What Factors Are Associated with Time-to-Surgery for Geriatric Hip Fractures? An Analysis of the American College of Surgeons' Trauma Quality Improvement Program Database

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INTRODUCTION:

Increased time to surgery (TTS) for geriatric patients with hip fractures is independently associated with increased risk of perioperative morbidity and mortality. Facility and patient-level variables associated with time to surgery have not been fully described. In this study, we aimed to determine the facility and patient factors associated with 1) TTS and 2) complications for patients ≥65 years old with hip fractures, to inform strategies for reducing TTS.

METHODS:

Using the American College of Surgeons (ACS) Trauma Quality Improvement Program database, we identified 65,512 patients ≥65 years old who underwent hip fracture surgery during 2017–2018 at ACS-verified level I-III trauma centers. Facility and patient factors, including trauma center level, teaching hospital status, hospital size, age, sex, race, comorbidities, and injury severity score (ISS), were recorded. The primary outcome was TTS, defined as the time from emergency department or hospital arrival to surgery (in hours). Factors associated with TTS were evaluated using multivariable generalized estimating equations with a gamma distribution and log link function. Secondary outcomes included in-hospital complications, general medical complications, and return to the operating room (OR), and were evaluated with multivariable logistic regression.

RESULTS:

Of 65,512 eligible patients, 37,782 (57.7%) and 58,732 (89.7%) received surgery within 24 and 48 hours of arrival, respectively. In the multivariable analysis, male sex and Black race were associated with a 5% (95% CI: 4-7%) and 14% (95% CI: 8-20%) increase in TTS, respectively. Anticoagulant therapy (+25% [95% CI: 22-28%]), bleeding disorder (+19% [95% CI: 12-26%]), and congestive heart failure (+16% [95% CI: 13-19%]) were also associated with increased TTS. Facility factors such as trauma center level, teaching status, and size of the hospital were not independent predictors of TTS. An increase in TTS of 12 hours was independently associated with 14% (95% CI: 12-16%), 15% (95% CI: 13-16%), and 8% (95% CI: 2-15%) increase in the odds of experiencing any hospital complication, a general medical complication, and return to the OR.

DISCUSSION AND CONCLUSION:

Patient, but not facility, factors were associated with increased TTS for geriatric patients with hip fractures. Further research is needed to describe the general and context-specific determinants (e.g., inefficient transfer processes, OR staffing) of TTS for hip fractures.

Table. Predictors of Time to Surgery via Generalized Estimating Equations Model Analysis.

Variable	Exponentiated Estimate	95% Confidence Interval	p-value
Intercept	1030.71	910.41-1166.78	<0.001
Age (years)	1.000	0.999-1.001	0.54
Sex			
Female	0.95	0.93-0.96	<0.001
Male	Reference		
Race			
White	Reference		
American Indian	0.92	0.84-1.01	0.08
Asian	1.12	1.04-1.21	0.004
Black	1.14	1.08-1.20	<0.001
Pacific Islander	1.04	0.74-1.46	0.83
Other	1.18	1.10-1.27	<0.001
Multi-race	1.02	0.93-1.12	0.62
Comorbidities			
Alcohol use disorder	1.14	1.08-1.20	<0.001
Angina pectoris	0.92	0.83-1.01	0.09
Anticoagulant therapy	1.25	1.22-1.28	<0.001
Bleeding disorder	1.19	1.12-1.26	<0.001
Active chemotherapy for cancer	1.05	0.99-1.11	0.12
Cirrhosis	1.13	1.05-1.21	0.001
Chronic obstructive pulmonary disease	1.09	1.06-1.11	<0.001
Cerebrovascular accident	1.01	0.98-1.04	0.50
Dementia	1.02	1.00-1.04	0.03
Diabetes mellitus	1.04	1.02-1.06	<0.001
Disseminated cancer	1.08	1.01-1.16	0.02
Functionally dependent health status	1.05	1.02-1.08	<0.001
Congestive heart failure	1.16	1.13-1.19	<0.001
Hypertension	1.02	1.01-1.04	0.004
Myocardial infarction	1.11	1.04-1.19	0.002
Peripheral arterial disease	1.01	0.96-1.06	0.73
Mental or personality disorder	0.98	0.95-1.00	0.06
Chronic renal failure	1.14	1.09-1.19	<0.001
Current smoking	0.99	0.97-1.02	0.55
Steroid use	1.01	0.96-1.05	0.72
Substance use disorder	0.97	0.92-1.03	0.36
Injury severity score	1.02	1.020-1.027	<0.001
Trauma center level			
I	Reference		
II	1.02	0.95-1.10	0.56
III	1.13	1.03-1.23	0.006
Teaching status			
Community	Reference		
University	1.07	0.99-1.15	0.08
Non-teaching	0.99	0.93-1.05	0.71
Bed size			
≤200	Reference		
201-400	1.04	0.97-1.12	0.29
401-600	1.11	1.01-1.23	0.04
>600	1.09	0.98-1.20	0.10

Exponentiated estimates are interpreted as a multiplier of the time to surgery with each unit increase in the predictor variable if continuous or presence of the predictor variable if categorical.