Computerized Provider Order Entry Reduces Length of Stay in a Community Hospital

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Keywords

Computerized physician order entry system, CPOE, length of stay, meaningful use, HITECH Act

Summary

Objective: Does computerized provider order entry (CPOE) improve clinical, cost, and efficiency outcomes as quantified in shortened hospital length of stay (LOS)? Most prior studies were done in university settings with home-grown electronic records, and are now 20 years old. This study asked whether CPOE exerts a downward force on LOS in the current era of HITECH incentives, using a vendor product in a community hospital.
Methods: The methodology retrospectively evaluated correlation between CPOE and LOS on a per-patient, per-visit basis over 22 consecutive quarters, organized by discipline. All orders from all areas were eligible, except verbals, and medication orders in the emergency department which were not available via CPOE. These results were compared with quarterly case mix indices organized by discipline. Correlational and regression analyses were cross-checked to ensure validity of R-square coefficients, and data were smoothed for ease of display. Standard models were used to calculate the inflection point.
Results: Gains in CPOE adoption occurred iteratively house-wide, and in each discipline. LOS decreased in a sigmoid shaped curve. The inflection point shows that once CPOE adoption approaches 60%, further lowering of LOS accelerates. Overall there was a 20.2% reduction in LOS correlated with adoption of CPOE. Case mix index increased during the study period showing that reductions in LOS occurred despite increased patient complexity and resource utilization.
Conclusions: There was a 20.2% reduction in LOS correlated with rising adoption of CPOE. CPOE contributes to improved clinical, cost, and efficiency outcomes as quantified in reduced LOS, over and above other processes introduced to lower LOS. CPOE enabled a reduction in LOS despite an increase in the case mix index during the time frame of this study.

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Appl Clin Inform 2014; 5: 685–698
http://dx.doi.org/10.4338/ACI-2014-04-RA-0029
received: April 9, 2014
accepted: June 17, 2014
published: July 30, 2014
Citation: Schreiber R, Peters K, Shaha SH. Computerized provider order entry reduces length of stay in a community hospital. Appl Clin Inf 2014; 5: 685–698
http://dx.doi.org/10.4338/ACI-2014-04-RA-0029

1. Background and Objectives

Over the past three decades, financial constraints, scarce resources, patient preferences, and the regulatory environment exerted significant pressure on hospitals to reduce hospital length of stay (LOS) [1]. Bundled payments, along with prospective and retrospective payment reductions, as examples, have encouraged or incentivized more efficient processes and approaches to patient care [2-3]. Hospitals have responded by instituting numerous strategies to shorten patient stays, including leveraging capabilities associated with electronic medical records (EMRs) as well as relying on traditional human-dependent improvements [4-5]. Recent federal incentives legislated in the HITECH act [6] accelerated efforts to implement EMRs. A key component of certified EMRs is computerized provider order entry (CPOE). The current investigation asks if CPOE favorably affects LOS which represents a readily available composite proxy metric for clinical, cost, and efficiency outcomes.

At least six studies [7–12] suggest CPOE can contribute to shortened LOS. Five of these studies are now more than a decade old; one is over 20 years old. Only one [12] is from the past 3 years and it examines LOS only in an emergency department. The CPOE software programs used in these six studies were primarily stand-alone or home-grown products. One [9] used a commercial vendor product that was "extensively modified" and did not integrate with the hospital's pharmacy information system: pharmacists entered written orders faxed to pharmacy.

In contrast, a recent study [13] failed to show reduction in either ICU or in total hospital LOS after implementation of CPOE. However, that study was limited, as not all orders were available for CPOE and other areas of the hospital were not CPOE-enabled. Although the negative findings about CPOE and ICU LOS appear valid, their conclusion was questionable in that overall hospital LOS was unaffected because CPOE was not available outside of the ICU.

The question of whether CPOE favorably impacted LOS remained imperative. Like most organizations, institution of CPOE was phased and adoption varied throughout our hospital, including in different locations, among different disciplines, and among physicians within each discipline. This study seeks to ascertain the impact of CPOE on care efficiencies as summarized by the LOS statistic.

The hypothesis of this study is that increasing rates of CPOE adoption led to reduced LOS at a community hospital using an unmodified, vendor-supplied EMR with fully integrated pharmacy, lab, and imaging systems for ordering purposes. An additional postulate was that phased CPOE adoption by discipline caused a phased reduction in LOS within each discipline.

The analysis includes case mix index (CMI) to determine whether changes in LOS might be explainable by changes in CMI and thus less attributable to CPOE. CMI provides a standard measure for comparing cumulative patient severity of illness and resource intensity across hospitals [14], wherein hospitals with higher CMIs treat a greater number of severely ill or resource intensive patients. Although the CMI mainly affects reimbursement, it is also sensitive to diagnosis related groups and comorbid conditions which are potent and proven predictors of LOS. Exploring whether CMI changed in conjunction with CPOE adoption would affect explanations for any changes in LOS. Finally, this study sought to explore the level of CPOE adoption at which impacts on LOS begin to accelerate, once the relationship is established.

To answer the CPOE-LOS question required a quasi-experimental retrospective correlational design [15], relating changes in LOS with CPOE adoption rates throughout the organization and within different disciplines. To our knowledge there have been no such studies, and none in the current healthcare environment.

2. Methods

The methodology quantified the correlation of CPOE adoption with LOS while considering CMI. We did not control for other projects and initiatives affecting LOS during the study period.

Holy Spirit Hospital is a suburban community hospital in Pennsylvania with 270 acute care beds. The medical staff is responsible for all inpatient orders. Many of the physician groups have physician assistants and some have specified practice RNs who assist in entering orders. The hospital enjoys affiliation with a local university medical center, and with several medical, nursing, and physician assistant (PA) schools within Pennsylvania and elsewhere. There are a handful of medical students, several PA students, and numerous nursing students, and only one or two residents, usually on the surgical service.

In the second quarter of 2009 the responsibility for most medical inpatients and for medical consultations devolved to full time hospitalists whereas previously a single, large internal medicine practice cared for these patients. CPOE became available to the hospitalists mid-2008, so the bulk of the CPOE and LOS data reflect a fairly consistent practice pattern. Specialists were and still are largely private groups.

The hospital implemented an EMR (Sunrise Clinical Manager©, Allscripts©, Chicago) in August 2007. CPOE began February 2008. Over the subsequent 5 years the EHR grew to include other modules such as nursing and allied health documentation, electronic medication administration, medication reconciliation, and electronic physician documentation. Once trained on the EMR, most users did not require retraining except for new modules as they were introduced. We suspect that with repetitive use over time users became more proficient and efficient with use of CPOE. From 2008 until the end of 2013, the duration of this study, CPOE grew to greater than 90% of all orders house-wide, with varying adoption rates within physician disciplines.

This retrospective, correlational, interrupted time series study included data for 66 consecutive months from July 2007, through December 2012, representing 22 consecutive quarters. Data included 76,972 discharges with 6,135,994 eligible orders. Eligible orders included all pharmacy (medication and intravenous), laboratory, cardiology and radiology imaging, nursing care, admission/discharge/transfer, consult, respiratory therapy, ancillary services (physical, occupational, and speech therapies), and dietary orders from all inpatient floors including the behavioral health unit. All of these orders were integrated into the EMR as both the source of the CPOE and the corresponding results repository and retrieval. The only exclusions from CPOE calculations were verbal orders, and medication orders in the emergency department which were not entered electronically until after the study period.

De-identified data were downloaded from the EMR for analysis. Initial data analysis focused on the overall CPOE and LOS statistics. The data base was sufficiently robust to permit breakdown of CPOE rates and LOS first on a per-patient/per-visit basis, and then by the discipline of the attending physician. The categorization of discipline for CPOE and LOS data resided in the Allscripts© database, whereas for the case mix index (CMI) this originated in the business decision support software (Siemens OAS Financials©). These two sets of definitions did not match completely, but overlapped sufficiently to allow for analysis and from which to draw reasonable conclusions.

Data were summarized by quarterly average LOS in aggregate house-wide, and by the 19 clinical disciplines for which sample sizes were statistically adequate. Annualized (four quarters) moving averages were also computed for LOS data as a smoothing strategy for ease of visualization in graphics and analysis due to the degree of variability. Concurrent CPOE data utilization rates (i.e., adoption) were computed as quarterly figures calculated by attending of record, by discipline, and cumulatively house-wide (no smoothing applied). Sample sizes for any quarter exceeded all *a priori* power analysis sample size requirements by greater than 3-fold.

Correlational and regression analyses focused on quantifying the degree of predictive relationship between CPOE and LOS. Pearson's correlation coefficients were computed for all disciplines collectively (house-wide), and by disciplines individually using LOS as a continuous variable and CPOE adoption rate as a percentage, with arcsine [16], probit [17–18], and Fourier [19] transformations for confirmatory purposes. The p values remained unchanged significantly throughout transformation and confirmatory analyses. LOS was analyzed as a 3-quarter moving average as a smoothing technique.

Regression analyses were pursued to further describe the CPOE-LOS relationship, as well as the predictive strength as quantified by R-square coefficients. All statistics were evaluated for significance at a minimum of $p<0.05$. All analyses were conducted using SPSS for Windows (IBM© SPSS© version 21.0), and all graphics were created in Excel 2010© (Microsoft©). For statistical tests, the conservative sample size figures (n) for LOS were the number of discharges by discipline, and for CPOE it was the number of quarters of data analyzed.

The Holy Spirit Hospital Institutional Review Board granted a waiver of informed consent based on the minimal risk of divulging personal health information.

3. Results

Descriptive statistics for CPOE and LOS pre- (quarters 1 and 2) and post-CPOE (20 quarters) are summarized in ▶Table 1. The gains in CPOE, and the corresponding changes in LOS, were statistically significant for 13 of the 19 disciplines and for the disciplines collectively (i.e., house-wide). There was no significant change in LOS for the remaining six disciplines: Gastroenterology, Oncology/Hematology, Otolaryngology, Neurological Surgery, Oral Surgery, and Plastic Surgery.

Prior to installation of an EMR, LOS had been declining slowly. LOS was 4.58 days during the fiscal year 2006 (July 2005-June 2006), 4.46 days in 2007, and 4.41 days in 2008. The last figure differs slightly from the LOS data in ▶Table 1 due to use of a different time interval.

3.1 Predictive Correlation: CPOE and LOS

The regression solutions for LOS and CPOE verified statistically significant linear solutions for both variables across time house-wide (▶Figure 1): CPOE (R^2=0.981, $p<0.001$; r=0.990, t=45.555, $p<0.001$; b=0.041, $p<0.001$); LOS (R^2=0.579, $p<0.001$; r=0.761, t=7.977, $p<0.001$; b=-0.013, $p<0.001$).

The linear regression model for CPOE as a predictor of LOS was also statistically significant (R^2=0.637, $p<0.001$, see ▶Figure 2), and no other model (i.e., quadratic, cubic, etc.) resulted in a significantly better fit (i.e., R^2 change). The slope was statistically significant in an inverse direction (b=-0.338, $p<0.001$). The R^2 of 0.637 is interpreted to mean that 63.7% of the variation in CPOE can be explained by a correlated variation in LOS.

Identical analyses were conducted for each of the 13 disciplines for which statistical significance was shown previously. Results revealed similar correlational and regression patterns, although each statistically less pronounced at the individual discipline level than for the house-wide collective due to reduced sample size (▶Table 2, all R^2 values reflect a linear model). Statistically significant correlations were verified for each of the 13 disciplines individually, reconfirming the inverse relationship between CPOE and LOS (▶Table 2).

Correlations for the remaining six disciplines were not statistically significant due primarily to sample size limitations, although each showed an appropriate trend in the negative direction.

▶Table 2 also shows the adjusted R^2 value for the house-wide correlation which infers that approximately 63.7% of the reduction in length of stay correlates to the use of CPOE.

3.2 Adding CMI to the Analysis:

In the 22 quarters, the case mix index (CMI) increased slightly but significantly for the organization as a whole as well as for 13 disciplines, all concurrent with significant reductions in LOS for comparable time periods (▶Table 3). The disciplines listed in the CMI data represent aggregations as reported from financial data sources which are not identical to the CPOE/LOS discipline labelling reported from the electronic health record.

▶Figure 3 shows the CMI across the 22 quarters of the study data, summarized by FY to ensure statistical stability (p values shown are for t-tests for percent change versus zero), graphed against the changes in CPOE and LOS. Scaling masks the statistically significant rise.

3.3 Inflection Point for LOS

The inflection point in the LOS vs CPOE curve indicates the point in CPOE adoption at which LOS begins to change rapidly and the full benefit of CPOE begins to be experienced. ▶Figure 4 shows the sigmoidal, polynomial solution for the trend analysis.

This polynomial regression solution revealed the curvilinear relationship as the most significant solution, with $R^2 = 0.887$, representing a 25.03% increase in the R-square value over the simple linear relationship previously verified. The importance of this solution is the clear indication of an inflection point at which LOS begins to statistically fall as CPOE adoption reaches a critical level. The computed inflection point [20] was 58.31% CPOE adoption, with standard error of 4.05 (95% confidence interval 54.26–62.36%). The interpretation is that LOS began to drop statistically when CPOE adoption achieved roughly 60%.

3.4 Other Initiatives and Programs of Note

During the period of the study the hospital's physical facilities underwent refurbishing, staffing was reduced, and there were new initiatives which increased the burden of care on providers. These included documentation improvement and budgetary constraints (data not shown). Process improvements that may have improved LOS included interdisciplinary rounding in certain areas such as critical care, educational efforts to increase awareness of the need for shortened LOS, and greater awareness of the distinction between observation and inpatient admission status. Any or all of these factors may have contributed to an increase or decrease in LOS, or had no effect at all. The analysis included all observation and full admission patients, but we did not attempt to measure the impact of these other aspects.

4. Discussion

This analysis clearly shows a statistically significant inverse association between CPOE and LOS. That correlation supports the hypothesis that an increase in CPOE utilization and adoption leads to a decrease in LOS, which serves as a readily available, industry-ubiquitous proxy metric for clinical, cost, and efficiency outcome. The quantification of the inflection point further solidifies the impact of CPOE on LOS in a community hospital setting, and underscores the importance of reaching critical tipping points in CPOE adoption. While these reductions in LOS were achieved in parallel with other hospital efforts designed to lower LOS, the rising CMI and strength of the relationship lead to the conclusion that CPOE was arguably the strongest contributor to the improvement experienced. Further, the analysis by discipline confirmed the relationship between CPOE and LOS by most disciplines, especially those most amenable to improved LOS, even as other pressures and initiatives affected the clinicians.

LOS decreased slowly even before implementation of an EMR. Between 2005 and 2006 there was a 0.12 day drop in LOS, and between 2006 and 2008, when CPOE began, there was only a 0.07 day decrease. From 2008 until the end of the data collection for this study in 2012, LOS declined a further 0.97 days. This study shows that CPOE was a major influence of this far more dramatic decrease.

Two other factors provide confidence in CPOE as one of the major contributors to the reduction experienced, if not the major factor. First, the smoothness of the changes in both CPOE and LOS, as illustrated in the graphics provided, do not represent the commonly experienced jumps followed by plateaus seen in most time series studies related to continuous improvement undertakings [21]. Second, the magnitude of the R^2 associated with CPOE is far beyond any expectation of predictive value for a single variable in such a complex outcome as LOS [22].

Prior studies in university hospitals showed reductions of LOS when residents were the primary users of CPOE as part of home-grown EHRs. This study reflects efforts within a community hospital with both employed and independent practitioners and only a few residents, using a vendor-provided solution. Prior studies did not examine this combination. The current findings suggest that highly generalizable improvements are possible within a wide range of settings.

An interesting finding was the computation of the inflection point for LOS, or that point in CPOE adoption at which reduction of LOS accelerated: around 60%. LOS was not substantively affected until CPOE reached a certain threshold or tipping point, even though early drops in LOS gained some traction, but not until the inflection point was reached did the drop in LOS gain momentum. Federal requirements associated with stage 2 Meaningful Use requirements under the HITECH Act regulations call for CPOE to account for 60% of medication orders, but only 30% of laboratory and radiology orders [23]. The meaningful use requirements may not yet be rigorous enough to demonstrate a true return on investment for EMRs, at least with respect to lowering LOS, which may account for the disappointment that some have expressed with the meaningful use regulations thus far. The data from this study imply that the full benefits of CPOE for lowering LOS will not be reached before adoption exceeds 60% for all orders.

Given that hospitals have made many process changes to shorten LOS, how does CPOE contribute an even further decline? CPOE increases efficiency [24–25], decreases turn-around-time [26], and decreases the likelihood that a clinician will order an unnecessary antibiotic [27-28]. One study noted that when physicians reviewed results, informational messages regarding a patient's provisional diagnosis-related group and current length of stay, while not the same as CPOE, did help to reduce LOS for intervention group patients [29]. In the aggregate, all of this information, examined in light of the robust literature cited, supports the interpretation that CPOE in and of itself may be an independent factor in LOS reduction.

One limitation of the study is its retrospective design. Only a retrospective design could test the effects of CPOE on LOS without risking severe Hawthorne effects, wherein conscious or unconscious efforts to reduce LOS during adoption of CPOE would explain the reduction, rather than a direct effect of adoption. Additionally, the data were defined at the per-patient, per-visit level, which controlled for clinicians opting not to use CPOE consistently, which helped to compensate for the retrospective data collection.

Data on other initiatives that focused on LOS reduction were not part of this study, nor was there any practical way to control for these. The hospital did not substantially alter its case management processes during the data collection time frames, which also pre-date institution of Medical Homes and value-based purchasing contracts. There may have been other changes in practice patterns or treatment guidelines but this study did not investigate these factors. Despite the numerous other programs the hospital did undertake to reduce LOS starting well before the introduction of CPOE, LOS did not change significantly until CPOE began. Taken together, these factors mitigate the limitations of the study methodology. This study cannot establish causality between CPOE and LOS due to these and other unidentified confounders.

Analyses at the discipline level showed that the likelihood of reduced LOS is directly proportional to the CPOE rate across disciplines. Disciplines where CPOE did not significantly correlate with reduced LOS included those for which LOS was generally pre-determined by design. For example, with respect to Ob/Gyn, Pennsylvania mandates a minimum two day maternity stay. Even before CPOE, LOS in the Ob/Gyn department, which has disproportionately more obstetric than gynecologic care, was only 2.5 days. The Orthopedic service includes a large proportion of elective joint replacement procedures for which a length of stay of three days has not changed over the years, probably due to standardized care and discharge plans. Similarly, disciplines such as Cardiology and Neurosurgery, despite caring for a wide range of patients with various diagnoses, have inpatient lengths of stay determined largely by well-established guidelines for LOS.

Since analysis of the data is on a per-visit basis it is not relevant whether the attending physician of record as opposed to other specialists did or did not utilize CPOE. Rather it was the total burden of orders during that visit that determined the relationship between CPOE usage and LOS. One explanation for the variability of LOS within any given discipline over time is that some patients had greater or fewer orders by the attending physician versus consultants with varying CPOE adoption rates. This is not a limitation in the current study since the magnitude and direction of the relationship between CPOE and LOS in each service is similar, which supports the conclusion of a correlation between these two metrics.

Research which studies these questions must be careful to ensure comparable workflows before and after inauguration of CPOE. In one study [30] CPOE appeared to increase LOS in an emergency department. However, prior to institution of CPOE, patients were seen first by the triage nurse, and then were registered. After CPOE, registration occurred immediately, falsely increasing LOS. When making LOS calculations and attributing them to a certain intervention, one must be attentive to workflow changes that might impact the data. Workflows during the course of data collection for this study did not change. Future researchers in this arena should be attentive to the impact of workflow on CPOE and LOS measurements.

5. Conclusions

Increasing rates of CPOE in a community hospital using an unmodified vendor EMR correlates with reduced inpatient length of stay. Most regard reduced LOS as quantitative evidence of improved clinical, cost, and efficiency outcomes. It should be anticipated that similar reductions can occur in non-university hospitals, using a vendor product, where there are employed and community based physicians and their physician extender staffs. Length of stay continues to decrease beyond the well-known economic pressures of DRG payments, per capita payment plans, and maximization of hospital efficiencies. CPOE enabled a reduction in LOS despite an increase in the case mix index during the time frame of this study, further showing that CPOE adds a true return on investment despite sicker patients requiring more intensive interventions and therapies.

6. Clinical Relevance

The meaningful use incentives included in the HITECH Act of 2009 clearly accelerated the rate of adoption of health care information technology, but the return on that investment has been far more difficult to demonstrate. The results of this study show that CPOE, a key component of healthcare IT, contributes substantially to reduced length of stay which in turn augments its return on investment, and has tangible and measurable benefits for patients and providers.

Contributors

RS conceived the project. SHS designed, and SHS and KP performed the statistical analyses. All authors made substantial contributions to the analysis and interpretation of the data. RS drafted the initial manuscript. All authors made substantial revisions to the manuscript, and all approved the final version prior to submission.

Funding

There was no funding for this research.

Conflicts of interests

RS and KP have no competing interests to declare. SHS is employed by Allscripts©. His contribution to this research was neither funded nor reviewed by Allscripts©. Allscripts© was not involved in any aspect of the research or analysis, nor in the preparation of or decision to submit the manuscript.

Protection of Human and Animal Subjects

This research was granted a waiver of informed consent by the Holy Spirit Hospital Institutional Review Board.

Acknowledgments

The authors thank Gil Kuperman and Jos Aarts for their helpful suggestions regarding literature review; Ross Koppel for extensive critique of and suggestions for the draft of the manuscript; and Margaret Anderson for invaluable assistance providing de-identified LOS and case mix index data.

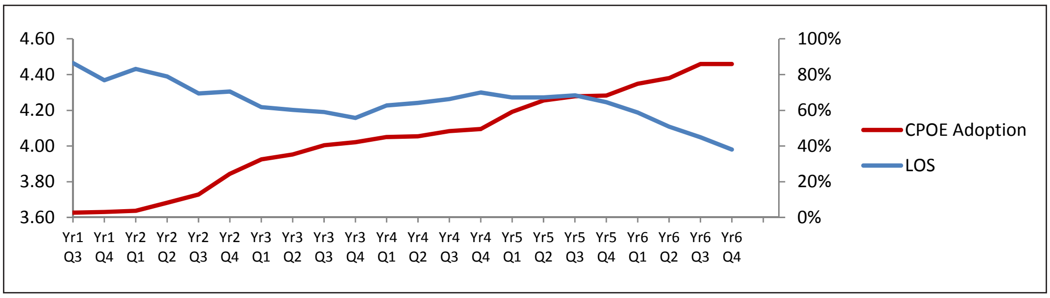

Fig. 1 Statistically significant time-series linearity for CPOE and LOS.

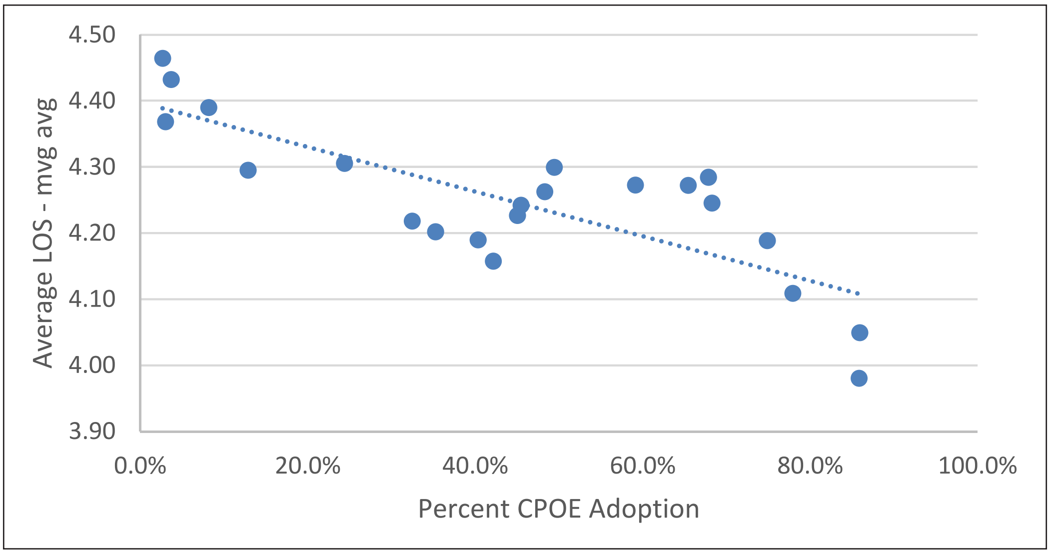

Fig. 2 LOS and CPOE changed inversely over 22 consecutive quarters.

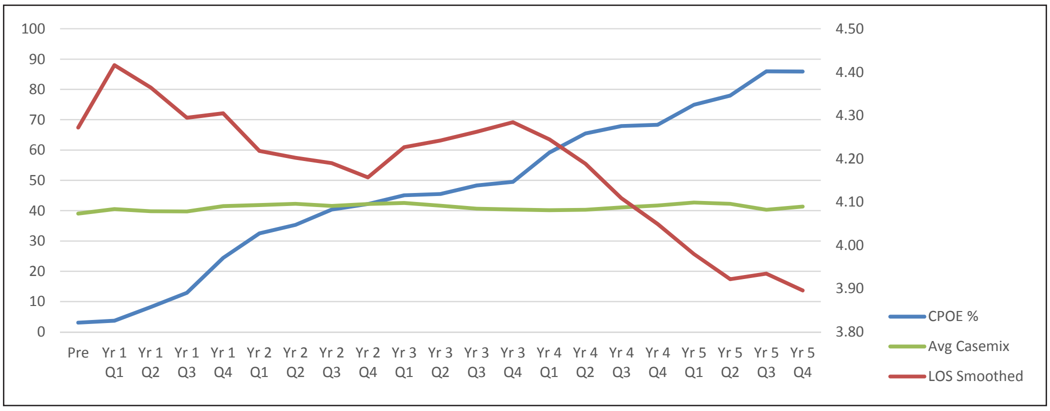

Fig. 3 Case Mix Index (CMI) graphed against the CPOE adoption rate and smoothed LOS.

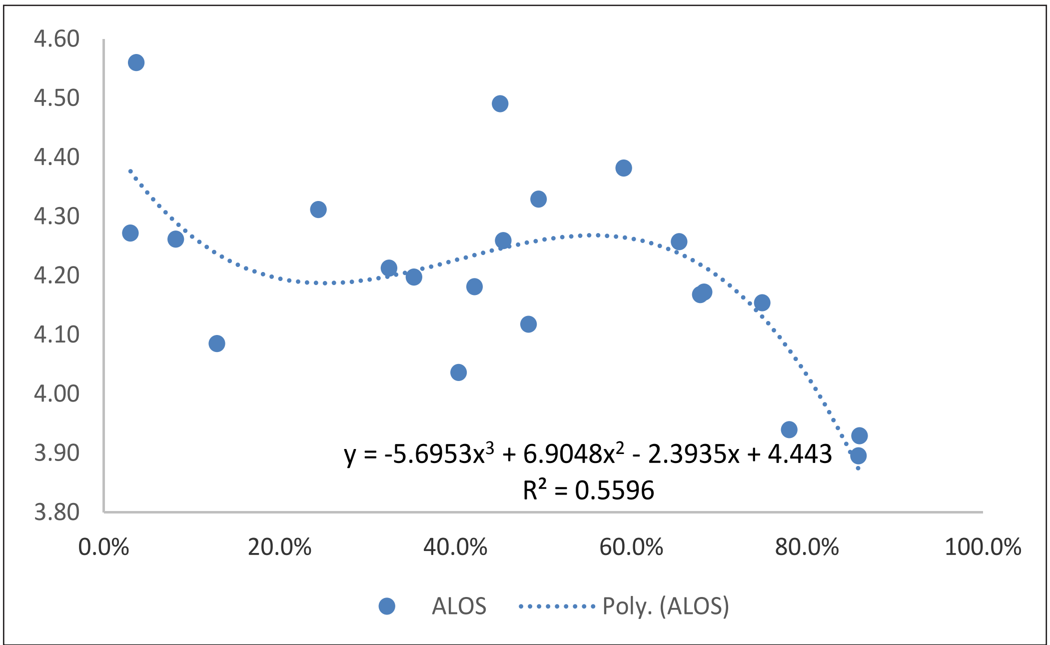

Fig. 4 Polynomial best-fit relationship between CPOE and LOS

Table 1 Descriptive statistics for CPOE and LOS data

		House Wide	Cardiology	Family Medicine	Gastro-enterology	Hospitalists	Internal Medicine	Medicine	Nephrology
LOS	Pre	4.802	2.993	4.921	5.583	4.502	5.579	4.657	6.000
	Post	3.834	2.588	4.723	3.500	4.116	4.945	3.000	4.353
	Net Change	0.968	0.405	0.198	2.083	0.385	0.633	1.657	1.647
	% Change	20.2%	13.5%	4%	37.3%	8.6%	11.4%	35.6%	27.5%
	p	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
CPOE (% adoption)	Pre	2	3	2	1	2	2	2	2
	Post	80	60	72	73	89	77	87	87
	Net Change	78	57	70	72	87	75	85	85
	% Change	4031%	1900%	3500%	7200%	4350%	3750%	4250%	4250%
	p	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
		Obstetrics & Gynecology	**Oncology & Hematology**	**Pulmonary Medicine**	**Surgery, General**	**Surgery, Orthopedics**	**Surgery, Thoracic**	**Surgery, Vascular**	**Urology**
LOS	Pre	2.513	6.019	7.567	5.353	3.485	7.169	2.968	2.723
	Post	2.334	4.609	3.636	5.103	3.146	6.539	2.806	2.114
	Net Change	0.179	1.410	3.931	0.250	0.339	0.630	0.162	0.609
	% Change	7.1%	23.4%	51.9%	4.7%	9.7%	8.8%	5.5%	22.4%
	p	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
CPOE (% adoption)	Pre	0	2	1	1	0	7	3	1
	Post	96	48	94	86	88	88	72	81
	Net Change	96	46	93	85	88	81	69	80
	% Change		2300%	9300%	8500%		1157%	2300%	8000%
	p	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Table 2 Relationship between CPOE Adoption and Length of Stay

		R^2		
Discipline	**r**	**Value**	**Percent**	**p**
House-Wide	-0.798	0.637	63.7	<0.001
Cardiology	-0.278	0.077	7.7	0.036
Family Medicine	-0.431	0.186	18.6	0.008
Hospitalists	-0.297	0.088	8.8	0.032
Internal Medicine	-0.799	0.638	63.8	<0.001
General Medicine	-0.918	0.843	84.3	<0.001
Nephrology	-0.513	0.263	26.3	0.003
Hematology/Oncology	-0.367	0.135	13.5	0.015
Pulmonary	-0.301	0.091	9.1	0.031
General Surgery	-0.695	0.483	48.3	<0.001
Orthopedic Surgery	-0.782	0.612	61.2	<0.001
Thoracic Surgery	-0.335	0.112	11.2	0.022
Vascular Surgery	-0.552	0.305	30.5	0.002
Urology	-0.483	0.233	23.3	0.004

Table 3 Descriptive statistics for average length of stay (ALOS) and average case mix index (CMI).

	House Wide	Cardiac Cath Services	Cardiac EP Services	Cardiac Surgery	General Medi-cine	General Surgery	Cardiology
ALOS FY 2008	4.39	2.52	4.17	8.21	4.86	8.03	3.50
ALOS FY 2012	4.13	2.62	3.67	7.36	4.85	6.91	3.51
Net Change	-0.26	0.10	-0.50	-0.85	-0.01	-1.12	0.01
% Change	-6.0	4.0	-12.0	-10.4	-0.3	-13.9	0.4
p	< 0.001	< 0.001	< 0.001	< 0.001	0.011	< 0.001	0.005
Avg CMI FY 2008	1.5241	2.1159	3.7252	5.6684	1.2362	2.8923	0.9892
Avg CMI FY 2012	1.6062	2.0936	3.8325	5.7511	1.2738	2.9648	0.9952
Net Change	0.0821	-0.0223	0.1074	0.0827	0.0376	0.0725	0.0061
% Change	5.4	-1.1	2.9	1.5	3.0	2.5	0.6
p	< 0.001	0.018	0.005	0.044	< 0.001	< 0.001	< 0.001
	Oncology Medical	Orthopedics	Pulmonology	Spine	Thoracic Surgery	Urology	Vascular Services
ALOS FY 2008	4.86	3.75	5.37	3.46	9.66	3.64	4.05
ALOS FY 2012	4.62	3.49	4.78	3.27	7.35	3.84	3.41
Net Change	-0.24	-0.26	-0.59	-0.19	-2.31	0.20	-0.64
% Change	-5.0	-6.9	-11.0	-5.4	-23.9	5.6	-15.9
p	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001
Avg CMI FY 2008	1.3030	1.7811	1.2910	2.8550	3.0397	1.4061	2.1985
Avg CMI FY 2012	1.3477	1.9375	1.2985	3.3470	3.3116	1.5662	2.1324
Net Change	0.0448	0.1564	0.0074	0.4921	0.2719	0.1601	-0.0661
% Change	3.4	8.8	0.6	17.2	8.9	11.4	-3.0
p	0.001	< 0.001	0.002	< 0.001	0.013	< 0.001	< 0.001

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