

Time-Driven Activity Based Cost Analysis of Medical and Social Optimization of Patients Before Hip and Knee Arthroplasty in a Health Safety Net Hospital

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INTRODUCTION: Outcomes following total joint arthroplasty of the hip and knee can be improved with preoperative optimization of modifiable risks. An orthopaedic team-driven program to optimize medical and social factors prior to TJA in a health safety net hospital (Screen Access Resources Follow-Up Elective Surgery (SAFE) was shown in previous work to reduce complication and discharge to post-acute care facilities. We aim to determine the cost of the SAFE protocol using Time Driven Activity Based Costing (TDABC).

METHODS:

This is a prospective observational cohort study using TDABC to assess cost of implementing the SAFE protocol. The inclusion criteria consisted of patients undergoing primary total joint arthroplasty (TJA) of the hip or knee at a tertiary care urban health safety net (HSN) hospital. A process map was created for the 5-step process of SAFE (Figure 1).

Processing times were measured by direct observation, and cost per unit time was calculated using labor rate data from the institution's accounting department. Seventy-nine consecutive patients were observed.

RESULTS: The mean total time required for one patient to complete the entire S.A.F.E. process is estimated at 74.24 minutes (range 66.51, 81.98 minutes). The time required for an Advanced Practice Provider (APP) to carry out their portion of the S.A.F.E. process was a mean of 68.06 minutes (range 60.94, 75.18 minutes), corresponding to a labor compensation mean of USD 87.26 (range of USD 78.13, 96.39) per patient. For a Surgical Coordinator the mean time was 6.18 minutes (range 5.57, 6.80 minutes), with a compensation of USD 4.46 (range of USD 4.02, 4.90) per patient. The mean total personnel cost of an individual patient undergoing SAFE was estimated at USD 91.72 (range USD 82.15, 101.29). The average time for ASA 1 and 2 patients was 52.00 minutes (range 44.76, 59.24) versus 47.89 minutes (range 37.45, 58.33 minutes) for more medically complex ASA 3 and 4 patients. A one-tailed t-test revealed no statistically significant difference between the groups (p = 0.24).

DISCUSSION AND CONCLUSION: TDABC is an effective framework for identifying high-resource tasks within the SAFE protocol, a comprehensive pre-operative protocol to mitigate medical and social risk factors in patients undergoing TJA in a HSN hospital. The SAFE-1 phase was most time-consuming. We demonstrate that SAFE costs up to USD 96.39 exceeding that of newly introduced Principal Care management codes that reimburse approximately USD83 for the first 30 minutes of preoperative optimization. Our data support the use of these codes as a viable means of conducting critical perioperative tasks and suggest the work may be currently undervalued. As only a limited number of patients have completed the full SAFE process, this is a preliminary analysis, and the ASA group comparison p-value may change as more data are collected.

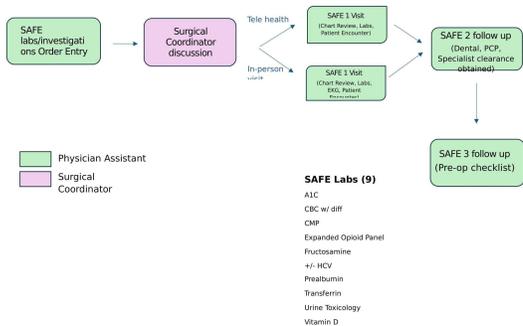


Figure 1. SAFE Process Map

Process Step	Mean Time (minutes)	Range (95% C.I.)
SAFE labs/investigations Order Entry	2.19	(1.97, 2.41)
Surgical Coordinator discussion	6.18	(5.57, 6.80)
SAFE 1 visit	50.37	(46.02, 54.72)
SAFE 2 follow up	4.81	(3.50, 6.11)
SAFE 3 follow up	10.70	(9.45, 11.94)
Total	74.24	(66.51, 81.98)

Table 1. Mean times for each SAFE step with a 95% confidence interval