

Original Research Article

Initial prior authorization denial is associated with increasingly prolonged approval times in outpatient orthopaedic surgery: a 2017-2022 comparative cohort study

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ABSTRACT

Background: Prior authorization (PA) is widely used by insurers to manage healthcare costs but may delay care, especially after an initial denial. While physician surveys report rising administrative burden from PA, objective data quantifying how denials affect approval timelines remain limited. This study evaluated whether an initial PA denial was associated with longer approval times for outpatient orthopaedic surgery, and whether this delay in care worsened between 2017 and 2022.

Methods: We conducted a retrospective cohort study of PA processing timelines for outpatient shoulder, elbow, hip, and knee surgeries performed by a single orthopaedic surgeon in 2017 and 2022. Cases were categorized as Denial (initial denial followed by eventual approval) or No Denial (approved without appeal or not requiring PA). Welch's two-sample t-tests with 95% confidence intervals compared approval wait times between groups and years.

Results: A total of 169 surgeries were included (58 in 2017, 111 in 2022). The Denial group had significantly longer approval times than the No Denial group in both 2017 (58.7 vs. 10.4 days; $p=0.012$) and 2022 (132.2 vs. 11.9 days; $p<0.001$). Among denied cases, mean approval time rose significantly from 2017 to 2022 (58.7 vs. 132.2 days; $p=0.014$); non-denied cases showed no change.

Conclusions: Initial PA denial was associated with substantially prolonged approval times for outpatient orthopaedic surgery, and delays more than doubled from 2017 to 2022. These findings suggest the burden of PA appeals may be rising and underscore the need for larger multicenter studies to characterize insurer-related delays.

Keywords: Care delays healthcare access, Insurance denial, Orthopaedic surgery, Prior authorization, Utilization management

INTRODUCTION

Prior authorization (PA) is a utilization management strategy used by health insurers to determine whether a requested medication, procedure, or service meets coverage requirements before care is delivered. Originally introduced to reduce unnecessary healthcare utilization and control costs, PA requirements have expanded substantially over the past several decades and now apply

to a wide range of prescriptions, diagnostic tests, imaging studies, specialist referrals, hospital admissions, and elective surgical procedures.

Although intended to promote appropriate resource utilization, the PA process has become an increasingly recognized source of administrative burden, unaccounted for cost, and delays in patient care. Before treatment can proceed, providers and administrative staff must submit

clinical documentation supporting medical necessity and await insurer review. When requests are denied, additional appeals and supporting documentation are frequently required before authorization is ultimately granted, further delaying treatment and increasing physician office costs.

National physician surveys consistently demonstrate the widespread impact of PA requirements. In the 2025 American Medical Association (AMA) Prior Authorization Physician Survey, 95% of physicians reported that PA delayed patient care, while 26% reported that PA had resulted in serious adverse events. Additionally, 79% reported that PA sometimes led patients to abandon recommended treatment. Similar findings have been reported within orthopaedic surgery. In a 2023 survey conducted by the American Association of Hip and Knee Surgeons (AAHKS), 96% of respondents reported delays in access to care attributable to PA, 87% reported associated negative clinical outcomes, 57% reported that PA rarely or never changed treatment, and 56% reported that PA rarely or never followed evidence-based guidelines.^{1,2}

Previous studies have demonstrated that prolonged wait times for elective orthopaedic procedures are associated with worsening pain, declining function, reduced quality of life, and inferior postoperative improvement when surgery is delayed beyond clinically meaningful thresholds.³⁻⁵ Despite these concerns, relatively little objective evidence quantifies how much an initial PA denial prolongs approval timelines. Most published studies rely on physician surveys or cross-sectional analyses of denial rates rather than direct measurement of insurer approval intervals.^{2,6} Furthermore, whether denial-associated delays have changed over time remains largely unknown despite widespread reports of increasing PA requirements and denial frequency.^{1,2} The primary objective of this study was to compare prior authorization approval times between outpatient orthopaedic surgeries that experienced an initial denial and those approved without appeal. A secondary objective was to determine whether denial-associated approval delays changed between the years 2017 and 2022.

METHODS

Study design and setting

This US-based retrospective cohort study evaluated prior authorization (PA) processing timelines for outpatient orthopaedic surgeries performed by a single orthopaedic surgeon practicing across multiple hospitals in the Pacific Northwest. Surgeries performed between January 1 and December 31 of 2017 and 2022 were identified for inclusion.

Inclusion criteria

Eligible cases included outpatient orthopaedic procedures involving the shoulder, elbow, hip, or knee that underwent

a documented prior authorization process through the clinic's centralized administrative workflow during either the 2017 or 2022 study period.

Exclusion criteria

Cases were excluded if surgery did not require prior authorization because of emergent status, involved hardware removal only, was paid for out of pocket, or lacked sufficient PA documentation within the electronic medical record (EMR).

Data collection

For each eligible surgery, variables abstracted from the electronic medical record included the date of surgical order placement, the date of prior authorization submission when applicable, denial and appeal status, the date of final insurer determination, and the number of documented denial events.

Although surgeries were limited to those performed during calendar years 2017 and 2022, relevant documentation occurring outside those periods (e.g., appeals or approvals completed after the calendar year) was included when directly related to an eligible surgical episode.

Outcomes

Prior authorization status

Cases were categorized according to the outcome of the prior authorization process. The Denial group included surgeries that received at least one formal insurance denial but were ultimately approved following appeal. The No Denial group included surgeries that were approved without appeal, as well as cases in which the insurer determined that prior authorization was not required. Although the latter technically did not require a prior authorization, these cases were included because the clinic was still required to submit documentation and await the insurer's response before proceeding with surgery.

Prior authorization approval time

The primary outcome was time to prior authorization determination, defined as the number of days between the surgical order and either formal authorization or notification that prior authorization was not required. For cases in which submission of the PA request was intentionally delayed because of clinic workflow or patient preference, the date of PA submission was used as the start of the interval rather than the surgical order date. This approach isolated insurer processing time by excluding delays unrelated to payer review.

Denial events

Denial status was determined from formal insurer denial letters documented within the EMR. Provider-submitted

appeal letters and supplemental documentation responding to a given denial were not counted as separate events, as these represented continued efforts to resolve a single denial. In contrast, a new formal denial letter issued by the insurer for the same surgical episode, such as a denial following an unsuccessful appeal, was counted as a separate denial event.

Statistical analysis

Continuous variables were summarized as means with standard deviations (SD). Between-group comparisons of mean prior authorization approval time were performed using Welch's two-sample *t*-tests with 95% confidence intervals (CIs), selected a priori because unequal sample sizes and unequal variances were expected in the Denial and No Denial cohorts. Categorical differences in denial frequency were evaluated using Fisher's exact test, and denial-event rates were compared using Poisson rate ratio testing. Statistical significance was defined as $p < 0.05$. Comparisons were performed between denial and no denial groups in 2017, denial and no denial groups in 2022, non-denied surgeries between 2017 and 2022, denied surgeries between 2017 and 2022, and all surgeries overall between 2017 and 2022. Differences in denial frequency between study years were evaluated using Fisher's exact test for the proportion of surgeries experiencing at least one denial, a Poisson rate ratio test for denial events per surgery, and Welch's two-sample *t*-test for the mean number of denials among denied patients. Welch's two-sample *t*-test was selected because the primary outcome of interest was the difference in mean approval time between groups and because the test is robust to unequal variances and unequal sample sizes. All statistical analyses were performed using R version 4.6.1.

RESULTS

Descriptive statistics

After applying the inclusion and exclusion criteria, 169 outpatient orthopaedic surgeries were included in the

analysis, comprising 58 surgeries performed in 2017 and 111 performed in 2022 (Figure 1). Baseline cohort characteristics are summarized in Table 1. In 2017, 11 surgeries (19.0%) experienced at least one prior authorization denial, while 47 (81.0%) were approved without denial. In 2022, 13 surgeries (11.7%) experienced a denial and 98 (88.3%) were approved without denial.

Patient characteristics

Patient age and cohort distribution were similar across study years and denial groups (Table 1), reducing the likelihood that observed differences in approval timelines were attributable to baseline age imbalance.

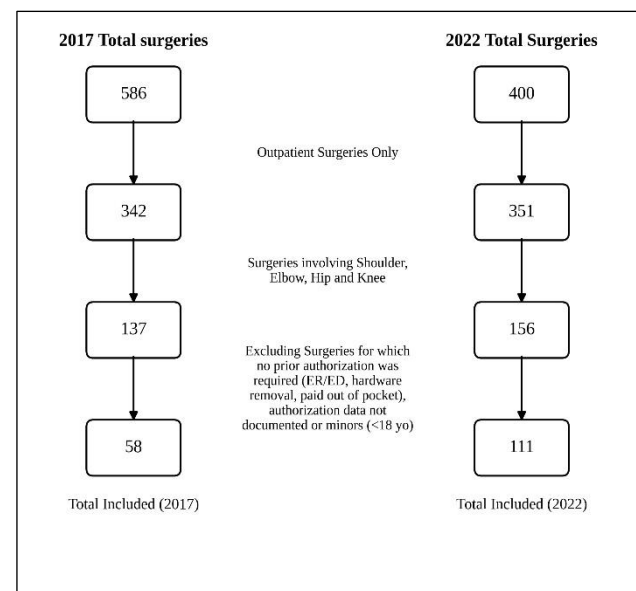


Figure 1: Study inclusion flowchart.

Flow diagram illustrating identification of eligible outpatient orthopaedic surgeries performed during the 2017 and 2022 study periods and application of inclusion and exclusion criteria. The final analytic cohort consisted of 58 surgeries from 2017 and 111 surgeries from 2022.

Table 1: Patient characteristics by study year and prior authorization status.

Characteristic	2017 Overall	2017 No denial	2017 Denial	2022 Overall	2022 No denial	2022 Denial
Surgeries, n	58	47	11	111	98	13
Mean age, years (SD)	48.9 (13.3)	47.9 (13.6)	50.2 (12.0)	50.5 (14.3)	50.6 (14.3)	49.4 (14.8)
Patients with ≥ 1 denial, N (%)	11 (19.0)	0	11 (100)	13 (11.7)	0	13 (100)
No denial, N (%)	47 (81.0)	47 (100)	0	98 (88.3)	98 (100)	0

Values are presented as n, N (%), or mean (SD). Denial indicates at least one formal insurer denial followed by eventual approval.

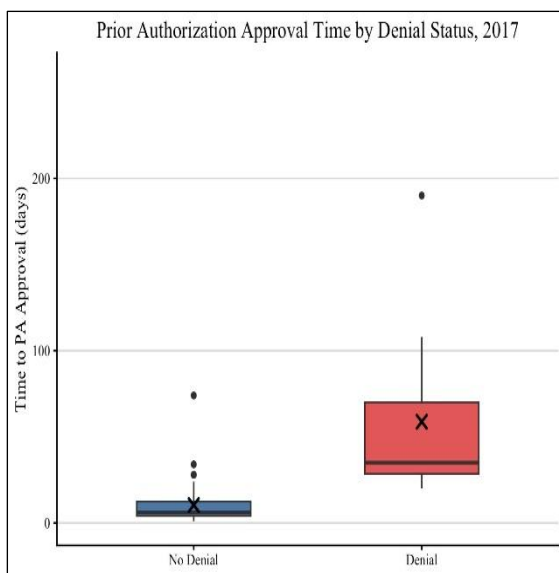
Prior authorization approval times

Approval times and comparative analyses are summarized in Table 2. In 2017, patients with an initial denial waited 58.7 days compared with 10.4 days in the No Denial group; in 2022, the corresponding means were 132.2 and

11.9 days. These differences are displayed graphically in Figure 2 and Figure 3. Approval time was measured from surgical order or delayed prior authorization submission to final insurer authorization or notification that prior authorization was not required. Dash indicates not applicable or not abstracted.

Table 2: Prior authorization approval times and comparative analyses.

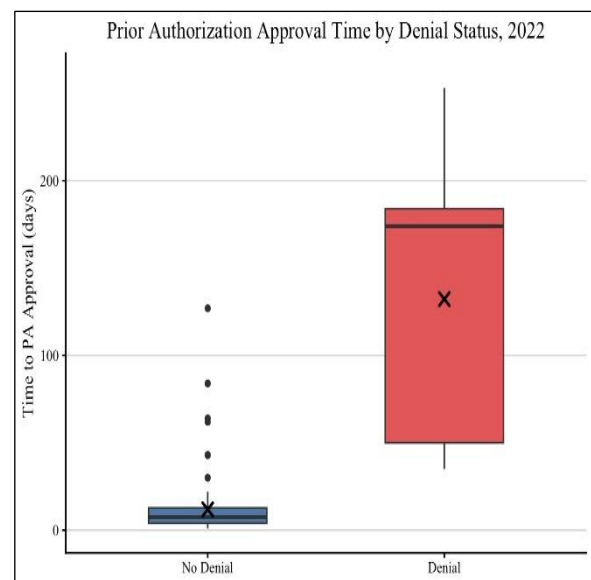
Group	Number of patients	Mean approval time, days (SD)	Range (days)	Comparison group	Mean difference (days)	95% CI	P value
2017, all surgeries	58	19.6 (31.1)	-	2017 vs. 2022 All surgeries	6.5	-5.9 to 18.8	0.303
2017, No Denial	47	10.4 (12.3)	-	2017 Denial vs. No Denial	48.3	13.0 to 83.6	0.012
2017, Denial	11	58.7 (52.4)	20-190	2022 Denial vs. No Denial	120.3	71.8 to 168.9	<0.001
2022, all surgeries	111	26.0 (50.1)	-	2017 vs. 2022 No Denial	1.5	-3.5 to 6.5	0.559
2022, No denial	98	11.9 (17.7)	-	2017 vs. 2022 Denial	73.5	16.8 to 130.2	0.014
2022, denial	13	132.2 (80.1)	35-253				

**Figure 2: 2017 Denial versus No Denial.**

Box-and-whisker plots comparing time to prior authorization determination for surgeries that experienced an initial denial and those approved without denial in 2017. Time to prior authorization determination was defined as the number of days from the surgical order, or prior authorization submission date when submission was intentionally delayed, to insurer authorization or notification that prior authorization was not required. Boxes represent the interquartile range (IQR), the horizontal line within each box indicates the median, whiskers extend to the minimum and maximum values, and the × symbol denotes the mean.

Comparative analysis

Comparative analyses are also summarized in Table 2. Denial was associated with significantly longer approval time in both study years, and approval time among denied patients increased significantly from 2017 to 2022, as illustrated in Figure 4.

**Figure 3: 2022 Denial versus No Denial.**

Box-and-whisker plots comparing time to prior authorization determination for surgeries that experienced an initial denial and those approved without denial in 2022. Time to prior authorization determination was defined as the number of days from the surgical order, or prior authorization submission date when submission was intentionally delayed, to insurer authorization or notification that prior authorization was not required. Boxes represent the interquartile range (IQR), the horizontal line within each box indicates the median, whiskers extend to the minimum and maximum values, and the × symbol denotes the mean.

Overall, initial denial was the dominant factor associated with prolonged approval time. Mean approval time for patients without a denial remained statistically unchanged between 2017 and 2022, whereas denied cases showed large within-year differences and a significant cross-year increase. Thus, the observed delay increase was concentrated in the denied cohort rather than reflecting generalized slowing of routine authorization processing.

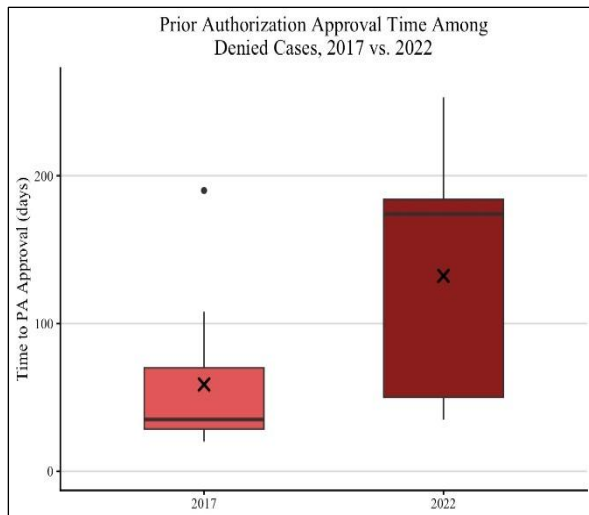


Figure 4: 2017 versus 2022 Denial groups.

Box-and-whisker plots comparing time to prior authorization determination among surgeries that experienced an initial denial in 2017 and 2022. Time to prior authorization determination was defined as the number of days from the surgical order, or prior authorization submission date when submission was intentionally delayed, to insurer authorization or notification that prior authorization was not required. Boxes represent the interquartile range (IQR), the horizontal line within each box indicates the median, whiskers extend to the minimum and maximum values, and the × symbol denotes the mean.

Denial frequency

The proportion of surgeries experiencing at least one denial did not differ significantly between study years (19.0% in 2017 vs. 11.7% in 2022; Fisher's exact test, $p=0.246$).

Similarly, there was no significant difference in denial events per surgery (0.224 vs. 0.162 events/surgery; rate ratio 0.72, $p=0.449$), or mean number of denials among denied patients (1.18 vs. 1.38; mean difference 0.20; 95% CI, -0.28 to 0.68; $p=0.388$).

DISCUSSION

Principal findings

This study demonstrated that patients whose prior authorization requests were initially denied experienced substantially longer approval times than patients whose requests were approved without appeal. Moreover, among patients experiencing an initial denial, approval times more than doubled between 2017 and 2022, increasing from a mean of 58.7 to 132.2 days. In contrast, approval times among patients who did not experience a denial remained stable over the same period. Together, these findings suggest that the growing burden of prior authorization may be driven less by routine authorization processing and more by the increasing complexity and duration of the appeals process following an initial denial.

Importantly, denial frequency itself did not significantly differ between study years. Rather, the time required to resolve denied cases increased substantially. This distinction suggests that the impact of prior authorization may not be adequately captured by reporting denial rates alone and highlights the importance of evaluating approval timelines as an additional measure of payer burden.

Comparison with existing literature

Our findings are consistent with orthopaedic and health-services literature showing that prior authorization can delay medically indicated care and impose substantial administrative work. A prospective multicenter shoulder and sports medicine analysis reported low final denial rates but measurable care delays and staff burden, while total joint arthroplasty studies similarly found longer approval intervals, frequent requests for additional documentation, and few denials ultimately upheld after appeal.⁶⁻⁸ Systematic-review evidence outside orthopaedics further supports the clinical relevance of authorization-related delay, reporting associations with delayed treatment, disease exacerbation, avoidable utilization, and inferior outcomes in several specialties.⁹

The present study adds patient-level orthopaedic surgical data showing that denial-associated delay, rather than routine authorization processing, accounted for the major temporal increase in approval time. This matters because prior authorization may be defended as a cost-control or appropriateness tool; however, recent arthroplasty data suggest limited financial benefit when authorization requirements prolong time to surgery without reducing downstream costs.¹⁰

Evidence that PA improves quality of care is limited. Earlier systematic review data found reduced drug utilization and spending after PA implementation but did not directly demonstrate improved health outcomes.¹¹ More recent reviews report the opposite signal: PA was associated with delayed treatment, disease exacerbation, preventable hospitalization, longer hospital stay, reduced disease-free survival, medication-fill delay after coronary stenting, and increased neurologic disease activity.^{9,12,13} In orthopaedics, contemporary arthroplasty studies report longer time to surgery without measurable financial gain, supporting the interpretation that PA may restrict or postpone indicated care rather than improve its quality.^{7,10}

Previous orthopaedic studies have similarly reported prolonged approval times associated with prior authorization. In a large prospective total hip and knee arthroplasty cohort, mean approval times were 26.3 days for THA and 33.7 days for TKA, while denial-to-approval intervals averaged approximately 63-65 days and fewer than 1% of initial denials were ultimately upheld.⁷ Similarly, elective-spine data presented by AAOS reported that more than 80% of initially denied surgical requests were reversed after appeal, again suggesting that many

denials postpone rather than prevent indicated surgical care.¹⁴

Additional orthopaedic literature similarly suggests that authorization requirements and surgical wait times may postpone needed care, including spine imaging that is frequently completed after initial preauthorization barriers and arthroplasty waiting-list delays associated with worse symptoms and reduced quality of life.¹⁵⁻¹⁷ Although the present study reflects a U.S. insurance-authorization pathway, international orthopaedic literature also shows that delayed access to elective orthopaedic care is clinically consequential, including United Kingdom reports of rising waiting lists, reduced surgical capacity, and worsening quality-of-life burden among patients awaiting hip or knee arthroplasty.¹⁸⁻²⁰

Our findings closely mirror these observations. Every patient included in our Denial group ultimately received authorization for surgery, reinforcing previous reports that most initial denials are eventually overturned. Because all initially denied cases were eventually authorized, usually with surgeon administrative intervention, the denial process functioned primarily as a delay mechanism rather than a durable utilization-management decision. This finding suggests that, in this cohort, post-denial review imposed substantial administrative burden on the physician office and prolonged patient wait time without changing the eventual authorization outcome. Notably, approval delays in our 2022 cohort averaged more than 132 days, approximately twice as long as delays reported in contemporary arthroplasty studies. Although differences in patient population, payer mix, geographic region, and study methodology likely contribute to this discrepancy, our findings raise the possibility that denial-associated delays may be increasing over time and warrant further investigation in larger multicenter cohorts.

Interpretation

One of the most notable findings of this study was that approval times among patients without an initial denial remained relatively unchanged between 2017 and 2022, whereas delays following denial increased dramatically. This pattern suggests that routine prior authorization processing may not have substantially slowed during the study period. Instead, the increasing delay appears concentrated within the appeals process itself.

Several factors could plausibly contribute to this trend, including increasing documentation requirements, additional levels of insurer review, evolving utilization management policies, or greater administrative complexity surrounding appeals. Although this study was not designed to determine the specific mechanisms responsible for longer approval times, these findings are consistent with national reports and orthopaedic surveys describing increasing PA requirements, growing administrative burden, care abandonment, and delays across medical and surgical specialties.^{1,2,7,9}

This study has several notable strengths. First, unlike many previous investigations that relied on physician self-reported surveys, this study directly measured prior authorization timelines using patient-level electronic medical record data, allowing objective quantification of insurer-related delays. Second, all cases were derived from the practice of a single orthopaedic surgeon using a consistent clinical workflow. Although this limits generalizability, it also reduces variability related to differences in provider practice patterns or institutional authorization procedures, strengthening comparisons between study years. Finally, by examining two time points separated by five years, this study provides longitudinal insight into changes in prior authorization processing rather than a single cross-sectional snapshot.

Several limitations should be considered when interpreting these findings. First, this was a U.S.-based retrospective study performed within a single orthopaedic practice, limiting generalizability to other institutions, geographic regions, payer populations, and countries with different healthcare financing or authorization structures. Similar delay-related access problems have been described internationally in orthopaedic waiting-list literature, but those studies generally address system capacity rather than U.S.-style insurer preauthorization. Second, documentation from 2017 was less complete than documentation from 2022, resulting in fewer eligible cases. Because denied cases typically generated substantially more correspondence than straightforward approvals, missing documentation likely affected uncomplicated approvals disproportionately. If correct, this would bias our estimates toward underestimating, rather than exaggerating, differences between study years. However, this assumption could not be directly verified. Third, the number of denied cases was relatively small in both study years (11 in 2017 and 13 in 2022), limiting statistical precision despite the large observed effect sizes. In addition, approval times among denied patients demonstrated considerable variability, indicating that individual insurer policies and appeal processes likely differ substantially. Fourth, this study compared two discrete years rather than evaluating annual trends across the intervening period. Consequently, it cannot determine whether the observed increase represents a gradual temporal trend or reflects changes occurring during a shorter interval.

Finally, this analysis evaluated only prior authorization for surgery. Delays resulting from denials of prerequisite imaging studies, specialist referrals, or other components of the surgical pathway were not captured and may further underestimate the total impact of prior authorization on patient care.

CONCLUSION

In conclusion, initial prior authorization denial was associated with substantially prolonged approval times for outpatient orthopaedic surgery, with denial-associated

delays more than doubling between 2017 and 2022. Because every initially denied case ultimately received authorization, the post-denial pathway in this cohort delayed care and increased physician-office administrative burden without altering the eventual authorization outcome. Approval times for non-denied cases remained stable and denial frequency did not significantly increase, indicating that the principal burden arose from the duration and complexity of appeal resolution rather than routine authorization review. These findings support the use of approval time, not denial rate alone, as a clinically meaningful measure of prior authorization burden in U.S. orthopaedic practice. Broader multicenter, payer-specific, and international comparative studies are needed to confirm these trends, identify modifiable sources of delay, and guide policies that preserve appropriate utilization management without unnecessarily delaying medically indicated orthopaedic surgery.

Recommendations

Future studies should examine prior authorization timelines across multiple institutions, orthopaedic subspecialties, geographic regions, and payer types to determine whether the trends observed in this study are generalizable. Longitudinal analyses incorporating consecutive years would further clarify whether denial-associated delays have progressively increased over time. Prospective studies evaluating recent policy reforms and insurer-specific authorization practices may also help identify opportunities to reduce unnecessary delays while maintaining appropriate utilization management.

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