

Do Unicompartmental Knee Arthroplasty Patients Who Fail to Achieve the MCID Have Higher Rates of Conversion to Total Knee Arthroplasty? *Findings from a Prospectively-Maintained Multi-Institutional Arthroplasty Registry*

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INTRODUCTION:

Failed unicompartmental knee arthroplasty (UKA) leads to revision and conversion to total knee arthroplasty (TKA). Conversion of UKA to TKA presents technical and perioperative hurdles, and this already difficult procedure can become even more challenging if the operation is delayed. Arthroplasty surgeons and patients may therefore benefit from strategies to identify UKA patients at high risk for conversion to TKA, who may benefit from closer monitoring, targeted therapy, and timely intervention. One such strategy may be utilization of the minimal clinically important difference (MCID) threshold following UKA. Patients who achieve the MCID experience clinically meaningful improvement in their symptoms, which may be associated with improved long-term outcomes. By contrast, patients who do not achieve the MCID may be more likely to experience unresolved pain, suboptimal biomechanics, or limited recovery, which could contribute to higher conversion rates. The aim of this study was to investigate if MCID achievement following UKA was independently statistically significantly associated with rate of conversion to TKA.

METHODS:

This was a retrospective analysis of a prospectively-maintained multi-institutional arthroplasty registry. A total of 760 UKAs with mean 5-year follow-up were identified. Demographics and baseline characteristics were collected at the time of surgery (**Table 1**). Patients completed the Patient-Reported Outcomes Measurement Information System (PROMIS) Physical Function – Short Form 10a (PF-10a), both preoperatively and 1-year postoperatively. Patients were categorized according to postoperative achievement of a literature-derived MCID threshold of +3.1 in PROMIS PF-10a score. Conversion-free survival at 1-year, 3-year, and 5-year follow-up were compared between UKA patients who achieved the MCID, and those who did not achieve the MCID, using the Kaplan-Meier method. To isolate the independent contribution of MCID achievement to conversion rates, we additionally performed forward conditional multivariable binary logistic regression models.

RESULTS:

Following UKA, the MCID was achieved by 528 (69.5%), while 232 (30.5%) did not achieve the MCID. UKA patients who did not achieve the MCID had lower rates of conversion-free survival at 3-year (95.2% vs. 99.1%; $p = 0.002$) and 5-year (93.1% vs. 98.7%; $p = 0.005$) follow-up (**Table 2**). **Figure 1** depicts conversion-free survival curves for UKA patients. MCID achievement in UKA remained independently statistically significantly associated with increased likelihood of conversion-free survival (Odds Ratio = 2.5; $p = 0.020$), after adjusting for demographics and baseline characteristics (**Table 3**).

DISCUSSION AND CONCLUSION:

Arthroplasty surgeons may benefit from strategies to identify UKA patients at increased risk for conversion to TKA, in order to tailor postoperative follow-up protocols and implement timely and targeted interventions. The present study highlighted one such potential strategy: utilization of the minimal clinically important difference (MCID). UKA patients who do not achieve the MCID are more likely to undergo conversion to TKA at 3-year and 5-year follow-up. This association remained, even after accounting for patient demographics and baseline characteristics. These patients who do not achieve the MCID may exhibit unresolved pain, inadequate postoperative recovery, or restricted physical functioning, which may predispose them to higher rates of conversion to TKA. Utilization of MCID thresholds in UKA patients may therefore be a strategy to identify patients at higher risk for conversion to TKA, who could benefit from closer postoperative monitoring.

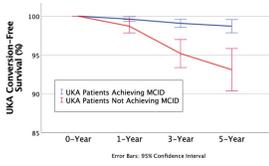


Figure 1. Conversion-free survival curves for unimpaired knee arthroplasty (UKA), stratified by patient achievement of minimal clinically important difference (MCID). Patients who did not achieve the MCID had lower rates of conversion-free survival at 3 year (92.2% vs. 94.7%, p = 0.002) and 5 year (85.1% vs. 90.7%, p < 0.0001) follow-up.

Table 1. Baseline characteristics of unimpaired knee arthroplasty (UKA) patients, stratified by patient achievement of minimal clinically important difference (MCID).

Variable, n (%) or mean ± SD	All UKA Patients (n = 214)	UKA Patients Who Achieved the MCID (n = 107)	UKA Patients Who Did Not Achieve the MCID (n = 107)	P Value
Age	62.9 ± 12.9	62.9 ± 12.5	62.9 ± 13.2	0.99
Sex				0.99
Male	106 (50.0%)	53 (49.5%)	53 (49.5%)	
Female	108 (50.0%)	54 (50.5%)	54 (50.5%)	
Race/ethnicity				0.40
Black/African American	26 (12.1%)	13 (12.2%)	13 (12.2%)	
White/Caucasian	188 (87.9%)	94 (87.8%)	94 (87.8%)	
Diabetes Mellitus	62 (28.9%)	31 (28.9%)	31 (28.9%)	0.99
Preoperative PROMIS Pain Interference	60.1 ± 11.0	60.1 ± 11.1	60.1 ± 10.9	0.99
Preoperative PROMIS Global Physical Health	62.1 ± 7.3	62.1 ± 7.4	62.1 ± 7.2	0.98

UKA, unimpaired knee arthroplasty; MCID, minimal clinically important difference; PROMIS, patient-reported outcome measurement information system.

Table 2. Conversion-free unimpaired knee arthroplasty (UKA) survival at all available postoperative time points, stratified by patient achievement of the minimal clinically important difference (MCID).

Variable, n (%)	All UKA Patients (n = 214)	UKA Patients Who Achieved the MCID (n = 107)	UKA Patients Who Did Not Achieve the MCID (n = 107)	P Value
3-Year Conversion-Free Survival	92.2% (197/214)	94.7% (101/107)	89.7% (96/107)	0.002
5-Year Conversion-Free Survival	85.1% (182/214)	90.7% (97/107)	80.4% (85/107)	< 0.0001

Table 3. Results of the forward conditional multivariable binary logistic regression. When unimpaired knee arthroplasty (UKA) occurs as independently statistically significantly associated with achievement of conversion-free knee arthroplasty (UKA) at 3-year follow-up.

Variable*	Odds Ratio	95% Confidence Interval		P Value
		Lower	Upper	
MCID Achievement by PROMIS Pain Interference	1.2	1.2	1.4	< 0.001
Diabetes Comorbidity (Binary Yes/No)	0.4	0.4	0.7	< 0.001
Age (per 1-year increase)	1.1	1.0	1.1	< 0.001

MCID, minimal clinically important difference; PROMIS, patient-reported outcome measurement information system. Variables were entered as a forward conditional manner, where only variables independently statistically significantly associated with conversion-free survival at 3-year follow-up were included in the model. *Continuous variables were standardized for overall intercept, age, sex, body mass index, Diabetes Comorbidity (Binary), and preoperative PROMIS Global Physical Health. All variables are listed with their model fit and independently statistically significant regression model (p < 0.05).