

Cost of Operating Room Time is \$46.04 Dollars per Minute

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Objectives: The purpose of this study is to establish a consensus estimate of operating room cost per minute based on currently published literature.

Design: Literature review.

Main outcome measurement: Operating room cost per unit of time.

Results and conclusions: A Google Scholar search produced 51 articles regarding “operating room cost per minute,” of which 14 had novel estimates for OR cost per minute. The mean of these estimates was \$46.04 ± \$32.31. There was little consistency in methodology among the included articles, which is reflected in the large range of values.

Level of Evidence: IV; Review

Keywords: Business, management, human resources, cost, value, efficiency.

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INTRODUCTION

Value based practice, defined as weighing the cost of treatment against the change in patient quality of life, has become an important consideration in treatment planning in orthopaedic surgery^{1,2}. High costs^{3,4} draw the attention of payers, while discrepancies in reimbursement disincentivize surgeons^{5,6}. Ultimately what matters most is the ability to provide better outcomes per healthcare dollar spent⁷. While significant effort is being put into measuring patient reported outcomes⁸, we must also clarify the true costs in healthcare. A major factor of healthcare costs pertinent to the orthopaedic surgeon is the costs associated with the operating room (OR). The number of measurable and associated factors is vast and remains poorly defined in the literature. This has contributed to the ongoing controversy regarding actual cost per unit time in the OR.

The cost to run an operating room can be divided into direct costs such as staff wages and consumable items, indirect costs such as building maintenance, leasing/mortgage payments and laundry services, professional fees such as

anesthesia and surgeon fees, and specialty service fees such as intraoperative fluoroscopy, blood bank, lab, and orthopaedic implants⁹. Most of these figures can be estimated from purchase orders and salaries payable by hospital accounting systems¹⁰. More recently, time driven activity-based costing (TDABC) has allowed a more accurate way to assign cost in a complex environment where staff are often multi-tasking and thousands of consumables are utilized. TDABC divides complex care into discrete cycles allowing micro-costing assessment and assignment of cost based on time¹¹.

In either of these methods, decisions must be made when attempting to measure and/or conceptualize the actual cost of a surgery. It should be noted that data in the current literature pertaining to the cost of the operating room often¹², but not always¹³, excludes the costs associated with anesthesia services, perioperative services, surgeon fees, blood bank expenses, radiology services, and implants. Consistent data on operating room costs is needed for effective healthcare resource allocation. The purpose of this study is to review available literature estimating the cost per minute of running an operating room.

METHODS

Literature search was performed in Google Scholar and PubMed for “operating room cost per minute”. All article titles were reviewed by both authors, and either discarded or selected for further review. Abstracts of selected articles were reviewed and those that had novel estimates for operating room cost per minute were included. Papers were excluded if they focused on costs for procedures, considering the large mean discrepancy in the procedural cost of an average orthopedic procedure versus an open-heart surgery necessitating a full team to operate a heart lung bypass machine. The methods of the remaining articles were scrutinized to determine what was included in the cost and what was excluded. Where applicable, a single number was extracted to calculate the mean cost per minute. For articles that only reported a range, we took the median of the range

Table 1. All estimates of OR cost per unit time found in literature.

Author	Year	OR \$/min	OR \$/min inflation adj	Included	Excluded
Childers	2018	\$37.45	\$44.19	OR staffing, cleaning and maintenance salaries, sterile processing, consumable supplies, recovery room costs	Anesthesia, implants, radiology, pathology and blood bank
Park	2009	\$20.83	\$28.77	Salary and benefits, supplies, drugs, services, depreciation	
Moody	2018	\$16.21	\$19.13	OR staffing, medications, supplies, salaries, equipment depreciation, training, hospital overhead	Anesthesia, physician services, soft goods, implants
Shippert	2020	\$62.00	\$71.89	OR fees, anesthesia	
Maskal	2020	\$64-\$115	\$73- \$131	Undisclosed	Anesthesia
Holloran-Schwartz	2013	\$94.14	\$119.73	Support staff salaries, drapes, room maintenance, use of non-chargeable items	Professional fees of surgeon or anesthesia
Abbott	2007	\$18.47	\$26.39	Staff, heating, lighting, basic consumables	
Taravella	2012	\$11.24	\$14.50	Hospital accountant estimate	
Koehler	2016	\$29.44	\$36.34	Staff (\$2.70/min), direct costs (\$11.52/min), overhead (\$15.22/min)	Physician labor (\$12.29/min)
Chapa	2010	\$50	\$67.94	Estimate based on published charges	
Hamid	2014	\$23.20	\$29.03	Direct and indirect costs	
Ackerman	2002	\$18	\$29.64	Undisclosed	
Polacco	1998	\$18	\$32.72	Operating room use	Anesthesia staff
Gilardino	2015	\$17.50	\$21.88	Undisclosed	
Mean		\$36.14	\$46.04		

reported. We extracted the fiscal year for the cost estimate when available and used the publication year when it was not. All figures were adjusted for inflation to 2022 dollars.

RESULTS

Literature search generated a total of 51 articles. Thirty-seven of these articles were excluded after title review. Of this thirty-seven, twenty-eight were excluded because they did not have novel estimates, six were excluded because they were not peer reviewed journals, and three were excluded for poor methodology and/or concern for quality. Of the fourteen articles included, three were specific to orthopaedic procedures. Five out of fourteen articles explicitly excluded anesthesia costs and specialty service costs. The mean cost per

minute adjusted to 2022 dollars from all fourteen papers was \$46.04 per minute of OR time with a standard deviation of \$32.31.

DISCUSSION

The purpose of this study was to determine the inflation-adjusted cost of one minute of operating room time based on the reported data available within the current literature. From the fourteen articles that met our inclusion criteria, it was determined that the estimated mean inflation-adjusted cost per minute of operating room time is \$46.04 (at the date of publication). There were several notable findings from this review that must be considered, including vast discrepancies in differential cost reporting, how the value of

the operating room should be determined, and the lack of correlation of cost to reimbursement and patient outcomes.

It was found that there was a large discrepancy with regards to the costs measured in the reported price-per-minute among the included articles. The majority of articles did not include the cost of anesthesia care with the exception of one study¹⁴. Additionally, one article included perioperative recovery room costs¹⁵, and one included cost for trainings and CME¹⁶. While specialty services costs such as blood bank expenses and radiology support differ greatly by case, most operative cases require the same anesthesia burden, and this cost would be relevant to factor in with future studies. It was also found that several of the articles used figures supplied by the hospital with little mention of how the number was calculated. This lack of rigor and varying degree of included/excluded associated costs may contribute to the wide range of numbers for OR cost per minute, which was found to be from \$14.50 to \$131.65. This led to a standard deviation that was 75% of the mean. With future cost assessment, it would benefit decision makers to have a consistent way to measure operating room costs in order to benchmark performance and decide how to allocate resources.

Another confounding factor identified during the current review is how to account for indirect costs such as building maintenance for ORs that are not always in use. Operating rooms that are dormant are significantly less costly¹⁷, however there were few estimates for how the vacancy rate affects the overall cost. A cost-to-profit ratio would be helpful to determine the benefit of having and maintaining lower volume ORs within smaller health care facilities. This would be in contrast to larger markets where operating rooms are used well into the night, which may generate lower cost per minute, but the increased overhead for support staff and services allocation would need to be adjusted for. Understanding contributing factors and their respective financial implication with operating room cost would better enable appropriate resource allocation. For example, hiring extra staff to reduce room turnover time may lead to a reduction in overall cost, as a greater number of cases could be done per unit time, maximizing the cost-to-profit ratio.

While this study determined the estimated inflation-adjusted cost of the operating room per minute, there remains a lack of correlation of this cost to care reimbursement and patient outcomes. Further research is warranted in order to not only extrapolate a precise, reproducible standard for how operating room costs are measured and accounted for, but their effect on patient outcomes.

CONCLUSION

In conclusion, the mean cost for one minute of operating room time estimated from the literature is \$46.04. For most articles, this excludes anesthesia and specialty services. Further research is warranted to refine methodology and determine algorithmically a more precise and reproducible approach to measure the cost of OR time.

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