Ambulatory TSA: A Comprehensive Analysis of Current Trends, Complications, Readmission, and Costs

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Introduction:
Recently, ambulatory lower extremity total joint arthroplasty has emerged as a cost-effective and safe practice. There is a lack of literature that evaluates this practice for total shoulder arthroplasty (TSA). The objectives of the present study were to investigate the current trends in practice patterns of ambulatory TSA in the United States, characterize the rates of postoperative complications, hospital readmission rates and risk factors associated with readmission, and conduct a comparative cost analysis between ambulatory TSA surgeries and age, gender and comorbidity-matched inpatient TSA surgeries.

Methods:
A national private insurance database was queried for patients who underwent TSA between 2007-2014. Ambulatory TSA was identified by selecting only those patients with a service location of ambulatory surgical center or hospital outpatient surgical center with no admission orders or documented hospital stay. A control group of inpatient TSA was then created and matched to the study group by age, gender, obesity, tobacco use, and diabetes mellitus. Medical and shoulder-specific complications were assessed for both groups. Risk factors for readmission within 90 days postoperatively were examined. Finally, 30-day costs were queried and compared between ambulatory TSA and controls.

Results:
1,274 patients who underwent ambulatory TSA were included in the study and compared to 4,730 matched inpatient controls. From 2007 to 2014, the yearly incidence of ambulatory TSA increased 560%. In no instances were any perioperative complications present at a significantly higher rate in the ambulatory TSA patients, in fact, urinary tract infections ($p = 0.023$) and blood transfusions ($p = 0.007$) occurred significantly more frequently in the inpatient control group. The rate of readmission was not significantly different between the two cohorts ($p = 0.882$). Amongst ambulatory TSA patients, age ≥ 80 years, cardiac disease and several other medical comorbidities were significant risk factors for early readmission [*Table 1*]. Ambulatory TSA had significantly lower costs compared to matched controls in numerous itemized cost categories as well as DRG- related costs ($14,940 vs. $19,148, $P < 0.0001$) [*Table 2*].

Discussion and Conclusion:
The annual incidence of ambulatory TSA has substantially increased over the past decade in the studied insurance database. There were no significant increases found in perioperative complications or readmission rates in ambulatory TSA patients compared to matched non-ambulatory controls. Numerous risk factors exist for early readmission following ambulatory TSA, including older age and cardiac disease. Finally, ambulatory TSA represents a significant cost savings compared to inpatient TSA in age, gender and comorbidity-matched patients.

Table 1. Risk Factors for Readmission after Ambulatory TSA

	Readmitted		No Readmission		Statistical Comparison	
Total Number	114		1,160			
Demographics	*n*	*(%)*	*n*	*(%)*	*O.R. [95% CI]*	*P**
Female	70	(61.4%)	644	(55.5%)	*1.3 [0.9-1.9]*	*0.267*
Male	44	(38.6%)	516	(44.5%)		
Age < 50 yrs	2	(1.8%)	32	(2.8%)	*0.6 [0.1-2.7]*	*0.741*
Age 50 - 64 yrs	16	(14.0%)	192	(16.6%)	*0.8 [0.5-1.4]*	*0.575*
Age 65 - 79 yrs	70	(61.4%)	765	(65.9%)	*0.8 [0.6-1.2]*	*0.384*
Age ≥ 80 yrs	26	(22.8%)	172	(14.8%)	*1.7 [1.1-2.7]*	*0.035*
Obesity (BMI 30-39)	31	(27.2%)	266	(22.9%)	*1.3 [0.8-1.9]*	*0.362*
Morbid Obesity (BMI ≥ 40)	22	(19.3%)	189	(16.3%)	*1.2 [0.8-2.0]*	*0.489*
Tobacco Use	22	(19.3%)	178	(15.3%)	*1.3 [0.8-2.2]*	*0.331*
Alcohol Abuse	7	(6.1%)	56	(4.8%)	*1.3 [0.6-2.9]*	*0.696*
Caucasian Race	97	(85.1%)	935	(80.6%)	*1.4 [0.8-2.3]*	*0.299*
Black/African American Race	13	(11.4%)	70	(6.0%)	*2.0 [1.1-3.7]*	*0.044*
Comorbidities	*n*	*(%)*	*n*	*(%)*	*O.R. [95% CI]*	*P**
Diabetes Mellitus	62	(54.4%)	467	(40.3%)	*1.8 [1.2-2.6]*	*0.005*
Hyperlipidemia	103	(90.4%)	995	(85.8%)	*1.6 [0.8-3.0]*	*0.227*
Hypertension	107	(93.9%)	1,041	(89.7%)	*1.7 [0.8-3.8]*	*0.215*
Peripheral Vascular Disease	29	(25.4%)	196	(16.9%)	*1.7 [1.1-2.6]*	*0.031*
Congestive Heart Failure	54	(47.4%)	252	(21.7%)	*3.2 [2.2-4.8]*	*< 0.0001*
Coronary Artery Disease	67	(58.8%)	412	(35.5%)	*2.6 [1.7-3.8]*	*< 0.0001*
Chronic Kidney Disease	49	(43.0%)	254	(21.9%)	*2.7 [1.8-4.0]*	*< 0.0001*
Chronic Lung Disease	56	(49.1%)	350	(30.2%)	*2.2 [1.5-3.3]*	*< 0.0001*
Chronic Liver Disease	12	(10.5%)	84	(7.2%)	*1.6 [0.8-2.9]*	*0.279*
Depression	63	(55.3%)	454	(39.1%)	*1.9 [1.3-2.8]*	*0.001*
Hypercoaguable Disorder	13	(11.4%)	57	(4.9%)	*2.5 [1.3-4.7]*	*0.007*
Diagnoses	*n*	*(%)*	*n*	*(%)*	*O.R. [95% CI]*	*P**
Inflammatory Arthritis	20	(17.5%)	127	(10.9%)	*1.7 [1.0-2.9]*	*0.051*
Shoulder Avascular Necrosis	5	(4.4%)	44	(3.8%)	*1.2 [0.5-3.0]*	*0.953*

Table 2. 30 Day Costs (Reimbursements) and Statistical Comparison

	Ambulatory TSA (Total n = 1,274)				Matched Non -Ambulatory TSA (Total n = 4,730)				
Itemized Reimbursements	Amt Paid ($)	# of pts	avg paid/pt	std dev	Amt Paid ($)	# of pts	avg paid/pt	std dev	*P*
Surgery (Surgeon - CPT)	$1,973,700	1,274	$1,549	$719	$7,594,017	4,730	$1,606	$689	**0.009**
Concomitant Procedures	$150,977	276	$547	$348	$454,182	832	$546	$281	0.962
Anesthesia	$800,666	1,274	$628	$319	$3,058,766	4,730	$647	$317	**0.050**
Intra-op and Post-op Imaging	$85,367	1,232	$69	$41	$313,926	4,617	$68	$36	0.401
Shoulder	$53,637	1,176	$41	$23	$182,962	4,541	$40	$35	0.353
Other (chest XR, doppler scans, etc)	$31,730	600	$53	$32	$130,964	2,504	$52	$37	0.542
PACU/Obs/Admission/Discharge	$473,808	1,274	$372	$115	$2,436,091	4,730	$515	$98	**< 0.0001**
Intra-op and Post-op Labs/Path	$35,780	787	$45	$26	$141,378	2,463	$57	$31	**< 0.0001**
Inpatient and Outpatient PT/OT	$479,970	1,171	$410	$81	$1,657,041	3,006	$551	$101	**< 0.0001**
Home Health (other than PT/OT)	$80,689	299	$270	$130	$291,874	1,120	$261	$194	0.449
Follow-up Visits	$55,953	506	$111	$57	$243,392	2,180	$112	$49	0.689
Prescription Pharmaceuticals	$63,763	961	$66	$34	$228,165	3,517	$65	$39	0.470
Narcotics	$29,023	1,110	$26	$20	$126,257	3,369	$37	$19	**< 0.0001**
Anti-inflammatories	$9,566	152	$63	$36	$23,714	409	$58	$33	0.120
Muscle Relaxants	$1,528	135	$11	$9	$5,797	489	$12	$10	0.294
Antibiotics	$2,449	179	$14	$10	$11,508	632	$18	$10	**< 0.0001**
Anticoagulants	$16,828	90	$187	$101	$56,573	382	$148	$65	**< 0.0001**
Antiemetics	$1,369	98	$14	$11	$4,316	324	$13	$8	0.324
Total Itemized Reimbursements	$4,286,040	1,274	$3,364	$886	$16,732,758	4,730	$3,538	$849	**< 0.0001**
Grouped Reimbursements	Amt Paid ($)	# of pts	avg paid/pt	std dev	Amt Paid ($)	# of pts	avg paid/pt	std dev	
Diagnosis Related Group (DRG)	$19,033,698	1,274	$14,940	$2,863	$83,677,134	4,370	$19,148	$3,047	**< 0.0001**