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The effect of an orthopedic specialty hospital on operating room efficiency in shoulder arthroplasty

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Background: Operating room (OR) time is a major cost to the health care system. Therefore, increasing OR efficiency to save time may be a cost-saving tool. This study analyzed OR efficiency in shoulder arthroplasty at an orthopedic specialty hospital (OSH) and a tertiary referral center (TRC).

Methods: All primary shoulder arthroplasties performed at our OSH and TRC were identified (2013-2015). Manually matched cohorts from the OSH and TRC were compared for OR times. Three times (minutes) were recorded: anesthesia preparation time (APT; patient in room to skin incision), surgical time (ST; skin incision to skin closed), conclusion time (CT; skin closed to patient out of room).

Results: There were 136 primary shoulder arthroplasties performed at the OSH and matched with 136 at the TRC. OSH and TRC patients were similar in age ($P = .95$), body mass index ($P = .97$), Charlson Comorbidity Index ($P = 1.000$), sex ($P = 1.000$), procedure ($P = 1.000$), insurance status ($P = .714$), discharge destination ($P = .287$), and diagnoses ($P = .354$). These matched populations had similar ST (OSH: 110.0 ± 26.6 minutes, TRC: 113.4 ± 28.7 minutes; $P = .307$). APT (39.2 ± 8.0 minutes) and CT (7.6 ± 3.8 minutes) were shorter in the OSH patients than APT (46.3 ± 8.8 minutes; $P < .001$) and CT (11.2 ± 4.7 minutes; $P < .001$) in TRC patients. Total nonoperative time (sum of APT and CT) at the OSH (46.8 ± 8.9 minutes) was shorter than at the TRC (57.5 ± 10.4 minutes; $P < .001$).

Conclusions: Despite similar patient populations and case complexity, the OR efficiency at an OSH was superior to a TRC. Further analysis is needed to determine the financial implications of this superior OR efficiency.

Level of evidence: Level III; Economic and Decision Analysis

Keywords: Primary shoulder arthroplasty; operating room efficiency; health care economics; orthopedic specialty hospitals; health care policy; practice management

Use of shoulder arthroplasty in the United States is progressively increasing.[10,13,20,25] Concurrently, the federal government is attempting to increase access to care and contain health care costs.[1] One mechanism for cost containment is through bundled reimbursement, where instead of a fee for

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service, individual episodes of care are reimbursed by a prospectively determined amount.[6] The bundled payment model will specifically emphasize measures to lower costs for individual episodes of care without sacrificing health care quality. As demand for shoulder arthroplasty increases in the current health care economic climate, new approaches to cost savings continue to increase in importance.

One potential mechanism for containing costs for surgical episodes of care is maximization of operating room (OR) efficiency. Many strategies have been used to improve OR efficiency, including Lean and Six Sigma methodology,[8,29] system design,[14,16,27] parallel processing,[11,27] dedicated orthopedic operating rooms,[5,26] team assessment,[2,12,16] and ambulatory surgical centers.[24] One analysis specific to shoulder arthroplasty identified increased efficiency in a model of 2 operating rooms in which the surgeon was present for all critical portions of the case.[17] One potential contributor to OR efficiency that has not been studied is the effect of an orthopedic specialty hospital (OSH).

Recent analyses have found previously unrealized benefits to OSH use for healthy patients who do not require the resources of a tertiary referral center (TRC). These studies compared outcomes in healthy patients between an OSH and TRC for shoulder arthroplasty,[22] total ankle arthroplasty,[3] and total knee arthroplasty.[18] Matched patients from the OSH had significantly decreased length of stay (LOS) with equal readmissions, perioperative mortality, and reoperations as the TRC.[3,18,22] Another recent report found OSH use to be safe, with patients appropriately triaged and transferred when a higher-level emergency treatment was required.[21] Increased OR efficiency may be another yet unrealized benefit to OSH use.

One means of increasing OR efficiency is to decrease the amount of time spent in the OR not doing surgery. Previous analysis in shoulder arthroplasty defined 4 discrete intervals of patient time in the OR: anesthesia preparation time (APT; patient in room to skin incision), surgical time (ST; skin incision to skin closed), conclusion time (CT; skin closed to patient out of room), and turnover time (TT; patient out of room to next patient in room).[17] A decrease in any of the nonoperative intervals (APT, CT, and TT) would increase OR efficiency. This may be an effective cost-saving tool as OR time. Exact OR costs by time are difficult to assess but are estimated to be approximately $15 to $20 per minute[15,23]; therefore, time savings without sacrificing quality of care may be a method of containing health care costs. Although these recent studies show promising benefits to OSH use, recent legislation has limited expansion of the role of OSHs. It is within this context that we sought to analyze OR efficiency at our OSH compared with a carefully controlled cohort of patients at our TRC.

This study compared the OR efficiency in shoulder arthroplasty at an OSH and TRC. We hypothesized that even after matching patients for demographic factors, procedure variables, and comorbidities, OR efficiency at the OSH would be superior.

Materials and methods

Patient selection

A retrospective analysis of our shoulder arthroplasty database from January 1, 2013, to July 1, 2015, was performed. All primary shoulder arthroplasties performed at our OSH and TRC were identified by International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes. The ICD-9-CM codes used were 81.80 (total shoulder arthroplasty), 81.81 (shoulder hemiarthroplasty), and 81.88 (reverse total shoulder arthroplasty).

All procedures were performed by 4 fellowship-trained shoulder and elbow surgeons who operated at both the OSH and the TRC during the study period. Surgeons used the same preoperative, intraoperative, and postoperative protocols. Patient screening criteria for the OSH are described in Table I. Patients who met these screening criteria selected whether to have surgery at the OSH or the TRC. Importantly, patients with major cardiac comorbidities (such as those with an automated implantable cardioverter defibrillator), systemic comorbidities (end-stage renal disease), or known complications of anesthesia (such as a history or family history of malignant hyperthermia) were contraindicated for surgery at our OSH. Patients typically selected the surgery site based on proximity to home. In addition, recent analysis at our institution found that physician shareholder status in the OSH did not have an influence on time to surgical consent or the facility at which surgery was performed.[4] These results suggest that patients are not being disproportionately treated at the OSH over the TRC.

After identification of all OSH and TRC patients, demographic and clinical variables for each patient were identified including age, sex, body mass index (BMI), procedure performed, and medical comorbidities. Medical comorbidities were analyzed in 17 independent categories[28] and also in aggregate by calculating the age-adjusted Charlson Comorbidity Index (CCI). The CCI is a previously validated quantification of a patient's medical conditions using ICD-9-CM codes that was originally designed to determine 10-year mortality risk.[7,28] After this data collection, we designed manually matched patient cohorts between the OSH and TRC.

Comparison of facilities

The OSH and TRC are both within the one health system. Our orthopedic group has minority ownership stake in the OSH and a comanagement arrangement with financial incentives for management of the musculoskeletal product line at the TRC. In addition, the TRC has majority ownership stake in the OSH. Based on this arrangement, the orthopedic group and the TRC are partnered in an effort to lower costs and improve efficiency at the OSH and the TRC.

These 2 facilities have many important similarities in OR management. Both have designated subspecialty OR teams that do not change day by day. For most procedures, the surgical assistant is a resident or fellow of equivalent levels of training between the facilities. Both facilities have designated block rooms for implementation of regional anesthesia, the regional anesthesia is performed before the patient enters the OR. The surgeon at both facilities runs 2 staggered rooms, and there is no difference in the type of case or level of complexity of case in the second room at either facility.

Table I Patient screening criteria for the orthopedic specialty hospital

Hard stops (nearly automatic disqualification from OSH use)		
○ AICD		○ History or family history of malignant hyperthermia
○ BMI >40 kg/m^2		○ End-stage renal disease
Chronic conditions (each worth 1 point toward risk score)		
○ CHF	○ Chronic steroids	○ Hemoglobin <9 g/dL
○ TIA or CVA	○ Atrial fibrillation	○ Vascular disease
○ CKD	○ Cancer	○ BMI >35 kg/m^2
○ Diabetes	○ HIV/AIDS	○ Asthma
○ COPD	○ Sleep apnea	
Lifestyle risk factors (each worth 1 point toward risk score)		
○ Hospitalization or emergency department visit in past 12 months		○ History of falls
○ Admission to nursing facility or rehabilitation in past 6 months		○ Lives alone
○ Requires assistance with activities of daily living		○ <5 medications
○ Requires assistance with home medications		○ Chronic pain
○ Noncompliance with home treatment (eg, home glucometer testing)		○ Alcohol/drug Abuse
○ Noncompliance with home medications		○ Dyspnea
○ Impaired ambulatory status (other than orthopedic issue)		○ Low economic status
○ Limited access to transportation		○ Poor health literacy
○ Care giver anxiety or patient is primary care giver		○ Pets in the home
○ Acute/chronic wound or pressure ulcer		○ Cognitive impairment
○ Depression/anxiety or history of mental illness		○ Weak social support
○ Set up of home environment (stairs, throw rugs, hand rails)		○ Age >76 years
Scoring: Sum of all boxes checked ____ (mild risk <2; moderate risk 3-5; high risk >5).		

OSH, orthopedic specialty hospital; *AICD*, automated implantable cardioverter-defibrillator; *BMI*, body mass index; *CHF*, congestive heart failure; *TIA*, transient ischemic attack; *CVA*, cerebrovascular accident; *CKD*, chronic kidney disease; *HIV/AIDS*, human immunodeficiency virus/acquired immunodeficiency syndrome; *COPD*, chronic obstructive pulmonary disease.

Construction of matched cohorts

We identified 136 primary shoulder arthroplasty patients at the OSH and 1138 at the TRC with full clinical and demographic data. The 136 OSH patients were matched 1:1 to 136 of the 1138 TRC patients. The first set of criteria was to match equivalent sex and procedure (total shoulder arthroplasty, shoulder hemiarthroplasty, or reverse total shoulder arthroplasty). Once sex and procedure were matched, we evaluated BMI, age, and CCI concurrently. Our criteria for a positive match for each pair was to have the same sex, the same procedure, BMI within 5 points, age within 5 years, and CCI within 1 point. In addition to matching each pair individually, a running average of age, BMI, and CCI was recorded for the OSH and TRC subpopulations throughout the matching process. This was performed in an effort to dynamically monitor how these variables were changing for each subpopulation as a whole, and thus, the individual matching process could be tailored to maintaining similar overall subpopulations. In addition, we analyzed the 17 comorbidity categories of the CCI[28] to ensure a statistically equal composition of each comorbidity in the OSH and TRC cohorts.

Finally, we factored in insurance status, discharge destination (ie, home vs. rehabilitation), and diagnosis for surgery. One investigator performed the entire manual matching process and was blinded to all primary study outcomes at the time of matching. Once matched populations were identified, they were analyzed for equivalence. All of the TRC patients who were analyzed in the matched cohort would have qualified for surgery at the OSH.

Quality evaluation of matching process

Continuous variables (age, BMI, CCI) were analyzed by 2-sample *t* test assuming unequal variance. For categoric variables with only 2 categories (percentage of men patients, insurance type [Medicare vs. private], discharge disposition [home vs. inpatient rehabilitation]) and frequency of each of the 17 individual comorbidity categories[28] that are included in the CCI, a 2-sample *z* test for comparing proportions was calculated. For categoric variables with greater than 2 categories (procedure performed and diagnosis at time of procedure), a χ^2 analysis was calculated.

Outcomes analyzed

The outcomes studied were the different OR times for each case identified. The nursing staff at the OSH and the TRC record 4 times: the time in the room, time of skin incision, the time of procedure end (wound closure complete), and time out of the room. We used these times to construct 3 intervals for OR time: APT (patient in room to skin incision), ST (skin incision to skin closed), and CT (skin closed to patient out of room). These time intervals were validated in a prior analysis on primary shoulder arthroplasty when comparing 1 OR and 2 OR models.[17] The APT and CT constitute the nonoperative time for each surgical case, and the ST constitutes the operative time for each procedure. The percentage of nonoperative time for each procedure was calculated by dividing the total nonoperative time by the total time in the OR.

The OSH and TRC populations were first compared by ST. We first analyzed ST as a control mechanism for surgical complexity by comparing ST of the OSH and TRC by a 2-sample test assuming unequal variance. This was used as an added layer of the matching process, with the assumption that patients with similar demographics, comorbidities, diagnoses, procedure, and time of surgery would be adequately matched. Finally, APT, CT, nonoperative time, and percentage of nonoperative time were compared between the matched OSH and TRC cohorts by a 2-sample test assuming unequal variance as a measure of OR efficiency. Decreased nonoperative and percentage of nonoperative time was considered to be a measure of increased OR efficiency. All statistics were calculated with Excel 2013 software (Microsoft, Redmond, WA, USA).

Results

We identified 1274 primary shoulder arthroplasties performed by the study investigators: 136 at the OSH and 1138 at the TRC. The 136 OSH patients were matched 1:1 with a cohort of 136 TRC patients for analysis. Comparison of demographic and clinical variables (Table II) found the matched cohorts in each group were nearly identical in age ($P = .982$), BMI ($P = .967$), CCI ($P = 1.000$), sex ($P = 1.000$), procedure ($P = 1.000$), and diagnosis ($P = .354$). An examination of the 17 different comorbidity categories[28] of the CCI found no statistically significant differences in any comorbidity category

Table II Comparison of demographic and clinical variables between the orthopedic specialty hospital and tertiary referral center matched cohorts

Categories	OSH cohort (n = 136)	TRC cohort (n = 136)	*t* score,* *z* score,† or χ^2‡	*P* value
Age, yr			$t = -0.02$*	.982
Mean	64.99	64.97		
Median	65.97	65.75		
Standard deviation	9.03	9.10		
Range	43.55-90.36	40.29-86.29		
BMI, kg/m^2			$t = 0.07$*	.944
Mean	29.60	29.64		
Median	29.04	29.00		
Standard deviation	5.04	5.12		
Range	19.92-48.08	19.14-48.26		
CCI score			$t = 0.00$*	1.000
Mean	3.14	3.14		
Median	3.00	3.00		
Standard deviation	1.08	1.05		
Range	1.00-5.00	0.00-5.00		
Sex, %			$z = 0.00$†	1.000
Male	52.21	52.21%		
Female	47.79	47.79%		
Procedure, %			$\chi^2 = 0.00$	1.000
Total	69.12	69.12		
Hemi	7.35	7.35		
Reverse	23.53	23.53		
Insurance type, %			$z = 0.37$	.714
Private	53.68	51.47		
Medicare	46.32	48.53		
Disposition, %			$z = 0.56$	.287
Home	99.25§	98.53		
Rehabilitation/SNF	0.75‡	1.47		
Diagnoses			$\chi^2 = 5.54$	.354
Osteoarthritis	65.4	60.3		
CTA	21.3	22.8		
RA	0.7	2.9		
PTA	7.3	11.8		
Acute trauma	2.9	0.7		
AVN	2.2	1.5		

OSH, orthopedic specialty hospital; *TRC*, tertiary referral center; *BMI*, body mass index; *CCI*, Charlson Comorbidity Index; *SNF*, skilled nursing facility; *CTA*, cuff tear arthropathy; *RA*, rheumatoid arthritis; *PTA*, post-traumatic arthritis; *AVN*, avascular necrosis.

* Comparison of continuous variables calculated by 2-sample *t* test with equal variance.

† Comparison of 2 categoric variables calculated by 2-sample z test for comparing proportions.

‡ Comparison of multiple categoric variables calculated by χ^2 analysis.

§ These percentages are calculated from 133 patients, 3 patients were transferred to tertiary referral center went home, but were removed from this analysis.

Table III Comparison of the 17 comorbidity variables that comprise the Charlson Comorbidity Index between the orthopedic specialty hospital and tertiary referral center matched cohorts

CCI category	Patients with comorbidity		*z* score*	*P* value
	OSH (%)	TRC (%)		
Acute myocardial infarction	0.0	0.0	0.00	1.000
Congestive heart failure	0.0	0.7	1.01	0.313
Cerebrovascular disease	0.0	0.0	0.00	1.000
Peripheral vascular disease	0.7	0.7	0.00	1.000
Dementia	0.0	0.0	0.00	1.000
Pulmonary disease	10.3	11.8	0.39	0.697
Connective tissue disorder	0.7	4.4	1.93	0.053
Peptic ulcer disease	0.0	0.0	0.00	1.000
Liver disease	0.0	0.0	0.00	1.000
Diabetes	11.0	6.6	−1.30	0.196
Diabetes complications	0.0	0.7	1.01	0.313
Paraplegia	0.0	0.0	0.00	1.000
Renal disease	0.0	0.0	0.00	1.000
Cancer	0.7	0.0	−1.01	0.313
Metastatic cancer	0.0	0.0	0.00	1.000
Severe liver disease	0.0	0.0	0.00	1.000
HIV	0.0	0.0	0.00	1.000

OSH, orthopedic specialty hospital; *TRC*, tertiary referral center. *HIV*, human immunodeficiency virus.

* Comparison of proportional variables calculated by 2-sample *z* test for comparing proportions.

between the matched OSH and TRC cohorts (Table III). The cohorts were also statistically similar in the percentage of privately insured and Medicare patients (there were no Medicaid patients; $P = .714$; Table II) and in discharge destination, with similar percentages that went home compared with an inpatient rehabilitation center ($P = .287$; Table II).

The average ST for a primary shoulder arthroplasty was 110.0 ± 26.6 minutes at the OSH compared with 113.4 ± 28.7 minutes ($P = .307$) at the TRC. The average APT and CT for a primary shoulder arthroplasty at the OSH were 39.2 ± 8.0 minutes and 7.6 ± 3.8 minutes, respectively, compared with 46.3 ± 8.8 minutes ($P < .001$) and 11.2 ± 4.7 minutes ($P < .001$) at the TRC (Table IV).

Nonoperative time for primary shoulder arthroplasty was 46.8 ± 8.9 minutes at the OSH compared with 57.5 ± 10.4 minutes at the TRC ($P < .001$). At the OSH, 30.4% of OR time was nonoperative in the average case compared with 34.2% at the TRC ($P < .001$). In an operative day with 6 shoulder cases, this is equivalent to more than 1 hour of OR time saved with OSH use over a TRC in matched patients.

One difference between the OSH and TRC cohorts was the number of cases by each surgeon. At the OSH, 21 cases were done by G.R.W., 55 by M.D.L., 38 by M.L.R., and 22 by S.N. In comparison, at the TRC, 84 cases were done by G.R.W., 30 by M.D.L., 17 by M.L.R., and 5 by S.N. ($\chi^2 = 63.9$, $P < .001$).

The difference in average nonoperative times held true for each surgeon: average nonoperative times were 49.7 ± 10.6 minutes at the OSH compared with 57.1 ± 11.0 minutes at the TRC ($P = .007$) for G.R.W., 48.7 ± 8.5 minutes at the OSH compared with 57.2 ± 7.6 minutes at the TRC ($P < .001$) for M.D.L., 42.3 ± 8.7 minutes at the OSH compared with 61.8 ± 11.3 minutes at the TRC ($P < .001$) for M.L.R., and 47.0 ± 5.3 minutes at the OSH compared with 51.6 ± 8.0 minutes at the TRC ($P = .123$) for S.N. All 4 surgeons had shorter nonoperative times at the OSH than at the TRC, and 3 of the 4 had statistically significantly shorter nonoperative times.

Table IV Comparison of operating room times at the orthopedic specialty hospital and the tertiary referral center

Variable	OSH	TRC	Difference	*P* value
Average				
Anesthesia/preparation time, min	39.2	46.3	7.1	<.001
Surgical time, min	110	113.4	3.4	.307
Conclusion time, min	7.6	11.2	3.6	<.001
Nonoperative time, min	46.8	57.5	10.7	<.001
Nonoperative time, % of time in OR	30.4	34.2	3.8	<.001

OSH, orthopedic specialty hospital; *TRC*, tertiary referral center; *OR*, operating room.

Discussion

As the use of shoulder arthroplasty in the US continues to grow,[10,13,20,25] initiatives by the federal government to increase access to care and contain health care costs[1] are placing a premium on efficiency. Specifically, a potential cost-containment strategy is maximizing OR efficiency. To our knowledge, the effect of OSH use on OR efficiency has not been examined. After controlling for demographics, medical comorbidities, diagnosis, and case complexity (all cases were primaries, had the same distribution of procedures and diagnoses, and average ST was similar), there was more than 10 minutes less nonoperative time per case at the OSH than at the TRC. In a typical 6-case day, this leads to more than 1 hour of OR time saved. This OR time saved is all time in which surgery is not being done.

The decreased nonoperative time had 2 components, a significant difference in APT and CT. APT includes anesthesia induction and intubation as well as patient positioning and sterile preparation. CT depends on anesthesia reversal and extubation, removal of the drapes, and returning the patient to the hospital bed. At our institution, the same group of residents and fellows staff the OSH and TRC. Both institutions have dedicated orthopedic OR teams, a measure that Small et al[26] showed improved OR efficiency for total hip and knee arthroplasty. Both facilities have dedicated shoulder and elbow teams that do not change daily. Both facilities have designated block rooms for implementation of regional anesthesia, which is performed before the patient enters the OR.

Given the similarities in patient population, surgical complexity, and OR infrastructure, it is interesting that the OSH

was still more efficient than the TRC. One potential explanation for the increased OR efficiency is the different schedules for both anesthesia and OR staff at the OSH. At our TRC, anesthesia and OR staff work set shifts that may not correlate with the duration of the cases for the day. Therefore, efficiency at the TRC is not incentivized among the staff because their schedules remain the same no matter how efficiently the day moves. When the case volume is done for the day at our OSH, the OR staff and anesthesia are finished. This difference in hospital scheduling models incentivizes increased efficiency among the OR staff and anesthesia teams at the OSH compared with the TRC.

Use of an OSH has recently been found to have previously unrecognized benefits. Previous analyses have found that OSH use is associated with decreased LOS after shoulder arthroplasty,[22] knee arthroplasty,[18] and ankle arthroplasty,[3] decreased rates of inpatient rehabilitation after hip arthroplasty,[19] and improved perioperative outcomes in hip and knee arthroplasty.[9] However, the effect of OSH use on OR efficiency has yet to be analyzed until now. Many strategies to improve OR efficiency have been studied, including Lean and Six Sigma methodology,[8,29] system design,[14,16,27] parallel processing,[11,27] dedicated orthopedic operating rooms,[5,26] team assessment,[2,12,16] ambulatory surgical centers,[24] and use of a 2-room model.[17]

Results of this study suggest that use of an OSH may be another avenue to decreased OR time and therefore cost savings. Exact OR costs by time are difficult to assess but are estimated to be approximately $15 to $20 per minute.[15,23] Therefore, saving an extraneous 10 minutes of OR time per case may lead to significant savings if projected nationwide. These savings per case also have important ramifications for physician reimbursement as insurance carriers implement bundled payment models, in which individual episodes of care are reimbursed by a prospectively determined amount.[6] If health care providers can save more than 10 minutes per case, that is a substantial amount of money in the bundle saved.

The limitations of this study are that it is retrospective and is therefore subject to the limitations of retrospective data, specifically, the inability to elucidate causal relationships rather than simply correlative ones. Although patients were strictly matched by demographics, comorbidities, social variables, diagnosis, procedure performed, and surgical time, it is possible that there are underlying differences in the patient populations for which we did not account. However, subtle differences that may have been missed would be unlikely to affect the OR efficiency.

The only times that were examined were those when the patient was physically in the OR. That there are differences in turnover time (ie, the time between patients) between the OSH and TRC is possible. An analysis of this variable is not possible with the current data because these cases were nonconsecutive and therefore we do not know when the next patient entered the OR.

Additionally, we did not have access to formal cost data at both institutions and were unable to perform a direct analysis of money saved by the difference in OR times. This is a comparison of an OSH and 2 TRCs within 1 health system. Our orthopedic group has minority ownership stake in the OSH and a comanagement arrangement with financial incentives for management of the musculoskeletal product line at the TRC. In addition, the TRC has majority ownership stake in the OSH. Based on this arrangement, the orthopedic group and the TRC are partnered in an effort to lower cost and improve efficiency at both the OSH and the TRC. Although these factors add an unquantifiable level of bias to this investigation, we implemented a number of measures to limit this bias. The investigator who managed all of the primary data had no financial relationship with the orthopedic group, the matching process was blinded to outcomes, and all OSH patients were included in analysis.

We found a significant difference in OR efficiency, but this analysis may have understated the benefits of OSH use. Our group has taken a number of steps to maximize efficiency at the TRC, and yet the OSH remains more efficient. It is possible this difference would be greater if compared with a more general TRC in which subspecialty orthopedic OR teams were not used. Multicenter investigation will be necessary to determine whether the trends observed in this study are generalizable to other health systems with different arrangements.

Despite these limitations, we were able to identify superior OR efficiency at our OSH compared with our TRC when controlling for demographics, comorbidities, social variables, diagnosis, and surgical procedure/complexity.

Conclusion

We constructed 2 similar cohorts of shoulder arthroplasty patients, 1 from an OSH and 1 from a TRC. These patients were matched by procedure performed, demographics, medical comorbidities, and insurance status. Both facilities had the same surgeons, level of surgical trainees, and all orthopedic OR teams. Despite these similarities, OR efficiency at our OSH was superior to our TRC, with more than 10 minutes of nonoperative time saved per case. Given the expensive nature of OR time, this time saved may be a means of containing costs in shoulder arthroplasty care.

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In addition, at this time the Rothman Institute has a minority ownership stake in the OSH discussed in this report and a comanagement arrangement for management of the musculoskeletal product line at the TRC (Methodist Hospital-Thomas Jefferson University Hospital) discussed in this report. The TRC has a majority ownership stake in the OSH.

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