

Direct Variable Cost Comparison of MAC Versus WALANT Carpal Tunnel Release: A Time-Driven Activity-Based Costing Analysis

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INTRODUCTION: Value-based practices have become essential in modern medicine amidst the rapid rise in healthcare costs. In the context of elective hand surgery, growing variability in costs coupled with declining reimbursement rates have underscored the importance of accurate cost accounting to maximize value. Time-driven activity-based costing (TDABC) has recently emerged as a more accurate and granular estimation of direct variable costs compared to traditional accounting methods. Despite widespread use in spine and total joint arthroplasty, few studies have applied TDABC to explore the costs related to elective hand surgery. Though historically performed under monitored sedation (MAC), there has been a growing trend to perform carpal tunnel release (CTR) wide awake with local anesthesia and no tourniquet (WALANT). Given the similarities in outcomes for WALANT- and MAC-CTR as well as the increasing demand for this surgery, determining the most cost-efficient approach for CTR remains essential in ensuring value-driven care. This study utilized TDABC to compare the same-day facility costs of open CTR performed under MAC versus WALANT in a large contemporary cohort of patients.

METHODS:

We identified 474 consecutive, unilateral CTR (182 MAC, 292 WALANT) performed at an orthopaedic specialty hospital between 2015 and 2021. Itemized facility costs were calculated using a TDABC algorithm. To collect data for all phases of the patients' care, timestamps from electronic medical records, self-reporting of unobserved documentation time gathered from interviews with hospital personnel, direct observation with assistance from a third-party consultant, and multidisciplinary validation of process maps through meetings with staff and management were utilized. Only times related to direct patient care encounters on the day of the surgery were considered in these equations. The analysis was classified based on the timeline of care on the day of surgery, including preoperative, intraoperative operating room (OR), and post-anesthesia care unit (PACU) costs (Figure 1). Two patient cohorts were established based on anesthesia type: MAC-CTR and WALANT-CTR. Multivariate regression was performed to determine the independent effect of MAC on true facility costs.

RESULTS: The primary cost driver for both MAC- and WALANT-CTR were surgery-related personnel costs (46% vs 39%, respectively) (Figure 2). Total facility costs were \$170 higher in MAC-CTR compared to WALANT-CTR (\$652 vs \$482, $P<0.001$) (Table 2). MAC-CTR cases had higher personnel costs (\$537 vs \$394, $P<0.001$), likely due to higher surgery personnel (\$303 vs. \$185, $P<0.001$) and PACU personnel costs (\$117 vs. \$95, $P<0.001$). MAC CTR cases also had higher supply costs (\$119 vs \$81, $P<0.001$). When controlling for demographics and comorbidities, MAC-CTR was independently associated with an increase in personnel costs by \$150.65 (95% CI, \$131.09–\$170.21), supply costs by \$24.99 (95% CI, \$9.40–\$40.58) and total facility costs by \$175.66 (95% CI, \$150.18–\$201.09) per case.

DISCUSSION AND CONCLUSION:

The present study found that MAC-CTR was 35% more expensive to the facility, and independently associated with a \$176 increase in total facility cost per patient. From an intraoperative perspective, MAC-CTR performed in an ambulatory surgery center generally requires a hand surgeon, anesthesiologist, nurse anesthetist (CRNA), and a circulating nurse. In contrast, WALANT-CTR does not require anesthesiologists or CRNAs, and requires only the hand surgeon, surgical technician or scrub nurse, and a circulating nurse. If performed in-office, even less personnel can be expected as the circulating nurse can be substituted for a medical assistant. From a PACU perspective, MAC sedation requires a more thorough and lengthy postoperative assessment as patients must be able to meet numerous post-sedation requirements (e.g., patient recovery, ability to ambulate, ability to urinate) prior to discharge. Notably, WALANT-CTR facility costs presented here do not include additional cost savings from anesthesiologist service fees or preoperative labs clearance required for MAC-CTR surgeries. To reduce costs related to CTR surgery, greater efforts should be made to reduce the number of intraoperative personnel and maximize the use of WALANT-CTR in an outpatient setting.

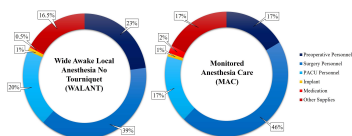
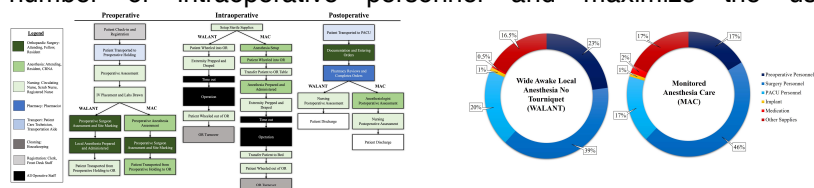


Table 2. Cost and Time of WALANT and MAC Carpal Tunnel Release

Variable	Total Cohort	MAC	WALANT	P-value
Total cost (\$)	524 [467,1,054]	652 [532,1,054]	482 [367,936]	<.001
Total personnel cost (\$)	427 [304,712]	537 [454,712]	394 [304,550]	<.001
Preop personnel cost	113 [114,113]	113 [113,113]	113 [113,113]	1
Surgery personnel cost	216 [117,479]	303 [217,479]	185 [117,339]	<.001
PACU personnel cost	100 [0,189]	117 [87,189]	95 [0,138]	<.001
Total supply cost (\$)	86 [11,480]	119 [11,480]	81 [62,428]	<.001
Implant cost	4 [0,23]	4 [0,23]	3 [0,16]	<.001
Medication cost	0 [0,34]	10 [0,30]	0 [0,74]	<.001
Other supply costs	81 [27,443]	96 [27,443]	77 [53,419]	<.001
Total OR time (minutes)	25 [14,51]	27 [16,51]	25 [14,46]	<.001
Wheels-in to incision	13 [1,30]	14 [7,30]	12 [1,30]	<.001
Incision to closure	10 [6,26]	9 [6,26]	10 [6,25]	0.159
Closure to wheels-out	2 [0,9]	2 [0,9]	2 [0,6]	<.001
PACU-to-discharge time (minutes)	25 [0,186]	65 [14,186]	27 [0,100]	<.001

Data represented as median [range]

MAC, Monitored Anesthesia Care; WALANT, Wide Awake Local Anesthesia No Tourniquet; PACU, postoperative anesthetic care unit; OR, Operating room.