Shifts in Surgical Timing and Outcomes in Geriatric Hip Fractures: Insights from the American College Surgeons National Trauma Data Bank

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INTRODUCTION: In the United States, approximately 300,000 geriatric hip fractures occur annually, with incidence increasing for advancing age and in women. These fractures account for nearly $15 billion in annual healthcare expenditures. Numerous studies utilizing large administrative datasets have investigated the relationship between time to surgery and clinical outcomes in this population. The consensus is that surgical repair within 24 hours optimizes mortality, complication rates, and hospital length of stay in geriatric patients with hip fractures, and it should not be delayed beyond 48 hours except for necessary medical stabilization. However, fewer studies examined changes in surgical practice patterns and thus outcomes in response to the growing evidence. This study aims to identify temporal changes in time to surgery and outcomes 10 years apart using the NTDB.

METHODS: Two queries of the NTDB were performed, separated by 10 years: the first covering 2011–2013 and the second 2021–2023. Inclusion criteria for both cohorts were patients 65 years or older with femoral neck, petrochanteric, or subtrochanteric fractures requiring surgical intervention. Patients with missing comorbidity, time-to-procedure, or outcome data were excluded. Statistical analysis included descriptive and univariate analyses of demographic variables. A multivariate logistic regression incorporated all variables found significant on univariate testing to evaluate the effect of time to surgery on outcomes. Analyses were conducted in Python version 3.11.5 with baseline significance set at $p<0.01$, with appropriate Bonferroni correction for multiple comparisons.

RESULTS: The 2011–2013 cohort contained 26,497 patients (18,417 Female) with 27,184 fractures (6,585 femoral neck fractures, 18,297 pertrochanteric fractures, and 2,302 subtrochanteric fractures). The 2021–2023 cohort included 91,791 patients (60,448 Female) with 98,122 fractures (77,491 femoral neck fractures, 18,479 pertrochanteric fractures, and 2,152 subtrochanteric fractures). The time to procedure for each cohort can be seen in Table 1. Similar results were found when adjusted for patients with a modified Charlson Comorbidity index (mCCI) less than 5. Table 2 outlines the percentage of adverse outcomes for each cohort, which shows statistically significant differences in the percentage of adverse outcomes. When comparing time to surgery of <24 vs. >48 for the 2011-2013 cohort, odds ratios for death, major complication or death, and any complication were 2.23 (CI: 1.92-2.83, p<0.0001), 2.71 (CI:2.422-3.03, p<0.0001), 2.83 (CI: 2.51-3.19, p<0.0001), respectively. For the 2021-2023 cohort, the odds ratios for death, major complication or death, and any complication were 7.92 (CI: 6.99-8.98, p<0.0001), 7.52 (CI: 6.83-8.28, p<0.0001), and 8.54 (CI: 7.59-9.62, p<0.0001), respectively.

DISCUSSION: The 2011–2013 cohort had more procedures before 24 hours, but the 2021–2023 cohort had more procedures in 48 hours or less. This also remained true after adjusting for patients with mCCI <5. More procedures were started in under 48 hours than 10 years ago, suggesting changing practice habits and increasing emphasis on early intervention. Comparing the total cohorts, patients were less likely to die and had fewer complications from 2021 to 2023 than from 2011 to 2013. The patients were more likely to be discharged home without an ICU stay and less likely to go to a SNF than 10 years prior, despite an increase in length of stay. Table 3 shows these findings remained true on subgroup analysis for time to procedure <24 hours and 24–48 hours. At time >48 hours, there was no significant difference in ICU stay or death. Within each subgroup, outcomes have improved, suggesting progress in hip fracture management from 10 years ago.

SIGNIFICANCE: Compared with a decade ago, physician practice patterns have shifted toward earlier surgery, resulting in improved outcomes, fewer ICU admissions, and a greater likelihood of home discharge. These findings emphasize the critical role of early surgery as the standard of care and demonstrate measurable advances in hip fracture management over time.

Table 1: Percentage of Patients that Underwent Surgery Within the Time Range for Each Cohort.

NTDB Data Years	2011–2013	2021–2023	p-value
Surgery <24 hours	64.80%	58.46%	<0.0001
Surgery ≤48 hours	87.17%	88.56%	<0.0001
Surgery >48 hours	12.83%	11.44%	<0.0001

Table 2: Percentage of Adverse outcomes for the three Cohorts, split into the total cohort and by time to procedure.

Time to Procedure	Percentage of Total Cohort (%)			Time to Procedure < 24hr (%)			Time to Procedure 24-48hr (%)			Time to Procedure> 48hr (%)		
NTDB Data Years	2011-2013	2021–2023	p-value	2011-2013	2021–2023	p-value	2011-2013	2021–2023	p-value	2011-2013	2021–2023	p-value
Adverse Outcome												
Death	2.4%	1.6%	<0.0001	2.0%	0.8%	<0.0001	2.4%	1.4%	<0.0001	4.6%	5.9%	0.0028
Major Complication or Death	7.5%	2.6%	<0.0001	6.2%	1.4%	<0.0001	7.2%	2.1%	<0.0001	15.1%	9.7%	<0.0001
Any Major Complication	6.4%	1.7%	<0.0001	5.1%	0.9%	<0.0001	6.1%	1.2%	<0.0001	13.3%	6.9%	0.0003
ARDS	1.2%	0.1%	<0.0001	0.8%	0.0%	<0.0001	1.3%	0.0%	<0.0001	2.8%	0.3%	<0.0001
Cardiac Arrest	0.6%	0.5%	0.0010	0.5%	0.2%	<0.0001	0.6%	0.4%	0.0573	1.7%	2.2%	0.0637
MI	1.2%	0.2%	<0.0001	1.0%	0.2%	<0.0001	1.0%	0.2%	<0.0001	2.4%	0.7%	<0.0001
Stroke/CVA	0.6%	0.4%	0.0003	0.4%	0.3%	0.0047	0.6%	0.3%	0.0028	1.1%	1.1%	0.9913
Unplanned Intubation	0.9%	0.7%	0.0231	0.7%	0.2%	<0.0001	0.6%	0.4%	0.0253	2.1%	4.0%	<0.0001
Severe Sepsis	0.5%	0.2%	<0.0001	0.3%	0.1%	<0.0001	0.3%	0.2%	0.0326	1.4%	1.2%	0.267
Length of Stay (days)												
<3	0.7%	0.9%	0.0013	0.9%	1.5%	<0.0001	0.4%	0.2%	0.0031	<0.01%	0.0%	0.5524
3-5	47.7%	41.2%	<0.0001	55.2%	48.9%	<0.0001	43.9%	38.2%	<0.0001	16.1%	9.2%	<0.0001
>=6	51.6%	58.0%	<0.0001	43.8%	49.6%	<0.0001	55.7%	61.6%	<0.0001	83.9%	90.8%	<0.0001
ICU length of stay (days)												
<1	85.9%	91.0%	<0.0001	87.3%	93.4%	<0.0001	87.5%	91.8%	<0.0001	75.9%	76.5%	0.5287
>=1	14.1%	9.0%		12.7%	6.6%		12.5%	8.2%		24.1%	23.6%	

Significant P-values are defined as p<0.0008 after Bonferroni correction for multiple comparisons and are presented in bold