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Patient Out-Of-Pocket Cost Burden with Elective Orthopaedic Surgery

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Abstract

Introduction: Out-of-pocket (OOP) costs for medical and surgical care can result in substantial financial burden for patients and families. Relatively little is known regarding OOP costs for commercially insured patients receiving orthopaedic surgery. The aim of this study is to analyze the trends in OOP costs for common, elective orthopaedic surgeries performed in the hospital inpatient setting.

Methods: This study utilized an employer-sponsored insurance claims database to analyze billing data of commercially insured patients who underwent elective orthopaedic surgery between 2014 and 2019. Patients who received single-level anterior cervical discectomy and fusion (ACDF), single-level posterior lumbar fusion (PLF), total knee arthroplasty (TKA), and total hip arthroplasty (THA) were identified. OOP costs associated with the surgical episode were calculated as the sum of deductible payments, co-payments, and co-insurance. Monetary data were adjusted to 2019 dollars. General linear regression, Wilcoxon-Mann-Whitney, and Kruskal-Wallis tests were utilized for analysis, as appropriate.

Results: In total, 10,225 ACDF, 28,841 PLF, 70,815 THA, and 108,940 TKA patients were analyzed. Most patients in our study sample had preferred provider organization (PPO) insurance plans (ACDF 70.3%, PLF 66.9%, THA 66.2%, TKA 67.0%). The mean OOP costs for patients, by procedure were: ACDF \$3,180 (SD=2,495), PLF \$3,166 (SD=2,529), THA \$2,884 (SD=2,100), and TKA \$2,733 (SD=1,994). Total OOP costs increased significantly from 2014 – 2019 for all procedures ($p < 0.0001$). Among the insurance plans examined, patients with HDHPs had the highest episodic OOP costs. The ratio of patient contribution (OOP costs) to total insurer contribution (payments from insurers to providers) was 0.07 for ACDF, 0.04 for PLF, 0.07 for THA, and 0.07 for TKA.

Conclusions: Among commercially insured patients who underwent elective spinal fusion and major lower extremity joint replacement surgery, OOP costs increased from 2014 to 2019. The OOP costs for elective orthopaedic surgery represent a substantial and increasing financial burden for patients.

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Keywords

out-of-pocket costs; elective; inpatient; orthopaedic surgery; financial toxicity

Introduction

Despite a reduction in the uninsured over the last decade,¹ as healthcare costs continue to rise,² patients are facing increasing financial burden for medical services.³ The annual Kaiser Family Foundation Employer Health Benefits Survey found that the annual premiums for workers with employer sponsored insurance have continued to rise over the past decade.⁴ In addition to monthly insurance premiums, when undergoing medical procedures, patients are responsible for variable out-of-pocket (OOP) expenses including: co-payments, co-insurance, and deductibles, incurred during the episode of care. A prior study found that these OOP costs have continued to rise for a variety of outpatient surgical procedures.⁵ In addition to being a source of financial stress, OOP costs can influence patients' decision to pursue elective surgical care.⁶ Further, the OOP cost burden may influence the timing of elective surgery, and there is evidence to indicate that some patients may opt to delay surgery until they turn 65 and become Medicare eligible, and thus have lower OOP obligations.⁷

Nevertheless, the incidence of elective, orthopedic surgeries have been rising over the past few years in both younger and older patients.⁸⁻¹¹ Traditionally, costs in the orthopaedic literature have been analyzed from the lens of providers (hospitals and surgeons) and payors (insurers), and not from the perspective of patients (direct OOP contribution). The reimbursement to surgeons have declined in both commercial and public payors,¹² while, the payments to hospitals have continued to rise,¹³ and resulted in rising orthopaedic surgical costs. Yet, relatively little is reported regarding OOP costs for patients receiving inpatient orthopaedic surgery. The aim of this study is to analyze the trends in patients' OOP cost burden for common, elective orthopaedic surgeries performed in the hospital inpatient setting for commercially insured patients.

Methods

Data Sources:

All data was obtained from the MarketScan Research Commercial Database (IBM Watson Health, Ann Arbor, MI), which is a convenience sample of claims data from >300 plans. Patients included in this database include active employees of large, self-insured corporations, early retirees, Consolidated Omnibus Budget Reconciliation Act (COBRA) continues, and dependents insured by employer-sponsored plans.

Patient Selection:

Patients undergoing inpatient surgery for single-level anterior cervical discectomy and fusion (ACDF), single-level posterior lumbar fusion (PLF), total knee arthroplasty (TKA) and total hip arthroplasty (THA), defined by CPT codes in Supplemental Table 1 were identified. Patients with traumatic, infectious, or malignant etiologies for surgery were

excluded by the presence of codes in Supplemental Table 2. Patients <18 years-old were excluded. To create a more homogeneous group, patients undergoing multi-level surgery for either ACDF or PLF were excluded. Those undergoing PLF were further stratified by whether a transforaminal or posterior interbody fusion was performed (CPTs 22633, 22630). To limit the analysis to fee-for-service insurance plans, patients with pre-paid, managed care and capitated insurance plans (health maintenance organizations [HMOs], capitated or partially capitated Point-Of-Service plans) were also excluded.

Study Variables:

The primary dependent variable in this study was OOP costs. This was calculated as the sum of deductible payments, co-payments, and co-insurance for the episode of care. Total net payments, i.e., the insurer's contribution, were defined as the sum of all payments from the insurer to providers (hospitals and physicians), not including the patient's OOP costs. All monetary data were adjusted for inflation to 2019-equivalent dollars using the Consumer Price Index (CPI). Patient age, sex, region, and year of surgery were also recorded.

Statistical Analysis:

All monetary variables were Winsorized at the 1st and 99th percentiles to limit the influence of outliers. Descriptive statistics were generated. Trend in OOP costs (total, inpatient, and ratio to net payments) over time were assessed using general linear regression. Differences in OOP costs between insurance plan types were assessed using the Wilcoxon-Mann-Whitney and Kruskal-Wallis tests, as appropriate. All analysis was conducted using SAS 9.4 (SAS Institute, Cary, NC). Statistical significance was considered $p < 0.05$.

Results

Descriptive Statistics

In total, 10,225 single-level ACDF, 28,841 single-level PLF, 70,815 THA, and 108,940 TKA patients were analyzed. The majority of patients undergoing ACDF, PLF, and TKA were female (ACDF 53.0%, PLF 58.0%, TKA 59.9%); THA (48.9% female). The vast majority of patients for each procedure had a preferred provider organization (PPO) insurance plan (ACDF 70.3%, PLF 66.9%, THA 66.2%, TKA 67.0%). The second most common insurance type was consumer-driven health plan (CDHP): ACDF 9.8%, PLF 12.3%, THA 12.3%, TKA 12.1%. (Table 1)

OOP Costs

The mean OOP costs by procedure were: ACDF \$3,180 (SD=2,495), PLF \$3,166 (SD=2,529), THA \$2,884 (SD=2,100), and TKA \$2,733 (SD 1,994). A substantial proportion of these costs were attributed to the inpatient hospitalization (ACDF \$1,689, PLF \$1,592, THA \$1,788, TKA \$1,621) (Table 2). For patients undergoing PLF, 66.6% (n=19,203) received an interbody fusion. The mean total OOP costs for those with vs. without interbody fusion were \$3,259 and \$3,119 ($p=0.04$).

The ratio of patient contribution (OOP costs) to total insurer contribution (payments from insurers to providers) was 0.07 for ACDF, 0.04 for PLF, 0.07 for THA, and 0.07 for TKA.

Trend in Out-Of-Pocket Costs

Even after adjusting for inflation, the total OOP costs increased significantly from 2014 – 2019 for all procedures ($p < 0.0001$), including: ACDF (2014: \$2,786, 2019: \$3,416, CAGR 4.2%), PLF (2014: \$2,729, 2019: \$3,401, CAGR 4.5%), THA (2014: \$2,514, 2019: \$3,175, CAGR 4.8%), and TKA (2014: \$2,369, 2019: \$3,048, CAGR 5.2%). (Figure 1).

Out-Of-Pocket Costs by Insurance Type

OOP costs differed significantly by insurance type. Figure 2 depicts mean OOP costs for all procedures combined by insurance type, and data stratified by procedure are provided in Table 3. Across all procedures, patients with high-deductible health plans (HDHP) exhibited highest episodic OOP costs (all $p < 0.0001$).

Discussion

Out-of-pocket costs may present a significant financial burden for patients requiring medical and surgical treatments.^{15–18} Yet, OOP costs in elective orthopaedic surgery have not been well studied. The goal of this investigation was to examine the trends in OOP costs in both spinal fusion and lower extremity major joint replacement among commercially insured patients in the United States. Our data demonstrates substantial OOP costs, which have continued to increase significantly for all procedures during the study period. Additionally, we found that among fee-for-service plans, OOP costs differed by insurance types, with highest OOP costs associated with high-deductible health plans.

The high OOP costs identified in this study represent a significant burden on the American patient. The median household income in the United States in 2019 was \$64,234.¹⁹ Thus, the OOP costs for orthopaedic surgeries could represent 4–5% of the family's annual income, in addition to the monthly insurance premiums. A 2018 report²⁰ on the economic well-being of U.S households found that 12% of adults would not be able to pay an unexpected expense of \$400, and 27% of adults would need to borrow money or sell a possession; thus, an OOP cost of \$2,733 for TKA found in our analysis would represent approximately 7x what 40% of the population would not be able to pay without extraordinary measures. Further, a report by the Kaiser Family Foundation found that even among those with employer-sponsored plans, 40% report trouble paying their medical bills.²¹

Prior research has shown decreased utilization of healthcare services when patients are confronted with high OOP costs.¹⁸ Foregoing or delaying needed surgical care may potentially lead to a more complicated and costly course^{22–24}, but in some cases may result in reduction of unnecessary services.^{25–27} There is evidence that with the implementation of the Affordable Care Act, OOP spending for healthcare services has continued to rise over the past decade, but the rate of increase has slowed.²⁸ In our study, we found that OOP costs for orthopaedic surgeries increased from 2014–2019 congruent with literature from other fields^{15,27}. For instance, Yoon et al. found a 42% increase in OOP costs for commercially insured patients undergoing cranial neurosurgery.²⁷ Feibi et al. reported a 52% increase in OOP costs for commercially-insured patients undergoing thyroidectomy.¹⁵ Further, we

found that a substantial component of the OOP cost for orthopaedic surgery was attributed to the hospitalization. This is consistent with the prior literature, which has demonstrated that hospitalizations account for the largest component of a patient's annual OOP expense.²⁹ Prior studies have shown lower OOP costs associated with utilization of outpatient settings such as ambulatory surgery centers.^{30–32} However, some procedures continue to remain on inpatient only lists due to payor mandates. As additional procedures are allowed to be performed in the outpatient setting, additional cost savings maybe realized for payors and patients.

We found that patients with HDHPs had the highest episodic OOP costs among all fee-for-service insurance health plans examined. This is not surprising, as these plans by design have higher deductibles, co-insurance, and OOP maximums in exchange for lower monthly premiums.^{4,33} Prior studies have found a similar association between HDHPs and episodic OOP costs for other health services such as primary care,³⁴ maternity care,³⁵ and general surgery.¹⁵ Patients under HDHPs have been shown to be vulnerable to temporal clustering of considerable OOP spending due to their high deductibles.²⁹ Nationally, these plans are become increasingly popular (29% enrollment increase from 2007 to 2017³⁶) and merit future study with regard to patient utilization of orthopaedic surgical care.

Our study has several limitations. First, our analysis focuses on commercially insured patients and does not include patients with government-sponsored health insurance plans such as Medicare and Medicaid, which are large payors for orthopaedic surgical services. Second, we focused on the inpatient setting and the effect of outpatient surgery (patients who received surgery in ambulatory centers or hospital outpatient departments) on OOP costs was not examined. This could be an area of future inquiry. Further, we did not have access to data on patient's monthly premiums, which is an important, recurring OOP cost. With lack of the monthly premium data, we are not able to ascertain whether as a whole, HDHP plans cost more or less in terms of total cost to the patient. This also remains an area for future inquiry. Finally, our analysis does not provide actionable directions to reduce patient OOP cost burden. We posit that future work should focus on exploring the impact of OOP costs on socioeconomically disadvantaged groups, and should focus on exploring mechanisms to limit cost burdens on these patients. However, this is beyond the scope of the current study. Despite these limitations, our study represents the largest analysis of episodic OOP costs associated with inpatient orthopaedic surgical procedures among commercially insured patients and provides cost data from the patient's perspective.

Conclusions

Among commercially insured patients that underwent spinal fusion and major lower extremity joint replacement surgery, OOP costs increased significantly from 2014 to 2019. Patients with HDHPs had the highest episodic OOP costs. An understanding of surgical costs from the patient's perspective is essential to improve perioperative counseling and develop strategies for future cost-containment efforts.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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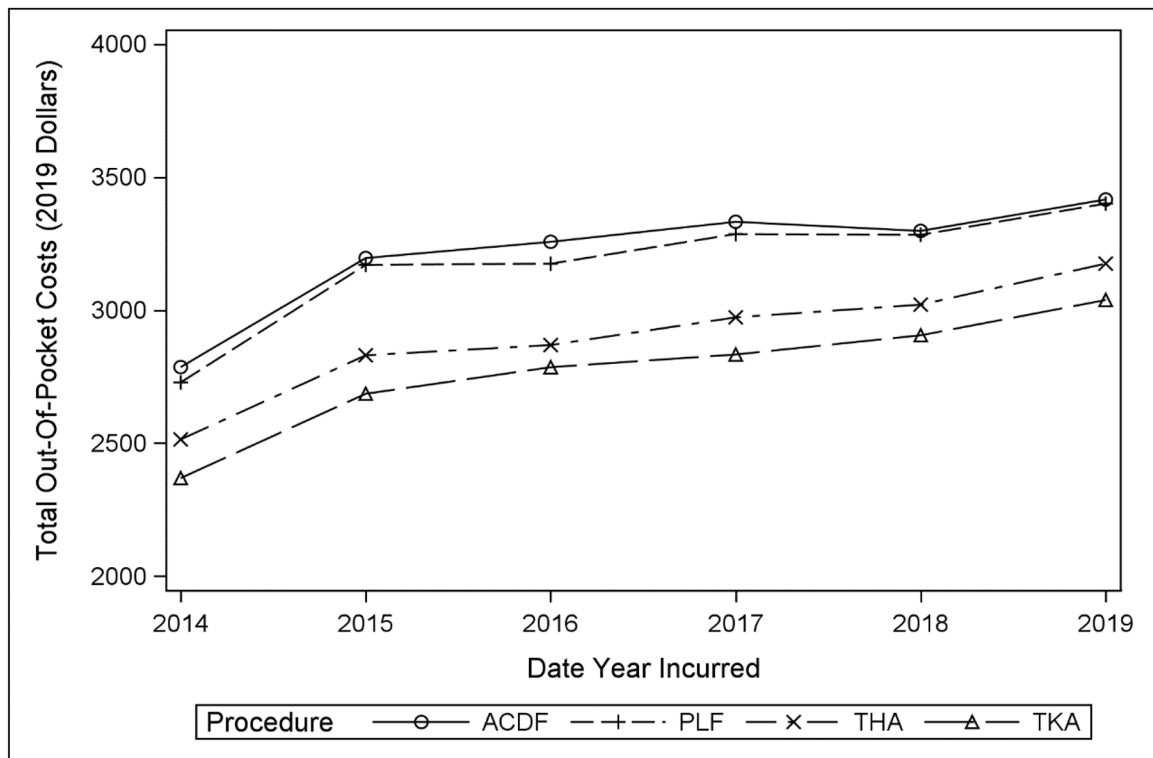


Figure 1:
 Out-Of-Pocket Costs Over Time, By Procedure
 Abbreviations: ACDF = Anterior Cervical Discectomy and Fusion, PLF = Posterior Lumbar Fusion, THA = Total Hip Arthroplasty, TKA = Total Knee Arthroplasty

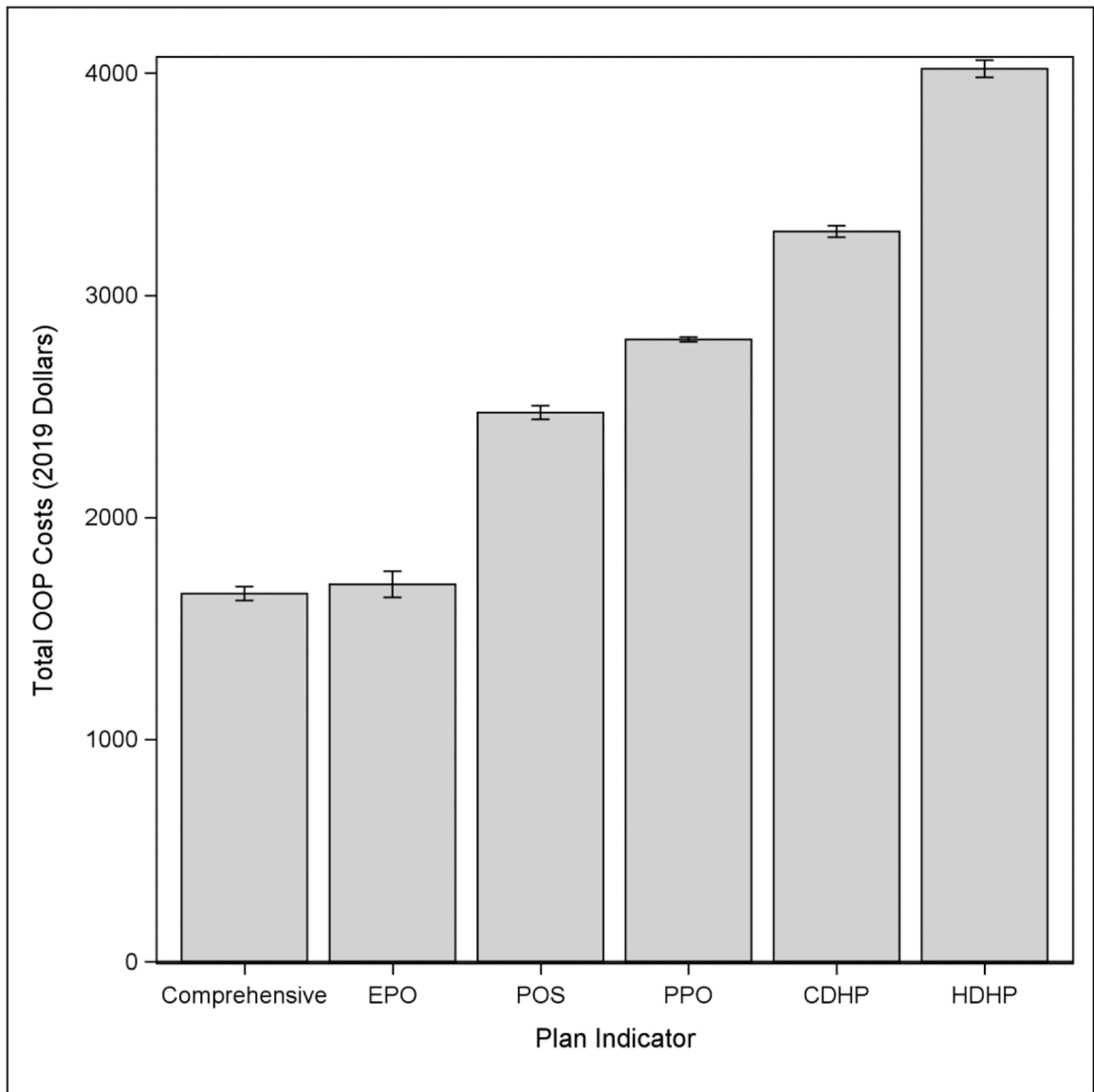


Figure 2:
 Out-Of-Pocket Costs by Insurance Plan Type, All Procedures
 Abbreviations: CDHP = Consumer-Driven Health Plan, EPO = Exclusive Provider Organization, HDHP = High-Deductible Health Plan, OOP = Out-Of-Pocket, POS = Point-Of-Service, PPO = Preferred Provider Organization

Table 1:

Patient and Plan Characteristics

Variable	ACDF		PLF		THA		TKA	
	N	%	N	%	N	%	N	%
All Patients	10,225	-	28,841	-	70,815	-	108,940	-
Sex								
Male	4,803	47.0	12,102	42.0	36,196	51.1	43,684	40.1
Female	5,422	53.0	16,739	58.0	34,619	48.9	65,256	59.9
Insurance Plan Type								
Comprehensive	438	4.3	1,302	4.5	3,186	4.5	5,428	5.0
EPO	93	0.9	267	0.9	741	1.1	1,194	1.1
POS	851	8.3	2,180	7.6	5,492	7.8	8,455	7.8
PPO	7,184	70.3	19,279	66.9	46,897	66.2	73,007	67.0
CDHP	999	9.8	3,560	12.3	8,728	12.3	13,193	12.1
HDHP	660	6.5	2,250	7.8	5,760	8.1	7,647	7.0
Region								
Northeast	1,257	12.3	3,644	12.6	14,078	19.9	16,083	14.8
North Central	1,868	18.3	6,298	21.8	16,884	23.8	28,100	25.8
South	5,447	53.3	14,799	51.3	28,788	40.7	49,545	45.5
West	1,625	15.9	3,972	13.8	10,732	15.2	14,684	13.5
Unknown	28	0.3	128	0.4	333	0.5	528	0.5

Abbreviations: ACDF = Anterior Cervical Discectomy and Fusion, CDHP = Consumer-Driven Health Plan, EPO = Exclusive Provider Organization, HDHP = High-Deductible Health Plan, PLF = Posterior Lumbar Fusion, POS = Point-Of-Service, PPO = Preferred Provider Organization, THA = Total Hip Arthroplasty, TKA = Total Knee Arthroplasty

Table 2:

Patient Age and Out-Of-Pocket Costs

Variable	ACDF		PLF		THA		TKA	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age	50.3	8.9	52.3	9.3	56.0	6.9	57.7	5.2
OOP Costs (\$, 2019)								
Total	3,180	2,495	3,166	2,529	2,884	2,100	2,733	1,994
Inpatient	1,689	1,856	1,592	1,842	1,788	1,742	1,621	1,622
Outpatient	1,491	1,323	1,556	1,350	1,080	994	1,092	976

Abbreviations: ACDF = Anterior Cervical Discectomy and Fusion, OOP = Out-Of-Pocket, PLF = Posterior Lumbar Fusion, POS = Point-Of-Service, PPO = Preferred Provider Organization, THA = Total Hip Arthroplasty, TKA = Total Knee Arthroplasty

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Table 3:

Out-Of-Pocket Costs by Insurance Plan Type, By Procedure

Variable	ACDF		PLF		THA		TKA	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Insurance Plan Type								
Comprehensive	1,955	2,092	1,779	1,867	1,769	1,692	1,537	1,474
EPO	1,781	1,451	1,802	1,602	1,736	1,449	1,645	1,380
POS	2,778	2,340	2,813	2,374	2,516	2,069	2,325	1,897
PPO	3,159	2,447	3,121	2,465	2,782	2,015	2,694	1,916
CDHP	3,573	2,454	3,499	2,520	3,378	2,091	3,148	2,028
HDHP	4,346	2,977	4,332	3,022	4,072	2,398	3,860	2,393

Abbreviations: ACDF = Anterior Cervical Discectomy and Fusion, CDHP = Consumer-Driven Health Plan, EPO = Exclusive Provider Organization, HDHP = High-Deductible Health Plan, PLF = Posterior Lumbar Fusion, POS = Point-Of-Service, PPO = Preferred Provider Organization, THA = Total Hip Arthroplasty, TKA = Total Knee Arthroplasty

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