Outcomes After Staged Bilateral Total Knee Arthroplasty Are Predicted By Prior Surgical Response and Patient Complexity, Not Timing

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Background

- It remains unclear how timing between staged bilateral total knee arthroplasty (BTKA) influences complication risk or patient reported outcomes (PROs).
- Studies suggest early second-stage surgery expedites recovery[1,2]; others report increased complications with intervals less than six weeks[3].
- This study **assessed whether inter-stage timing affects 90-day complications or one-year PROs.**

Materials and Methods

- Retrospective study at a single large-volume institute.
- Patients aged 18-89 who underwent staged BTKA from 2014-2024.

Grouping based on inter-stage timing:

- Quartiles
- Binary (≤6 vs >6 weeks)
- Continuous (per 30 days)

Primary outcomes:

- 90-day complication after second TKA
- Failure to meet minimal clinically important difference (MCID) at one-year after second stage
  - KOOS JR (**MCID = +16**)
  - VRS-12 PCS (**MCID = +5**)

Results

Total of 2,410 patients

- Median time: 245 days
- 4.7% overall complication rate

- **Inter-stage timing** not independently associated with complications or failure to meet MCID.
- Complication after first stage associated with increased complication risk (OR: 4.01, $P < 0.001$)
- Failure to meet MCID after first stage associated with subsequent failure:
  - KOOS JR (OR = 26.34; $P < 0.001$)
  - VRS-12 PCS (OR = 31.67; $P < 0.001$)

Results

Table 1. Demographic and Surgical Variables Based on Surgical Timing: Quartiles

Preoperative Variables	Total (N=2,410)	≤98 days (n=594)	>98 to ≤245 days (n=618)	>245 to ≤571 days (n=596)	>571 days (n=602)	P-value
Age, years	66.2 ± 8.5	64.9 ± 8.3	67.1 ± 8.5	66.8 ± 8.3	66.2 ± 8.5	< 0.001
Sex						
Women	1535 (63.7)	320 (53.9)	423 (68.4)	400 (67.1)	392 (65.1)	< 0.001
Men	875 (36.3)	274 (46.1)	195 (31.6)	196 (32.9)	210 (34.9)	
BMI, kg/m^2	33.0 ± 6.7	32.6 ± 6.0	33.7 ± 7.2	33.4 ± 6.9	32.3 ± 6.6	0.001
CCI						
≤1	323 (13.4)	96 (16.2)	81 (13.1)	66 (11.1)	80 (13.3)	
2	721 (29.9)	209 (35.2)	150 (24.3)	184 (30.9)	178 (29.6)	
3	770 (32.0)	191 (32.2)	207 (33.5)	192 (32.2)	180 (29.9)	< 0.001
4	412 (17.1)	70 (11.8)	113 (18.3)	108 (18.1)	121 (20.1)	
≥5	184 (7.6)	28 (4.7)	67 (10.8)	46 (7.7)	43 (7.1)	
ASA Class						
I-II	1597 (66.3)	419 (70.5)	369 (59.7)	375 (62.9)	434 (72.1)	< 0.001
III-IV	813 (33.7)	175 (29.5)	249 (40.3)	221 (37.1)	168 (27.9)	
Smoking Status						
Never	1233 (51.2)	321 (54.0)	310 (50.2)	308 (51.7)	294 (48.8)	
Former	1086 (45.1)	245 (41.2)	284 (46.0)	275 (46.1)	282 (46.8)	0.115
Active	91 (3.8)	28 (4.7)	24 (3.9)	13 (2.2)	26 (4.3)	
Any Complication: Stage 1	94 (3.9)	25 (4.2)	18 (2.9)	23 (3.9)	28 (4.7)	0.446

Table 2. Demographic and Surgical Variables Based on Surgical Timing: Binary

Preoperative Variables	Total (N=2,410)	≤6 weeks (n=231)	>6 weeks (n=2179)	P-value
Age, years	66.2 ± 8.5	64.3 ± 8.0	66.4 ± 8.5	< 0.001
Sex				
Women	1535 (63.7)	121 (52.4)	1414 (64.9)	< 0.001
Men	875 (36.3)	110 (47.6)	765 (35.1)	
BMI, kg/m^2	33.0 ± 6.7	31.3 ± 4.6	33.2 ± 6.9	< 0.001
CCI				
≤1	323 (13.4)	50 (21.6)	273 (12.5)	
2	721 (29.9)	77 (33.3)	644 (29.6)	
3	770 (32.0)	70 (30.3)	700 (32.1)	< 0.001
4	412 (17.1)	26 (11.3)	386 (17.7)	
≥5	184 (7.6)	8 (3.5)	176 (8.1)	
ASA Class				
I-II	1597 (66.3)	179 (77.5)	1418 (65.1)	< 0.001
III-IV	813 (33.7)	52 (22.5)	761 (34.9)	
Smoking Status				
Never	1233 (51.2)	114 (49.4)	1119 (51.4)	
Former	1086 (45.1)	106 (45.9)	980 (45.0)	0.650
Active	91 (3.8)	11 (4.8)	80 (3.7)	
Any Complication: Stage 1	94 (3.9)	15 (6.5)	79 (3.6)	0.032

Figure 1. Predictors of 90-day Complication

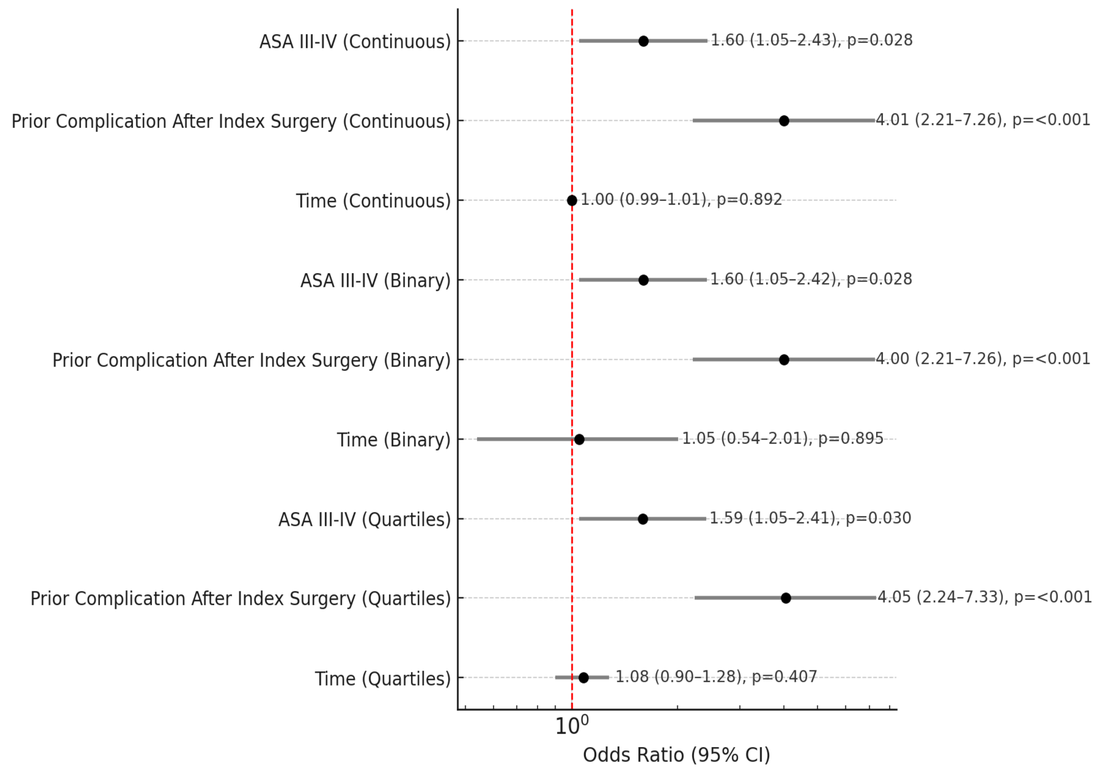


Figure 2. Predictors of Failure to Meet KOOS JR MCID at One-Year

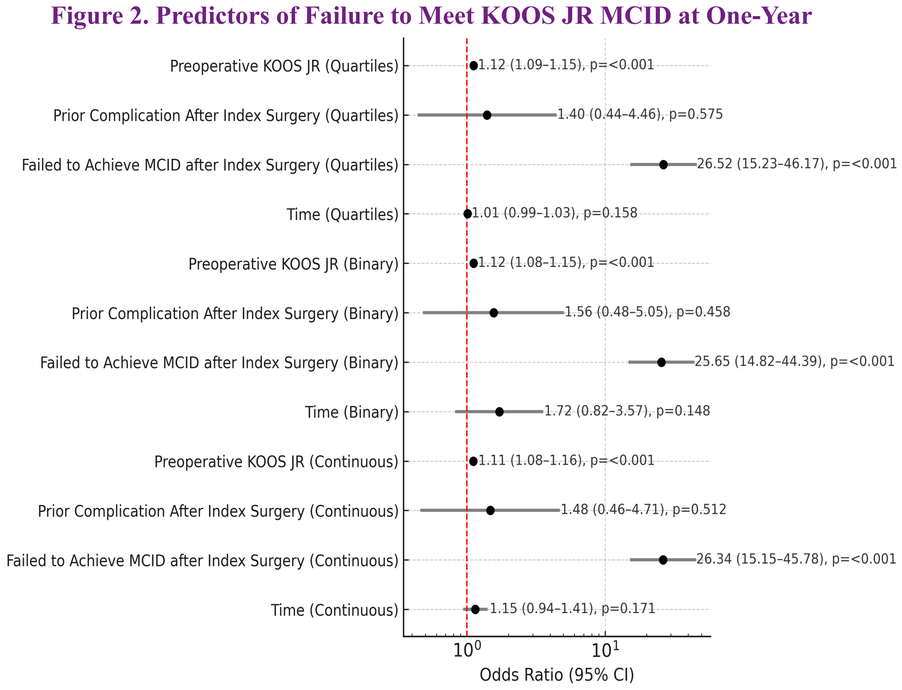
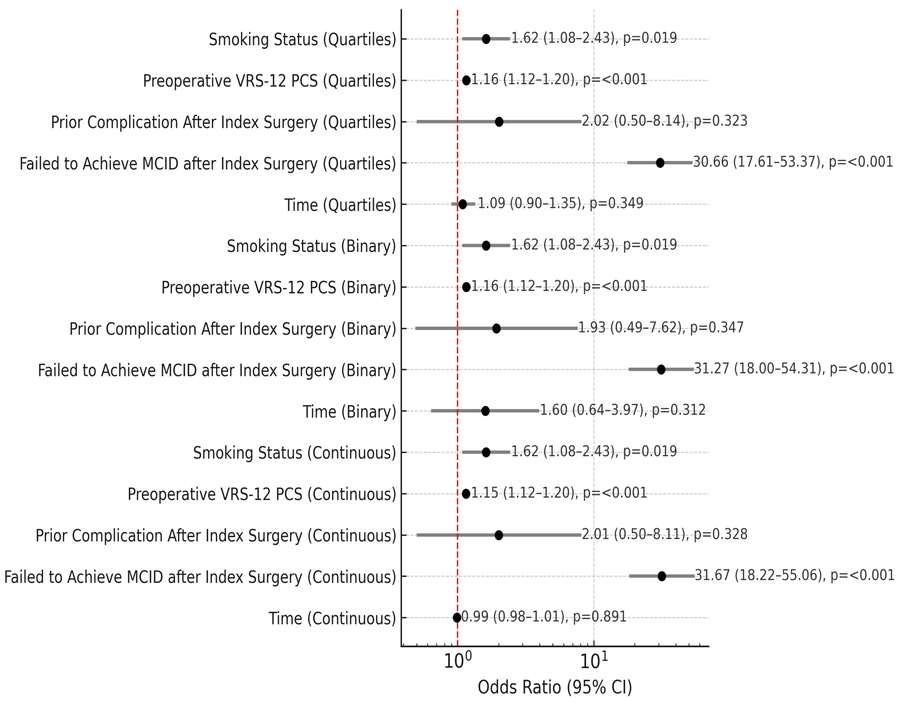


Figure 3. Predictors of Failure to Meet VRS-12 PCS at One-Year



Conclusions

- Timing not independently associated with complications or one-year MCID failure.
- Prior surgical response and patient complexity predict poor outcomes.
- Supports flexible, patient-centered scheduling.

References

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