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Table S1. Comparison of total hip replacement cohorts

	Pre-operative THR dataset (N=4,675)	THR patients with pre- and post-operative data (N=2,748)	Patients with pre- and post-operative HOOS-12 data (N=1,490)
Age in years, mean (SD)	66.9 (10.5)	67.1 (10.2)	65.9 (9.6)
Female, *n* (%)	2,574 (55)	1,540 (56)	809 (54)
BMI category, *n* (%)			
Underweight or normal weight	968 (21)	550 (20)	290 (19)
Overweight	1,615 (35)	945 (34)	525 (35)
Obese	2,042 (44)	1,225 (45)	659 (44)
ASA category, *n* (%)			
Healthy	346 (7)	198 (7)	127 (9)
Mild systemic disease	2,633 (56)	1,551 (56)	888 (59)
Severe systemic disease	1,639 (35)	975 (35)	462 (31)
Severe disease (threat to life)	51 (1)	23 (1)	12 (1)
Baseline Oxford Hip score, mean (SD)	20.5 (8.8)	20.8 (8.7)	21.4 (8.5)

THR: total hip replacement

Columns align with the patient groups depicted in Figure 1

Table S2. Comparison of total knee replacement cohorts

	Pre-operative TKR dataset (N=6,619)	**TKR patients with pre- and post-operative data (N=3,873)**	**Patients with pre- and post-operative KOOS-12 data (N=1,931)**
Age in years, mean (SD)	67.7 (8.8)	67.5 (8.6)	66.3 (8.3)
Female, *n* (%)	3,867 (58)	2,252 (58)	1,067 (55)
BMI category, *n* (%)			
Underweight or normal weight	629 (10)	337 (9)	180 (9)
Overweight	1,852 (28)	1,064 (27)	554 (29)
Obese	4,069 (61)	2,440 (63)	1,186 (61)
ASA category, *n* (%)			
Healthy	265 (4)	169 (4)	108 (5)
Mild systemic disease	3,474 (52)	2,036 (53)	1,042 (54)
Severe systemic disease	2,797 (42)	1,618 (42)	756 (39)
Severe disease (threat to life)	67 (1)	42 (1)	21 (1)
Baseline Oxford Knee score, mean (SD)	22.0 (8.3)	22.2 (8.2)	23.2 (8.1)

TKR: total knee replacement

Columns align with the patient groups depicted in Figure 1

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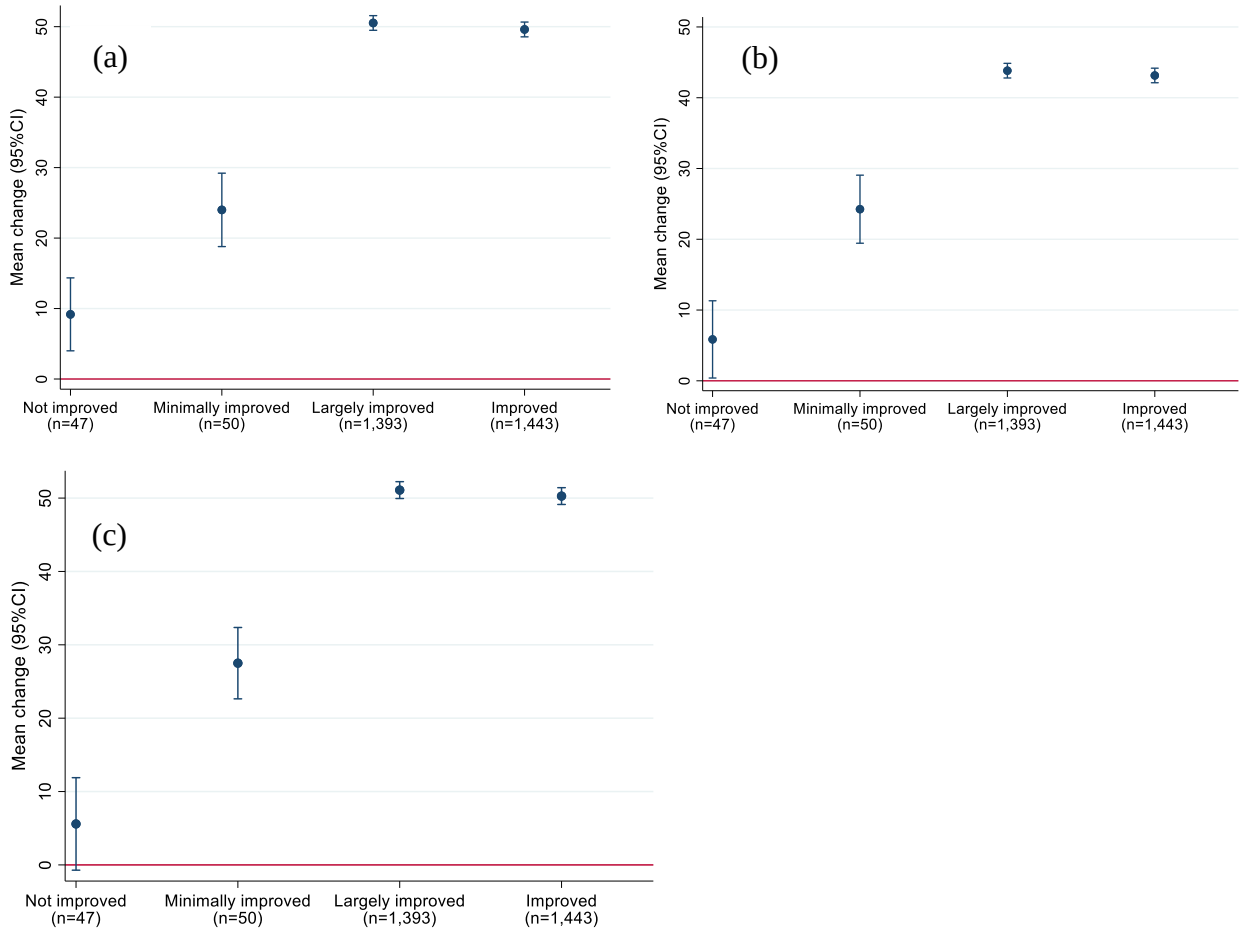

Figure S1. Mean (95% confidence interval) change in HOOS-12 (a) pain; (b) function; and (c) quality of life domain scores according to category of perceived change. Red horizontal line indicates no change in HOOS-12 score.

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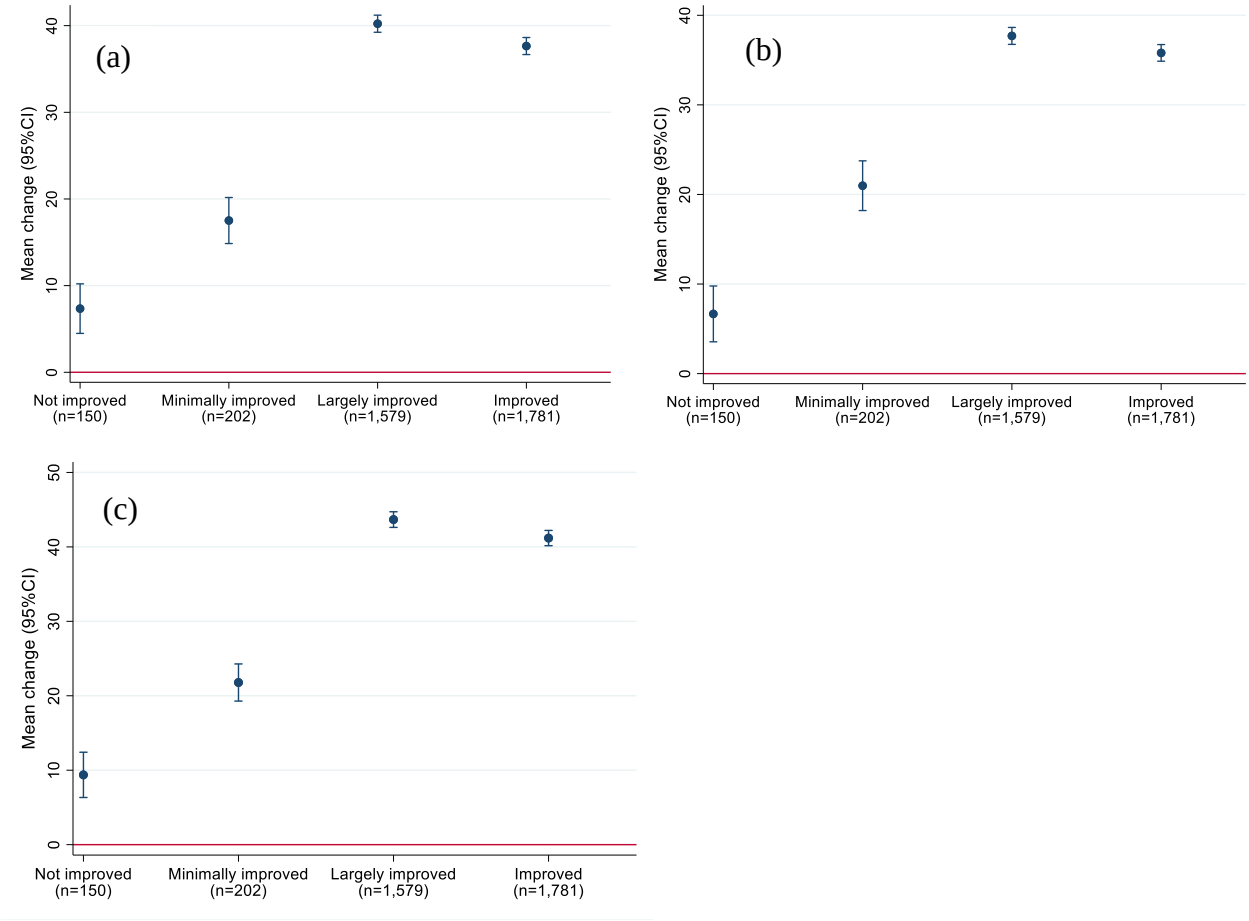

Figure S2. Mean (95% confidence interval) change in KOOS-12 (a) pain; (b) function; and (c) quality of life domain scores according to category of perceived change. Red horizontal line indicates no change in KOOS-12 score.

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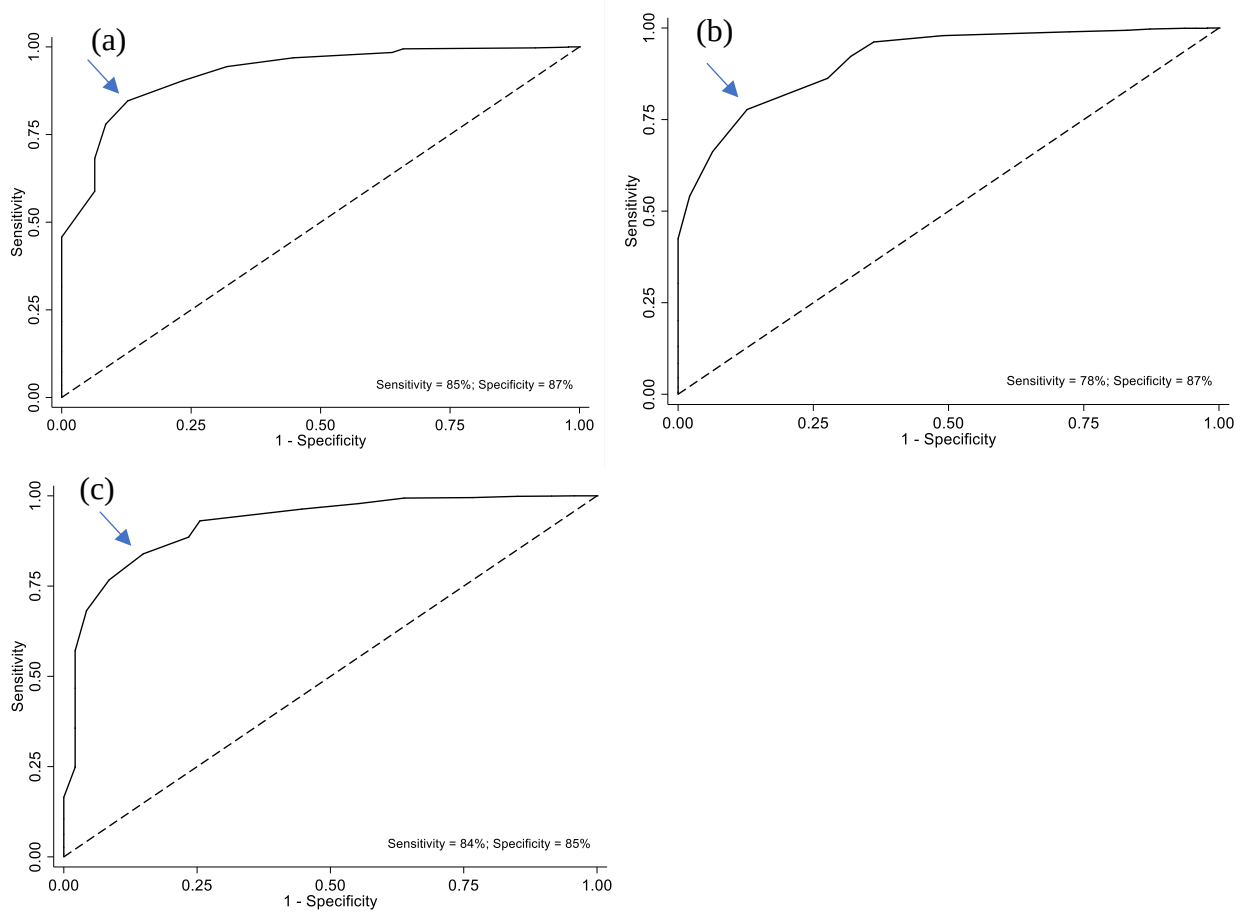

Figure S3. Receiver operating characteristic curve displaying overall accuracy in identifying an improvement according to patient-perceived change for the HOOS-12 (a) pain; (b) function; and (c) quality of life domain scores. Blue arrow indicates position of maximum sensitivity and specificity.

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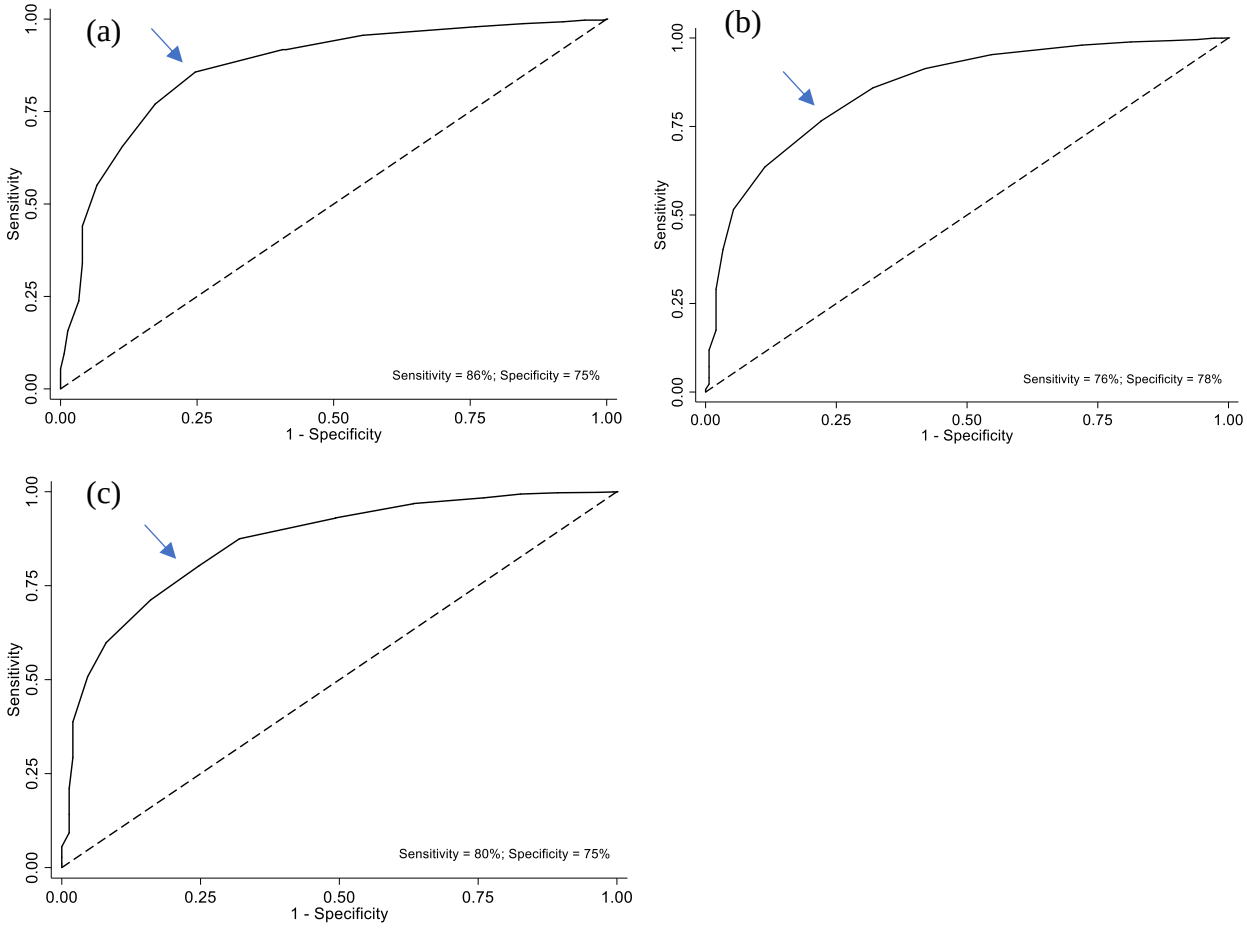

Figure S4. Receiver operating characteristic curve displaying overall accuracy in identifying an improvement according to patient-perceived change for the KOOS-12 (a) pain; (b) function; and (c) quality of life domain scores. Blue arrow indicates position of maximum sensitivity and specificity.

Box S1. How the MCIC values can be used to compare between-group differences

Should a clinician or researcher wish to use the MCIC values to design a study comparing the outcomes of two groups after surgery (for example, a study comparing two different femoral components), one approach would be to compare the proportion of patients in each group who report an improvement that exceeds the MCIC.

In this example, the hypothesis might be that there is a 20% between-group difference in the proportion of patients who exceed the MCIC value after surgery.

The following equation can be used to calculate the required sample size:

$$n = \frac{p_1(1-p_1) + p_2(1-p_2)}{(p_1-p_2)^2}(z\alpha_{/2} + z_\beta)^2$$

where p_1 is the proportion of patients in Group 1 exceeding the MCIC value;
p_2 is the proportion of patients in Group 2 exceeding the MCIC value;
$z\alpha_{/2}$ is the value from the normal distribution at the probability of α for a two-tailed test and is usually 1.960 when $\alpha \leq 0.05$; and
z_β is the value from the normal distribution at the probability of β and is usually 0.841 when $\beta = 0.2$ (i.e. power of 80%).

To detect a 20% difference in the proportion of patients exceeding the MCIC value, assuming 70% in Group 1 and 90% in Group 2:

$$n = \frac{0.7(0.3) + 0.9(0.1)}{(0.2)^2}(1.96 + 0.84)^2$$

Thus, a sample size of **59** patients in each group (i.e. total sample size of 118) would be required to detect a 20% difference in the proportion of patients achieving the MCIC value, assuming a 5% significance level and 80% power.

Box S2. How the MCIC values can be used to examine within-group changes

Should a clinician or researcher seek to examine within-group changes (for example, group-level improvement after knee replacement surgery), they may wish to consider whether the magnitude of observed change exceeds the MCIC value and thus can be considered clinically important.

When comparing pre- and post-treatment scores for a single group of patients, the hypothesis might be that the mean change in the KOOS-12 summary score after surgery exceeds 15.5 points.

The following equation can be used to calculate the required sample size:

$$n = \frac{(z\alpha_{/2} + z_\beta)^2 \sigma^2}{\Delta^2}$$

where $z\alpha_{/2}$ is the value from the normal distribution at the probability of α for a two-tailed test and is usually 1.960 when $\alpha \leq 0.05$;
z_β is the value from the normal distribution at the probability of β and is usually 0.841 when $\beta = 0.2$ (i.e. power of 80%);
σ^2 is the population standard deviation (which is usually unknown and estimated by the sample standard deviation); and
Δ^2 is the difference between the pre- and post-treatment KOOS-12 summary scores.

Given that we have estimated the MCIC for the KOOS-12 summary score to be 15.5 and the standard deviation of the KOOS-12 summary change score for our sample is 20.3, we can therefore estimate the required sample size as:

$$n = \frac{(1.96 + 0.84)^2 (20.3)^2}{(15.5)^2}$$

Thus, a sample size of **14** patients would be needed to detect a minimum difference in the KOOS-12 summary score of 15.5 points, assuming a 5% significance level and 80% power. The small sample size reflects the relatively large difference in KOOS-12 summary score. Where a sample standard deviation is not readily available, we recommend that the standard deviations reported for our change scores be used (as reported in Table 3).