'hospitals inside of your system,' 'hospitals outside of your system,' 'ambulatory providers inside of your system,' and 'ambulatory providers outside of your system.'

Hospital Characteristics. We used OSHPD databases to obtain data on hospital characteristics (Table 2). The extent of focus on Medi-Cal patients is measured by the percent Medi-Cal

discharges, calculated as the ratio of Medi-Cal discharges to total discharges. We were particularly interested in hospitals with 10% or more Medi-Cal discharges because California hospitals with Medi-Cal volume greater than or equal to 10% discharges are eligible for the Medicaid EHR Incentive Program.[4] Other characteristics of interest included hospital acute care bed size, ownership status, and status as a rural or teaching hospital.

Statistical Analysis

We begin by presenting descriptive statistics on California hospitals, and on meaningful use and health information exchange among all California hospitals. In order to provide a better understanding of the health information technology (HIT) landscape for California hospitals, we also present bivariate analyses examining the associations between the use of HIT and hospital characteristics. We performed tests of significance for all bivariate comparisons: we used analysis of variance (ANOVA) and chi-square analysis to test the significance in the difference between the means and counts, respectively.

Findings

California Hospitals

The majority of responding California hospitals were non-profit (63.2%) and had at least 100 beds (81.9%). Some 19.8% were small/rural, 8.2% were teaching, and 5.5% were Kaiser-owned (Table 4).

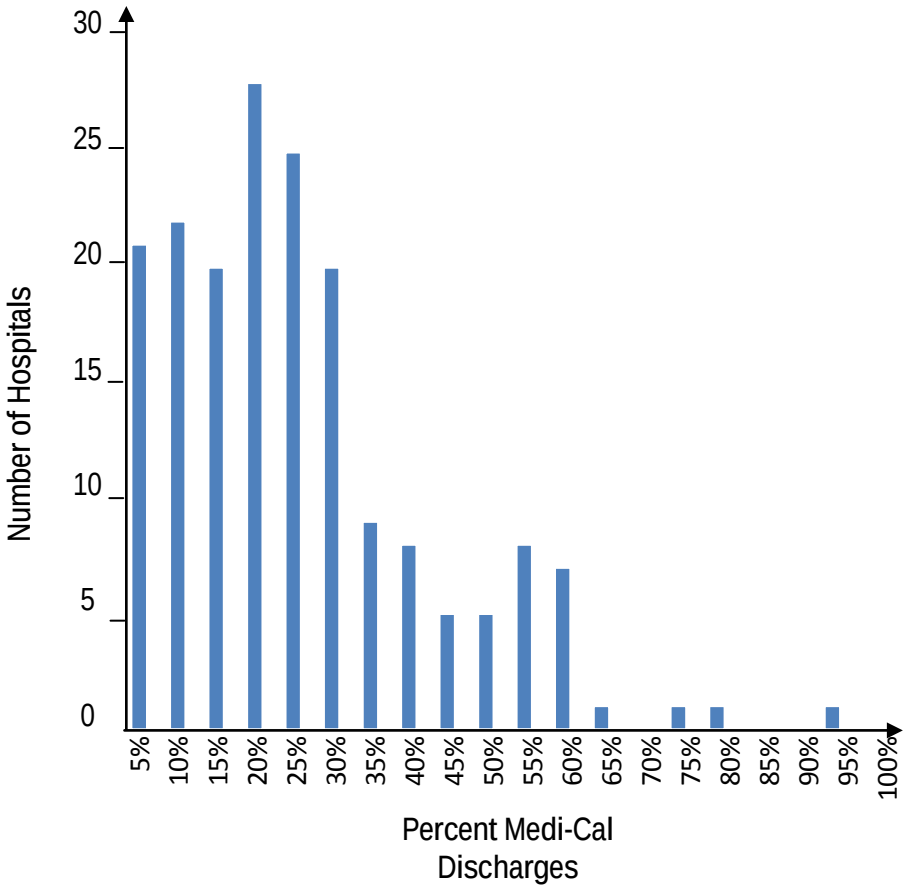
Table 4: Distribution of Acute Care, Non-Federal Hospitals in the Sample (N=182 hospitals)

	% of Hospitals	*Number of Hospitals*
Ownership:		
Non-Profit	63.0%	115
Investor	15.9%	29
District	15.9%	29
City/County	4.9%	9
Type of Hospital:		
Small/Rural	19.8%	36
Teaching	8.2%	15
Neither	72.0%	131
Type of Care:		
General	96.2%	175
Children's	2.7%	5
Size (licensed beds):		
0-99 beds	18.1%	33
100-199 beds	25.3%	46
200-399 beds	33.0%	60
400+ beds	23.6%	43
Size (licensed acute care beds):		
0-99 beds	26.9%	49
100-199 beds	24.7%	45
200-399 beds	35.7%	65
400+ beds	12.6%	23
Kaiser:		
Yes	5.5%	10
No	94.5%	172

Medi-Cal in California Hospitals

Medi-Cal discharges as a percent of total discharges varied greatly among California hospitals (Figure 1). The mean percentage of Medi-Cal discharges was 24%. Medi-Cal discharges comprised less than 10% of total discharges for 17.6% of hospitals, and more than 30% of discharges for 25.3% of hospitals.

Figure 1: Number of CA Hospitals by Percent of Total Discharges that are Medi-Cal Discharges



NOTE: Mean=24.0%, SD=17.0%.
N=182 Hospitals

Meaningful Use

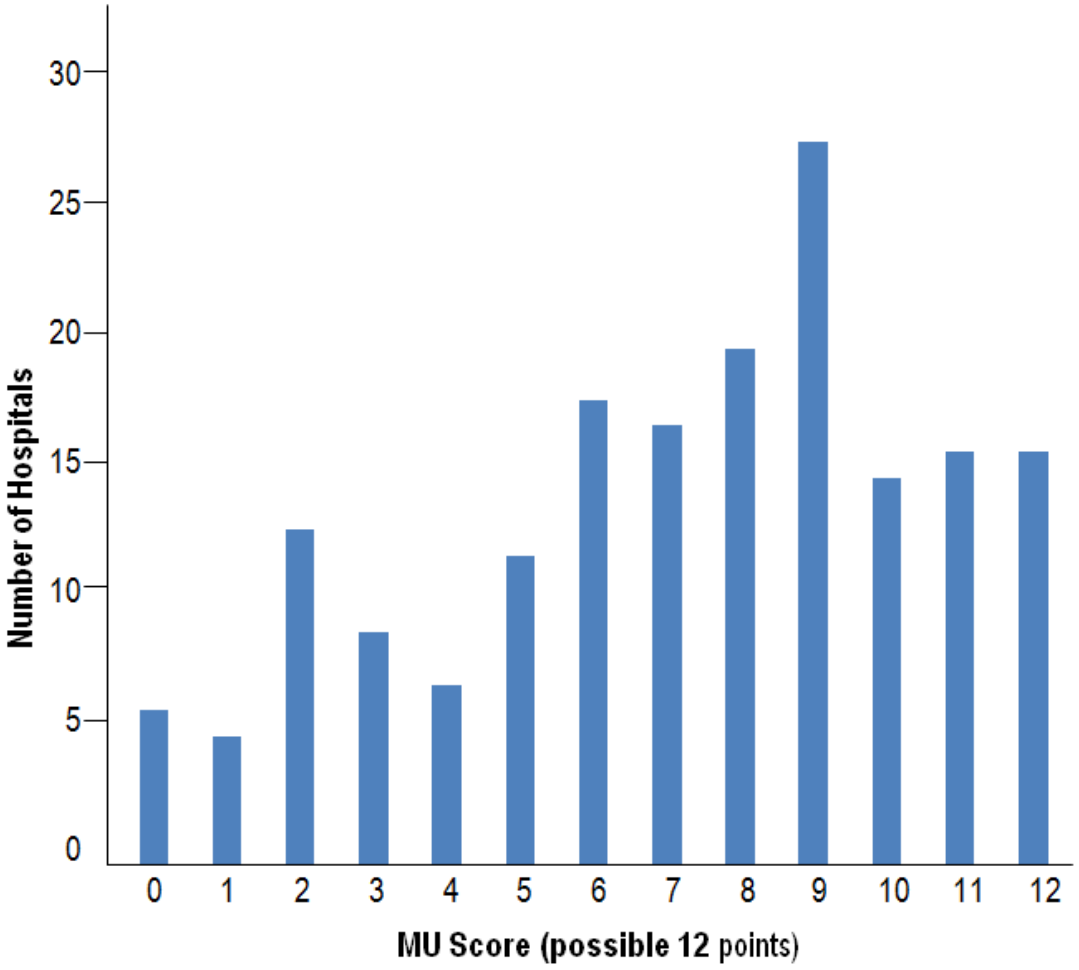
A majority of California hospitals had met each of 8 core meaningful use objectives (out of 12), ranging from 63.2% that had implemented drug-drug and drug-allergy checks to 88.5% that recorded key demographics (Table 5). However, fewer than half of responding hospitals met four core meaningful use objectives (highlighted in red), including only 36.3% that used CPOE for medications in at least one unit.

Table 5: Percent of CA Hospitals That Met Meaningful Use Objectives
(N=182 hospitals)

Meaningful Use Objective	Percent of Hospitals	N
Record key demographics	88.5%	161
Maintain comprehensive list of allergies	74.2%	135
Record smoking status	74.2%	135
Discharge Summaries	73.1%	133
Maintain active medication list	69.8%	127
Implement at least 1 of 6 clinical decision rules	69.2%	126
Record vital signs	64.8%	118
Implement drug-drug and drug-allergy checks	63.2%	115
Maintain up-to-date problem list	45.6%	83
Use CPOE for medications	36.3%	66
Give patients electronic copy of health information	35.7%	65
Report HQA and PQRI quality measures	21.4%	39
Laboratory Reports	89.6%	163
Perform medication reconciliation	57.1%	104
Summary care record for relevant transitions in care	55.5%	101
Record advanced directives	53.8%	98

Looked at another way, California hospitals' median meaningful use score was 8 (range 0-12) while the mean score was 7.2 (Figure 2).

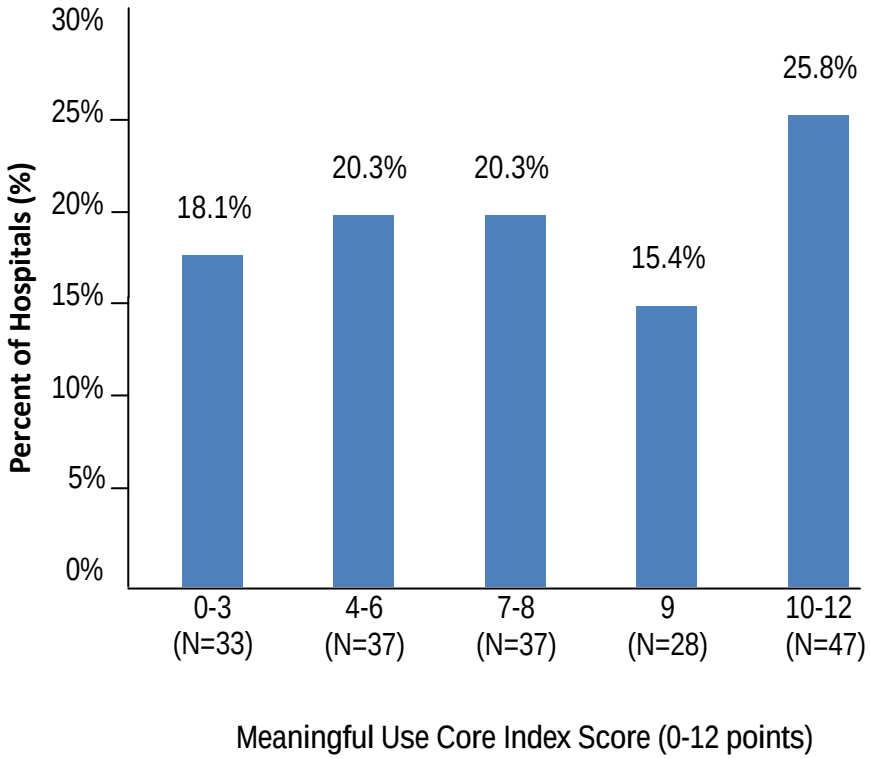
Figure 2: Distribution of Meaningful Use Core Objectives Index Score Among California Hospitals



NOTE: Mean=7.2, SD=3.3.
N=182 Hospitals

We created categories of hospitals according to their meaningful use score (0-3, 4-6, 7-8, 9, 10-12 points) (Figure 3). The first three categories had roughly the same number of hospitals, while we kept separate hospitals with a meaningful use score of 9 because by far the most hospitals were in that category compared to most other categories.

Figure 3: Distribution of CA Hospitals, by Meaningful Use Score



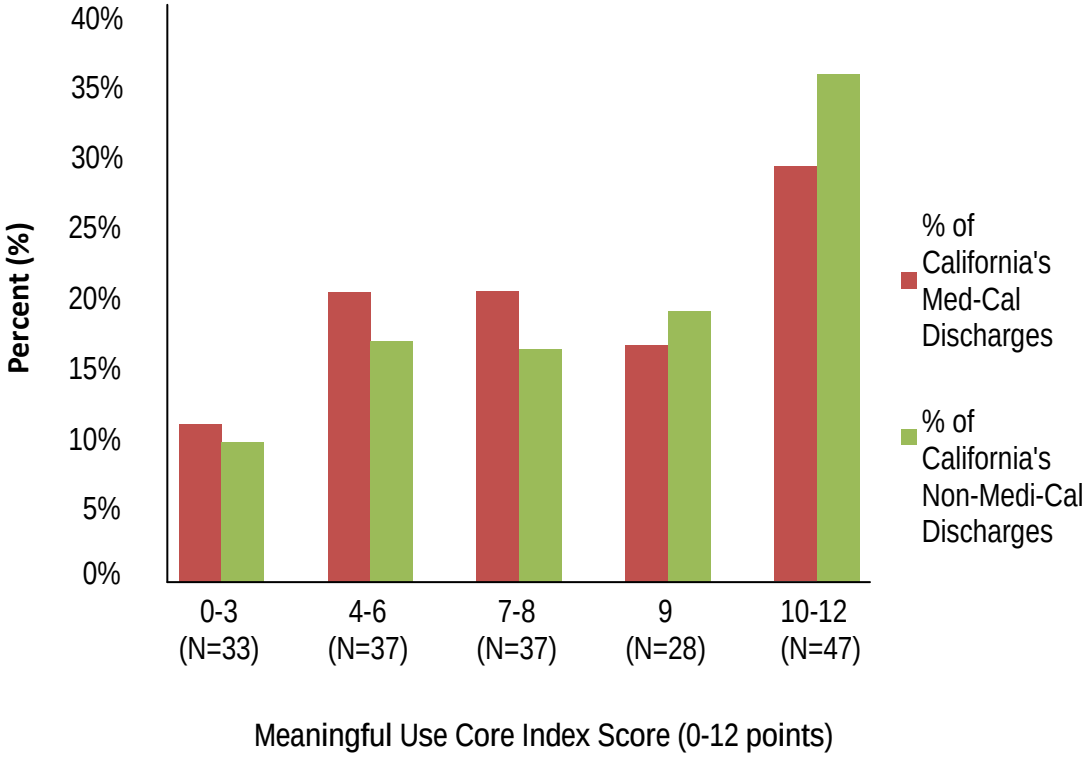
NOTE: N=182 Hospitals

Medi-Cal Discharges and Meaningful Use

Using several approaches, we examined the association between the extent to which hospitals serve Medi-Cal patients, and their meaningful use score. Overall, we found a pattern of Medi-Cal patients being served in hospitals with lower meaningful use scores. The first finding shows that pattern most definitively, whereas the other findings provide additional views on essentially the same phenomenon.

Compared to non-Medi-Cal discharges, more Medi-Cal discharges were in hospitals in the three lowest meaningful use categories, and fewer Medi-Cal discharges were in hospitals in the two highest meaningful use categories (Figure 4).

Figure 4: Percent of Medi-Cal Discharges and Non-Medi-Cal Discharges, by Category of Meaningful Use Score



NOTES:

For the 182 respondent hospitals, the total number of Medi-Cal discharges in a 12-month period in 2009-2010 was 492,334, and Non-Medi-Cal Discharges was 1,531,724.

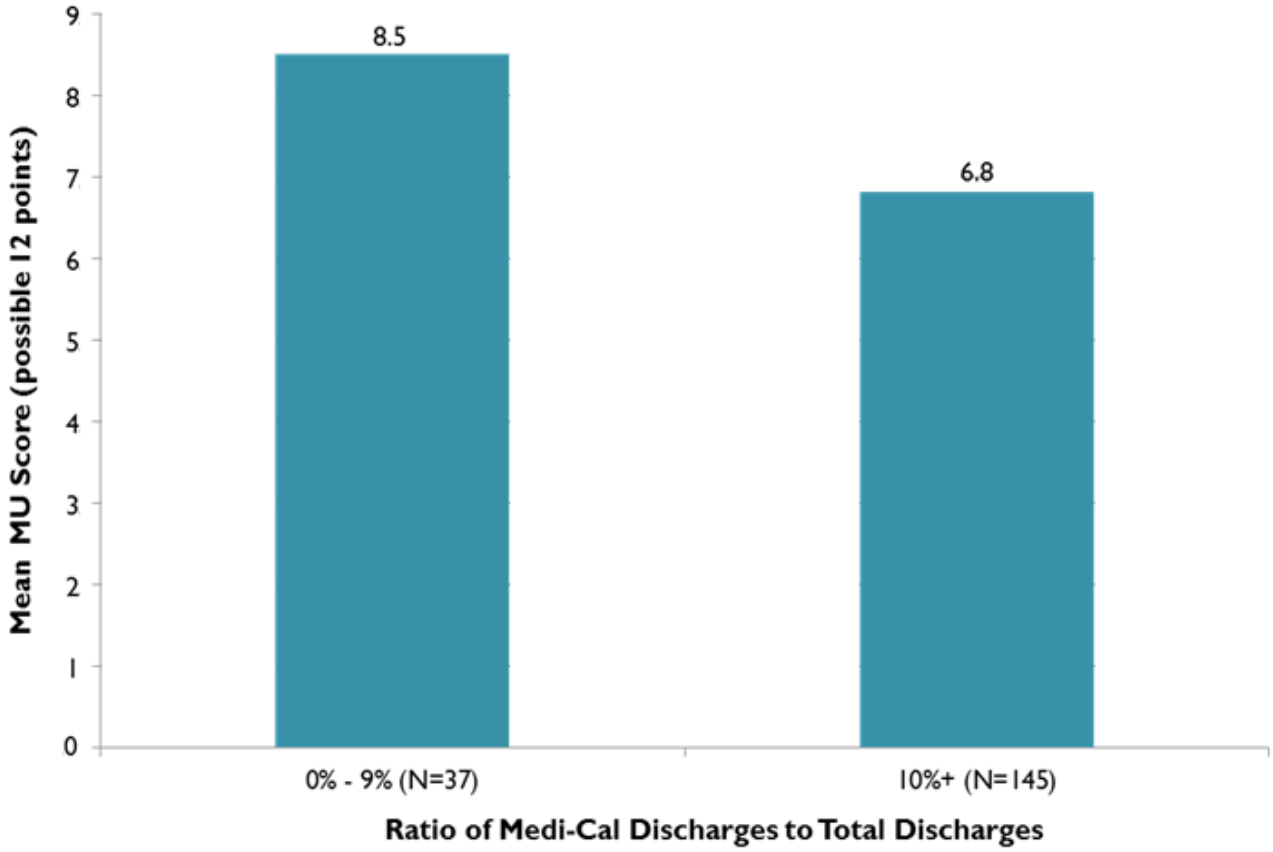
Paired samples t-test of significance of the difference between values for Medi-Cal discharges and non-Medi-Cal discharges: $p<0.001$.

N=182 Hospitals

We divided California hospitals into those that are eligible for the Medicaid EHR Incentive Program (Medi-Cal discharges accounted for 10% or more of all discharges) and those that are ineligible (all others) and looked at their mean meaningful use scores (Figure 5).

Hospitals that had sufficient Medi-Cal volume to meet Medi-Cal eligibility criteria had a mean meaningful use score that was significantly lower than hospitals that did not meet the eligibility criteria.

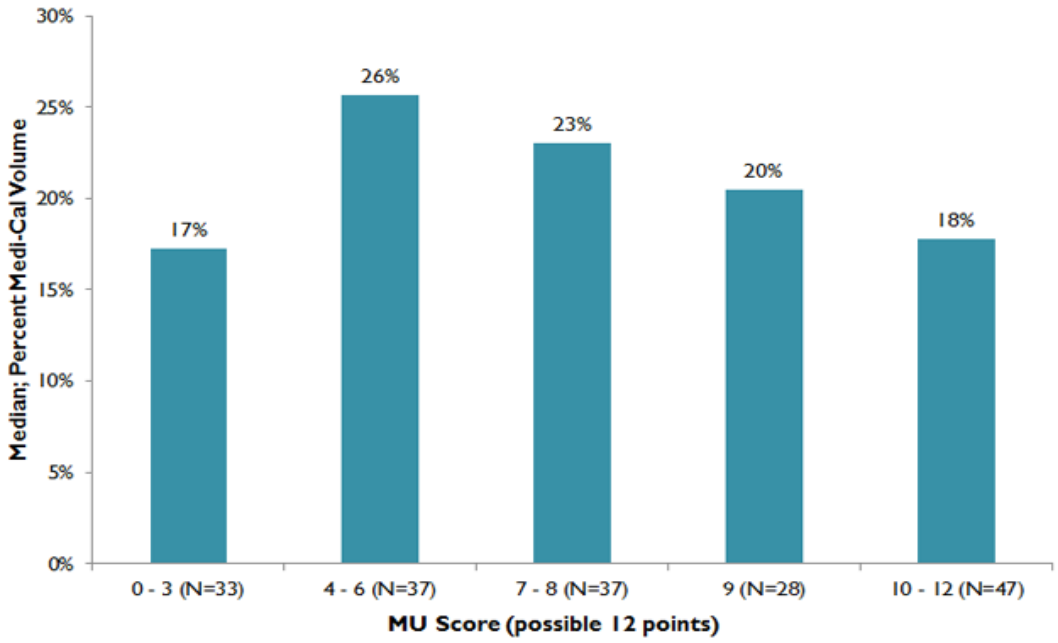
Figure 5: Meaningful Use Scores for Hospitals Meeting Medi-Cal Volume Criteria for Incentive Program (10%+ of Total Discharges) Compared to All Other Hospitals



NOTE: Unpaired t-test of significance of the difference between means: p=0.005.
N=182 Hospitals

Medi-Cal volume (as a percent of total discharges) declined with increases in meaningful use scores, except for hospitals with the lowest meaningful use scores (and smallest proportion of California patient discharges) (Figure 6).

Figure 6: Association Between Medi-Cal Hospital Value (Medians) and Meaningful Use Score



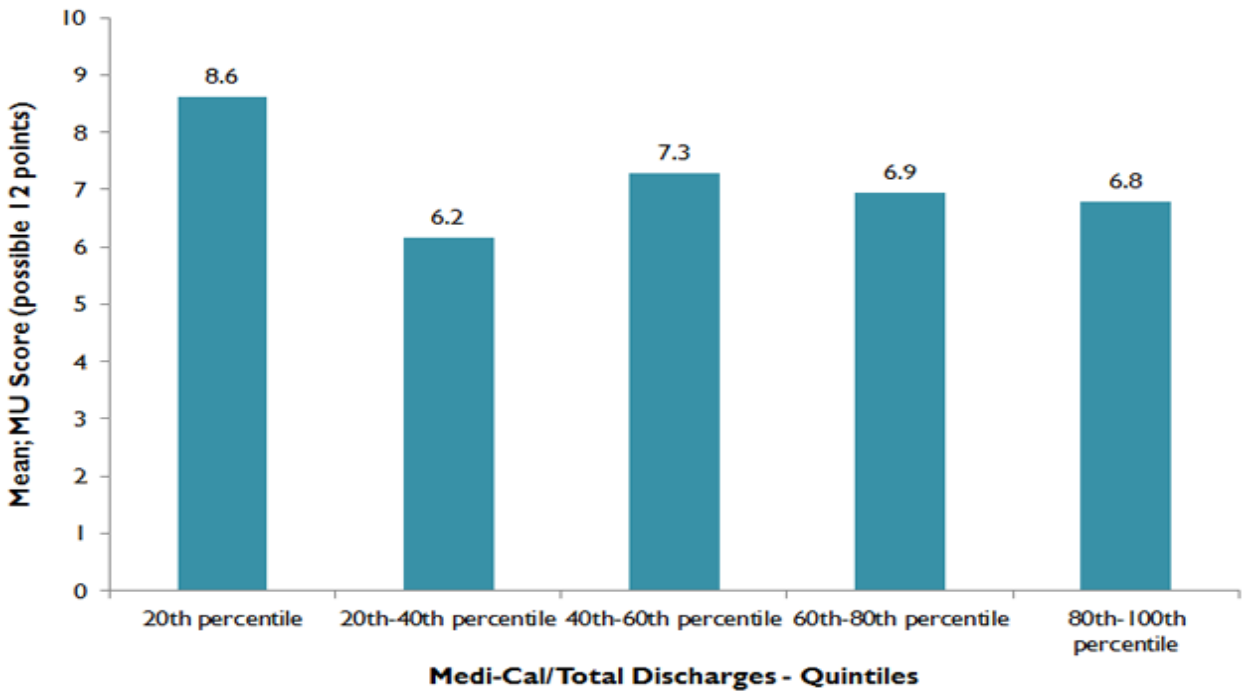
NOTES:

ANOVA test of significance of the difference between medians: p=0.051. N=182 Hospitals

Medi-Cal Volume is the percent of all hospital discharges paid by Medi-Cal, expressed here as a median.

We divided hospitals into quintiles according to Medi-Cal volume, and displayed the mean meaningful use score for each category. The hospitals with the fewest Medi-Cal patients (i.e., that were in the bottom quintile of Medi-Cal discharges as a percent of total discharges) had the highest mean meaningful use score; there was no clear pattern for the other quintiles (Figure 7).

Figure 7: Mean Meaningful Use Score for Quintiles of the Medi-Cal Volume

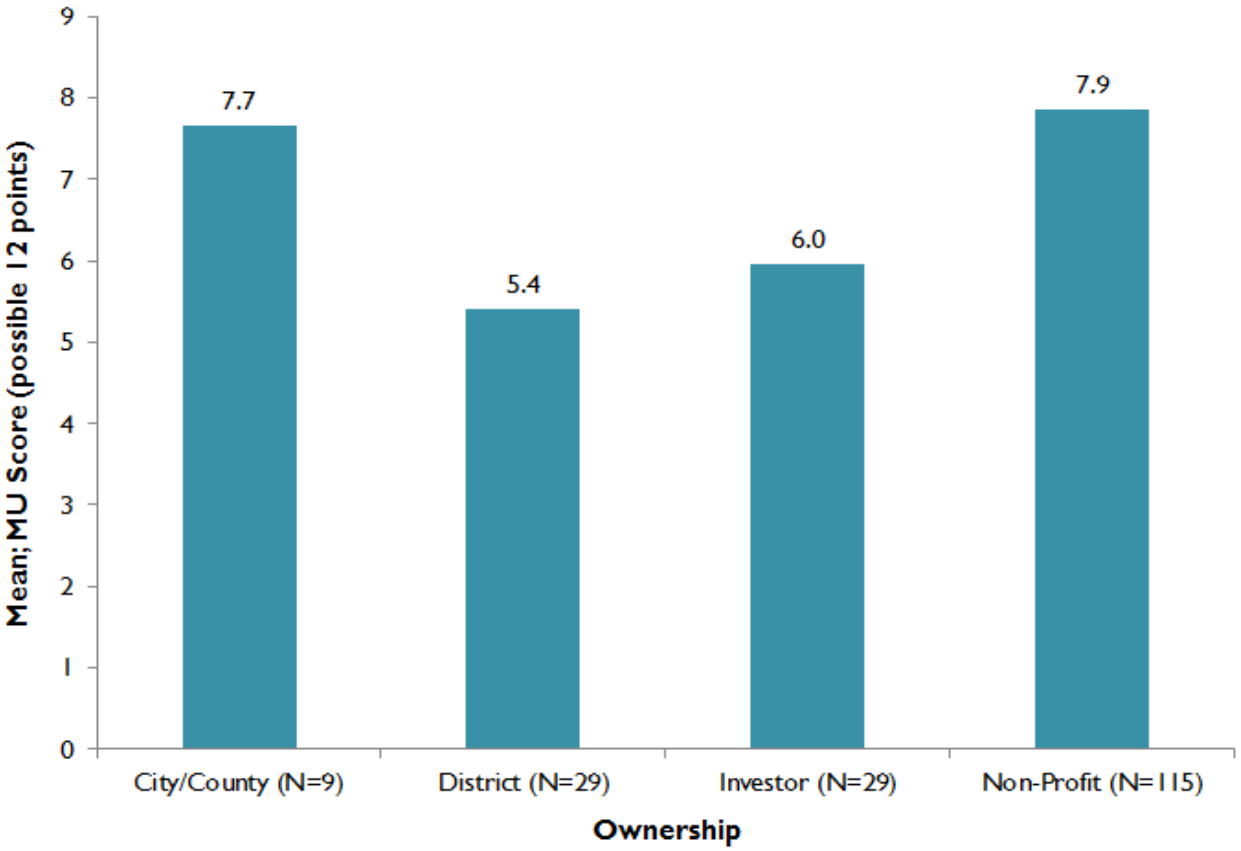


NOTE: ANOVA test of significance of the difference between means: p=0.026.
N=182 Hospitals

Hospital Ownership and Size and Meaningful Use Score

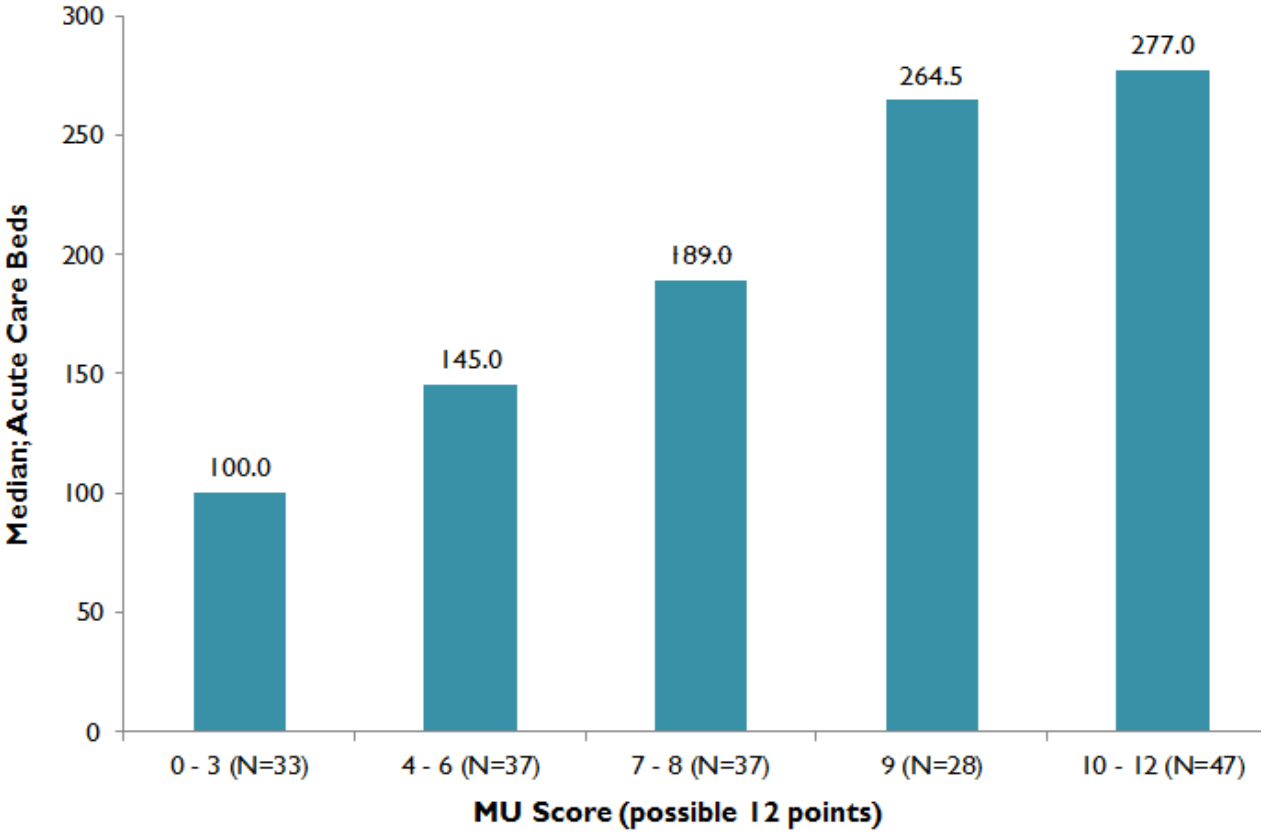
Non-profit hospitals – 63.2% of all responding hospitals – had substantially higher mean meaningful use scores (7.9) than did investor-owned hospitals and district hospitals (6.0 and 5.4, respectively) (Figure 8). Larger hospital size was also associated with higher meaningful use scores (Figure 9).

Figure 8: Mean Meaningful Use Scores by Categories of Hospital Ownership



NOTE: ANOVA test of significance of the difference between means: p<0.001.

Figure 9: Mean Meaningful Use Score by Hospital Size



NOTE: ANOVA test of significance of the difference between means: p<0.001.

Characteristics of High vs. Low Scoring Hospitals

In 2010, over one-quarter (25.8%) of California hospitals scored between 10 and 12 points, out of a possible 12, on the meaningful use core objectives index. These 47 responding high-scoring hospitals accounted for 35% of all California discharges, and 30% of Medi-Cal discharges. These high-scoring respondent hospitals included all 10 Kaiser hospitals, 4 of the 5 children's hospitals, and 8 of 15 teaching hospitals; they included only 3 of the 36 small/rural hospitals. High-scoring hospitals were relatively large (the median number of licensed acute care beds was 277) and had a moderate ratio of Medi-Cal discharges to total discharges (the median was 17.8%)

In contrast, 38.5% of responding California hospitals scored between 0-6 points, out of a possible12, on the meaningful use core objectives index. These 70 low-scoring hospitals accounted for 29% of all California discharges, and 32% of Medi-Cal discharges. Among respondents, these hospitals included 23 of the 36 small/rural hospitals, but only 2 of the 15 teaching hospitals. Compared to the high-scoring hospitals, low-scoring hospitals were much smaller (the median number of licensed acute care beds was115 beds) and a somewhat higher ratio of Medi-Cal discharges to total discharges (the median was 22.9%).

Unlikely to Implement – Spotlight on Computerized Provider Order Entry for Medications

Since CPOE is challenging to implement and use, it can be the most important obstacle to achieving widespread EHR meaningful use for California hospitals. Table 6 shows the percent of hospitals that had achieved each meaningful use core or menu objective (middle column of Table 6) and the percent of hospitals that responded that they were not likely to implement (see description of this response category below) the objective (right-most column of Table 6).

More than one-quarter of responding California hospitals – responsible for 27.4% of Medi-Cal discharges, and 16.2% of California's non-Medi-Cal discharges – reported that they were unlikely to implement CPOE for medications. A smaller fraction of hospitals reported that were unlikely to implement any of the other meaningful use objectives.

Table 6: Percent of Hospitals Unlikely to Implement Meaningful Use Objectives

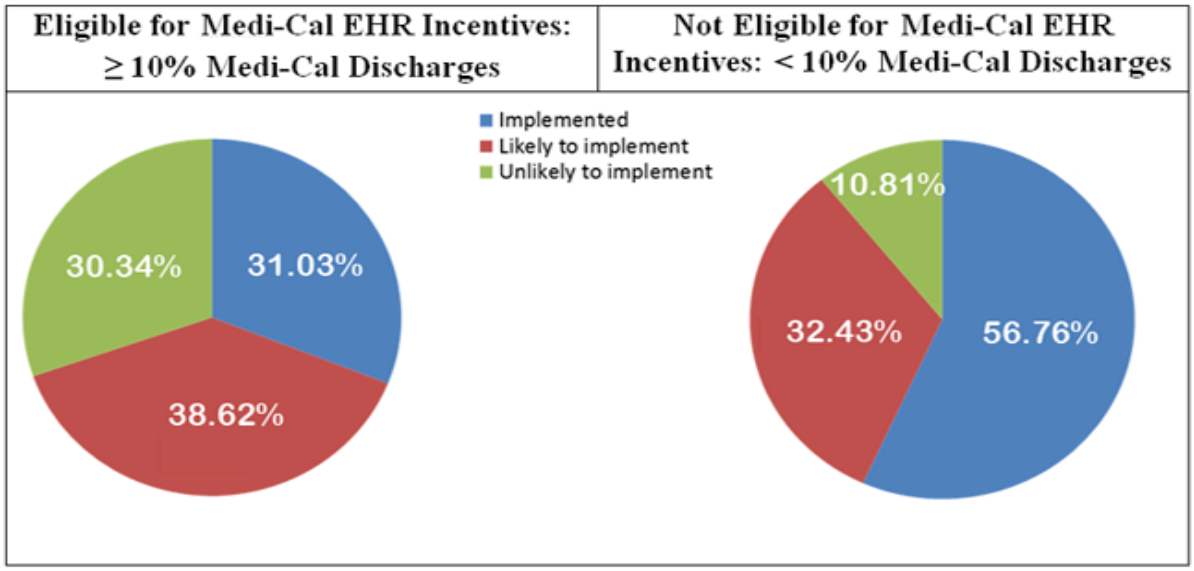
	Meaningful Use Objective	**% Hospitals Implemented**	**% Hospitals Unlikely to Implement**
CoreCore Objectives	*Report HQA and PQRI quality measures*	21.4	*n/a*
	Give patients electronic copy of health info	35.7	*n/a*
	Use CPOE-Medications	**36.3**	**26.4**
	Maintain up-to-date problem list	45.6	19.8
	Implement drug-drug and drug-allergy checks	63.2	14.8
	Record vital signs	64.8	13.7
	Record smoking status	74.2	11.5
	Discharge summaries	73.1	10.4
	Maintain active medication list	69.8	10.4
	Maintain comprehensive list of allergies	74.2	9.9
	Implement at least 1 of 6 clinical decision rules	69.2	9.9
	Record key demographics	88.5	4.4
Menu Objectives	*Perform medication reconciliation*	57.1	*n/a*
	Record advanced directives	53.8	23.1
	Summary care record for relevant transitions in care	55.5	20.3
	Laboratory reports	89.6	6.0

NOTE: The objectives italicized and with "n/a" under "% Hospitals Unlikely to Implement" did not have answer choices in the AHA Annual Survey Information Technology Supplement that could be interpreted as "unlikely to implement." N=182 Hospitals

Figure 10 displays the extent of implementation of computerized provider order entry (CPOE) for medications, among hospitals with greater than or equal to 10 percent Medi-Cal discharges (eligible for Medicaid EHR incentives) and less than 10 percent Medi-Cal discharges (not eligible for Medicaid EHR incentives).

Consistent with the results in the previous section, hospitals eligible for Medi-Cal EHR incentives (left pie chart) were far less likely to have implemented CPOE (31% vs. 57%), and were more likely to not implement CPOE (30% vs. 11%), than were hospitals not eligible for EHR incentives (right hand
side pie chart) (Figure 10).

Figure 10: Extent of Implementation of Computerized Provider Order Entry for Medication, by Medi-Cal Volume (Percent Medi-Cal Discharges)



NOTE: Chi-square test of significance of the difference between counts: p=0.007. N=182 Hospitals

Not surprisingly, compared to hospitals who had implemented or were likely to implement CPOE for medications, hospitals that were not likely to implement CPOE for medications had significantly lower meaningful use scores [mean=5.3; p<0.001]; had fewer licensed acute care beds [mean=157.2; p=0.002]; and were much more likely to be rural [p<.001].

When we looked at *all* meaningful use objectives, 66 of 182 hospitals (36.3%) were unlikely to meet at least one of the 10 core meaningful use objectives for which there was an "unlikely to implement" response choice. The 66 hospitals accounted for 34.4% of Medi-Cal discharges, and 23.9% of non-Medi- Cal discharges.

Health Information Exchange

The AHA Annual Survey Information Technology Supplement included questions on the extent of regional health information exchange (HIE) participation by hospitals.

Overall, participation in regional HIE efforts was modest. Specifically:

- 37% of hospitals are in an area with a regional HIE entity (for example, the Orange County or LA regional HIE entities);
- 18% of hospitals participate in regional HIE entity;
- 39% of hospitals do NOT participate in a regional HIE entity but have electronic framework to do so; and
- 42% of hospitals do NOT participate in a regional HIE entity and do NOT have electronic framework to do so.

The extent to which hospitals are exchanging data varies according to type of data and whether the exchange is with affiliated or unaffiliated hospitals and providers (Table 7). Overall, the most progress has been made in exchanging data with ambulatory care providers and hospitals within a health care system, with modest progress made in exchanging data with ambulatory care providers outside the system, and very little progress in exchanging data with unaffiliated hospitals.

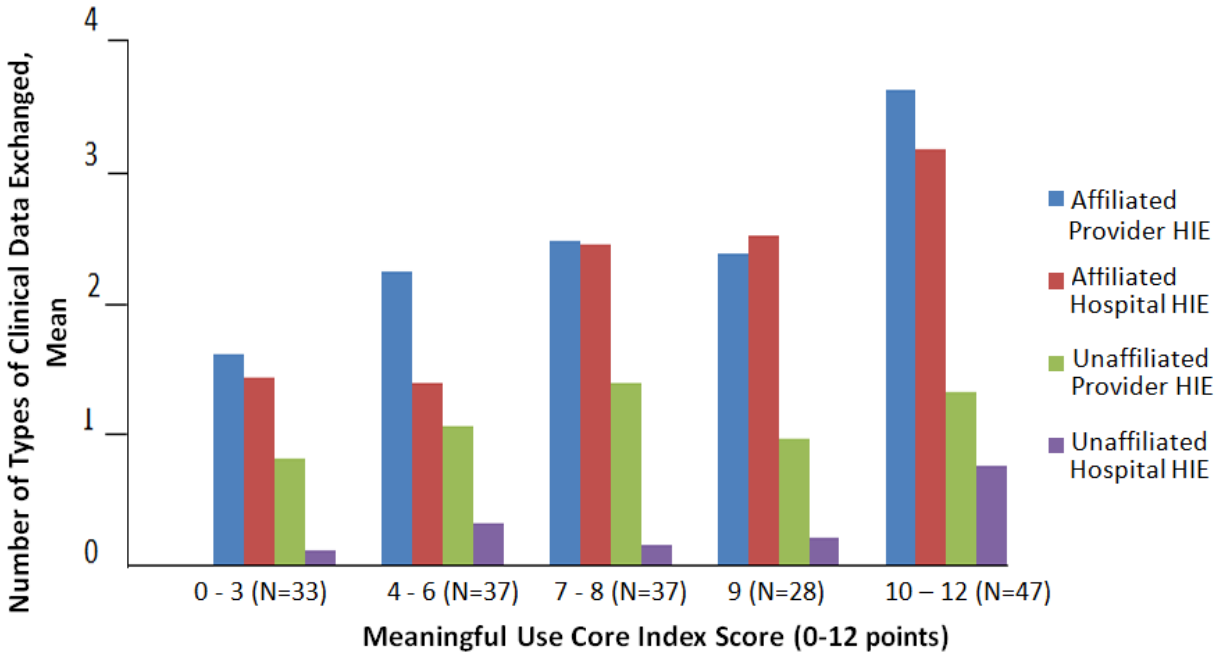
Table 7: Percent of CA Hospitals Exchanging Health Information with Affiliated vs. Unaffiliated Providers

	Affiliated entities/providers		**Unaffiliated entities/providers**	
Type of clinical data exchanged	With ambulatory care providers inside system	With hospitals inside system	With ambulatory care providers outside system	With hospitals outside system
Patient demographics	56.8%	48.6%	25.1%	7.7%
Laboratory results	56.8%	47.0%	33.3%	9.8%
Radiology reports	57.4%	45.9%	30.1%	9.3%
Clinical care record (clinical hist, exam)	40.4%	40.4%	12.0%	4.4%
Medication history	40.4%	39.9%	12.0%	3.8%
At least 1 type of data	62.3%	52.5%	38.3%	12.6%
All 5 types of data	21.3%	37.7%	9.8%	2.7%

N=182 Hospitals

We also explored the association between progress toward meaningful use and health information exchange for California hospitals (Figure 11). Not surprisingly, hospitals with higher meaningful use scores tended to have implemented more of all types of HIE, compared to hospitals with lower meaningful use scores.

Figure 11: Average Number of Different Types of Data Exchanged, by Meaningful Use Score



NOTES:

ANOVA test of significance of the difference between means: Affiliated Provider HIE (p=0.001); Affiliated Hospital HIE (p=0.002); Unaffiliated Provider HIE (p=0.587); and Unaffiliated Hospital HIE (p=0.038).

N=182 Hospitals

Summary of Findings

- The AHA dataset was a relatively good source of data for the purpose of determining California hospitals' progress towards achieving EHR meaningful use objectives and gaining EHR incentive payments. However, the AHA dataset also had its limitations: the response rate was modest and varied by type of hospital, while the questions on health information exchange were too general to elicit much information on the actual state of HIE. More granular information is needed, in order to anticipate challenges in meeting Stage 2 EHR meaningful use objectives that will require substantially more challenging data exchange than the Stage 1 objectives--especially for electronic exchange of Continuity of Care Documents.

- This analysis showed that most California hospitals had made some real progress towards meeting Stage 1 EHR meaningful use objectives, and likely would obtain EHR incentive payments. Nevertheless, achieving those objectives varied a great deal by type of hospitals, and implementing CPOE presents a difficult challenge in achieving EHR meaningful use for most hospitals.

- Of concern to OHIT, a higher proportion of Medi-Cal-focused hospitals tended to have lower meaningful use scores, as did smaller, rural, or investor-owned hospitals. Moreover, 26.4% of California hospitals reported that they were unlikely to meet the most difficult meaningful use objective (implementing CPOE) in the foreseeable future; such hospitals tended to be Medi-Cal focused, smaller and in rural locations.

- Data exchange was modest among affiliated providers and hospitals within a system, was less among unaffiliated providers, and was least among unaffiliated hospitals. This could pose challenges for meeting Stage 2 EHR meaningful use objectives, which will require more HIE capabilities to do so.

Recommendations

Over one-quarter of California hospitals responding to the survey were unlikely to meet Stage 1 EHR meaningful use objectives, and many of those hospitals were eligible for Medi-Cal EHR incentive payments. We recommend that:

- OHIT conduct a follow-up qualitative survey of selected hospitals struggling to meet Stage 1 objectives, in order to better understand factors preventing hospitals from benefiting from the EHR incentive program. This would better enable OHIT to devise policy initiatives (such as a technical assistance program) that could help such hospitals gain EHR meaningful use incentive payments.

- OHIT use the 2010 and 2011 AHA data to identify: a) a fuller list of specific hospitals that responded to the survey and are not likely to obtain Stage 1 EHR meaningful use payments (since some hospitals will have responded to one or another of the surveys, but not both), and b) specific hospitals that did not respond to the survey, and are unlikely to obtain Stage 1 EHR meaningful use payments. We suggest using the characteristics of those hospitals that responded and not likely to achieve meaningful use to identify those non-responding hospitals that have a high likelihood of not achieving EHR meaningful use.

- OHIT supplement the AHA data collection efforts in future years, by conducting a more in-depth survey of hospitals that are actually or potentially struggling to meet Stage 1 objectives, especially those that are eligible for Medi-Cal meaningful use incentives. That supplementary data would enable OHIT to devise specific policies to help such hospitals meet those objectives--for example, using federally matched funding and/or additional private foundation funding to provide bridge loans, grants, or technical assistance to struggling hospitals.

- OHIT may want to focus more attention on hospitals' HIE capabilities, since they are much more important in meeting Stage 2 EHR meaningful use objectives that they were in meeting Stage 1 objectives. We anticipate that future versions of the AHA survey will contain information on Stage 2 EHR meaningful use objectives and measures on HIE capabilities that enable meeting those objectives. We recommend that OHIT work with Cal eConnect to analyze such data as soon as possible because such HIE capabilities may be among the more (or the most) difficult to implement in order to meet Stage 2 EHR meaningful use objectives -- and therefore may require early policy intervention to help those hospitals struggling to meet Stage 2 objectives.

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Appendix 1: Authors

Diane R. Rittenhouse, MD, MPH
Diane Rittenhouse is Associate Professor of Family Medicine and Health Policy at the University of California, San Francisco. Her principal research interest lies at the intersection of social policy and clinical quality, particularly with regard to the organization, delivery and financing of primary care. She has received a Generalist Physician Faculty Scholar award from the Robert Wood Johnson Foundation. Dr. Rittenhouse is co-investigator for the National Study of Physician Practices funded by the Robert Wood Johnson Foundation. She is Principal Investigator for the evaluation of federal efforts to restore, expand and improve primary care services in Greater New Orleans following Hurricane Katrina, and for a qualitative study of the implementation of new models of primary care in the safety-net. She has published in peer-reviewed journals, including the New England Journal of Medicine and the Journal of the American Medical Association, on topics including innovations in primary care delivery and policies impacting the primary care workforce and delivery system. Dr. Rittenhouse has been invited to speak to members of the U.S. Congress on the role of the primary care in health reform.

Dr. Rittenhouse is a core faculty member of the Phillip R. Lee Institute for Health Policy Studies at UC San Francisco. She holds an M.D. and an M.P.H. with an emphasis in Health Policy and Management from the University of California. She completed post-doctoral research fellowships at the Philip R. Lee Institute for Health Policy Studies and the Department of Family and Community Medicine at UCSF prior to joining the faculty. Prior to her medical training she worked for both the California Statewide Office of Health Planning and Development, and for the Deputy Assistant Secretary for Health in Washington, D.C.

Robert H. Miller, PhD
Robert Miller is Adjunct Professor of Health Economics at the Institute for Health & Aging, University of California San Francisco (UCSF). He received his doctorate in economics from the University of Michigan in 1987, and has been a UCSF faculty member since 1989.

Dr. Miller conducts research on economic, organizational, and health policy issues affecting health information technology (HIT) use, with a focus on electronic health record (EHR) services and regional health information exchange (HIE). Dr. Miller is especially interested in EHR and HIE use for efficiency and quality improvement in safety-net organizations and small practices that serve Medicaid-insured and uninsured patients.

Currently, Dr. Miller is evaluating the $38.8 million federally-funded State HIE Cooperative Agreement Program award for the California Health & Human Services Agency, Office of Health Information Integrity. Dr. Miller recently completed a Commonwealth Fund-sponsored description and analysis of five organizations, including three California IPAs, that are providing EHR services to small practices.

Among past work, he analyzed barriers to financing clinical information systems in California health care delivery system organizations (for the Governor's HIT Financing Advisory Commission, California Department of Health and Human Services).

Dr. Miller was lead author on articles on: California health care organizations' efforts to satisfy patient-consumer principles for health information exchange (*Health Affairs 2012),* financing clinical information systems in California (*Health Affairs* 2009); the demise of the Santa Barbara regional health information exchange (*Health Affairs* 2007); the value of EHRs in community health centers (*Health Affairs* 2007) and solo or small groups (*Health Affairs* 2005); and barriers to EHR use in large organizations (*Health Affairs* 2004). In other past work, Dr. Miller published literature analyses comparing HMO versus non-HMO plan performance, as well as other analyses on the effects of managed care on physician organizations and on long-term care for the elderly.

Dr. Miller is a member of the Investment Advisory Committee for the United Health Group California Health Care Investment Program and of the Cal eConnect Business Advisory Group; he is a consultant to research projects and he has served as a member of expert and advisory panels, workshops, and committees on HIT adoption and use.

Kevin J. Wu, MPH

Kevin Wu is Project Director at the Department of Family and Community Medicine at the University of California, San Francisco. He has worked with Dr. Diane Rittenhouse since 2009 on a number of research projects, including: patient-centered medical home evaluation efforts of the post- Hurricane Katrina New Orleans safety-net primary care system; a national comparative case study project examining physician groups scoring low and high on quality and care management processes measures; and the Crescent City (New Orleans) Beacon Collaborative process evaluation.

Mr. Wu holds an M.P.H. with an emphasis in Health Behavior and Health Education from the University of North Carolina at Chapel Hill's Gillings School of Global Public Health. He also holds a B.S. in Public Health and a B.S. in Molecular & Cell Biology from the University of California, Berkeley.

Appendix 2: 2009 American Hospital Association Annual Survey – Information Technology Supplement

Field	Field Description
ID	AHA Identification Number
MCRNUM	Medicare Provider ID
MNAME	Hospital name (from membership)
MLOCADDR	Street address (from membership)
MLOCCITY	City (from membership)
MLOCSTCD	State code (from membership)
MLOCZIP	ZIP code (from membership)
BDTOT	Total facility beds set up and staffed
MCNTRL	Control/ownership (from membership)

Key

Government, nonfederal
12 = State
13 = County
14 = City
15 = City-county
16 = Hospital district or authority

Nongovernment, not-for-profit
21 = Church operated
23 = Other

Investor-owned, for-profit
31 = Individual
32 = Partnership
33 = Corporation

Government, federal
41 =Air Force
42 = Army
43 = Navy
44 = Public Health Service other than 47
45 = Veterans Affairs
46 = Federal other than 41-45, 47-48
47 = Public Health Service Indian Service
48 = Department of Justice

Field	Field Description
MSERV	Primary service code (from membership)

Key

10 = General medical and surgical
11 = Hospital unit of an institution (prison hospital, college infirmary, etc.)
12 = Hospital unit within an institution for the mentally retarded
13 = Surgical
22 = Psychiatric
33 = Tuberculosis and other respiratory diseases
41 = Cancer
42 = Heart
44 = Obstetrics and gynecology
45 = Eye, ear, nose and throat
46 = Rehabilitation
47 = Orthopedic
48 = Chronic disease
49 = Other specialty
50 = Children's general
51 = Children's hospital unit of an institution
52 = Children's psychiatric
53 = Children's tuberculosis and other respiratory diseases
55 = Children's eye, ear, nose and throat
56 = Children's rehabilitation
57 = Children's orthopedic
58 = Children's chronic disease
59 = Children's other specialty
62 = Institution for mental retardation
80 = Acute Long-Term Care
82 = Alcoholism and other chemical dependency
90 = Children's acute long-term

1a. Does your hospital have a computerized system which allows for:	Field Name
Electronic clinical documentation	
a. Patient demographics	q1_a1
b. Physician notes	q1_b1
c. Nursing notes	q1_c1
d. Problem lists	q1_d1
e. Medication lists	q1_e1
f. Discharge summaries	q1_f1
g. Advanced directives	q1_g1
Results viewing	
a. Laboratory reports	q1_a2
b. Radiology reports	q1_b2
c. Radiology images	q1_c2
d. Diagnostic test results	q1_d2
e. Diagnostic test images	q1_e2
f. Consultant reports	q 1_f2
Computerized provider order entry	
a, Laboratory tests	q1_a3
b. Radiology tests	q1_b3
c. Medications	q1_c3
d. Consultation requests	q1_d3
e. Nursing orders	q1_e3
Decision support	
a. Clinical guidelines	q1_a4
b. Clinical reminders	q1_b4
c. Drug allergy alerts	q1_c4
d. Drug-drug interaction alerts	q1_d4
e. Drug-lab interaction alerts	q1_e4
f. Drug dosing support	q1_f4
Bar coding	
a. Laboratory specimens	q1_a5
b. Tracking pharmaceuticals	q1_b5
c. Pharmaceutical administration	q 1_c5
d. Patient ID	q1_d5
Other functionalities	
a. Telemedicine	q1_a6
b. Radio frequency ID	q1_b6
c. Physician use of personal data assistant	q1_c6

Key

1 = Fully implemented across all units
2 = Fully implemented in at least one unit
3 = Beginning to implement in at least one unit
4 = Have resources to implement in the next year
5 = Do not have resources but considering implementing
6 = Not in place and not considering implementing

1b. Does your hospital have a computerized system which allows for:

Electronic clinical documentation	
a. Name, address, contact information	q1_b1a
b. Gender and date of birth	q1_b1b
c. Race and ethnicity	q1_b1c
d. Insurance type	q1_b1d
e. Preferred language for communication with providers of care	q1_b1e
f. Vital signs	q1_b1f
g. Height and weight and BMI displayed	q1_b1g
h. Smoking status	q1_b1h
i. Comprehensive list of allergies (including medication	q1_b1i
j. Summary care record for relevant transitions in care	q1_b1j
Results viewing	
a. Generation of a table or graph displaying patient specific lab results over time	q1_b2a
Decision support	
a. Advice on diagnosis	q1_b3a

Key
1 = Fully implemented across all units
2 = Fully implemented in at least one unit
3 = Beginning to implement in at least one unit
4 = Have resources to implement in the next year
5 = Do not have resources but considering implementing
6 = Not in place and not considering implementing

2. Does your electronic system allow you to do the following?	**Field Name**
a. Develop a list of a patient's current medications	q2_a
b. Compare a patient's inpatient and preadmission medication lists	q2_b
c. Provide an updated medication list at time of discharge	q2_c
d. Automatically generate Hospital Quality Alliance (HQA) measures	q2_d
e. Automatically generate Physician Quality Reporting Initiative (PQRI) measures	q2_e

Key
1 = Yes
2 = No
3 = Do not know

3. Do any arrangements exist in your area to share electronic patient-level clinical data through an electronic health information exchange (HIE) or a regional health information organization (RHIO)? q3

Key
1 = Arrangement (s) exist (s)
2 = Arrangement (s) do not exist (s)

3a. Please indicate your level of participation in a regional health information exchange (HIE) or regional health information organization (RHIO)? q3a

Key
1 = Participating and actively exchanging data in at least one HIE/RHIO
2 = Have the electronic framework to participate but not participating in any HIE/RHIO at this time
3 = Do not have the electronic framework to participate and not participating in any HIE/RHIO at this time

4. Does your hospital electronically exchange any of the following patient data with any of the providers listed below? (check all that apply)	**Field Name**
a. Patient demographics	
With hospitals in your system	q4a_1
With hospitals outside your system	q4a_2
With ambulatory providers inside your system	q4a_3
With ambulatory providers outside your system	q4a_4
b. Clinical care record	
With hospitals in your system	q4b_1
With hospitals outside your system	q4b_2
With ambulatory providers inside your system	q4b_3
With ambulatory providers outside your system	q4b_4
c. Laboratory results	
With hospitals in your system	q4c_1
With hospitals outside your system	q4c_2
With ambulatory providers inside your system	q4c_3
With ambulatory providers outside your system	q4c_4
d. Medication history	
With hospitals in your system	q4d_1
With hospitals outside your system	q4d_2
With ambulatory providers inside your system	q4d_3
With ambulatory providers outside your system	q4d_4
e. Radiology reports	
With hospitals in your system	q4e_1
With hospitals outside your system	q4e_2
With ambulatory providers inside your system	q4e_3
With ambulatory providers outside your system	q4e_4

Key
1 = Yes
2= No

5. In what year did you first deploy an EMH/EHR?	**q5**

6. Does your electronic system allow you to do the following?	**Field Name**
a. Check insurance eligibility	q6a
b. Submit claims electronically to both public and private payers	q6b
c. Send reminders to patients for pre-admission and/or follow-up care	q6c
d. Capture patient consents or authorization electronically	q6d

Key
1 = Yes
2 = No
3 = Do not know

7. Is your current system capable of providing patients with an electronic copy of their health information that includes all of the following functionalities: diagnostic test results, problem lists, medication lists, and allergies? **q7**

Key
1 = Yes
2 = No
3 = Do not know

7a. Through what mechanism (s) are you currently providing this electronic information? (Please check all that apply)	**q7a**
a. PHR	q7a_1
b. Patient portal	q7a_2
c. Secure message	q7a_3
d. USB drive or other physical device	q7a_4
e. Other (please list_____)	q7a_5_other
f. None	q7a_6

Key
1 = Yes
2 = No

8. Do you intend to apply for Medicare or Medicaid incentive payments for meaningful use of health IT? **q8**

Key

1. Yes, Medicare
2. Yes, Medicaid
3. Both Medicare and Medicaid
4. Neither
5. Undecided
6. Do not know

8a. In what federal fiscal year (Oct.1-Sept. 30) do you plan to make your first application? **q8a**

Key
2011
2012
2013
2014
2015
2016 - Medicaid only
After 2016 - Medicaid only
Do not know

8b. Why are you not pursuing or unsure whether you will pursue Medicare/Medicaid meaningful use incentive payments? (Please check all that apply) **q8b**

a. Cost - including acquisition and maintenance	q8_b1
b. Lack of access to capital	q8_b2
c. Resistance to implementation	q8_b3
d. Concerns about security or liability for privacy breaches	q8_b4
e. Uncertainty about certification process	q8_b5
f. Lack of vendor capacity	q8_b6
g. Lack of adequate IT personnel in the hospital to support implementation/maintenance	q8_b7
h. Challenge of meeting all meaningful use criteria within implementation timeline	q8_b8
i. Other	q8_b9
(specify)	q8b9_other

Key
1 = Yes
2 = No

8c. Of those selected from 8b, please indicate the single largest barrier to reaching meaningful use. **q8c**

Key
1 = Cost - including acquisition and maintenance
2 = Lack of access to capital
3 = Resistance to implementation

4 = Concerns about security or liability for privacy breaches
5 = Uncertainty about certification process
6 = Lack of vendor capacity
7 = Lack of adequate IT personnel in the hospital to support implementation/maintenance
8 = Challenge of meeting all meaningful use criteria within implementation timeline
9 = Other (specify)

9. Which two specific proposed meaningful use criteria will or would be the most challenging to achieve? (Please select only two)

a. Implement clinical decision support (CDS) rules	q9_1
b. Implement computerized provider order entry (CPOE) at specified level of sophistication	q9_2
c. Exchange clinical information with other providers	q9_3
d. Perform medication reconciliation across settings of care	q9_4
e. Give patients access to their data in electronic form	q9_5
f. Generate problem lists used codified data sets	q9_6
g. Generate numerator and denominator data for quality reporting directly from EHR	q9_7

Key
1 = Yes
2 = No

10. Does your IT Department currently support an infrastructure for two factor authentication (e.g., tokens or biometrics)? **q10**

Key
1 = Yes
2 = No
3 = Do not know

11. On the whole, how would you describe your EMR/EHR system? **q11**

Key
1 = A mix of products from different vendors
2 = Primarily one vendor
3 = Self-developed
4 = Not Applicable (go to question 13.)

12a. Who provides your primary inpatient EHR/EMR system? **q12a**

Key	
1 = Allscripts	
2 = Cerner	
3 = eClinical Works	
4 = Eclipsys	
5 = Epic	
6 = GE	
7 = McKesson	
8 = MED3000	
9 = Meditech	
10 = NextGen	
11 = QuadraMed	
12 = Sage	
13 = Siemens	
14 = Self-developed	
15 = Other (specify)	
Other described	q12a_other
16 = Would prefer not to disclose	

12b. Who provides your primary outpatient EHR/EMR system? **q12b**

Key
1 = Allscripts
2 = Cerner
3 = eClinical Works
4 = Eclipsys
5 = Epic
6 = GE
7 = McKesson
8 = MED3000
9 = Meditech
10 = NextGen
11 = QuadraMed
12 = Sage
13 = Siemens
14 = Self-developed
15 = Other (specify)
16 = Would prefer not to disclose

Other described	q12B_other

13. What changes, if any, are you planning for your EMR/EHR system within the next 18 months? (Check all that apply.)

Initial deployment	q13_1
Major change in vendor	q13_2
Major change in architecture	q13_3
Significant additional functionalities	q13_4
Do not know	q13_5
No major changes planned	q13_6

Key
1 = Yes
2 = No

Appendix 3: Weighting of Data

Post-Stratification Weighting was conducted with the 2011 UCSF California Hospital EHR Linked Data File to determine if the amount of non-respondents in the data file would pose a problem in interpreting unweighted data. The two variables of interest in the weighting procedure were: 'Ownership' and either 'Number of Acute Care Beds' or 'Number of Licensed Beds.' Both size categories (number of beds) were considered to see if one would show a more noticeable weighting effect than the other or not. The original categories for each variable were:

- **Ownership:**
  - City/County
  - District
  - Investor
  - Non-Profit
- **Number of Acute Care Beds:**
  - 0-99 beds
  - 100-199 beds
  - 200-399 beds
  - 400+ beds
- **Number of Licensed Beds:**
  - 0-99 beds
  - 100-199 beds
  - 200-399 beds
  - 400+ beds

Collapsed categories were then used in determining the post-stratification weights used in this weighting analysis. We had to collapse some categories in the **Ownership** and **Licensed/Acute Care Beds** variables because some cell sizes would have been too small to be meaningfully used in the weighting process.

- For the **Ownership** variable, we collapsed the 'City/County' and 'District' hospitals into one category because we were assuming they both could fall under the "public" categorization. This was also necessary to get adequate cell sizes.
- For the **Acute Care/Licensed Beds** variables, we collapsed the '200-399 beds' and '400+ beds' hospitals into one category so that we could get adequate cell sizes.

Weighting using both sets of variables (Ownership and Number of Acute Care Beds; Ownership and Number of Licensed Beds) did **not** make a significant difference. In select comparisons of means analyses, the means, standard deviations, and variances for the unweighted and weighted data are very similar. In this report and subsequent presentations of this data, we will use unweighted data.