HHS Public Access

Author manuscript

J Surg Res. Author manuscript; available in PMC 2018 October 29.

Published in final edited form as:

J Surg Res. 2015 June 01; 196(1): 124–129. doi:10.1016/j.jss.2015.02.054.

Patient satisfaction: does surgical volume matter?

Sarah E. Tevis, MD and **Gregory D. Kennedy, MD, PhD**[*]

Department of Surgery, University of Wisconsin, Madison, Wisconsin

Abstract

Background: Patient satisfaction is an increasing area of interest due to implications of pay for performance and public reporting of results. Although scores are adjusted for patient factors, little is known about the relationship between hospital structure, postoperative outcomes, and patient satisfaction with the hospital experience.

Methods: Hospitals participating in the University HealthSystem Consortium database from 2011–2012 were included. Patients were restricted to those discharged by general surgeons to isolate surgical patients. Hospital data were paired with Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) results from the Hospital Compare website. Postoperative outcomes were dichotomized based on the median for all hospitals and stratified based on surgical volume. The primary outcome of interest was high on overall patient satisfaction, whereas other HCAHPS domains were assessed as secondary outcomes. Chi square and binary logistic regression analyses were performed to evaluate whether postoperative outcomes or surgical volume more significantly influenced high patient satisfaction.

Results: The study population consisted of 171 hospitals from the University HealthSystem Consortium database. High surgical volume was a more important predictor of overall patient satisfaction regardless of hospital complication ($P < 0.001$), readmission ($P < 0.001$), or mortality rates ($P = 0.009$). Volume was found to play less of a role in predicting high satisfaction on the other HCAHPS domains. Postoperative outcomes were more predictive of high satisfaction with providers, the hospital experience, and environment.

Conclusions: High surgical volume more strongly predicted overall patient satisfaction on the HCAHPS survey than postoperative outcomes, whereas volume was less predictive in other HCAHPS domains. Patients may require more specific questioning to identify high quality, safe hospitals.

Keywords

Patient satisfaction; Surgical volume; HCAHPS

[*]*Corresponding author*. Department of Surgery, University of Wisconsin, 650 Highland Avenue, Madison, WI 53792. Tel.: +1 608 263 1164; fax: +1 608 263 7652. kennedyg@surgery.wisc.edu (G.D. Kennedy).

Disclosure

The authors have no conflicts of interest to declare.

Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.jss.2015.02.054.

1. Introduction

The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) [1] survey is now used nationwide to measure and compare patient satisfaction across hospitals. Because of both transparent reporting of results and penalties on financial reimbursement, hospitals face increasing pressure to perform well on the HCAHPS survey [2,3]. While hospitals are incentivized to produce highly satisfied patients, little is known about what drives patient satisfaction on the HCAHPS survey.

Hospital characteristics, markers of high quality and safe care, and patient outcomes have been evaluated as potential predictors of high patient satisfaction. Studies assessing culture of safety and process measure compliance have identified weak and conflicting relationships between high performing hospitals and patient satisfaction [4–7]. Similar conflicting results have been observed when assessing the relationship between patient outcomes and satisfaction scores, with the strongest documented relationship between low readmission rates and high satisfaction [6,8–10]. The authors have previously demonstrated no correlation between safety and effectiveness measures or patient outcomes and HCAHPS scores. However, a strong relationship between high surgical volume and high overall patient satisfaction was identified [11].

We sought to clarify the relationship between hospital structural measures such as surgical volume and short-term patient outcomes in predicting satisfaction scores on the HCAHPS surveys. Our aims were to assess surgical volume and patient outcomes in relation to overall patient satisfaction, as well as in relation to HCAHPS domains relating to provider communication, hospital experience, and hospital environment. We hypothesized that risk-adjusted outcomes and surgical volume would independently predict satisfaction scores, whereas non-risk adjusted outcomes would not correlate with satisfaction across HCAHPS domains.

2. Methods

2.1. Data source and patients

The University HealthSystem Consortium (UHC) database was queried from 2011–2012 to identify participating hospitals. The patient population was composed of adult patients who were discharged by general surgeons to isolate the surgical patient population. Hospital-level data were paired with HCAHPS survey results and Surgical Care Improvement Project (SCIP) process measure compliance from the Hospital Compare website over the same period. Hospitals were excluded if data from the UHC database or the Hospital Compare website were incomplete.

2.2. Explanatory variables

Hospitals were categorized as having high or low surgical volume based on whether they fell above or below the median of volume in the UHC database. Surgical volume reported by UHC includes all inpatient operations. Other hospital characteristics analyzed included geographic location, SCIP compliance, and proportion of intensive care unit (ICU) cases. The following patient outcomes were also assessed: length of stay (observed and risk

adjusted), complication rate, patient safety indicators (PSIs), readmission rate (all and related), and mortality rate (overall, early, and risk adjusted). A summary of the length of stay and mortality risk adjustment models is available at www.uhc.edu. The complication measure, as defined by UHC, was based on 14 International Classification of Diseases, Ninth Revision-defined complications and identified complications that developed during the index hospitalization, which were not present on hospital admission. Geographic location was evaluated as West, Midwest, Northeast, or South. SCIP compliance and PSIs were evaluated as proportion of measures where hospitals had perfect performance (100% SCIP compliance or zero PSIs). High-performing hospitals were defined as those performing better than the median for included hospitals on these measures. Similarly, the remaining explanatory variables were assessed as high performance, scoring in the top 50th% of hospitals, *versus* low performance, and hospitals scoring in the bottom 50th% for that measure.

2.3. Outcomes measures

The primary outcome of interest was overall patient satisfaction on the HCAHPS survey. The overall satisfaction domains on the HCAHPS survey are the overall rating of the hospital from 0–10 and the recommendation of the hospital to friends and family. Hospitals were defined as high performers if the proportion of top-box scores at the hospital was above the median for all hospitals.

Secondary outcomes included the other HCAHPS domains as follows: nursing communication, physician communication, receiving help, pain control, explanation of medications, cleanliness and quietness of room, and discharge information. Hospitals that scored above the median in top-box responses for each question were considered high performers.

2.4. Statistical analysis

This investigation was approved as minimal risk by the University of Wisconsin Health Sciences Institutional Review Board. Chi-square analysis was used to compare explanatory variables between low and high surgical volume hospitals. Hospital satisfaction scores were then evaluated in relation to the explanatory variables of interest stratified by the surgical volume. Logistic regression analysis was used to assess satisfaction on each of the HCAHPS domains in terms of surgical volume and explanatory variables of interest. Each HCAHPS domain was then evaluated in association with each explanatory variable to determine whether the explanatory variable of interest or surgical volume more strongly predicted high HCAHPS scores. All statistics were performed in IBM SPSS version 21, New York, and P values <0.05 were considered significant.

3. Results

From 2011–2012, 216 hospitals participated in the UHC database. Records were incomplete in 21 hospitals in the UHC database and 24 hospitals on the Hospital Compare website. The study sample therefore consisted of 171 hospitals. The surgical case mix for included hospitals demonstrated that the most common cases were general surgery or gastrointestinal

surgery procedures. The five most common procedures were cholecystectomy, appendectomy, gastroenterostomy, gastrectomy, and resection of small bowel.

Table 1 demonstrates hospital characteristics and patient outcomes in relation to the surgical volume. High volume hospitals had a higher proportion of ICU cases ($P = 0.002$) and longer length of hospital stay (observed $P < 0.001$ and risk adjusted $P = 0.002$). High volume hospitals also were found to have higher complication ($P < 0.001$) and readmission rates ($P < 0.001$) as compared with low surgical volume hospitals. High volume hospitals had higher early ($P = 0.018$) and overall mortality ($P < 0.001$) rates but similar risk-adjusted mortality ($P = 0.817$) rates to low surgical volume hospitals.

Table 2 demonstrates overall patient satisfaction stratified by volume, hospital characteristics, and patient outcomes. High surgical volume was more predictive of overall satisfaction than proportion of ICU cases, length of stay, early mortality, and overall mortality. Of note, both high volume and low risk-adjusted mortality independently predicted high overall satisfaction ($P = 0.001$). Interestingly, high volume hospitals with high complication and readmission rates were more likely to have high satisfaction scores, even when compared with high volume hospitals with better outcomes in these areas.

The effect of volume and outcome measures on both HCAHPS overall satisfaction measures are summarized in Table 3. Volume was a stronger predictor of overall satisfaction for most outcome measures. Both high volume and low mortality index were predictors of high satisfaction on the hospital ranking and recommendation of hospital domains.

Table 4 demonstrates a similar summary of predictors of satisfaction on the satisfaction with providers, hospital experience, and hospital environment domains. For these HCAHPS domains, surgical volume was less predictive of high satisfaction scores and when high volume did predict satisfaction, improved patient outcomes were also necessary for significantly increased satisfaction scores. The overall mortality outcome demonstrated significant relationships with the most HCAHPS domains (5 of 8). For this outcome, both high volume and improved outcomes were required for high satisfaction scores.

4. Discussion

Hospitals with high surgical volume are more likely to have high overall patient satisfaction, even after controlling for hospital variables and hospital-level patient outcomes. Conversely, both volume and improved outcomes were associated with satisfaction with providers, the hospital experience, and hospital environment. Although high volume hospitals may inspire confidence in patients when considering the overall experience of the hospitalization, patients may be better able to identify safer, high quality hospitals when asked more specific questions about the care they received.

Previous studies have demonstrated inconsistent relationships between markers of safety and efficiency, patient outcomes, and satisfaction on the HCAHPS study. We found that surgical volume independently predicted overall patient satisfaction, whereas other hospital characteristics and patient outcomes were not predictive of overall satisfaction. Jha *et al.* [12] demonstrated an association between process measure compliance and overall

satisfaction. However, the authors included both medical and surgical patients in the study and did not control for surgical or hospital volume. When controlling for volume, we found no significant relationships between SCIP process measure compliance and any satisfaction domains.

Similarly, high rates of PSIs were not found to correlate with patient satisfaction, with exception of the quietness of room domain where both low PSI rate and high surgical volume predicted high patient satisfaction. A previous study of medical and surgical HCAHPS scores found mixed associations between PSIs and satisfaction domains [6]. In surgical patients, satisfaction was higher in hospitals with low rates of respiratory failure, deep venous thrombosis, and pulmonary embolism. However, other PSIs did not reliably correlate with satisfaction scores.

Postoperative complications and hospital readmissions were not found to correlate with patient satisfaction on the HCAHPS survey. A previous study of colectomy patients [8] demonstrated a relationship between complications and decreased satisfaction with recommendation of the hospital ($P = 0.23$), staff responsiveness ($P = 0.0003$), and quietness of the room ($P = 0.002$). However, the study demonstrated high satisfaction with discharge information in patients who suffered complications ($P = 0.042$). Previous studies have demonstrated an association between high overall satisfaction and satisfaction with the discharge process and low readmission rates in medical patients [9,10]. No studies to date have identified the timing of complications and readmissions in relation to timing of survey completion, making interpretation of these relationships difficult.

This study is limited by joining two databases, UHC and Hospital Compare, in an effort to assess the relationship between hospital characteristics, quality, and safety of care and patient satisfaction scores on the HCAHPS survey. Although both databases contain hospital specific data, the patient populations differ between databases. Similarly, HCAHPS data are reported at the hospital level, and patient-specific data are not available. UHC is an administrative database and therefore is limited by the detail of individual hospitals' coding and documentation practices. The study was also limited by the small number of hospitals available in both databases, which only allowed for evaluation of high *versus* low performance rather than a more detailed look at variables and outcomes as quartiles or deciles. Nonetheless, we believe this study is an important first step in outlining predictors of high satisfaction, as well as demonstrating how different questions relate to quality and safety measures and hospital-level patient outcomes.

It is easy to think that patients are satisfied if they receive high quality care or if their physician is a good communicator. Our study demonstrates that patient satisfaction is a very complex measure that is impacted by a number of things including structural measures out of the control of the health care team providing care to the patient. High surgical volume strongly predicted high overall satisfaction on the HCAHPS survey. Patients may be more impressed with larger, high volume hospitals and therefore rank overall satisfaction more highly at these institutions. Conversely, high volume centers may have multidisciplinary systems in place that patients acknowledge when considering overall satisfaction. Before we use these measures as a reflection of safety, effectiveness, and efficiency, we must begin to

understand the full concept of “patient-centered care.” It is clear that many other factors contribute to the measures of patient centeredness. The discrepancy between patient satisfaction and quality and safety measures may indicate differences in patient engagement. Perhaps a patient who is fully engaged in their medical issues would be able to draw a distinction between safe and effective care and satisfaction might better correlate with these measures.

5. Conclusions

In summary, this study demonstrates that overall patient satisfaction is predicted by high surgical volume. When asked more specific questions about providers, hospital experience, and hospital environment, both volume and good hospital-level outcomes were associated with high satisfaction. We believe this indicates that patients are better able to identify safe, high quality hospitals when asked detailed questions about their hospital stay. Further studies assessing this relationship using patient specific data are needed to better understand how hospital characteristics and quality of care influence patient satisfaction on the HCAHPS survey.

Acknowledgment

This study was supported by a National Institutes of Health T32 training grant (CA090217). The authors thank Glen Leverson PhD for providing statistical advice for this study.

Authors’ contributions: S.E.T. and G.D.K. contributed to the design, statistical analysis, interpretation, writing, and editing of the article. S.E.T. contributed to the statistical analysis of the study.

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Table 1 -

Hospital structure and patient outcomes in relation to surgical volume.

Hospital structure and patient outcomes	Low volume, *N* = 86, *n* (%)	High volume, *N* = 85, *n* (%)	*P* value
Geographic location			
West	10 (37)	17 (63)	
Midwest	27 (56)	21 (44)	
Northeast	27 (52)	25 (48)	
South	22 (50)	22 (50)	0.451
SCIP compliance, %			
100	0(0)	1 (100)	
<100	86 (51)	84 (49)	0.313
% ICU cases			
Low	48 (56)	37 (44)	
High	38 (44)	48 (56)	0.002
Length of stay			
Short	61 (71)	25 (29)	
Long	25 (29)	60 (71)	<0.001
Length of stay index			
Low	53 (62)	32 (38)	
High	33 (38)	53 (62)	0.002
Complication rate			
Low	55 (65)	29 (34)	
High	31 (36)	56 (66)	<0.001
PSI			
None	3 (100)	0(0)	
≥1 PSI	83 (49)	85 (51)	0.082
Readmission rate (all)			
Low	59 (68)	28 (32)	
High	27 (32)	57 (68)	<0.001
Readmission rate (related)			
Low	56 (65)	30 (35)	
High	30 (35)	55 (65)	<0.001
Early mortality rate			
Low	51 (59)	35 (41)	
High	35 (41)	50 (59)	0.018
Mortality rate			
Low	56 (65)	30 (35)	
High	30 (35)	55 (65)	<0.001
Mortality index			
Low	43 (51)	41 (49)	
High	43 (49)	44 (51)	0.817

Table 2 -

Relationship between surgical volume, patient outcomes, and overall satisfaction (9 or 10 ranking).

	High satisfaction, *n* (%)	***P* value**	**OR (95% CI)**
LV, West	5(50)		
HV, West	10 (59)		1.429 (0.297–6.877)
LV, Midwest	9 (33)		0.500 (0.114–2.186)
HV, Midwest	13 (62)		1.625 (0.355–7.434)
LV, Northeast	6 (22)		0.286 (0.061–1.328)
HV, Northeast	11 (44)		0.786 (0.181–3.416)
LV, South	10 (46)		0.833 (0.187–3.723)
HV, South	15 (68)	0.029	2.143 (0.464–9.898)
LV, <100% SCIP	30 (35)		
LV, 100% SCIP	0 (0)		–
HV, <100% SCIP	48 (57)		2.489 (1.340–4.623)
HV, 100% SCIP	1 (100)	0.008	–
LV, high %ICU	9 (24)		
LV, low %ICU	21 (44)		2.506 (0.979–6.419)
HV, high % ICU	26 (54)		3.808 (1.489–9.739)
HV, low % ICU	23 (62)	0.005	5.294 (1.947–14.395)
LV, long LOS	7 (28)		
LV, short LOS	23 (38)		1.556 (0.564–4.295)
HV, long LOS	35 (58)		3.600 (1.308–9.911)
HV, short LOS	14 (56)	0.022	3.273 (1.008–10.621)
LV, high LOS index	10 (30)		
LV, low LOS index	20 (38)		1.394 (0.552–3.523)
HV, high LOS index	31 (58)		3.241 (1.289–8.147)
HV, low LOS index	18 (56)	0.024	2.957 (1.067–8.195)
LV, high complications	8(26)		
LV, low complications	22 (40)		2.126 (0.781–5.789)
HV, high complications	32 (58)		5.238 (1.912–14.353)
HV, low complications	17 (57)	0.015	2.933 (0.957–8.988)

	High satisfaction, *n* (%)	*P* value	OR (95% CI)
LV, ≥1 PSI	28 (34)		
LV, no PSI	2(67)		3.929 (0.341–45.217)
HV, ≥1 PSI	49 (58)		2.674 (1.429–5.001)
HV, no PSI	0 (0)	0.006	–
LV, high readmissions (all)	9 (30)		
LV, low readmissions	22 (37)		1.412 (0.530–3.763)
HV, high readmissions	35 (61)		3.778 (1.414–10.100)
HV, low readmissions	14 (50)	0.016	2.375 (0.783–7.203)
LV, high readmissions (related)	9 (30)		
LV, low readmissions	21 (37)		1.400 (0.541–3.620)
HV, high readmissions	33 (60)		3.500 (1.355–9.042)
HV, low readmissions	16 (53)	0.021	2.667 (0.924–7.699)
LV, high early mortality	9 (26)		
LV, low early mortality	21 (41)		2.022 (0.789–5.182)
HV, high early mortality	25 (50)		2.889 (1.130–7.389)
HV, low early mortality	24 (69)	0.003	6.303 (2.225–17.852)
LV, high mortality	8(27)		
LV, low mortality	22 (39)		1.779 (0.674–4.698)
HV, high mortality	29 (53)		3.067 (1.166–8.067)
HV, low mortality	20 (67)	0.009	5.500 (1.813–16.681)
LV, high mortality index	9 (21)		
LV, low mortality index	21 (49)		3.606 (1.398–9.299)
HV, high mortality index	23 (52)		4.138 (1.611–10.627)
HV, low mortality index	26 (63)	0.001	6.548 (2.479–17.298)

CI = confidence interval; OR = odds ratio; LOS = length of stay; LV = low volume; HV = high volume

Table 3 -

Volume and patient outcomes as predictors of high overall satisfaction.

Volume and patient outcomes	Ranks hospital 9 or 10 of 10	Definitely recommends hospital
Geographic location	–	–
SCIP compliance	–	–
Percentage of ICU cases	Volume	Volume
Length of stay	Volume	Volume
Length of stay Index	Volume	Volume
Complications	–	Volume
PSIs	–	–
Readmissions (all)	–	Volume
Readmissions (related)	–	Volume
Early mortality	Volume	Volume
Mortality	Volume	Volume
Mortality index	Volume, outcome	Volume, outcome

Volume indicates volume significantly influenced higher satisfaction on this domain, outcome indicates outcome significantly influenced higher satisfaction on this domain, volume, outcome indicates volume and outcome both independently predicted higher satisfaction.

Table 4 -

Volume and patient outcomes as predictors of satisfaction with providers, hospital experience, and hospital environment.

Volume and patient outcomes	Physician communication	Nursing communication	Always received help	Medications explained	Pain controlled	Discharge information	Cleanliness of room	Quietness of room
Geographic location	–	–	–	O*	–	–	–	–
SCIP compliance	–	–	–	–	–	–	–	–
Percentage of ICU cases	–	–	–	–	–	–	–	–
Length of stay	–	V&O	–	–	–	–	–	–
Length of stay index	–	V, O	–	–	–	V&O	–	V
Complications	–	–	–	–	–	–	–	V&O
PSIs	–	–	–	–	–	–	–	V&O
Readmissions (all)	–	–	–	–	–	–	–	–
Readmissions (related)	–	–	–	–	–	–	–	–
Early mortality	–	–	–	–	–	–	–	–
Mortality	V&O	V&O	–	V&O	O	V&O	–	–
Mortality index	–	V&O	–	–	–	O	–	–

V = Volume, indicates volume significantly influenced higher satisfaction on this domain.

O = Outcome, indicates outcome or hospital characteristic significantly influenced higher satisfaction on this domain.

V, O: indicates volume and outcome both independently predicted higher satisfaction.

V&O = Both high volume and better outcome needed for significance.

*Southern hospitals were predictive of higher satisfaction regardless of volume.