



## Original Research

# Trends in Total Hip Arthroplasty Length of Stay and Coding Status From 2018 to 2021: Two-Year Impact of the Removal From the Inpatient-Only List

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## ABSTRACT

**Background:** Total hip arthroplasty (THA) was removed from the Centers for Medicare and Medicaid Services inpatient-only (IPO) list on January 1, 2020. The impact of this policy changes on length of stay (LOS) and coding status (inpatient/outpatient) beyond 2020 remains to be fully defined.

**Methods:** Data were obtained from the 2018 to 2021 National Surgical Quality Improvement Program database. Elective primary THA patients aged 18 y or older were identified by Current Procedural Terminology code. Year of surgery, age (dichotomized at  $\geq$ / $<$ 65 y old), American Society of Anesthesiologists classification, smoking status, coding status, and LOS were assessed. Pearson chi-squared tests compared categorical variables, while analysis of variance tests evaluated continuous variables.

**Results:** Overall, 156,212 THA patients were identified. Over the 4 y of study, outpatient cases increased by 1392% from 3.7%-5.75% to 35.6%-54.2% ( $P < .0001$ ). Analogously, average LOS decreased from 1.91-1.75 to 1.50-1.35 d ( $P < .0001$ ). This pattern of decreased LOS was seen in patients aged  $\geq$ 65 y (traditional Medicare eligibility,  $P < .0001$ ) and those  $<$ 65.

**Conclusions:** These data demonstrate a continued increase in outpatient THA since the IPO list removal, with over half of cases classified as outpatient in 2021 and a corresponding reduction in LOS. Notably, the outpatient status is an administrative designation that was not defined by same-day discharge or lack of overnight stay. The observed changes in both age groups ( $\geq$ 65 and  $<$ 65 y) underscore the extensive impact of the IPO list removal on surgical practices.

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## Introduction

Primary total hip arthroplasty (THA) is projected to reach a yearly rate of 850,000 cases by 2030. [1] Previously, the Centers for Medicare and Medicaid Services (CMS) classified THA as an inpatient procedure, meaning the usage of this billing code was only honored for CMS patients who were formally admitted to the hospital and were coded as an “inpatient” within insurance claims. However, on January 1, 2020, CMS announced the removal of THA from the inpatient-only (IPO) list, designating usage of this billing

code could be considered for patients classified as inpatient or outpatient.

Care for THA patients has advanced over recent decades. A 2000-2013 longitudinal study reported decreased hospital length of stay (LOS) following THA, attributed to improved perioperative care and evolving patient expectations. [2] In fact, continued advances in intraoperative and postoperative cares have demonstrated that outpatient THA is a safe option for a select patient population for whom this can be considered without increased adverse events. [3-5] This has dovetailed with increased recognition of the need for value-based care, which can be facilitated by the improved efficiency and reduced costs associated with outpatient THA. [6-8]

The definition of inpatient vs outpatient coding status remains an important consideration. Although an “outpatient” procedure is often used clinically to refer to a “same day” surgery with no

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overnight stay, this is not always the case from a billing perspective; observational and/or 23-h stays are classified as outpatient procedures and are therefore conceptually associated with lesser care requirements. [9] As such, patients undergoing outpatient-coded procedures are not always discharged on the same calendar day of surgery. [10] More explicitly, for the purposes of this study, “outpatient” surgery is defined by the billing designation associated with the index THA and does not require patients to be discharged the same day or overnight.

With increasing evidence of the safety of shorter hospital stays after total joint arthroplasty, CMS removed total knee arthroplasty (TKA) from the IPO list in 2018. [11] This resulted in reduced hospital LOS from 2017 to 2018 ( $2.31 \pm 1.56$  d vs  $2.05 \pm 1.57$  d;  $P < .001$ ) and more patients being discharged the same day (5.09% vs 2.28%;  $P < .001$ ). [12] Interestingly, the increased prevalence of outpatient TKA was observed for those not only with Medicare but also for younger patients with other coverage policies. [12] Following that policy change for TKA, CMS subsequently removed primary THA from the IPO list on January 1, 2020. As such, elucidating the implications of transitioning to outpatient procedures is critical to understanding healthcare economics and patient care.

Previous work from Iorio et al. characterized claims data from a Medicare-only data set between April 2020 and December 2020 and showed a substantial increase in outpatient THA and reduced LOS in comparison to the same period in 2019. [13] Another study by Cochrane et al. analyzed 2015 to 2020 National Surgical Quality Improvement Program (NSQIP) data and also showed increased outpatient THA following the IPO list removal (while not leading to increased early complications, readmissions, or reoperations). [14] These analyses are insightful but limited in scope, such that they assessed the Medicare patient population only or were limited to short-term data covering only the first-year impact of this policy change in 2020. Unfortunately, the 2020 data were further confounded by many clinical implications of the initial wave of the global COVID-19 pandemic.

With these considerations in mind, the primary aim of the present study was to evaluate the impact of removing THA from the CMS IPO list in 2020 among adult patients undergoing primary elective THA over multiple years extending through 2021 in a large national data set. The secondary goals were to assess the impact of the 2018 TKA IPO policy change on outpatient THA practice prior to the THA policy change in 2020 and also to determine how the federal policy change influenced younger patients not covered by traditional Medicare.

## Material and methods

### Study population

The current study utilized data from the 2018–2021 NSQIP databases. NSQIP is a large, nationally validated, multi-insurance database that records data from over 650 academic and private medical centers. Each participating center has one or more designated clinical reviewers who collect data on patient demographics, preoperative lab values, medical comorbidities, perioperative results, and 30-day complications. [12,15–18]

Adult patients ( $\geq 18$  y old) undergoing THA were selected using the Current Procedural Terminology code 27130. Only procedures coded as “elective” were included. Our institutional review board has determined studies using this data set are exempt from review.

### Patient variables, coding status, and length of stay

Patient and surgical characteristics were abstracted from the dataset. These include year of surgery, age, sex, coding status

(inpatient vs outpatient), American Society of Anesthesiologists (ASA) classification, smoker status (defined within 1 y prior to the index procedure), and hospital LOS. NSQIP added the additional “nonbinary” option within patient sex data starting in 2019. As 2018 data did not include this option, we have excluded “nonbinary” patient data from the sex analysis only. However, there were less than 5 “nonbinary” individuals who met study criteria within individual yearly data.

In terms of age, NSQIP codes patients as whole number values, except patients  $\geq 90$  y of age: patients  $\geq 90$  y old are coded as “90+.” As such, patients with the “90+” designation were considered 90 y old for the current study. For subsequent analyses, age was dichotomized based on Medicare eligibility, with patients  $< 65$  y old defined as ineligible and  $\geq 65$  y old as eligible.

Inpatient and outpatient status are distinctly coded in the dataset based on each institution’s characterization of admission status, as NSQIP follows the hospital’s determination. In addition, LOS was used as a continuous variable, as given in NSQIP, and a categorical variable, defined by categorizing the same LOS data into 0, 1, 2, and  $\geq 3$ -d categories. [16] Of note, LOS was defined by the number of days transpired between the operation and discharge, as described in the NSQIP database. For clarity, same-day discharge would be defined as LOS = 0 as 0 full days would have transpired between surgery and discharge.

### Data analysis

Ordinal and categorical variables (dichotomized age, sex, coding status, ASA classification, smoker status, and categorical LOS) were compared with Pearson chi-squared tests. Continuous variables (age and continuous LOS) were compared with analysis of variance tests. Statistical analysis was completed using Stata v17.0 and GraphPad Prism v9.5.1. Figures were created using Microsoft PowerPoint. Statistical significance was defined at  $P \leq .05$ .

## Results

### Study population

A total of 156,212 THA patients were identified by year: in 2018, there were 38,627; in 2019, there were 43,654; in 2020, there were 34,121; and in 2021, there were 39,810. The majority of each year’s patient population was  $\geq 65$ , or Medicare-eligible (from 2018–2021: 55.4%, 56.6%, 56.7%, and 57.0%). There was a minimal but statistically significant difference in age between these years’ patient populations, with average age ranging from 65.48 to 65.76 y old ( $P = .0028$ ). Also, a significant trend toward a sicker cohort of THA patients, as defined by ASA, was observed over the 4-y period. This trend was primarily driven by an increase in ASA Class 3 patients and a corresponding decrease in ASA Class 2 patients ( $P < .0001$ ). Additionally, there was a reduction in the proportion of patients who had smoked within 1 y prior to the index THA during the study period, decreasing from 11.8% in 2018 to 10.6% in 2021 ( $P < .0001$ ). Detailed data are presented in Table 1.

### Coding status trends

The prevalence of outpatient-coded THA significantly increased over the years of the study from 3.7%–5.7% to 35.6%–54.2% (Fig. 1,  $P < .0001$ ). This change represents a 1392% increase in outpatient THA over 4 y (21,571 vs 1445 patients) and a 77.5% increase from 2020 to 2021 (21,571 vs 12,152 patients) (Table 2). This trend was most marked from 2019 to 2020 and continued from 2020 to 2021 (Fig. 1).

**Table 1**  
Patient characteristics of adult patients who underwent a primary elective total hip arthroplasty in 2018, 2019, 2020, and 2021.

Total n = 156,212	2018 (n = 38,627)	2019 (n = 43,654)		2020 (n = 34,121)	2021 (n = 39,810)	P
Age (y)						
Mean ± SD	65.48 ± 11.21	65.71 ± 11.12	Removal from the inpatient-only list on January 1, 2020	65.65 ± 11.06	65.76 ± 11.25	.0028
Age ≥65 y old	21,386 (55.4%)	24,723 (56.6%)		19,334 (56.7%)	22,670 (57.0%)	<.0001
Sex						.1364
Male	17,621 (45.6%)	19,914 (45.6%)		15,757 (46.2%)	18,045 (45.3%)	
Female	21,006 (54.4%)	23,738 (54.4%)		18,362 (53.8%)	21,762 (54.7%)	
ASA classification <sup>a</sup>						<.0001
1	1286 (3.3%)	1419 (3.3%)		1004 (2.9%)	1174 (3.0%)	
2	20,354 (52.7%)	22,177 (50.8%)		17,306 (50.7%)	19,847 (49.9%)	
3	16,210 (42.0%)	19,265 (44.1%)		15,096 (44.3%)	17,914 (45.0%)	
4	710 (1.8%)	754 (1.7%)		688 (2.0%)	810 (2.0%)	
5	4 (0.01%)	3 (0.01%)		3 (0.01%)	0	
Smoker status <sup>b</sup>						<.0001
Yes	4542 (11.8%)	5043 (11.6%)		3837 (11.3%)	4201 (10.6%)	
No	34,085 (88.2%)	38,609 (88.5%)		30,282 (88.8%)	35,606 (89.5%)	

<sup>a</sup> ASA, American Society of Anesthesiologists.

<sup>b</sup> Defined within 1 y prior to index procedure.

*Length of stay trends*

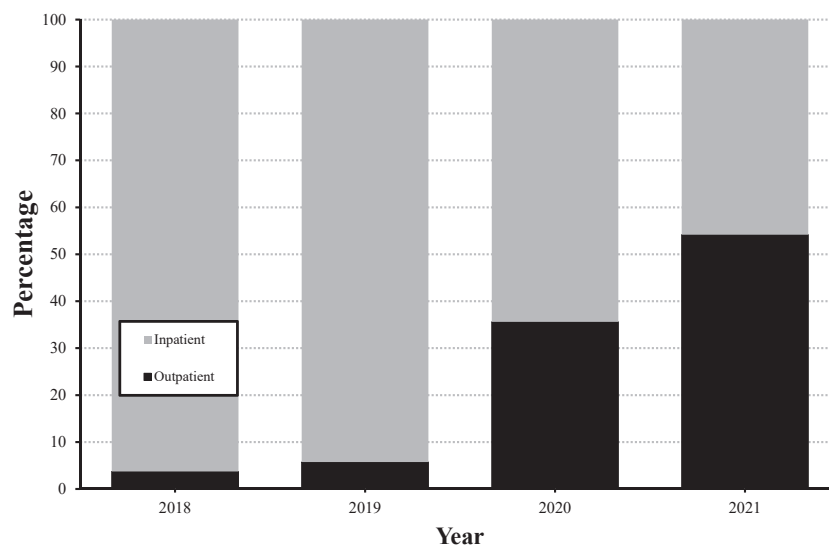
The average LOS decreased significantly over the years of the study from 1.91-1.75 to 1.50-1.36 d (Table 2 and Fig. 2,  $P < .0001$ ). Analysis of categorized LOS revealed significant differences during the same period—specifically, in 2020 and 2021, more patients were discharged the same day or 1 day following THA, while fewer patients had 2 or ≥3-d stays compared to 2018 and 2019 (Table 2 and Fig. 3). Moreover, more patients were discharged on the same day following THA in 2021 compared to 2020 (LOS = 0: 26.3% in 2021, 17.2% in 2020) (Table 2 and Fig. 3). A significant difference in categorized LOS from 2018 to 2021 was also observed in both outpatient and inpatient-coded procedure groups (Fig. 4,  $P < .0001$ ).

For patients 65 y or older, categorized LOS analysis displayed similar changes to the overall sample population, with more patients staying 0 or 1 d instead of 2 or ≥3 d (Fig. 5). These same changes were also observed in patients less than 65 y of age.

**Discussion**

With increasing evidence of the safety and effectiveness of performing THA on an outpatient basis for certain patients, CMS removed THA from the IPO list on January 1, 2020. [2-4,6,19,20] Previous studies have analyzed the immediate effects of this policy change on complication and coding status trends, showing an increase in outpatient-coded THA and decreased LOS. [13,14,21] However, the COVID-19 pandemic during 2020 may have been a confounding variable affecting the analysis of this policy change. As such, the current study further characterized the changes resulting from THA's removal from the IPO list in a large administrative database from 2018 to 2021.

It is important to note the current study defines outpatient THA using the insurance coding status associated with the index procedure and does not imply such patients were all discharged within 23 h of surgery. Even further, this study identified some outpatient-coded patients with a hospitalization of 3 d or longer. Nevertheless,



**Figure 1.** Inpatient vs outpatient coding trend from 2018 to 2021. Bar graph showing the yearly proportion of THA patients coded as either “inpatient” or “outpatient” from 2018 to 2021. Legend indicates classification.

**Table 2**

Characterization of insurance coding and length of stay of adult patients who underwent a primary elective total hip arthroplasty in 2018, 2019, 2020, and 2021.

Total n = 156,212	2018 (n = 38,627)	2019 (n = 43,654)	2020 (n = 34,121)	2021 (n = 39,810)	P
Coding			Removal from the inpatient-only list on January 1, 2020		<.0001
Inpatient	37,182 (96.3%)	41,150 (94.3%)	21,969 (64.4%)	18,239 (45.8%)	
Outpatient	1445 (3.7%)	2504 (5.7%)	12,152 (35.6%)	21,571 (54.2%)	
LOS <sup>a</sup> (d)					
Mean ± SD <sup>b</sup>					<.0001
0	2699 (7.0%)	4247 (9.7%)	5871 (17.2%)	10,466 (26.3%)	<.0001
1	15,200 (39.4%)	19,597 (44.9%)	17,181 (50.4%)	18,382 (46.2%)	
2	11,954 (31.0%)	11,572 (26.5%)	6320 (18.5%)	5906 (14.8%)	
≥3	8774 (22.7%)	8238 (18.9%)	4749 (13.9%)	5056 (12.7%)	

<sup>a</sup> LOS, length of stay.<sup>b</sup> SD, standard deviation.

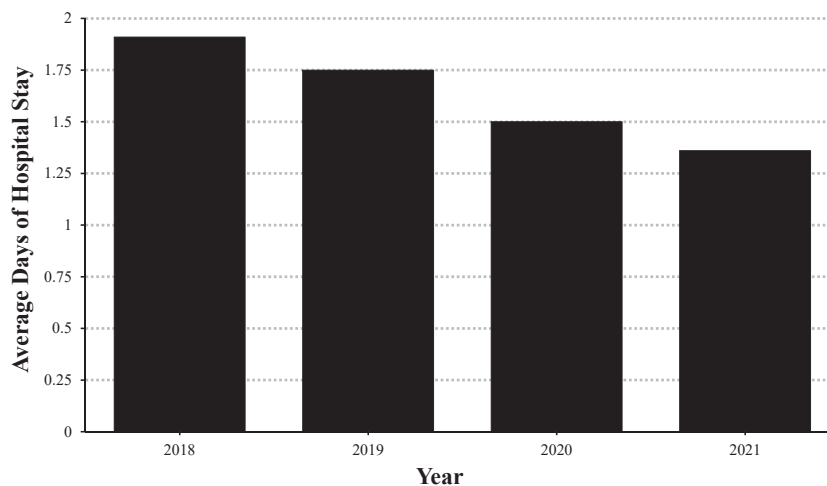
the presented data demonstrated the prevalence of outpatient-coded THA continued to increase from 2020 to 2021, with a newly established majority of primary elective THA becoming coded as outpatient in 2021 (54.2%). With Cochrane et al. showing 34.7% of THA procedures were coded as outpatient in 2020, the current study's finding of 35.6% outpatient THA within the same year concurs with that observation. [14] Furthermore, the large increase from 2020 to 2021 (35.6%-54.2%) suggests a continued, systemic shift toward predominantly outpatient THA that extends beyond the short-term changes observed due to the COVID-19 pandemic in 2020. These findings may point toward the removal of THA from the IPO list as a significant driver of the push toward outpatient THA. However, many factors may have also contributed to the increased incidence of outpatient THA, including familiarity with the outpatient protocol, financial considerations, and hospital census.

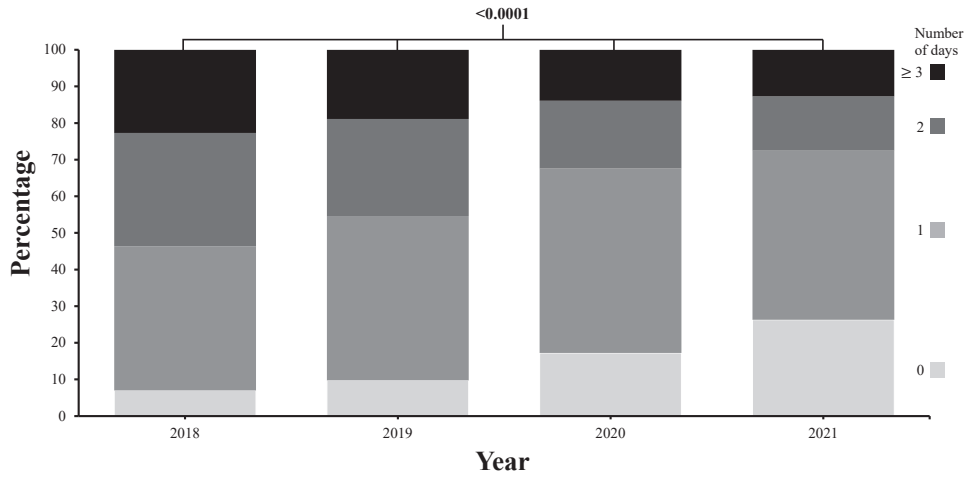
Though the decline in LOS for THA began before the policy change in 2020, a notable decrease in overall LOS was observed in 2021 compared to 2020 (2021: 1.36; 2020: 1.56). This decrease in LOS may have been driven by the increase in patients discharged the same day or 1 d after surgery and the concurrent reduction of 2 or ≥3-d stays. Iorio et al. showed similar findings, with increased same-day discharge and decreased overall LOS after THA immediately following the IPO list removal in 2020. [13] Notably, the present study does not account for differences in disposition. There may have been changes in the proportion of patients who were discharged to skilled inpatient rehabilitation facilities, other nursing care facilities, or home within the study period. Even so,

these data also reflect a systemic shift toward decreased LOS that continued past 2020 and were sustained into 2021.

An interesting observation within the data is that the movement of THA toward an outpatient-coded procedure actually began in 2018 and continued gradually in 2019. This initial change followed the IPO policy change for TKA in 2018 but preceded the IPO policy change for THA in 2020. Thus, while hip and knee surgeons began adopting outpatient protocols for TKA in 2018, they clearly began applying those principles to THA cases for select patients at the same time. Of note, 61.1% of these outpatient-coded patients from 2018 through 2019 were <65, suggesting that early adoption of outpatient THA was primarily undertaken in non-Medicare patients, though some patients ≥65 who were Medicare-eligible did appear to be impacted. Overall, the actual IPO policy change in 2020 clearly has become a major catalyst to the observed trend toward outpatient THA demonstrated in this analysis.

Moreover, the data presented in this analysis show that outpatient THA was being performed in a newly established majority of THA cases in 2021 (54.2%), meaning that 45.8% of THA cases were still performed with the need for an "inpatient" status with a LOS ≥2. In the past 2 y, private and commercial payors have exerted new and powerful downward pressures on hospitals and surgeons by redefining THA as an outright "outpatient" procedure. These policies, which now require "preauthorization" for any inpatient care following THA, often threaten denial of "authorization" for inpatient care for THA and are quite frankly incongruous with the reality of the national data presented within this analysis.

**Figure 2.** Average length of stay trend from 2018 to 2021. Bar graph showing the average yearly length of stay (days) following THA from 2018 to 2021.



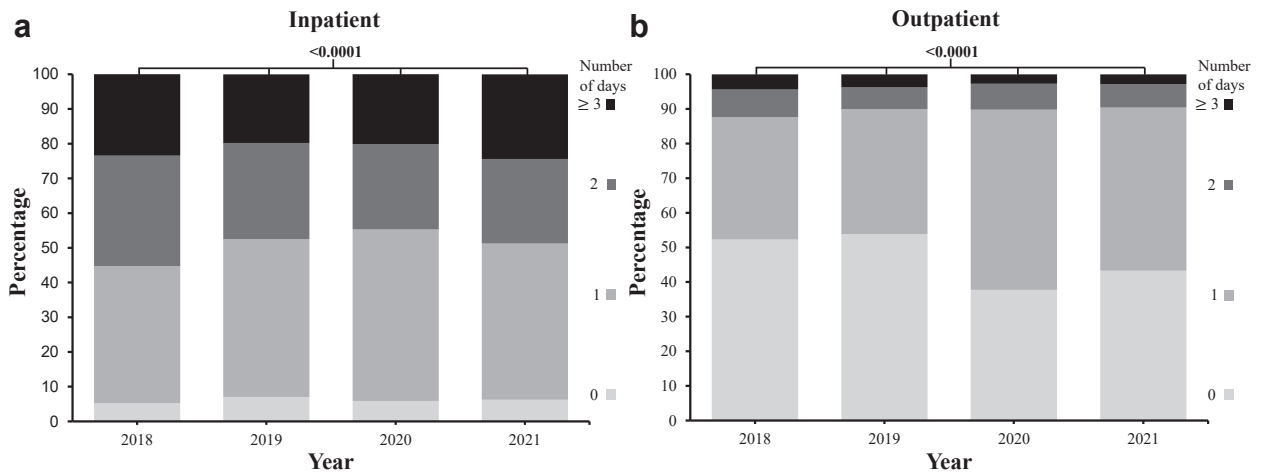
**Figure 3.** Overall population: length of stay trend from 2018 to 2021. Bar graph showing the yearly proportion of patients within each length of stay category (defined as 0, 1, 2, and  $\geq 3$  d) following THA from 2018 to 2021. Legend indicates classification.

The widespread confusion and significant administrative burden created from these insurer policies following the IPO rule change have negatively impacted surgeons, hospitals, and patients and should be re-evaluated as a significant percentage of THA (45.8%) in 2021 continued to require an inpatient stay following the procedure. Based on this observation, our suggestion would be to abandon the prior “outpatient” vs “inpatient” delineations and establish three categories for arthroplasty care: true “same day” surgery (such as might occur at an ambulatory surgery center), “overnight” or “observation” lasting 23 h, or “inpatient” with anticipation of at least 2 nights in a hospital. Establishment of clear guidelines explaining how a patient would qualify for each of these 3 designations would also be enormously helpful to surgeons planning their patient’s care.

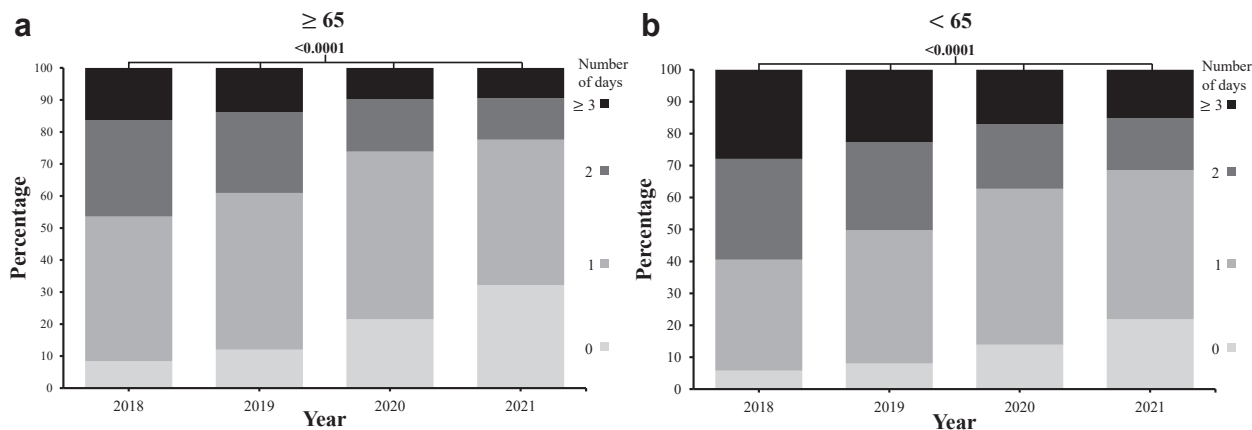
The altered LOS distribution and decreased average LOS were observed in both patients  $<65$  and  $\geq 65$  y old. Although some patients under 65 y old could have been covered by CMS-provided insurance (estimated at 15% [12]), most of these patients would have coverage outside of CMS. Thus, the IPO list removal would not have directly affected these patients. These data suggest that CMS

policy change led to broad changes, affecting patients with and without CMS-provided insurance coverage.

The current study has limitations. This study used data from the NSQIP database, and statistics may not be nationally representative. Patients could have had their outpatient status changed after the initial decision. Depending on hospital coding policy, this change in coding status may not have been reflected in the NSQIP database and could be responsible for the outpatients with  $\geq 3$ -d stays. NSQIP also does not directly code for insurance providers, so the 65-y age cutoff was used to designate Medicare eligibility. Further, as COVID-19 continued into 2021 to a varying degree across the United States, the pandemic could have also affected the results of this study. The present study also did not characterize disposition details, which may act as a confounding variable and limit generalizability to surgeons within international healthcare systems that may have limited access to the option of discharge to skilled nursing facilities. Lastly, we do not yet have data for 2022 and 2023, but it certainly would be of great interest to analyze the continued trends of outpatient THA in longer-term observation.



**Figure 4.** Inpatient and outpatient length of stay trends from 2018 to 2021. Bar graphs showing the “inpatient” vs “outpatient” categorical length of stay trend following THA from 2018 to 2021. (a) Bar graph showing yearly proportion of each length of stay category for procedures coded as “inpatient.” (b) Bar graph showing yearly proportion of each length of stay category for procedures coded as “outpatient.” Length of stay categories are defined as 0, 1, 2, and  $\geq 3$  d. Legend indicates classification.



**Figure 5.** Age-effect on length of stay trend from 2018 to 2021. Bar graphs showing the categorical length of stay trend following THA from 2018 to 2021 for patients 65 y or older vs patients younger than 65 y of age. (a) Bar graph showing yearly proportion of each length of stay category for patients 65 ys of age or older. (b) Bar graph showing yearly proportion of each length of stay category for patients younger than 65 y of age. Length of stay categories are defined as 0, 1, 2, and  $\geq 3$  d. Legend indicates classification.

## Conclusions

After the removal of THA from the CMS IPO list, patients were more likely to be considered outpatients and be discharged the same day or the day after surgery. This is true for patients both  $<65$  and  $\geq 65$  y old. There was a significant change between 2019 and 2020, which could have been related to the CMS IPO ruling as well as COVID-19. However, the clear continuation of this trend from 2020 into 2021 suggests more than just COVID-19 and instead points toward the impact of the CMS IPO ruling. Critically, these trends continued into 2021, suggesting a broad, widespread impact of this national healthcare policy change on the THA patient population.

## Conflicts of interest

M. M. Dhodapkar receives research support from Richard K. Gershon, M.D. Fund at Yale University School of Medicine and is an associate editor of Visual Abstracts North American Spine Society Journal. S. J. Halperin receives support from the Jane Danowski Weiss Family Foundation Fund at Yale University School of Medicine. L. E. Rubin is an editorial/governing board member of Arthroplasty Today, Journal of Arthroplasty, and Reconstructive Review; is a paid consultant for ConvaTec, Depuy Synthes, Thompson Surgical Instruments, and Innovative Medical Products; and receives publishing royalties from Johns Hopkins University Press, SLACK Incorporated, and Wolters Kluwer. J. N. Grauer is the editor-in-chief of North American Spine Society Journal and a board member of North American Spine Society. All other authors declare no potential conflicts of interest.

For full disclosure statements refer to <https://doi.org/10.1016/j.artd.2024.101568>.

## CRedit authorship contribution statement

**Joshua G. Sanchez:** Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Meera M. Dhodapkar:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Scott J. Halperin:** Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

**Will M. Jiang:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Jonathan N. Grauer:** Writing – review & editing, Visualization, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Lee E. Rubin:** Writing – review & editing, Writing – original draft, Visualization, Validation, Project administration, Methodology, Formal analysis, Data curation, Conceptualization.

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