CHSR Center for Health Services Research
Applying Research to Optimize Care©

# What We Are Reading

Synopses of recent studies in health services research
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## Implementation of a Value-Driven Outcomes Program to Identify High Variability in Clinical Costs and Outcomes and Association With Reduced Cost and Improved Quality

### Take Away Points

- It is useful for physicians to understand health care service costs (not charges) as they relate to patient outcomes.
- There are benefits in having a multidisciplinary team work together using a value-driven outcomes tool to address cost variability and patient outcomes.

### The Issue

**Source**
Lee VS, Kawamoto K, Hess R, Park C, Young J, et al. Implementation of a Value-Driven Outcomes Program to Identify High Variability in Clinical Costs and Outcomes and Association With Reduced Cost and Improved Quality. *JAMA*, 2016; 316(10):1061-1072 *http://jamanetwork.com/journals/jama/article-abstract/2552208*

Fee-for-service payment models reward care volume over value. In 2014, this payment model accounted for 17.7% of the US gross domestic product and is estimated to increase to 19.6% by 2024. However, value-based payment models encourage efficient, quality, and patient-centered care through financial penalties and rewards. To implement a value-based payment model, it is important for physicians to understand care costs (not charges). Yet, few large health care organizations have accurately measured total care costs at the individual patient level and relate cost to quality. Therefore, the objective of this study was to measure the association of a value-driven outcomes tool that allocates costs of care and quality measures to individual patient encounters with cost reduction and health outcome optimization.

### Study Methods and Design

*Value-Driven Outcomes and Identifying Cost*

The value-driven outcomes tool is modular, extensible framework that allocates care costs to individual patient encounters. It abstracts data from the health care system's enterprise data warehouse, which includes data on patient encounters; national quality metrics and clinician-defined metrics; supply, pharmacy, imaging and laboratory utilization; human resource utilization; and the general ledger (i.e., institution's complete financial transactions). The value-driven outcomes tool uses these data to calculate and integrate cost information with relevant quality and outcomes measures. This tool takes a health care system prospective in identifying costs attributable to direct patient care. For this study, cost was measured using Medicare severity diagnosis related groups (MS-DRGs) for major joint replacement of lower extremity without major complications or comorbidities (MS-DRG 470) and sepsis (MS-DRG 871), the overall cost per unit or cost per case, the components of that cost, and cost variability were identified.

*Program Overview*

Multidisciplinary value improvement teams included clinicians, administrative leaders and process engineers. These teams defined the key metrics for quality and perfect care, they viewed and monitored care costs and quality metrics using institutional web-based value-driven outcomes visualization tools. The data were used to provide feedback to clinicians monthly, on an individual patient basis or at the clinician or service-line level to facilitate broader understanding of variations in cost and quality.

Evaluations were based on direct comparisons of outcomes between designated time intervals preceding and following the exposures. For total joint replacement changes in mean costs and length of stay after exposures were assessed using a 12-month baseline period. Patients meeting initial and modified perfect care criteria were compared between designated 4-month intervals. Changes in hospitalists' laboratory utilization was assessed by changes in daily use of the laboratory, daily costs, length of stay, and risk of 30-day readmission. Primary evaluation of sepsis used the systemic inflammatory response syndrome (SIRS) criteria being met to first anti-infective agent administration. Secondary evaluation of sepsis was length of stay, mortality, and total direct cost normalized to the baseline mean cost. Potential sepsis cases were identified through billing data and confirmed by physician medical record audit.

*Analyses*

For this analysis, 34,000 inpatient discharges, 52,000 emergency department visits and 1.7 million total patient visits were used. Descriptive summaries were provided as counts and percentages for binary variables and as means and standard deviations for numeric variables. Proportion of deaths were compared between the evaluation and baseline period using Fisher's exact test and generalized linear models (GLMs) were used to analyze changes between the baseline and evaluation periods for all other outcomes. GLMs used binary outcomes for comparisons of perfect care indexes, 30-day mortality, and the proportion of patients with anti-infective agents administered for nosocomial and multidrug resistant infections and for community-acquired infections. Gamma outcomes were used for costs, length of stay, and time to administration of anti-infective agents. For each of these outcomes, log and identify link functions were used to evaluate relative change and absolute change. Binomial outcomes models that were negative with log link functions and offset equal to log length of stay were used to analyze relative changes in the number of tests ordered per day. In the joint replacement and laboratory utilization projects, statistical inferences were performed using asymptotic likelihood ratio. To account for positive skewness and smaller sample sizes, confidence intervals in the sepsis project were obtained using the bias-correction and accelerated bootstrap method. Analyses was conducted using SAS version 9.4 or R version 3.3.0. All hypothesis tests were performed using 2-sided $\alpha$=.05 without adjustment for multiple comparison.

**Key Findings**

- 46.0% of total care costs accounted for inpatient total direct care costs ($470.4 million) and 54% of outpatient direct costs ($553.1 million)
- Using the revised perfect care index created by the multidisciplinary team for joint replacement, the 4-month mean perfect care increased to 65% from the initial perfect care index of 50% (15%absolute increase; 95%CI, 6%-24%;P = .002)
- Direct cost reduced 11% (95%CI, 7%-14%; P < .001) and length of stay decreased from 3.50 days to 2.88 days (reduction, 0.63 days; 95% CI, 0.50-0.76 days; P < .001) from baseline year to post-implementation evaluation
- Decrease in facilty utilization and length of stay accounted for 34% cost reduction between baseline and post-implementation evaluation
- The mean (SD) cost per day for laboratory testing on the hospitalist service was $138 ($233) (median, $113; IQR, $79- $160) during the baseline period and $123 ($213) (median, $99; IQR, $66-$147) (mean difference, −$15; 95% CI, −$19 to −$11; P < .001) during post-implementation evaluation.
- The time from meeting SIRS criteria to administration of anti-infective agents was reduced to a median time of 2.2 hours (IQR, 1.0-4.5 hours) and a mean (SD) time of 3.6 (4.7) hours (mean difference from baseline to implementation, −4.1 hours; 95%CI, −9.9 to −1.0 hours; P = .02).

**Limitations:**

- The data lacks insight into care provided outside the health care organization, particularly for pharmacy, laboratory, and imaging services.
- The population in Utah tend to be younger and more physically active, so the findings may not be generalizable to health systems in other states.
- The clinical improvement studies used pre-post designs generally without concurrent control groups or statistical adjustment for potential confounding factors; therefore, causality cannot be established.
- Continuous quality improvement includes a package of changes that can be adapted over time and the discrete component that contributes most to change cannot be isolated.
- The physicians were not blinded to the interventions but were aware of the outcomes being assessed as part of the process.
- Exposing outcomes and costs publicly could lead to unintended consequences, such as clinicians shifting away from high-cost and high-risk patients.
- The value-driven outcomes tool only assessed direct costs.

**Final Thoughts**

The goal of value-driven outcomes tool was to increase awareness of high variability in cost across units, departments, and clinicians. The use of a multifaceted value-driven outcomes tool to identify high variability in costs and outcomes in the University of Utah health care system was associated with reduced costs and improved quality for 3 selected clinical projects. To reduce high variability costs, this tool showed it is beneficial for clinicians to understand actual care costs and outcomes achieved for individual patients with defined clinical conditions. However, further research is needed to demonstrate the generalizability and scalability of of the value-driven outcomes approach across more conditions, units, and other healthcare systems.