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# Trends in Comorbidities and Complications in Octogenarians and Nonagenarians Undergoing Total Hip and Knee Arthroplasty

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## Introduction

With an ever-increasing median age of total hip and knee arthroplasty (THA, TKA) recipients the proportion of patients aged 80+ and 90+ is likely to increase. These patients present unique challenges in terms of higher comorbidity burden, frailty and perioperative risks requiring a customized approach to healthcare to meet their unique needs. However, large scale data specifically characterizing these patient groups is lacking. The primary objective of this study was to offer an extensive overview of the variations in THA/TKA outcomes and practices across diverse age spectrums, with a specific focus on addressing the challenges posed by an aging population.

## Materials and Methods

This retrospective cohort study was exempt from full review by our IRB. We utilized the Premier Healthcare database to identify patients undergoing THA and TKA from 2006 to 2022 in two age groups: 80-88 years and  $\geq 89$  years. These two groups were then compared to those aged 65-70, the typical age group for THA/TKA recipients. We evaluated trends in proportion of octogenarian and nonagenarian and patient and hospital level characteristics, and perioperative complications, stratified by age groups.

Subsequently, multivariable mixed-effects models were applied to compare octogenarian and nonagenarian patients to those aged 65-70 in terms of major complications (defined as having any complications including acute renal failure, delirium, myocardial infarction, pulmonary embolism, respiratory failure, cerebral complication and mortality during hospitalization). Estimates were presented as odds ratios (OR) and 95% CIs.

## Results/Case Report

We identified  $n=583,539$ ,  $n=73,936$  and  $n=10,142$  TKA patients aged 65-70, 80-88 and  $\geq 89$  years, respectively; this was  $n=191,064$ ,  $n=105,803$  and  $n=11,173$  for THAs. The proportion of octogenarians and nonagenarians increased over time for both THA (from 11.4% to 15.0% and from 0.91% to 2.51% from 2006 to 2022, respectively) and TKA (from 10.7% to 13.0% and from 0.59% to 0.95% from 2006 to 2022, respectively). (Figure 1)

In TKAs, neuraxial anesthesia was more frequently used in older patients (16.6% in patients 89+, 14.9% in patients aged 80-88 and 13.9% in patients aged 65-70); a similar pattern was observed for THA. Interestingly, nonagenarian and octogenarian TKA recipients had a lower comorbidity burden than those aged 65-70 while the reverse was true

for THA recipients.

(Table 1)

Our multivariable models showed that even among patients who have the same level of comorbidity burden, octogenarian and nonagenarian patients (compared to those aged 65-70) are at higher risk for experiencing major complications. (Table 2)

## Discussion

Previous research has demonstrated increased mortality and perioperative complication risk in THA/TKA patients aged 89+ years. (1) Our study confirms this trend and is able to display a similar trend for patients aged 80-88 years. This is notable given the demonstrated increase in the proportion of octogenarian and nonagenarian THA/TKA recipients. These findings can be attributed to the growing elderly population and advancements in less invasive surgical techniques, which have collectively expanded the accessibility of these procedures to older age groups. It is imperative to acknowledge the presence of survivor bias within our analyzed cohort. Patients aged >80 years demonstrated a comparable or even lower burden of comorbidities, likely due to their survival up to cohort entry. This suggests that even when octogenarian and nonagenarian THA/TKA patients appear to be in good health, age remains a significant risk factor for increased morbidity and mortality in major surgical procedures.

Our analysis was specifically concentrated on inpatient mortality and complications, as the Premier Healthcare database does not include data on readmissions and post-discharge complications. It is important to recognize that the absence of this data influences the interpretation of our findings. Therefore, an evaluation that includes outpatient complications is essential to fully understand the risks associated with octogenarians and nonagenarians undergoing THA and TKA surgery.

## References

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## Disclosures

No

## Tables / Images

Graph 1. Age Trend in TJA

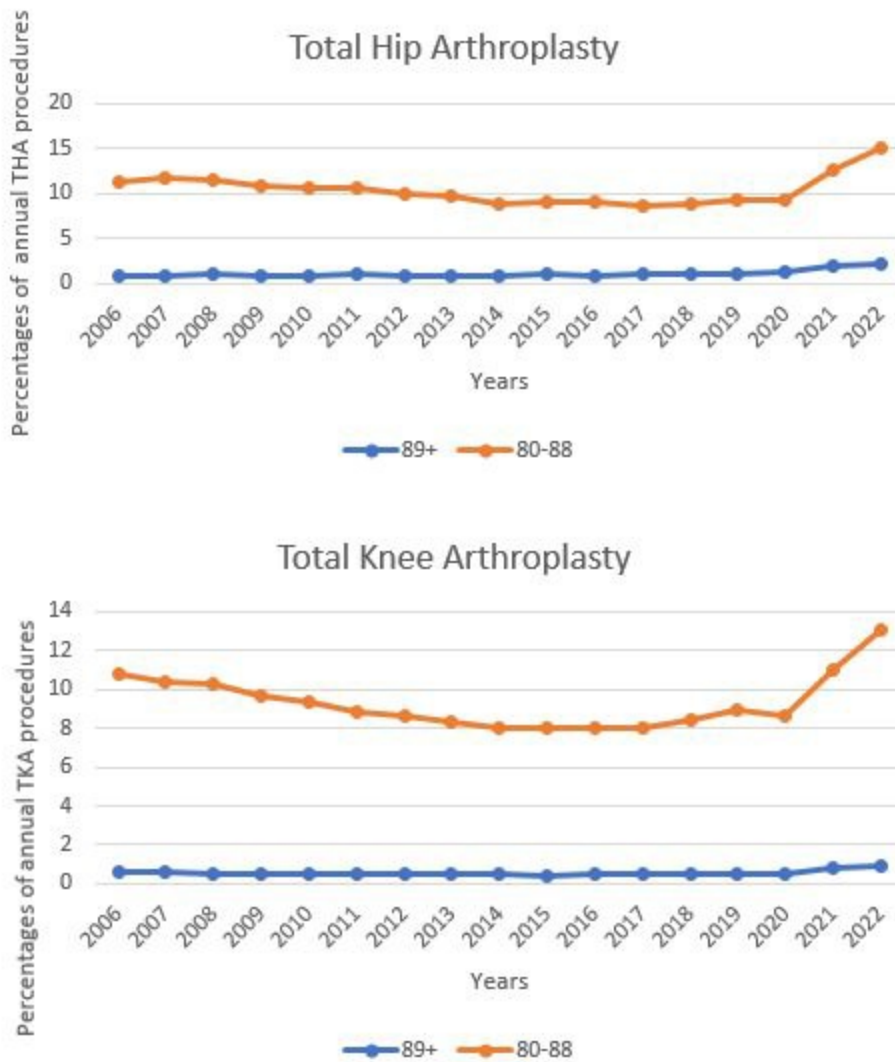


Table 1. Elixhauser Comorbidity Groups in TJA stratified by age groups

Elixhauser comorbidities in TKA patients, n %	65-70		89+		80-88	
	0	137578	34.8%	3757	37.0%	65349
1	118311	29.9%	2900	28.6%	50948	29.3%
2	77599	19.6%	1912	18.9%	32028	18.4%
3	61603	15.6%	1573	15.5%	25611	14.7%
Elixhauser comorbidities in THA patients, n %						
0	76012	39.8%	3661	32.8%	38637	36.5%
1	57704	30.2%	3230	28.9%	31191	29.5%
2	33076	17.3%	2234	20.0%	19386	18.3%
3	24272	12.7%	2048	18.3%	16588	15.7%

**Table 2. Mixed Model Outcomes Comparing Major Complications Between Age Groups**

		TKA		THA	
		OR (95% CIs)	p-value	OR (95% CIs)	p-value
<b>Overall</b>	89+ vs 65-70	3.98 (3.62, 4.37)	<.001	5.6 (5.09, 6.16)	<.001
	80-88 vs 65-70	2.75 (2.65, 2.86)	<.001	3.32 (3.13, 3.53)	<.001
<b>Subgroups</b>	ELX=0, 89+ vs 65-70	5.63 (4.77, 6.64)	<.001	7.63 (6.25, 9.32)	<.001
	ELX=0, 80-88 vs 65-70	3.53 (3.27, 3.8)	<.001	4.47 (3.95, 5.05)	<.001
	ELX=1 or 2, 89+ vs 65-70	4.08 (3.54, 4.69)	<.001	6.09 (5.3, 7)	<.001
	ELX=1 or 2, 80-88 vs 65-70	2.83 (2.68, 3)	<.001	3.4 (3.11, 3.71)	<.001
	ELX=3+, 89+ vs 65-70	2.63 (2.17, 3.18)	<.001	3.64 (3.06, 4.32)	<.001
	ELX=3+, 80-88 vs 65-70	2 (1.86, 2.15)	<.001	2.42 (2.18, 2.68)	<.001

\*Mixed-effects models were applied to compare octogenarian and nonagenarian patients to the typical age cohort for if having any major complications. Models were adjusted for age, race, sex, type of insurance, Elixhauser Comorbidity index group, year of surgery, hospital location, bed size, and hospital teaching status. A random intercept term that varies at the level of each hospital was included in the model, accounting for the cluster effect of patients within hospitals as they are likely to experience similar care.