



Centers for Medicare and Medicaid Services' Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores and gynecologic oncology surgical outcomes[☆]

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ABSTRACT

Objective. The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) is a national survey of inpatient experience. This study evaluated the association between HCAHPS survey results and outcomes in gynecologic cancer surgery.

Methods. This observational study used HCAHPS survey data from 2009 to 2011 to assign hospitals into score terciles. The Nationwide Inpatient Sample (NIS) database was used to identify admissions during the same time period for gynecologic cancer-specific surgeries. Data sources were linked at the hospital level. Postoperative complications, mortality, and prolonged length of stay were compared between higher and lower scoring hospitals. Complications were grouped as 'surgical', 'medical', or 'care team'. Mixed effects models were used to evaluate the associations between hospitals' HCAHPS scores and outcomes after adjustment for patient and hospital-level variables.

Results. 17,509 linked encounters in 651 hospitals across the U.S. were identified, with 51% uterine, 40% ovarian, and 9% cervical cancer surgical admissions. In-hospital mortality was lower in hospitals in the top HCAHPS score tercile compared to bottom HCAHPS score tercile (odds ratio (OR) 0.54, 95% CI: 0.31–0.94). Surgery in higher scoring HCAHPS hospitals was associated with less 'surgical' complications (OR 0.82, 95% CI 0.69–0.98). No association was found between 'medical', 'care team', overall complications, or prolonged hospitalization ($p > 0.05$) and HCAHPS scores.

Conclusions. Gynecologic oncology surgeries performed in top HCAHPS tercile hospitals were associated with lower in-hospital mortality and surgical complications compared to surgeries performed in bottom tercile hospitals. Associations between HCAHPS scores and other adverse events were not seen.

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1. Introduction

The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, developed by the Agency for Healthcare Research and Quality, is a national standardized survey of patients' perspectives on their recent inpatient hospital care. The Centers for Medicare and Medicaid Services (CMS) has included HCAHPS performance in the calculation of value-based incentive payments

implemented by the Affordable Care Act, incentivizing attention towards patient experience. Additionally, results from the survey are made publicly available as an effort to increase hospital accountability and to allow patients to make meaningful comparisons of patient experience between hospitals [1,2]. Patients can access this information on the CMS Hospital Compare website.

While results from the HCAHPS survey provides healthcare consumers with a patient-centered data tool to potentially aid in medical care decision making, there is not currently data to support the use of the HCAHPS survey as a surrogate for safer, high-quality care. As a measure of patient experience, the HCAHPS survey is not designed to measure clinical outcomes or the quality of surgical care. Prior surgical literature has described mixed findings with respect to the correlation between inpatient experience scores and short term postoperative morbidity, mortality, length of stay, readmission, and other indicators of patient safety [3–7].

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There is minimal available data on the association between patient experience as measured by HCAHPS and postoperative outcomes for gynecologic oncology surgery. Understanding a possible association between HCAHPS scores and outcomes for gynecologic oncology patients may provide insight into the shared causes or potential interventions that may improve both patient experience and high quality surgical care or provide evidence that HCAHPS scores should be used with caution by patients seeking to make decisions regarding quality of care. We sought to evaluate the association between hospital-level data from the HCAHPS survey and postoperative outcomes in gynecologic cancer patients using the National Inpatient Sample (NIS) database.

2. Materials and methods

A population based observational study was conducted using linkage of the HCAHPS survey results database and the NIS database from years 2009–2011. Adverse postoperative outcomes for gynecologic oncology patients were analyzed at the patient level. Outcomes included inpatient postoperative mortality, inpatient postoperative complications, and hospital length of stay. The primary exposure of interest was hospital-level patient experience as measured by the HCAHPS survey. The MD Anderson Cancer Center Institutional Review Board reviewed and exempted this study from the approval process.

Historical HCAHPS survey data over the time period studied was collected from the publicly available CMS Hospital Compare website [8]. The HCAHPS survey is a nationally administered standardized survey tool used across 4100 participating hospitals, given to a random sample of adult inpatients admitted for medical, surgical, or maternity care between 48 h and six weeks post-discharge [9]. Participating hospitals must survey patients through each month of the year with at least 300 completed surveys over four calendar quarters. The survey, which is not limited to Medicare or Medicaid beneficiaries, incorporates multiple contact methods and attempts, and accounts for response rates and nonresponse bias to statistically adjust for participating patient characteristics [2].

The HCAHPS survey asks questions focused on patients' recent hospital experience. Over the study period analyzed this included questions regarding nursing communication, physician communication, hospital staff responsiveness, perceptions of pain management, explanation of medications, hospital cleanliness, hospital quietness, and discharge communication. Also included were two summary questions of global hospital experience: 'How do patients rate the hospital overall?' and 'Would patients recommend the hospital to friends and family?'

Available answers were provided in multiple choice format, and the survey is offered in multiple languages. HCAHPS results are publicly reported as "top-", "middle-" and "bottom-" box scores, where "top-box" refers to the most positive possible response to individual survey questions.

Adverse surgical in-hospital outcomes data was collected from the NIS database, an inpatient care database developed for the Healthcare Cost and Utilization Project sponsored by the Agency for Healthcare Research and Quality. During the time period studied, the NIS was comprised of a 20% stratified sample of hospitals across the United States. The NIS contains data on clinical and nonclinical data elements for hospital admissions abstracted from discharge data. This includes patient and hospital characteristics, payment source, comorbidity measures, and diagnosis and procedure International Classification of Diseases (ICD) codes [10].

Study design was modeled after a previously published study of patient experience and short-term outcomes in urologic surgery utilizing NIS data [7]. In order to select inpatient admissions for gynecologic oncology-specific surgeries, admissions with ICD-9-CM codes for both gynecologic cancer and relevant associated surgeries were identified. Both minimally invasive and open procedure codes were included. These admissions included concurrent uterine cancer codes and codes

for simple hysterectomy, concurrent cervical cancer codes and codes for radical or simple hysterectomy, and concurrent ovarian cancer codes and codes for adnexal surgery, hysterectomy, or debulking procedures. Debulking procedures included bowel resection, ostomy creation, and upper abdominal procedures such as splenectomy, partial hepatectomy, or operations on the diaphragm. After gynecologic cancer surgical admissions were identified from the NIS dataset, admissions with hospital identifier data available were linked to hospital-level HCAHPS survey data using American Hospital Association hospital identifiers, hospital addresses, and ZIP codes. A random 1% sample of the final cohort was manually audited to verify linkage. The years 2009–2011 were selected for analysis, as changes to the NIS database after 2012 removed hospital identifiers which allowed for database linkage. After linkage, exposure variables and postoperative outcomes measures were identified within the NIS gynecologic surgical admission-HCAHPS linked dataset.

Our primary exposure of interest was hospital-level data on patients' inpatient experience as measured by HCAHPS survey scores. Summary scores for hospitals were created from the percentage of responders assigning "top-box" answers to survey questions. Hospitals were divided into terciles by HCAHPS summary scores, in order to compare surgical outcomes in the top tercile to the bottom tercile hospitals. Score terciles were chosen based on prior studies utilizing this delineation in HCAHPS; others have used quartile, quintile, or 50th percentile [6,7,11,12]. Scores were also collected from subcomponent domains of the HCAHPS survey: pain management, explanation of medication, discharge information, cleanliness and quietness, and patient satisfaction.

Outcomes of interest included mortality, complications, and prolonged length of stay. Mortality was defined as in-hospital mortality during surgical admissions for each hospital. Prolonged length of stay was defined as the top 10th percentile of duration of hospitalization according to cancer type and surgical approach (minimally invasive or open approach). Complications were broadly characterized as either 'surgical', 'medical', or 'care team', modeled after similar categories utilized by Shirk et al. [7]. Medical complications were defined using ICD-9-CM diagnosis codes for cardiovascular, pulmonary, neurologic, and selected infectious complications. Similarly, we defined surgical complications using diagnosis codes for iatrogenic injury, reoperation, foreign body, and surgical site complications based on diagnosis codes. Care team complications included codes for medication or drug reactions, pressure ulcers, and selected infectious complications. A fourth category, 'any complication', pooled all codes from these categories. Patient and hospital-level characteristics were collected to adjust for differences seen according to HCAHPS score. Patient-level characteristics included age, race/ethnicity, comorbidity (using the Elixhauser comorbidity method), expected payer, median zip code income quartile, gynecologic cancer type, year of surgery, surgical approach, and non-emergent or emergent procedure status. Payer was categorized as Medicare, Medicaid, or other, which included private insurers and self-pay patients. Hospital-level characteristics included ownership/control, teaching status, rural/urban location, bed size, and census region of the country, procedure volume, and nurse staff size. All hospital and patient-level characteristics were taken from the NIS database.

Summary statistics such as mean, median, frequency, and percentage were used to describe continuous or categorical variables by HCAHPS survey summary score terciles. Analysis of variance and Chi-square tests were used to compare patient characteristics distributions by HCAHPS terciles. Mixed effect models were used to evaluate the associations between inpatient postoperative outcomes and HCAHPS score terciles. We computed the odds ratios and its 95% confidence interval (95% CI) for the inpatient outcomes comparing top HCAHPS tercile hospitals with bottom HCAHPS tercile hospitals adjusting for hospital and patient characteristics. For comparison of postsurgical outcomes and HCAHPS survey subdomain scores, the Benjamini-Hochberg method was used to control false discovery rate [13]. A 10% false

positive rate was used. All analyses were conducted with SAS (version 9, SAS Institute, Cary, NC).

3. Results

Hospital survey data was successfully linked to 79.9% of the inpatient encounters identified in the NIS cohort of gynecologic cancers and related surgical admissions with hospital name, zip code, and address available, which resulted in 17,509 linked patient encounters across 651 hospitals. Patient and hospital characteristics of the total cohort and distribution of characteristics across HCAHPS score terciles are shown in Table 1. The majority of patients were white, nearly one out of three had an Elixhauser comorbidity index of 3+, and over half had insurance provider other than Medicare or Medicaid. Of this cohort, 51% of encounters were uterine cancer surgical admissions, 40% ovarian cancer surgical admissions, and 9% were cervical cancer surgical admissions. The majority of hospitals were non-teaching facilities and in urban locations. Both hospital and patient characteristics differed across HCAHPS score tercile scores. Notably, in our cohort, hospitals in the top HCAHPS summary scores tercile were more likely to be smaller, rural, non-teaching hospitals.

Table 1
Patient and hospital characteristics across HCAHPS score terciles.

Characteristic	Total	HCAHPS tercile			p-Value
		Bottom	Middle	Top	
Age (median)	61	61	61	61	0.43
Race, %					<0.0001
White	63.9	57.8	67.1	65.7	
Other/unknown	14.2	8.6	14.6	19.2	
Hispanic	9.3	14.1	7.3	7.0	
Black	8.7	14.0	6.7	6.0	
Asian	3.9	5.5	4.2	2.1	
Income quartile, %					<0.0001
First	17.9	18.7	14.5	21.5	
Second	21.6	19.9	18.5	27.1	
Third	25.6	26.5	26.2	24.0	
Fourth	34.9	34.8	40.8	27.4	
Elixhauser comorbidity, %					0.02
0	20.1	19.2	20.8	20.1	
1	25.9	25.0	26.5	26.2	
2	22.9	23.0	22.8	22.9	
3+	31.1	32.8	29.9	30.8	
Cancer type, %					0.48
Cervical	8.7	9.2	8.4	8.7	
Ovary	40.5	40.0	40.4	41.2	
Uterine	50.7	50.8	51.2	50.1	
Expected payer, %					<0.0001
Medicaid	8.1	12.2	6.0	6.7	
Medicare	39.0	37.9	39.0	40.0	
Other	52.9	49.9	55.0	53.2	
Minimally invasive, %	17.0	14.8	19.2	16.3	<0.0001
Elective admission, %	85.8	83.2	87.8	85.8	<0.0001
Hospital ownership, %					<0.0001
Government, nonfederal	11.5	15.3	6.0	12.7	
Private, nonprofit	73.7	62.9	81.1	79.2	
Private, investor-owned	14.7	22.7	12.9	8.1	
Teaching hospital, %	33.0	36.2	36.8	26.2	0.03
Bed size, %					0.0004
Small	19.2	10.9	19.9	27.1	
Medium	33.2	34.1	32.8	32.6	
Large	47.6	55.0	47.3	40.3	
Rural location, %	20.4	12.7	18.4	30.3	<0.0001
Region, %					<0.0001
Northeast	25.7	29.3	29.4	18.6	
Midwest	18.6	10.5	13.9	31.2	
South	26.3	23.6	27.4	28.1	
West	29.5	36.7	29.4	22.2	
Procedure volume, %					0.06
Bottom tercile	37.9	36.7	34.8	42.1	
Middle tercile	31.8	32.3	32.8	30.3	
Top tercile	30.3	31.0	32.3	27.6	

After adjustment for patient and hospital-level characteristics, the relationship between HCAHPS scores terciles and outcomes was described (Fig. 1). Gynecologic oncology patients treated in hospitals in the top tercile for HCAHPS scores compared with bottom tercile summary scores had lower postoperative inpatient mortality (OR 0.54, 95% CI: 0.31–0.94) and were less likely to have a 'surgical' complication (OR 0.82, 95% CI: 0.69–0.98) during their surgical admission. Surgical complications included iatrogenic injury codes, bleeding complications, wound complications, need for reoperation, or postoperative gastrointestinal complications. There was no association between HCAHPS score terciles and 'medical' or 'care team' complications. When all complications were grouped together, there was also no association seen between gynecologic oncology patients treated at top tercile HCAHPS score hospitals compared with bottom tercile hospitals. Outcomes were stratified by disease site across HCAHPS summary score terciles (Table 2). When stratified by disease site, significant outcomes differences were seen only in uterine cancer surgical patients, for prolonged hospitalization and care team complications. Analysis in cervical cancer surgical patients was limited by number of patients with cervical cancer included in this study.

The relationship between individual HCAHPS survey subdomains and outcomes of interest were mixed (Table 3). Hospitals were assigned to terciles for each individual subdomain of the HCAHPS survey (nursing communication, physician communication, responsiveness of hospital staff, pain management, explanation of medications, discharge information, cleanliness and quietness, and patient satisfaction) in order to examine the relationship between highest tercile and lowest tercile scores on individual measures of the HCAHPS survey and our categories of postoperative short-term outcomes. Notably, higher HCAHPS scores for the 'responsiveness of staff' and 'explanation of medications' domains were associated with decreased mortality, overall postoperative complications, and 'surgical' complications. Hospitals with higher physician communication scores were also less likely to have postoperative gynecologic oncology patients with prolonged hospitalization.

4. Discussion

Using Hospital Compare HCAHPS survey data and the NIS database, we found an association between hospital-level HCAHPS survey results and some in-hospital outcomes in gynecologic oncology surgical admissions, including mortality and selected short term surgical complications.

Publicly-available and relevant metrics are needed to describe differences in care specific to oncology patients while remaining understandable to the average healthcare consumer. One recent publication examined the relationship of outcomes and the Centers for Medicare and Medicaid Services' (CMS) Hospital Compare star rating, another publicly available CMS rating system that assigns hospitals a star rate from 1 to 5 (lowest to highest), and incorporates HCAHPS data into the scoring system [14]. The star score is a complex composite metric based on 64 possible measures in 7 categories: mortality, safety, readmissions, patient experience, care effectiveness, timeliness and efficient use of medical imaging. Scores may be based on a minimum of 3 measures in 3 categories, at least 1 of which must be the mortality, safety, or readmissions categories. In a cohort of multiple solid tumor types including ovarian cancer patients, the star rating correlated with short-term mortality, complication rates, readmissions, and prolonged length of stay. Compared to use of HCAHPS survey scores alone, the star rating system may be more useful for cancer patients when choosing between hospitals for their surgical care. However, procedure-adjusted surgical volume of hospitals was similarly associated with these outcomes, suggesting that public reporting of case volume may be of equal value to the patient consumer as the star rating system in identifying which hospital will minimize likelihood of short-term morbidity and mortality following cancer surgery. This reinforces the known phenomenon of improved ovarian cancer outcomes related to

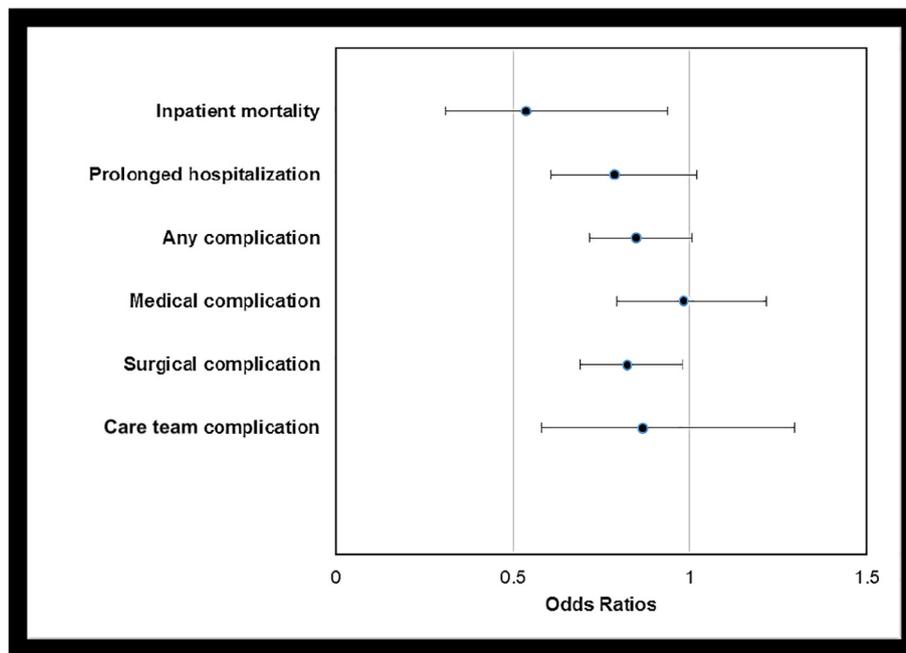


Fig. 1. Odds ratios of in-hospital postoperative outcomes in top vs bottom tercile HCAHPS summary score hospitals.

both surgeon experience and hospital case volume, despite the majority of ovarian cancer patients receiving care from less-experienced surgeons and in lower volume hospitals [15,16].

Limitations of this study include the limitations of the datasets used. By design, HCAHPS survey scores are meant to capture a measure of patient experience, not postoperative outcomes, and captures data at a hospital level. As with any survey, HCAHPS is vulnerable to response bias. Additionally, while the hospitals analyzed were located across all major regions in the United States and included a mixture of hospital types, our analysis was still limited to hospitals included in the NIS dataset with available hospital identifiers, which may affect the generalizability of this study. Other limitations of the NIS dataset include the restriction of available outcomes to in-hospital, short-term events; longer-term postoperative outcomes, process improvement measures, patient safety indicators and hospital readmissions, or other post discharge data was not available. Furthermore, with relatively limited numbers of patients and more rare outcomes such as inpatient mortality following surgery, differences in outcomes were not preserved when

our cohort was broken down by disease site. The NIS dataset also does not include the ability to measure cancer-specific outcomes of interest such as residual disease at the end of surgery, time to chemotherapy after surgery, or disease-specific survival. Finally, while associations between hospital HCAHPS scores and gynecologic oncology surgery outcomes were found, caution should be taken when broadly applying these inferences to the individual gynecologic patient.

While adverse surgical outcomes are relevant to oncology patients, publicly available quality metrics specific to broader aspects of oncology care are equally important. One such list of potential quality measures were compiled from a variety of sources including Society for Gynecologic Oncology (SGO), the American Society of Clinical Oncology (ASCO), and included selected general oncology measures from the National Quality Forum (NQF) [17]. This list of 12 proposed quality measures included documentation of tumor debulking status for advanced ovarian cancer patients, documentation of discussion of or referral to hospice within 30 days of death, and tracking of survival of gynecologic cancer patients by stage. Adherence to National Comprehensive Cancer

Table 2

Association between in-hospital postoperative outcomes and HCAHPS summary score tercile (top vs. bottom), by disease site.^a

	Ovarian cancer patients	Uterine cancer patients	Cervical cancer patients
Inpatient mortality	OR 0.62 (95% CI: 0.33–1.12)	OR 0.21 (95% CI: 0.04–1.07)	Not determined
Extended stay	OR 1.02 (95% CI: 0.71–1.45)	OR 0.66 (95% CI: 0.48–0.92)	OR 0.72 (95% CI: 0.41–1.27)
Postop complication	OR 0.84 (95% CI: 0.65–1.06)	OR 0.81 (95% CI: 0.64–1.02)	OR 0.85 (95% CI: 0.56–1.29)
Surgical complication	OR 0.82 (95% CI: 0.65–1.03)	OR 0.81 (95% CI: 0.63–1.03)	OR 0.81 (95% CI: 0.53–1.25)
Medical complication	OR 1.04 (95% CI: 0.78–1.38)	OR 0.92 (95% CI: 0.67–1.25)	OR 0.81 (95% CI: 0.36–1.83)
Care team complication	OR 1.09 (95% CI: 0.67–1.77)	OR 0.52 (95% CI: 0.29–0.96)	OR 0.20 (95% CI: 0.01–3.51)
Any other complication	OR 0.85 (95% CI: 0.58–1.25)	OR 0.93 (95% CI: 0.52–1.68)	OR 0.56 (95% CI: 0.19–1.65)

^a Bold indicates statistical significance.

Table 3
Association between in-hospital postoperative outcomes and HCAHPS survey subdomain tercile (top vs. bottom).

HCAHPS survey subdomain odd ratios (95% CI) ^a	Inpatient mortality	Prolonged hospitalization	Any postoperative complication	Medical complication	Surgical complication	Care team complication
Nursing communication	0.38 (0.20–0.73)	0.78 (0.6–1.02)	0.84 (0.7–1.01)	0.90 (0.72–1.13)	0.81 (0.67–0.97)	0.81 (0.53–1.25)
Physician communication	0.45 (0.26–0.79)	0.70 (0.54–0.92)	0.98 (0.82–1.18)	0.92 (0.73–1.16)	0.93 (0.77–1.13)	0.99 (0.64–1.53)
Responsiveness of hospital staff	0.34 (0.18–0.63)	0.76 (0.58–0.99)	0.79 (0.67–0.94)	0.99 (0.8–1.24)	0.77 (0.64–0.92)	0.75 (0.48–1.15)
Pain management	0.53 (0.31–0.92)	0.84 (0.66–1.08)	0.93 (0.79–1.09)	1.03 (0.84–1.27)	0.88 (0.75–1.04)	0.92 (0.62–1.37)
Explanation of medications	0.52 (0.31–0.88)	0.84 (0.66–1.06)	0.81 (0.7–0.95)	0.88 (0.72–1.07)	0.79 (0.68–0.93)	0.80 (0.55–1.18)
Discharge information	0.86 (0.51–1.48)	0.94 (0.72–1.22)	0.94 (0.79–1.13)	0.94 (0.76–1.16)	0.94 (0.75–1.09)	0.96 (0.63–1.47)
Cleanliness and quietness	0.47 (0.26–0.85)	0.77 (0.59–1.00)	0.84 (0.71–1)	0.92 (0.74–1.15)	0.85 (0.71–1.01)	0.89 (0.59–1.35)
Patient satisfaction	0.47 (0.28–0.78)	0.97 (0.73–1.27)	0.99 (0.82–1.19)	1.10 (0.81–1.28)	0.97 (0.8–1.17)	0.88 (0.57–1.37)
Overall Summary Score	0.54 (0.31–0.94)	0.79 (0.61–1.02)	0.85 (0.72–1.01)	0.98 (0.79–1.22)	0.82 (0.69–0.98)	0.87 (0.58–1.30)

^a Bold indicates statistical significance.

Network guidelines for gynecologic cancer care correlates with patient outcomes, and may similarly be used as a cancer surgery quality metric [18]. If national consensus of gynecologic oncology-specific measures could be compiled, more meaningful comparisons of hospitals for the consumer may be achieved.

Including patient experience measures in an assessment of value-based healthcare and tying this to reimbursement in CMS' Value-Based Purchasing Program is an important step in promoting patient-centered medicine. However, incorporation of HCAHPS scores in a pay-for-performance system is not without potentially negative consequences. As Sacks et al. notes, the relationship between patient experience scores and objective measures of quality of healthcare delivered should be of interest to policy makers – a negative correlation would suggest that incentivizing either measure could be at the detriment to the other [3]. Based on our current study in gynecologic oncology patients a negative correlation between outcomes and HCAHPS scores was not observed, but vigilance is warranted when considering the potential unintended consequences of incentivizing selected aspects of patient care. The associations seen in this study suggests that on a population level, HCAHPS scores may be capturing a hospital-wide patient experience factor related to outcomes in patient care. This study cannot prove that an intervention to increase HCAHPS scores would improve clinical outcomes. It is plausible, however, to hypothesize that aspects of the HCAHPS survey overlap with quality care, and that there may be downstream effects in improving certain domains of patient experience such as responsiveness, communication, and patient education that impact outcomes of clinical care. This area warrants further study. In our cohort, when HCAHPS subdomains were analyzed, hospitals scoring lower in the physician and nursing communication, explanation of medications, and responsiveness categories had an association with adverse in-hospital outcomes in gynecologic oncology surgical patients.

This study adds to the growing body of literature on widely used and publically reported measures of patient experience and their association with practical, patient-centered surgical outcomes. At this time, however, our data does not support the use of HCAHPS scores to inform patients on gynecologic oncology surgery quality of care. Availability of outcomes and safety data may provide a more nuanced assessment of hospital care for the patient consumer, and yet more relevant measures of safety and quality of oncologic surgical care is needed. With validation of these metrics and endorsement from national quality organizations, the next step of providing patients with clearly communicated data would further improve responsible transparency in healthcare for our patients.

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Author contributions

JAD, CCS, LAM and KHL conceptualized and designed the research plan. WH, HZ, and SF performed statistical analysis. JD drafted original manuscript. JAD, WH, CCS, HZ, SF and LAM were involved in data interpretation and manuscript development. All authors reviewed, discussed, and approved the edited final version of the manuscript.

Declaration of Competing Interest

LAM received research funding from AstraZeneca for unrelated research, and has participated in an advisory board for Clovis Oncology in 2016. CCS received research funding from AstraZeneca for unrelated research. All other authors report no conflict of interest.

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