Determining a Preoperative International Normalized Ratio Threshold Safe for Hip Fracture Surgery

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Introduction

- Hip fractures are one of the most common orthopaedic injuries among the elderly, and as life expectancy continues to rise, the incidence of hip fractures has increased [1]
- The international normalized ratio (INR) is routinely obtained preoperatively to assess a patient's readiness for surgery to evaluate bleeding risk [2]
- The purpose of this study was to 1) assess the relationship between preoperative INR in hip fracture patients and postoperative complication rates and 2) establish an INR threshold under which patients risks without correction are comparable to normal INRs

Materials and Methods

- We retrospectively reviewed cases of hip fracture surgical stabilization in the American College of Surgeons National Surgical Quality Improvement Program from 2012 to 2018
- Cases were stratified into four groups based on preoperative INR levels: 1) < 1.4, 2) ≥1.4 and <1.6, 3) ≥1.6 and <1.8, and 4) ≥1.8
- These cohorts were assessed for differences in preoperative factors, intraoperative factors, and postoperative course
- Multivariate logistic regression models were used to assess the risk of transfusion, 30-day mortality, cardiac complications, and wound complications adjusting for all preoperative and intraoperative factors

Results

Variable	N (%)					P-value
	All Cases N = 35,910	INR < 1.4 N = 33,484 (93.2)	≥1.4, <1.6 N = 867 (2.4)	≥1.6, <1.8 N = 865 (2.4)	≥1.8 N = 692 (1.9)	
Transfusion	11,266 (31.4)	10,392 (31.0)	297 (34.3)	299 (34.6)	278 (40.2)	< 0.001
30-Day Mortality	2,305 (6.4)	2,067 (6.2)	84 (9.7)	88 (10.2)	66 (9.5)	< 0.001
Wound Complication	461 (1.3)	417 (1.3)	17 (2.0)	18 (2.1)	9 (1.3)	0.049
Cardiac Complication	828 (2.3)	745 (2.2)	35 (4.0)	25 (2.9)	23 (3.3)	0.001

Table 1. Postoperative complication rates by INR class

	Odds Ratio	Lower 95% CI	Upper 95% CI	P-value
Transfusion				
INR < 1.4	Reference	-	-	
≥1.4, <1.6	0.86	0.71	1.1	0.16
≥1.6, <1.8	0.90	0.73	1.1	0.34
≥1.8	1.4	1.1	1.8	<0.01
30-Day Mortality				
INR < 1.4	Reference	-	-	-
≥1.4, <1.6	1.2	0.86	1.5	0.34
≥1.6, <1.8	1.4	1.0	1.9	0.03
≥1.8	1.5	1.0	2.0	0.03
Cardiac Complications				
INR < 1.4	Reference	-	-	-
≥1.4, <1.6	1.3	0.83	2.0	0.27
≥1.6, <1.8	0.80	0.46	1.4	0.44
≥1.8	1.5	0.88	2.4	0.14
Wound Complications				
INR < 1.4	Reference	-	-	-
≥1.4, <1.6	1.5	0.84	2.6	0.18
≥1.6, <1.8	1.6	0.88	2.9	0.13
≥1.8	0.98	0.43	2.3	0.97

Table 2. Logistic Regression Analysis of Odds of Bleeding Requiring Transfusion, 30-Day Mortality, Cardiac Complications, and Wound Complications by INR Class

- 35,910 cases were identified, with 33,484 (93.2%) performed on patients with preoperative INR < 1.4, 867 (2.4%) on INR ≥1.4 and <1.6, 865 (2.4%) on INR ≥1.6 and <1.8, and 692 (1.9%) on INR ≥ 1.8 (**Table 1)**
- A preoperative INR ≥ 1.8 was independently associated with increased odds of bleeding requiring transfusion (**Table 2)**
- A preoperative INR ≥1.6 was associated with increased odds of mortality (**Table 2)**

Conclusions

- In this study, we found a threshold of INR < 1.6 to be safe for patients prior to undergoing hip fracture surgery
- Below this value, patients avoid an increased risk of both transfusions and 30-day mortality seen at higher INR values
- These findings may allow for adjustments to preoperative protocols and improve outcomes of hip fracture surgery

References:

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2. Ignjatovic, V. Prothrombin time/international normalized ratio. Haemostasis: methods and protocols. 2013; 992: 121-9.