2020

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Introduction

Hip fracture management is an ongoing challenging task that orthopedic surgeons face daily. As the population is increasingly getting older, the incidence of this injury is becoming more prevalent with an estimation of 4.5 million by 2050 [1-2]. Patients who suffer hip fractures have a high one-year morbidity and mortality rate. Further, delay to surgery greater than 24 hours causes a further increase in these rates [3-8]. One of the factors for this delay is obtaining pre-operative cardiac evaluation and echocardiograms. In an attempt to prevent postoperative complications, these resources are often overused leading to an unnecessary delay to surgery [9-12]. This is a consequence of the unavailability of evidence about specific risk factors that are predictive of postoperative complications in hip fracture patients.

Objectives

- **Primary objective:** Evaluate how pre-operative cardiac evaluation affects time to surgery, in-hospital, and 30-day postoperative complications
- **Secondary objective**: Identify specific risk factors predictive of in-hospital, and 30-day postoperative complications

Methods

- Case-control study conducted in a teaching hospital located in Camden, New Jersey from January 2011 to December 2015
- Inclusion criteria: Age > 50 at the time of fracture, patients treated for a hip fracture
- Exclusion criteria: Age < 50 at the time of fracture, pathological fractures (i.e infection and cancer in the femur), pediatric and pregnant patients
- Electronic records were evaluated for demographic data, cardiology consultation, echocardiogram results and in-hospital and 30-day postoperative complications
- MACE complications included: atrial fibrillation, heart failure, chest pain, myocardial infarction, pulseless electrical activity (PEA) arrest, and deaths due to cardiovascular etiology.
- Statistical analysis: Univariate and multivariate regression

Results

Table 1. Demographics

Total number of patients	411
Females	312 (75.9%)
Males	99
Mean age	80.98 (55-109)
Average ASA	2.88 (1-4)
Average EF %	58.16 (15 – 80)
Time to surgery (days)	1.75 (0-11)
Length of stay (days)	5.45 (2-63)

Table 2. Mean time to surgery (days)

(-) Cardiology	(+) Cardiology	P-value
1.56	2.04	0.001
(-) Echocardiogram	**(+) Echocardiogram**	
1.55	2.44	<0.001

Table 3. In-hospital Postoperative Complications (P-values)

Risk Factor	Total CV	OR (CI)	MACE	OR (CI)	Pulmonary	OR (CI)	Neurological	OR (CI)	Deaths	OR (CI)
Age	0.1130		0.4775		0.7108		0.0684		0.4746	
Time to Surgery	0.0668		0.0855		0.2701		0.6794		0.0485	1.242 (1.001-1.541)
Fracture pattern										
Femoral neck	0.7062		0.6553		0.6255		0.1038		0.7763	
Intertrochanteric	0.2694		0.5369		0.2759		0.1013		0.7962	
Subtrochanteric	0.3874		0.1674		0.8733		0.8831		0.3488	
Basicervical	0.2006		0.9861		0.9858		0.9896		0.9881	
Subcapital	0.9904		0.9938		0.9937		0.9929		0.9920	
Pertrochanteric	0.8597		0.4906		0.4353		0.3075		0.7328	
Type of surgery										
ORIF	0.2845		0.4047		0.4047		0.0302	0.443 (0.212-0.925)	0.2197	
Total Arthroplasty	0.5536		0.5538		0.9823		0.9868		0.3598	
Hemiarthroplasty	0.6678		0.4858		-		-		-	
Percutaneous Fixation	0.9875		0.9875		0.9875		0.9906		0.9893	
Intramedullary Nail	0.1126		0.1999		0.9875		0.9906		0.9893	
ASA score	0.7902		0.1544		0.1591		0.3262		0.0160	3.585 (1.268-10.136)
(+) CV consult	0.3063		0.0810		0.1161		0.5025		0.0383	2.600 (1.053-6.421)
Risk Stratification										
Low	0.7829		0.9720		0.6874		0.5097		0.9761	
Moderate	0.6638		0.5839		0.0677		0.7751		0.3305	
High	0.9878		0.7523		0.0667		0.0010	5.039 (1.928-13.174)	0.0902	
(+) Echocardiogram	0.3407		0.2455		0.1502		0.1699		0.6880	
Ejection fraction < 50	0.9741		0.9655		0.2278		0.4354		0.9700	
Ejection fraction < 60	-		-		-		0.0463	5.000 (1.026-24.357)	-	
Ejection Fraction	0.3397		0.6268		0.0257	0.940 (0.890-0.992)	0.0504		0.9870	

Table 4. 30-Days Postoperative Complications (P-values)

Risk Factor	Total CV	OR (CI)	MACE	OR (CI)	Pulmonary	OR (CI)	Neurological	OR (CI)	Deaths	OR (CI)
Age	0.1249		0.1249		0.5818		0.4102		0.2246	
Time to Surgery	0.5869		0.5869		0.4732		0.6716		0.2435	
Fracture pattern										
Femoral neck	0.8469		0.8469		0.8585		0.2910		0.9702	
Intertrochanteric	0.6434		0.6434		0.7184		0.9856		0.3325	
Subtrochanteric	0.9715		0.9715		0.9863		0.9887		0.9745	
Basicervical	0.9912		0.9912		0.9895		0.0129	20.050 (1.885-212.803)	0.9881	
Subcapital	0.9961		0.9961		0.9953		0.9957		0.9947	
Pertrochanteric	0.9794		0.9794		0.0365	6.065 (1.120-32.831)	0.9774		0.9723	
Type of surgery										
ORIF	0.2302		0.2302		0.4864		0.3515		0.7310	
Total Arthroplasty	0.9888		0.9888		0.9867		0.0365	11.314 (1.165-109.886)	0.9850	
Hemiarthroplasty	-		-		-		-		-	
Percutaneous Fixation	0.9921		0.9921		0.9906		0.9913		0.9894	
Intramedullary Nail	0.9921		0.9921		0.9906		0.9913		0.9894	
ASA score	0.6472		0.6472		0.6083		0.6392		0.7470	
(+) CV consult	0.9875		0.9875		0.8616		0.6046		0.9528	
Risk Stratification										
Low	0.9823		0.9823		0.9790		0.2108		0.9762	
Moderate	0.9633		0.9633		0.1511		0.9598		0.9672	
High	0.0077	12.222 (1.937.736)	0.0077	12.222 (1.937.736)	0.9775		0.9792		0.9745	
(+) Echocardiogram	0.8878		0.8878		0.2134		0.5327		0.9093	
Ejection fraction < 50	0.9742		0.9742		0.9700		0.9742		0.9742	
Ejection Fraction	0.9416		0.9416		0.5604		0.6534		0.9416	

Conclusion

- Obtaining cardiology consultation and echocardiogram alone delay surgery by 0.48 and 0.89 days, respectively
- In the context of cardiac risk stratification, high risk stratification was a predictor for 30-day postoperative cardiac complications and in-hospital PEA arrest
- Cardiac risk stratification and echocardiogram ejection fraction were not predictive of any other postoperative cardiac complications
- Obtaining a cardiac evaluation and high ASA scores, independently, resulted as predictor of in-hospital deaths
- Delay to surgery was predictive for in-hospital PEA arrest and deaths
- Pertrochanteric fractures were predictive of 30-day postoperative pulmonary complications.

Discussion

Our data demonstrates important predictors of in-hospital and 30-day complications. Effort should be made to minimally delay time to surgery in patients with hip fractures. The risk factors analyzed in this study should be taken into consideration during the decision making process in order to analyze the benefits and risk association with early surgical fixation. We encourage researchers to continue analyzing risk factors predictive of postoperative complications to further improve the decision making process and prevent the overuse of resources during the process.

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