

# Pre- and Intraoperative Predictors of Health-Related Quality of Life and Ambulatory Function After Hip Fracture Surgery: A Multicenter Cohort Study

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## Background

- The identification of prognostic factors after hip fracture is important for risk stratification and postoperative intervention strategies.
- Among the predictors, modifiable factors can be targeted and optimized through clinical interventions, whereas non-modifiable factors can be utilized for screening vulnerable patients and planning individualized management.
- We aimed to clarify prognostic factors associated with health-related quality of life at discharge and later walking ability in older adults following hip fracture surgery, and to investigate the relationship between these two outcomes.

## Methods

- Design:** Multicenter retrospective cohort study
- Participants:** 4,281 patients aged  $\geq 50$  years who underwent hip fracture surgery (2016-2024)
- Data source:** The nationwide **Korean Hip Fracture Registry**
- Outcomes:** **Discharge EQ-5D & Follow-up KOVAL (6mo)**
- Statistics:** Multivariate linear regression & Goodness of fit between models was compared using Pseudo-R<sup>2</sup>, Akaike's information criterion (AIC), and Bayesian information criterion (BIC)
- Models:**
  - ✓ Discharge EQ-5D: Model 1 (non-modifiable factors) vs Model 2 (Model 1+modifiable factors)
  - ✓ Follow-up KOVAL: Model 1 (non-modifiable) vs Model 2 (Model 1 + modifiable) vs Model 3 (Model 2 + discharge EQ-5D)

## Results

- Adding modifiable perioperative factors substantially improved model fit for both outcomes

Predictors	Model 1		Model 2	
	$\beta$ (95% CI)	p-value	$\beta$ (95% CI)	p-value
Sex (female)	-0.019 (-0.035 to -0.002)	0.029	-0.020 (-0.036 to -0.003)	0.019
Age (per 1 year)	-0.002 (-0.003 to -0.001)	<0.001	-0.002 (-0.003 to -0.001)	<0.001
ASA score (per 1-grade worse)	-0.025 (-0.038 to -0.012)	<0.001	-0.025 (-0.037 to -0.012)	<0.001
Albumin (per 1 g/dL)	0.039 (0.025 to 0.054)	<0.001	0.046 (0.032 to 0.061)	<0.001
CCI score				
0				
1	-0.013 (-0.031 to 0.004)	0.144	-0.012 (-0.029 to 0.005)	0.174
2	-0.024 (-0.046 to -0.002)	0.036	-0.021 (-0.043 to 0.001)	0.056
$\geq 3$	-0.050 (-0.074 to -0.026)	<0.001	-0.050 (-0.073 to -0.027)	<0.001
Baseline KOVAL	-0.016 (-0.020 to -0.012)	<0.001	-0.019 (-0.023 to -0.015)	<0.001
Type of fracture				
Femur neck				
Intertrochanteric	-0.018 (-0.033 to -0.003)	0.022	-0.031 (-0.049 to -0.013)	<0.001
Type of Anesthesia (regional)			0.021 (0.007 to 0.036)	0.004
Transfusion (Yes)			0.026 (0.006 to 0.046)	0.010
Postoperative complications (Yes)			-0.028 (-0.052 to -0.003)	0.026
Days to ambulation after surgery				
POD 1-2				
POD 3-4			-0.098 (-0.117 to -0.078)	<0.001
Malnutrition (Yes)			0.005 (-0.018 to 0.028)	0.672
Time to surgery (per 1 day)			0.001 (0.000 to 0.001)	0.036
	Model 1 <sup>a</sup>	Model 2 <sup>b</sup>	Model 2 - Model 1	
Pseudo-R <sup>2</sup>	0.060	0.109	0.049	
AIC	-77.128	-294.850	-217.722	
BIC	11.840	-141.446	153.286	

<sup>a</sup> Model 1: non-modifiable factors

<sup>b</sup> Model 2: Model 1 + modifiable factors

Pseudo-R<sup>2</sup> improved from 0.060 (Model 1) to 0.109 (Model 2); AIC decreased from -77.1 to -294.9

Predictors	Model 1		Model 2		Model 3	
	$\beta$ (95% CI)	p-value	$\beta$ (95% CI)	p-value	$\beta$ (95% CI)	p-value
Sex (female)	0.123 (-0.008 to 0.254)	0.065	0.134 (0.004 to 0.264)	0.044	0.093 (-0.033 to 0.219)	0.146
Age (per 1 year)	0.060 (0.053 to 0.066)	<0.001	0.056 (0.049 to 0.063)	<0.001	0.052 (0.045 to 0.058)	<0.001
ASA score (per 1-grade worse)	0.265 (0.165 to 0.365)	<0.001	0.227 (0.127 to 0.328)	<0.001	0.177 (0.079 to 0.274)	<0.001
Albumin (per 1 g/dL)	-0.303 (-0.417 to -0.188)	<0.001	-0.289 (-0.403 to -0.174)	<0.001	-0.193 (-0.304 to -0.082)	<0.001
CCI score						
0						
1	0.132 (-0.006 to 0.270)	0.061	0.125 (-0.012 to 0.262)	0.075	0.100 (-0.032 to 0.233)	0.139
2	0.219 (0.045 to 0.394)	0.014	0.209 (0.036 to 0.383)	0.018	0.166 (-0.002 to 0.333)	0.053
$\geq 3$	0.282 (0.096 to 0.469)	0.003	0.271 (0.086 to 0.457)	0.004	0.168 (-0.012 to 0.347)	0.067
Baseline KOVAL	0.247 (0.216 to 0.278)	<0.001	0.249 (0.217 to 0.280)	<0.001	0.210 (0.179 to 0.241)	<0.001
Type of fracture						
Femur neck						
Intertrochanteric	0.291 (0.174 to 0.409)	<0.001	0.342 (0.199 to 0.486)	<0.001	0.277 (0.139 to 0.416)	<0.001
Type of Anesthesia (regional)			-0.057 (-0.173 to 0.059)	0.338	-0.012 (-0.125 to 0.100)	0.828
Transfusion (Yes)			0.263 (0.105 to 0.422)	0.001	0.317 (0.164 to 0.471)	<0.001
Postoperative complications (Yes)			0.377 (0.181 to 0.573)	<0.001	0.320 (0.130 to 0.509)	<0.001
Days to ambulation after surgery						
POD 1-2						
POD 3-4			0.427 (0.269 to 0.586)	<0.001	0.226 (0.071 to 0.380)	0.004
Malnutrition (Yes)			0.180 (-0.003 to 0.362)	0.053	0.190 (0.014 to 0.366)	0.035
Time to surgery (per 1 day)			0.000 (-0.004 to 0.004)	0.881	0.001 (-0.003 to 0.005)	0.474
Discharge EQ5D					-2.065 (-2.297 to -1.834)	<0.001
	Model 1 <sup>a</sup>	Model 2 <sup>b</sup>	Model 3 <sup>c</sup>	Model 2 - Model 1	Model 3 - Model 2	
Pseudo-R <sup>2</sup>	0.207	0.220	0.272	0.013	0.052	
AIC	17535.067	17478.905	17183.246	-56.162	-295.659	
BIC	17624.134	17631.592	17342.294	7.458	-289.298	

<sup>a</sup> Model 1: non-modifiable factors

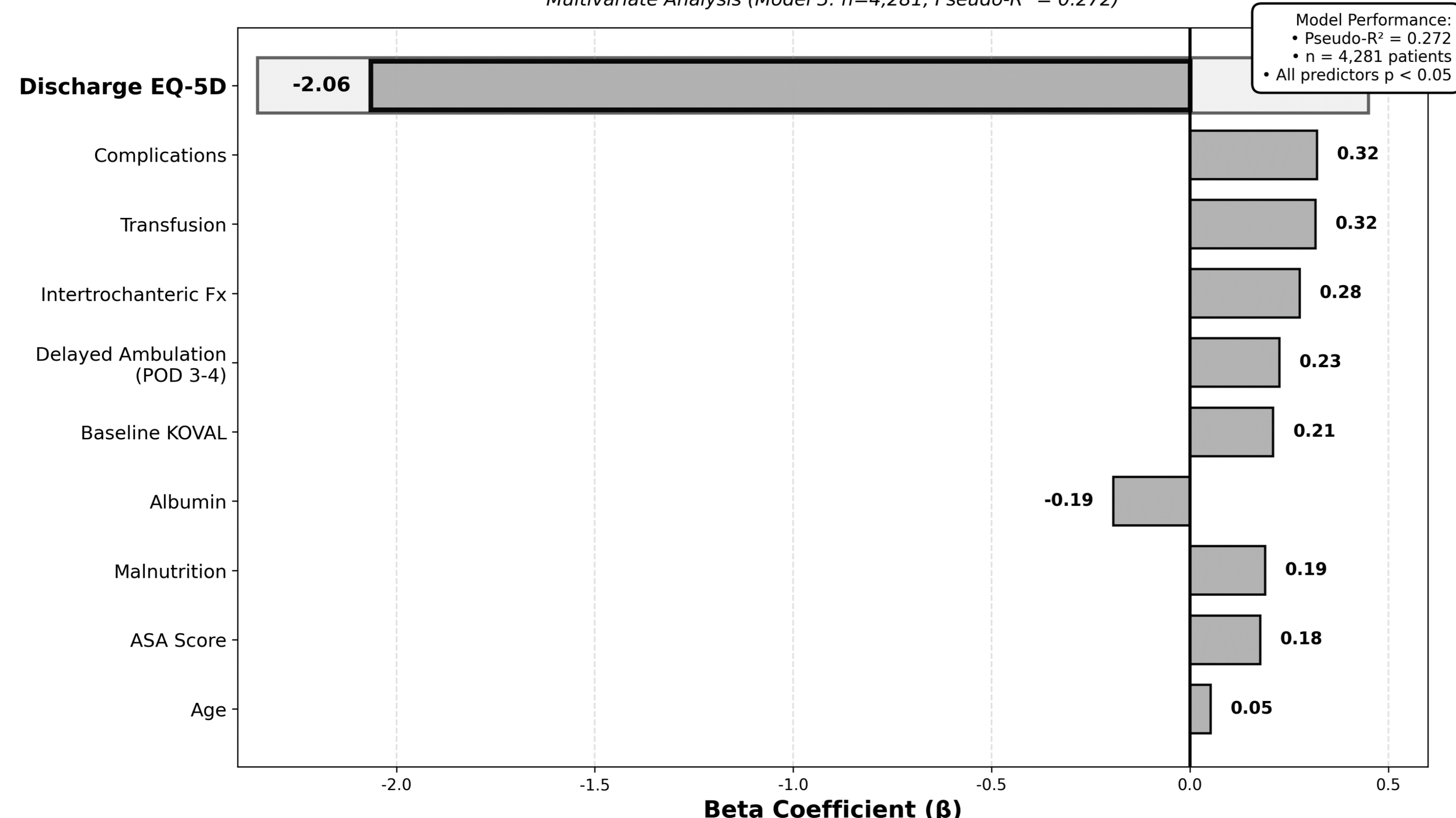
<sup>b</sup> Model 2: Model 1 + modifiable factors

<sup>c</sup> Model 3: Model 2 + discharge EQ5D

Pseudo-R<sup>2</sup> improved from 0.207 (Model 1)  $\rightarrow$  0.220 (Model 2)  $\rightarrow$  0.272 (Model 3); discharge EQ-5D showed strongest negative association ( $\beta = -2.06$ )

## Predictors of Follow-up Walking Ability (KOVAL) After Hip Fracture

Multivariate Analysis (Model 3: n=4,281, Pseudo-R<sup>2</sup> = 0.272)



## Key Predictors

### Better Discharge EQ-5D:

- Regional anesthesia
- Higher albumin
- Earlier ambulation
- No complications

### Better Follow-up KOVAL:

- Higher **discharge EQ-5D**
- Lower ASA score
- Earlier ambulation
- No transfusion
- No complications
- No malnutrition

## Conclusions

- Modifiable perioperative factors** meaningfully enhance explanatory power for discharge EQ-5D beyond non-modifiable factors
- Discharge EQ-5D** is a strong independent determinant of subsequent walking ability after hip fracture surgery.
- These findings support **targeting perioperative optimization**—particularly strategies that improve discharge EQ-5D—to maximize post-discharge ambulatory function in hip fracture patients.