

Anchor Down: The Cost of Surgical Anchors

Christopher Bacak MD MS¹, Hanan Zisling BS², Alexis Sandler MD¹, Reid Tompkins MD¹, Benjamin Childs MD¹, Nata Parnes, MD^{3,4}

1) Texas Tech University Health Science Center, El Paso, TX 2) NSU Dr. Kiran C. Patel College of Osteopathic Medicine, Ft. Lauderdale, FL 3) Carthage Area Hospital, Carthage, NY 4) Claxton-Hepburn Medical Center, Ogdensburg, NY

Objectives: The purpose of this study is to quantify individual surgical anchor cost based on currently published literature.

Design: Systematic literature review.

Main outcome measurement: Surgical Anchor Cost

Results: Pubmed search produced 297 articles regarding “anchor AND cost OR value” of which 7 had novel estimates for the cost of a surgical anchor. The estimate for surgical anchor cost was found to be \$578 ± \$220.

Conclusion: Data extrapolated in this systematic review showed anchor cost to be \$578 on average with a standard deviation of \$220. With the paucity of data and heterogeneity of values analyzed in this report, this value cannot be used as a truly reliable estimate for the cost. Continuing research into medical implants and equipment costs is imperative as the industry only continues to grow.

Level of Evidence: IV; Systematic Review

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

(*J Ortho Business 2023; Volume 3, Issue:2, Pages 13-15*)

INTRODUCTION

The suture anchor industry is projected to grow to a billion-dollar industry by 2028. Increased use in the United States is at the forefront of this change.¹ With surgical anchors being used more frequently, it’s important to consider the cost burden on the healthcare system, and how this translates to costs for individual patients. Surgical anchor cost has been shown to be a primary driver of overall surgical cost.²

Individual surgeon choice and preference can have a significant role in the cost experienced by patients.³ When educated about costs, surgeons have been shown to be willing to implement techniques and decisions that reduce cost.^{4,5} This is one of the reasons medical costs are increasingly a subject of research.⁶

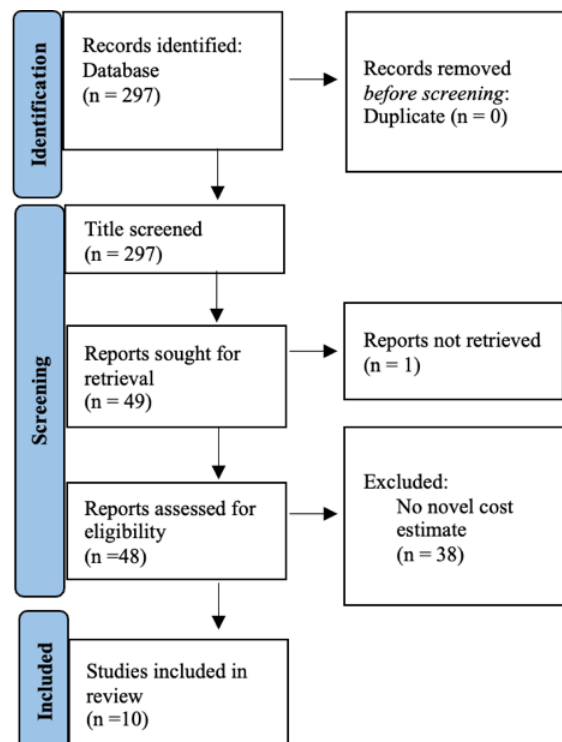
The purpose of this paper is to analyze the data available in order to quantify the cost of individual suture anchors. We hypothesize that there is minimal published data

regarding the cost of suture anchors. Furthermore, we hypothesize that the methodology and results of published estimates of suture anchor cost will vary widely.

METHODS

This systematic review was performed in accordance with PRISMA guidelines for methodology and reporting. Eligibility criteria were determined by study design, type of participant, intervention, types of comparisons, and outcome measures. Study designs included any cohort, trial, or case series. The types of participants were limited to adult patients. Types of interventions included any intervention involving anchors, arthroscopic or open. Outcome measures included were cost per anchor. Studies were included if there was a methodology stated for obtaining cost and that cost was able to be reduced to cost per anchor. Studies were excluded if anchor cost was mentioned but no dollar value was stated.

Figure 1: PRISMA flow diagram of studies from search through screening by inclusion and exclusion criteria



A search was performed in Pubmed for the following keywords: “anchor AND cost OR value.” Results from all years were obtained. All results were cataloged, and, in the first phase, study titles were screened for eligibility by a single author. The remaining abstracts were screened and for those that met the inclusion criteria, full articles were reviewed independently by two authors.

Data collected from articles included study aim, study type, population, number of subjects, description of the intervention, type of anchor used, outcome measures, outcomes, costs, and quality of life measures as well as statistical methods.

The methods of the remaining articles were scrutinized to determine what was included and excluded in the relevant cost calculations. Where applicable, a single number was extracted to calculate the mean cost. For articles that only reported a range, the median of the range reported was used in cost calculations. 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

The search yielded 297 studies. Title screening eliminated 248 as irrelevant. One was unable to be retrieved (n=1). Of the remaining forty-eight full-text articles, ten were included (Figure 1). Thirty-eight were eliminated that had no novel cost estimate (n=38).

Seven of the ten included studies had cost-per-anchor estimates and adequate methods. The cost per anchor for these seven studies ranged from \$300 to \$850 (Table 1). The mean inflation-adjusted cost per anchor was \$578 ±220.

DISCUSSION

Using inflation-adjusted values, the mean individual anchor cost was \$578 with a standard deviation of \$220. The large standard deviation demonstrates the discrepancies in the underlying studies, which were found to have a wide range of surgical anchor costs based on research methodology and variation in the type of implant.

Table 1: Studies with novel cost estimates for anchor cost as well as those excluded due to lack of individual anchor cost, lack of methods, or use of charges rather than cost.

Author (year)	Anchor type	Cost	(Std dev) [Std Error]	Inflation adjusted*	Year	Method
Seidl (2016) ⁷	-	\$563	(\$30)	\$725	2013	Hospital Cost
Burns (2019) ⁸	Knotless	\$470	-	\$606	2013	Hospital Direct Cost
	Knotted	\$360	-	\$464		
Narvy (Jan 2016) ⁹	-	\$601	-	\$845	2009	Hospital Cost
Narvy (Oct 2016) ¹⁰	-	\$363	-	\$468	2013	Hospital Cost
Werner (2018) ¹¹	All Suture	\$850	-	\$1039	2017	Hospital Cost
Hinse (2016) ¹²	-	\$300		\$381	2015	Lab Cost
Bokshan (2019) ¹³	-	\$788	\$158	\$999	2014	Cost estimated from Charges
Mean				\$578 ±220		

While data on the type of implant utilized was not available for all the studies, Burns et. al. specifically analyzed the difference in cost between knotless and knotted suture anchors and found that knotless anchors were on average \$142 more expensive than knotted suture anchors (\$606 vs \$464).⁷ Werner et. al. utilized a variety of suture anchor types in a biomechanical evaluation and reported the cost to be significantly higher at \$1039 dollars per anchor.¹⁰

Data collection methodology varied widely across studies. Hinse et.al. studied anchor biomechanics in cadaver pigs; in this study, surgical anchors were reported as a laboratory cost of \$381 each.¹¹ Most of the studies included in this review utilized hospital cost analysis in which anchors ranged from \$468-\$1039. The significant variance and discrepancy in cost, when compared to the lab study, could be indicative of hospital-imposed costs with anchor usage and surgical interventions.

Limitations to this systematic review include data limited to what was reported in the original studies and heterogeneity of cost estimates amongst the studies. Overall, this systematic review extrapolated data from only seven studies after an extensive search and screening process. These studies were all limited in power, and many did not include

costs as specific aspects of analysis in their methodology, but simply reported cost. Therefore, while there is a reported mean amongst the studies analyzed, it is impossible to reliably estimate if this number truly reflects the actual cost of a surgical anchor.

Future areas of study could include single and multi-center analyses of surgical anchor cost based on type and manufacturer to more reliably quantify numerical data and provide concrete values for anchor cost. Further studies could analyze surgical anchor outcomes based on the cost to portray the cost-effectiveness of utilizing more expensive anchors, with regards to quality-adjusted life year in order to fuel Markov analyses of the gathered data.

CONCLUSION

Data extrapolated in this systematic review showed anchor cost to be \$578 on average with a standard deviation of \$220. With the paucity of data and heterogeneity of values analyzed in this report, this value cannot be used as a truly reliable estimate for the cost. Continuing research into medical implants and equipment costs is imperative as the industry only continues to grow.

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