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Association between patient satisfaction and short-term outcomes after major cancer surgery

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Abstract

Objective—To investigate whether patient satisfaction, as measured by the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, is associated with short-term outcomes after major cancer surgery.

Materials and Methods—We first used national Medicare claims to identify patients who underwent a major extirpative cancer surgery from 2011–2013. Next, we used Hospital Compare data to assign the HCAHPS score to the hospital where the patient underwent surgery. We then performed univariate statistical analyses and fit multi-level logistic regression models to evaluate the relationship between excellent patient satisfaction and short-term cancer surgery outcomes for all surgery types combined and then by each individual surgery type.

Results—We identified 373,692 patients who underwent major cancer surgery for one of nine cancers at 2,617 hospitals. In both unadjusted and adjusted analyses, hospitals with higher proportions of patients reporting excellent satisfaction had lower complication rates ($P<0.001$), readmissions ($P<0.001$), mortality ($P<0.001$), and prolonged length of stay ($P<0.001$) than hospitals with lower proportions of satisfied patients, but with modest differences. This finding held true broadly across individual cancer types for complications, mortality, and prolonged length of stay, but less so for readmissions.

Conclusions—Hospital-wide excellent patient satisfaction scores are associated with short-term outcomes after major cancer surgery overall, but are modest in magnitude.

Keywords

health care quality; cancer; value

Both patient advocates and payers are increasingly emphasizing public reporting of patient satisfaction ratings as a mechanism for helping patients choose where to obtain health care

[1, 2]. Moreover, CMS and other payers are now linking hospital reimbursement to specific measures of patient satisfaction, including the Value Based Purchasing program, where patient experiences of care comprise 25% of the reward or penalty criteria. In fact, CMS considers these ratings sufficiently important that they require most hospitals to measure patient satisfaction with the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, and include these satisfaction ratings in Hospital Compare, a publically available data set used to classify hospital quality [3].

While these measures are increasingly being emphasized, it is unclear whether they accurately reflect health care outcomes and are good harbingers of health care quality. Importantly, endorsement of these data by CMS may imply to patients that high satisfaction scores are indicative of superior care and outcomes across a wide range of clinical services. In truth, however, the components of hospital HCAHPS scores are extremely heterogeneous, and the relationships with clinical outcomes are not always clear. For instance, some of the HCAHPS items reflect domains such as team communication, responsiveness, and care coordination, that are likely to impact patient care across many different service lines. Other items, in contrast, indicate aspects of hospital care (e.g., a single poor patient interaction, or cleanliness of facilities) that offer little insight regarding broader care delivery in the facility. Furthermore, it is unclear if patients are able to accurately assess quality. As a consequence, determining whether patient satisfaction should be viewed as a measure of quality requires additional validation, including assessment of its relationship with objective clinical outcomes for inpatient diagnoses and procedures. Because it is common and complex, with involvement of many different disciplines within a hospital, major cancer surgery is a useful area for examining these questions further.

In this context, we evaluated whether patient-reported hospital satisfaction is associated with short-term outcomes after major cancer surgery. Namely, do patients treated at hospitals with higher HCAHPS scores have fewer complications, readmissions, mortality, and prolonged length of stay? While some have assessed the association between patient satisfaction and surgical outcomes [4, 5], this study expands upon this body of work by evaluating this relationship across nine different cancer types and more than 300,000 patients. Our analysis therefore clarifies the association between patient satisfaction and surgical outcomes and provides new insight into the relationship between patient satisfaction and hospital quality, as well as the potential relevance of publically available satisfaction scores for patients considering where to go for major cancer surgery.

METHODS

Data sources

We utilized three data sets to perform this analysis. First, we used the 100% Medicare Provider Analysis and Review File for 2011–2013 to identify the patient cohort, clinical data, and outcomes of interest. We also used publically available data from the 2014 Hospital Compare program, which includes survey ratings from 2013, to identify HCAHPS scores for each hospital. Finally, we used the American Hospital Association Annual survey to measure characteristics of hospitals performing the surgeries of interest.

Study population

We included in this analysis all Medicare beneficiaries aged 66 to 99 years who underwent a major extirpative surgery for bladder, colorectal, esophageal, kidney, liver, lung, ovarian, pancreatic or prostate cancer from January 1, 2011 through November 30, 2013. We excluded patients who had 2 or more different oncologic procedures on the same day or who had more than one procedure 180 days apart. To reduce statistical noise, we excluded from our analysis hospitals with fewer than 10 oncologic procedures during the period of interest.

Exposure Variables

Our exposure variable is based on the HCAHPS survey that is administered randomly by CMS to patients who are between 48 hours and 6 weeks post-discharge. It includes 27 questions, 18 of which measure patients' perceptions of their recent hospital stay [6, 7]. The questions include an overall hospital rating, as well as measures about doctor and nurse communication, staff responsiveness, pain management, communication about medicines, hospital cleanliness and quietness, provision of discharge information, and whether a patient would recommend the hospital to others. Each question is rated from 0 (worst) to 10 (best). CMS cleans and reports the data as the percent of patients answering each response category to each question. For example, the overall hospital satisfaction rating question is reported as the percent of patients rating a hospital a 0 to 6, 7 or 8, or 9 to 10. The survey results are made publically available as part of the Hospital Compare program [8].

For this analysis, we used data from a single question on the HCAHPS survey reflecting a patient's overall satisfaction with the hospital. We defined excellent satisfaction with hospital care as the proportion of patients who rated the overall experience of the hospital as a 9 or 10; this measure is similar to previous reports that used HCAHPS data to examine overall patient satisfaction [9]. Since we wanted to evaluate the relevance of the publically reported HCAHPS measure for assessing health care quality, we used the hospital wide HCAHPS rating, as defined in Hospital Compare, and not individual level data.

Outcome measures

We measured 4 outcomes occurring within 30 days of the index cancer surgery: mortality, complications, prolonged length of stay, and hospital readmissions. Complications were defined using established methods [10–12], and included infections, bleeding, gastrointestinal, neurologic, pulmonary, renal, cardiac, and others. Prolonged length of stay was defined as a hospital stay exceeding the 90th percentile for an individual procedure [13].

Statistical Analysis

In order to assess hospital characteristics across levels of satisfaction, we created a binary measure based on the mean proportion of patients reporting excellent satisfaction and performed univariate statistical analyses comparing hospital and patient characteristics across this measure. We next performed univariate statistical analyses to evaluate the association between cancer surgery outcomes and the continuous measure of the proportion of patients reporting excellent satisfaction at each hospital. We performed these analyses for all cancers combined, as well as for each type of cancer individually (i.e., bladder, colorectal, esophageal, etc.).

Next, we examined the independent association between cancer surgery outcomes and patient satisfaction, after adjusting for patient and hospital characteristics. To do this, we fit multi-level logistic regression models, controlling for both patient (age, sex, race, Elixhauser comorbidities and surgery type) and hospital characteristics (hospital bed number, urban vs. rural location, region, teaching status, and cancer surgery volume). To further assess whether the association varied by individual cancer, we included an interaction term between excellent satisfaction rating and type of cancer. We used STATA's margins command to estimate the odds ratios for individual cancers taking into account the interaction term. We then determined the slopes of the odds ratios lines to determine statistical significance.

Finally, to evaluate whether assigning one year of HCAHPS data across our three years of outcomes data affected our analyses, we performed a sensitivity analysis to determine outcome stability over time.

All analyses were performed using STATA 14 (StataCorp LP, College Station, Texas), at the 5% significance level. The University of Michigan institutional review board deemed this study exempt from review.

RESULTS

We identified 384,519 patients who underwent major cancer surgery at 2,667 hospitals in the United States from 2011 through 2013; among this group, 374,707 patients (97%) at 2,646 hospitals (99%) matched with the Hospital Compare HCAHPS file. The distribution of cancer sites was as follows: 4% bladder, 39% colorectal, 1% esophageal, 12% kidney, 1% liver, 18% lung, 5% ovarian, 3% pancreatic and 17% prostate cancer.

At a hospital-level, the mean proportion of patients reporting excellent satisfaction was 67 percent, with a standard deviation of 8 (Figure 1). Table 1 presents characteristics of the patients and hospitals in our sample according to the mean proportion of patients reporting excellent satisfaction. There were significant differences in patient and hospital characteristics. Patients undergoing surgery at hospitals with higher satisfaction scores were younger (74 vs. 75 years), more frequently male (59 vs. 56%) and Caucasian (88 vs 84%), and had less co-morbidity. There were also differences in geographic region, number of beds and hospital profit status.

Across all hospitals and procedures, the median frequencies of our measured 30-day outcomes were as follows: 3.4% mortality rate, 43.7% complication rate, 12.4% readmission rate, and 10.3% prolonged length of stay. Appendix Table A1 demonstrates median cancer specific outcome rates.

In univariate analyses, excellent satisfaction was associated with better short-term outcomes after major cancer surgery. A similar relationship was also observed for most of the individual cancers across each of the outcomes. The one exception was readmissions where only four of the nine cancers (prostate, lung, kidney, and colorectal) demonstrated a significant relationship (Appendix Table 2).

After controlling for patient and hospital characteristics, hospitals with higher proportions of patients reporting excellent satisfaction had lower complication rates ($P<0.001$), readmissions ($P<0.001$), mortality ($P<0.001$), and prolonged length of stay ($P<0.001$) than hospitals with lower proportions of satisfied patients (Figure 2). For example, patients who had major cancer surgery at hospitals where only 35% of patients reported excellent satisfaction had a 14.4% rate of readmission; in comparison, the readmission rate was only 11% among patients having surgery at a hospital where 95% of patients reported excellent patient satisfaction. This relationship was consistent across all the individual cancer types for prolonged length of stay, for 6 of 9 cancers for complications (prostate, lung, kidney, ovarian, pancreatic, and colorectal), 7 of 9 cancers for mortality (prostate, lung, ovarian, bladder, pancreatic, liver, and colorectal), and 4 of 9 cancers for readmissions (prostate, lung, kidney, colorectal) (Figure 3). Finally, our sensitivity analysis demonstrated stable outcomes over time.

DISCUSSION

We observed a significant, inverse association between the proportion of patients reporting excellent satisfaction with care at a hospital and the frequency of adverse outcomes with major cancer surgery. This finding was robust across individual cancer types for complications, mortality and prolonged length of stay, but less consistent for readmissions, where a similar correlation was identified for only 4 of 9 cancers. Collectively, these findings suggest that overall patient satisfaction scores are associated with better short-term outcomes after major cancer surgery; however, the magnitude of this effect is small with some variability across different types of cancer.

By examining over 300,000 patients undergoing surgery for nine different cancers, our findings provide additional insight regarding the relationship between patient-reported hospital satisfaction and cancer surgery outcomes. Previous literature in this area has shown mixed results. For hospital-level outcome measures (i.e., not for a particular procedure or service line), at least one analysis identified a similar inverse association between patient satisfaction and all-cause readmissions [14]; other studies, in contrast, found no relationship between satisfaction and readmissions [15, 16], complications [15, 16], mortality [16], or increased length of stay [16]. Likewise, for patients undergoing colorectal surgery, no association was found between overall patient satisfaction and post-operative complications [5]. Prior work in urology, however, revealed that patient satisfaction was associated with a lower frequency of nursing-sensitive complications and prolonged length of stay for patients undergoing urologic cancer surgery [4].

There are several potential reasons why patient satisfaction may be associated with short-term outcomes after major cancer surgery. First, this may reflect an increased hospital safety culture that impacts both the patient experience and clinical care delivery. In fact, several hospitals have recently hired Chief Experience Officers (CXO) with the specific goal of improving patient satisfaction, hospital ratings and reimbursement. While the role of the CXO focuses on improving the patient experience, many hospitals and CXO's believe that such efforts include changes in a hospital's safety culture that may also yield higher quality care and better patient outcomes [17]. In keeping with this perspective, other investigators

have found that HCAHPS scores positively correlate with better safety and teamwork climates [18], both of which could affect short-term outcomes after major surgery [19].

Second, these findings may indicate nursing quality. Interactions with nurses are the predominant drivers of patient satisfaction; nurses who are responsive, compassionate, respectful, well trained, and efficient, garner increased overall patient satisfaction [4, 20–24]. Nursing characteristics, including higher education levels and lower patient-to-nurse staffing ratios, have been previously associated with lower 30-day mortality rates, 30-day readmission rates, and failure to rescue [19, 25, 26]. Third, our findings may demonstrate that surgeons, who communicate more with their patients, are better able to meet their patients' expectations while in the hospital and manage their patients post-operatively, translating into improved patient satisfaction scores and outcomes.

Our study has several limitations. First, because we used only Medicare claims data our results may not be generalizable to the entire U.S. population. Nonetheless, Medicare is the largest payer and the major driver of health policy in the United States and CMS is the primary user of data from the HCAHPS survey [7]. Second, although we look at individual level outcomes, we measure hospital-level satisfaction scores. Hospital wide HCAHPS ratings are publically reported and used in value based reimbursement programs. We further only generalize our results to hospital-wide (i.e., not individual level) satisfaction measures. In fact, we caution against using individual level patient satisfaction scores as proxy measures for quality of care as these measures are more susceptible to health status and intrinsic differences in patients [27–29], and emphasizing individual ratings can lead to worse patient outcomes and increased utilization [30–32].

Third, we were unable to adjust for some patient characteristics, including illness severity and depression, which are associated with lower patient-satisfaction scores [28, 29]. However, we adjusted for other Elixhauser co-morbidities and the Hospital Compare HCAHPS measure includes an adjustment for self-rated health. We also did not adjust for procedural factors, such as the surgical approach or extent of resection, that could affect short-term outcomes after major cancer surgery. Although such granular clinical details are important, this analysis focused on the association between hospital-wide patient satisfaction scores (including scores for patients hospitalized for reasons other than cancer surgery) and short-term outcomes after major cancer surgery. Third, there were some baseline differences in HCAHPS scores across geographic regions. While adjusting for region likely doesn't account for local cultural issues, further work could explore the underpinnings of these geographic differences. Fourth, given that the HCAHPS survey is completed after a patient's discharge, patients with good health outcomes (i.e., decreased readmissions and lower complication rate) may be more likely to have better perceptions of care. However, studies have shown that this does not necessarily hold true [31], and even if it does, we are not attempting to determine causation, just association. Fifth, we determined patient satisfaction using HCAHPS scores for the inpatient episode. While other measures exist that reflect global satisfaction, HCAHPS scores are perhaps the most relevant from a policy perspective because they are available to potential patients and are used in Medicare reimbursement programs, including hospital Value Based Purchasing. Last, we only captured HCAHPS

scores for one year of our 3-year cohort, but our sensitivity analyses demonstrated stable outcomes over time.

These limitations notwithstanding, our findings have important implications for policymakers interested in value based purchasing initiatives, hospital administrators, and patients. For policymakers, our results support evaluating patient satisfaction at the hospital level and for its continued use in value based purchasing. However, the scores need to be used judiciously as they reflect small differences in short-term outcomes. For hospital administrators, these data suggest that low HCAHPS scores could be indicative of less than optimal outcomes. It is therefore important for hospital administrators to evaluate and respond to patient satisfaction ratings, including entertaining the possibility of hiring a CXO to help improve the safety culture of the organization. Lastly, for health care consumers, our analyses demonstrate that patient satisfaction scores are correlated with short-term outcomes after major cancer surgery, but the differences in outcomes are modest and it is unclear whether the findings are similar across service lines.

Taken together, our findings suggest that overall hospital satisfaction is positively associated with short-term outcomes after major cancer surgery cancer, but with nominal differences. Moving forward, the association between patient satisfaction and clinical outcomes should be evaluated on a broader scale. These assessments should include the relationship between individual HCAHPS components and outcomes, as well examination of relationships across service lines and for other longer-term outcomes after major cancer surgery. It will also be important to determine if these relationships hold in safety net hospitals, as these hospitals have, on average, lower patient experience scores than non-safety net hospitals [33]. In addition, it will be critical to better understand what characteristics of a hospital allow for improved satisfaction and outcomes, such as a better safety culture. Ultimately, accurate measures of hospital quality are necessary for equitable reimbursement, patient choice, and improving outcomes.

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Vertical line = mean

Figure 1.
Percent of Hospitals with an Excellent Satisfaction Rating
Vertical line = mean

Figure 2. Probability of adverse cancer surgery outcomes according to the proportion of patients reporting excellent satisfaction for all cancers combined*
 *Adjusted for patient (age, sex, race, Elixhauser comorbidities, surgery type) and hospital characteristics (hospital bed number, urban vs. rural location, region, teaching status, cancer surgery volume)

A) Complications

* Statistically significant

B) Readmissions

* Statistically significant

C) Mortality

* Statistically significant

D) Prolonged Length of Stay

*Statistically significant

Figure 3.

Probability of adverse cancer surgery outcomes according to the proportion of patients reporting excellent satisfaction for each individual cancer type* A) Complications B) Readmissions C) Mortality D) Prolonged Length of Stay

**Adjusted for patient (age, sex, race, Elixhauser comorbidities, surgery type) and hospital characteristics (hospital bed number, urban vs. rural location, region, teaching status, cancer surgery volume)

Table 1

Patient and hospital characteristics stratified by the proportion of patients reporting excellent satisfaction

	At or Below Mean	Above Mean	P-value
Patient Characteristics			
Age (mean)	75.0	74.2	0.0032
Male Sex (%)	56.0	59.1	<0.001
Race			<0.001
Caucasian	84.0	87.8	
African American	9.5	7.5	
Other	6.5	4.7	
Number of Comorbidities			<0.001
0	9.0	10.7	
1	19.4	21.6	
2	22.0	22.7	
3	18.6	18.0	
4	31.1	27.1	
Hospital Characteristics			
Geographic region (%)			<0.001
Northeast	23.7	11.4	
Midwest	20.2	31.1	
South	35.7	38.8	
West	20.4	18.8	
No of beds	<0.001		
<100	16.0	27.4	
100–299	57.6	43.3	
300–499	18.4	18.8	
>=500	8.0	10.6	
Hospital profit status (%)			<0.001
For-profit	21.6	13.1	
Nonprofit	64.0	74.8	
Public	14.4	12.2	
Teaching hospital (%)	33.4	35.6	0.233
Urban location (%)	72.0	73.2	0.473

Appendix Table 1

Cancer-specific outcome rates

	Complications	Readmissions	Mortality	Prolonged Length of Stay
All cancers	43.7	12.4	3.4	10.3
Prostate	12.4	4.7	0.3	0.4
Bladder	71.1	26.5	3.4	16.3
Esophageal	59.4	20.8	5.3	33.4
Pancreatic	51.3	21.7	4.2	25.9
Lung	35.5	11.7	3.1	8.4
Liver	49.9	18.7	5.6	15.5
Kidney	41.2	9.7	1.6	4.0
Colorectal	56.1	14.7	5.2	13.8
Ovarian	55.8	15.9	4.1	10.3

Appendix Table 2

Unadjusted cancer surgery outcomes by the proportion of patients reporting excellent satisfaction for all cancers combined and individual cancers

	Complications		Readmissions		Mortality		Prolonged Length of Stay	
	OR	p-value	OR	p-value	OR	p-value	OR	p-value
All cancers	0.98	<0.001	0.99	<0.001	0.97	<0.001	0.97	<0.001
Prostate	0.98	<0.001	0.99	<0.001	0.96	<0.001	0.95	<0.001
Bladder	1.00	0.413	1.00	0.088	0.97	<0.001	0.98	<0.001
Esophageal	0.99	0.003	1.00	0.650	0.98	0.109	0.97	<0.001
Pancreatic	0.98	<0.001	0.99	0.074	0.96	<0.001	0.97	<0.001
Lung	0.99	<0.001	0.99	0.001	0.98	<0.001	0.98	<0.001
Liver	0.99	0.234	1.00	0.523	0.98	0.013	0.99	0.070
Kidney	0.99	<0.001	0.99	0.002	0.99	0.029	0.98	<0.001
Colorectal	0.99	<0.001	0.99	<0.001	0.98	>0.001	0.98	<0.001
Ovarian	0.99	<0.001	1.00	0.629	0.97	>0.001	0.97	<0.001

Excellent satisfaction is defined by the proportion of patients who rate HCAHPS overall hospital satisfaction a 9 or 10.