

## Supplementary material

**Table i.** Patient demographics

Variable	Robotic-arm surgery	Manual surgery	p-value
Mean age (SD)	62.5 (6.9)	61.7 (7.9)	0.548*
Gender male:female (ratio)	1.17:1	1.29:1	0.860 <sup>†</sup>
Mean pre-operative AKSS (0 to 200) (SD)	105 (27)	102 (27)	0.407*
AKSS, proportion of patients score < 100 (%)	48	48	N/A
Mean pre-operative OKS (0 to 48) (SD)	20.9 (8.1)	20.5 (7.5)	0.773*
OKS, proportion of patients score < 12 (%)	10	10	N/A
Median pre-operative pain, VAS (0 to 100) (IQR)	57 (38 to 71)	52 (41 to 68)	0.836*
VAS, proportion of patients score > 70 (%)	29	23	N/A
Median pre-operative depression, HAD (IQR)	5 (3 to 8)	4 (3 to 8)	0.802*
Depression (HAD), proportion of patients score > 8 (%)	29	27	N/A
Median pre-operative anxiety, HAD (IQR)	6.0 (2 to 8)	6.5 (4 to 10)	0.018*
Anxiety (HAD), proportion of patients score > 8 (%)	30	39	N/A
Median pre-operative UCLA (IQR)	4 (3 to 6)	3.5 (3 to 5)	0.430*
UCLA, proportion of patients score ≥ 5 (%)	26	38	N/A
Mean SF-12 (Physical Component Score) (SD)	32.8 (7.7)	32.5 (8.3)	0.837*
Mean SF-12 (Mental Component Score) (SD)	54.2 (10.6)	53.1 (10.5)	0.549*
Median pre-operative PCS (IQR)	11 (4 to 21)	13 (6 to 20)	0.404*
PCS, proportion of patients score > 20 (%)	25	23	N/A
Median pre-operative SDS (Primary Care Evaluation Of Mental Disorders Score) (IQR)	3 (2 to 5)	4 (2 to 6)	0.129*
SDS, Proportion of patients score > 5 (%)	16	28	N/A

\*independent-samples *t*-test

<sup>†</sup>chi-squared test

AKSS, American Knee Score; N/A, not applicable; OKS, Oxford Knee Score; VAS, Visual Analogue Score; IQR, interquartile range; HAD, Hospital Anxiety and Depression Scale; UCLA, University of California at Los Angeles activity score; SF-12, 12-Item Short Form Health Survey; PCS, Pain Catastrophising Score; SDS, Somatic Disease Score

**Table ii.** One year post-operative clinical results

Variable	Robotic-arm surgery	Manual surgery	p-value
Median AKSS (0 to 200) (IQR)	171 (153 to 179)	164 (144 to 182)	0.106*
AKSS, proportion of patients > 180 (%)	44	26	0.059 <sup>†</sup>
Median FJS (IQR)	60.4 (22.9 to 81.3)	50 (29.2 to 68.8)	0.285*
FJS, proportion of patients > 80% (%)	26	13	0.067 <sup>†</sup>
Median OKS (0 to 48) (IQR)	40 (32 to 44)	39 (33 to 44)	0.618*
OKS, proportion of patients > 43 (%)	46	41	0.592 <sup>†</sup>
Median pain, VAS (0 to 100) (IQR)	4.5 (2 to 18)	5.0 (1 to 23)	0.537*
Median UCLA (IQR)	5 (4 to 6)	5 (4 to 7)	0.162*
UCLA, proportion of patients moving up at least 1 category after surgery (%)	69	52	0.06 <sup>†</sup>
Mean SF-12 (Physical Component Score) (SD)	46.8 (9.8)	44.6 (9.8)	0.544*
Mean SF-12 (Mental Component Score) (SD)	54.9 (8.3)	54.6 (8.3)	0.825*
<b>Complications (%)</b>			
Deep infection	0	0	
MUA	0	0	
<b>Wound complications (%)</b>			
Stitch abscess/minor wound breakdown	2	12	
Redness/swelling in a dry wound	5	5	
Wound leakage (negative cultures)	0	5	
Revised (%)	0	0	

\*independent-samples *t*-test

<sup>†</sup>chi-squared test

AKSS, American Knee Society Score; IQR, interquartile range; FJS, Forgotten Joint Score; OKS, Oxford Knee Score; VAS, Visual Analogue Scale; UCLA, University of California at Los Angeles activity score; SF-12, 12-Item Short Form Health Survey; MUA, Manipulation Under Anaesthesia

**Table iii.** Factors predictive of excellent clinical outcome (AKSS > 180, OKS > 43, FJS > 80%). Using AKSS > 180, OKS > 43 and FJS > 80% as markers of excellent clinical outcome, the key factors associated with achieving excellent outcome were a pre-operative activity level > 5 on the UCA activity score (all three outcome measures), use of robotic-arm surgery (two outcome measures) and not having pre-operative depression (one outcome measure)

Variable	AKSS > 180			OKS > 43			FJS > 80%		
	OR	95% CI	p-value*	OR	95% CI	p-value*	OR	95% CI	p-value*
Pre-operative UCLA > 5	3.95	1.59 to 9.80	0.003	2.57	1.10 to 6.00	0.029	3.12	1.16 to 8.39	0.024
Robotic-arm surgery	2.77	1.14 to 6.74	0.025	N/A	N/A	N/S	3.04	1.09 to 8.48	0.033
Pre-operative depression, HAD > 8	N/A	N/A	N/S	0.16	0.03 to 0.75	0.021	N/A	N/A	N/S
Pre-operative anxiety, HAD > 8	N/A	N/A	N/S	0.40	0.15 to 1.06	0.066	N/A	N/A	N/S
SDS > 5	0.13	0.03 to 0.62	0.076	N/A	N/A	N/S	N/A	N/A	N/S
Pre-operative pain > 70	N/A	N/A	N/S	N/A	N/A	N/S	N/A	N/A	N/S
Pre-operative PCS > 20	N/A	N/A	N/S	N/A	N/A	N/S	N/A	N/A	N/S
Pre-operative AKSS < 100	N/A	N/A	N/S	N/A	N/A	N/S	N/A	N/A	N/S

\*binary logistic regression modelling

AKSS, American Knee Score; OKS, Oxford Knee Score; FJS, Forgotten Joint Score; OR, odds ratio; CI, confidence interval; UCLA, University of California at Los Angeles activity score; N/A, not applicable; N/S, not significant; HAD, Hospital Anxiety and Depression Scale; SDS, Somatic Disease Score; PCS, Pain Catastrophising Score

**Table iv.** Factors predictive of poor clinical outcome (AKSS < 120, OKS < 24, FJS < 20%)

Variable	AKSS < 120			OKS < 24			FJS < 20%		
	OR	95% CI	p-value*	OR	95% CI	p-value*	OR	95% CI	p-value*
Pre-operative UCLA > 5	N/A	N/A	N/S	N/A	N/A	N/S	N/A	N/A	N/S
Manual surgery	2.83	0.91 to 8.79	0.071	N/A	N/A	N/S	N/A	N/A	N/S
Pre-operative depression, HAD > 8	6.16	2.06 to 18.48	0.001	6.35	2.06 to 18.48	0.001	4.43	1.63 to 12.04	0.004
Pre-operative anxiety, HAD > 8	N/A	N/A	N/S	14.68	1.67 to 129.40	0.016	N/A	N/A	N/S
SDS > 5	N/A	N/A	N/S	N/A	N/A	N/S	N/A	N/A	N/S
Pre-operative pain > 70	N/A	N/A	N/S	N/A	N/A	N/S	N/A	N/A	N/S
Pre-operative PCS > 20	N/A	N/A	N/S	N/A	N/A	N/S	N/A	N/A	N/S
Pre-operative AKSS < 100	N/A	N/A	N/S	N/A	N/A	N/S	N/A	N/A	N/S

\*binary logistic regression modelling

AKSS, American Knee Score; OKS, Oxford Knee Score; FJS, Forgotten Joint Score; OR, odds ratio; CI, confidence interval; UCLA, University of California at Los Angeles activity score; N/A, not applicable; N/S, not significant; HAD, Hospital Anxiety and Depression Scale; SDS, Somatic Disease Score; PCS, Pain Catastrophising Score

**Table v.** Three months post-operative clinical results

Variable	Robotic-arm surgery	Manual surgery	p-value
Median AKSS (0 to 200) (IQR)	164 (131 to 178)	143 (132 to 166)	0.041*
Median OKS (0 to 48) (IQR)	35 (29 to 41)	33 (23 to 38)	0.140*
Median FJS (IQR)	43.8 (20.5 to 68.2)	27.1 (15.2 to 62.5)	0.06*
FJS, proportion of patients > 80% (%)	15	8	0.265 <sup>†</sup>
Median pain, VAS (0 to 100) (IQR)	8 (2 to 21)	9 (4 to 28)	0.161*
Revised (%)	0	0	N/A

\*independent-samples t-test

<sup>†</sup>chi-squared test

AKSS, American Knee Score; IQR, Interquartile range; OKS, Oxford Knee Score; FJS, Forgotten Joint Score; VAS, Visual Analogue Scale; N/A, not applicable

**Table vi.** One year post-operative clinical scores for patients with pre-operative UCLA Activity score > 5

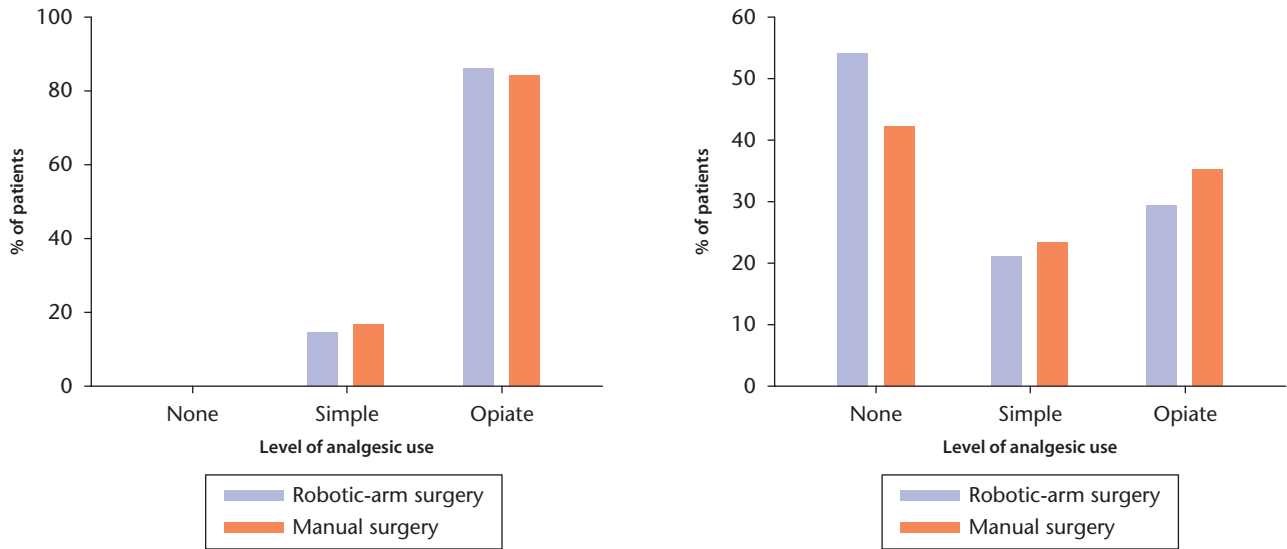
Variable	Robotic-arm surgery (n = 16, 25% of group)	Manual surgery (n = 23, 35% of group)	p-value*
Median AKSS (IQR)	193 (183 to 194)	175 (163 to 188)	0.0064
Median FJS (IQR)	73 (58 to 92)	60 (48 to 71)	0.0346
Median OKS (IQR)	46 (43 to 47)	41 (37 to 44)	0.0106

\*independent-samples t-test

AKSS, American Knee Score; IQR, interquartile range; FJS, Forgotten Joint Score; OKS, Oxford Knee Score

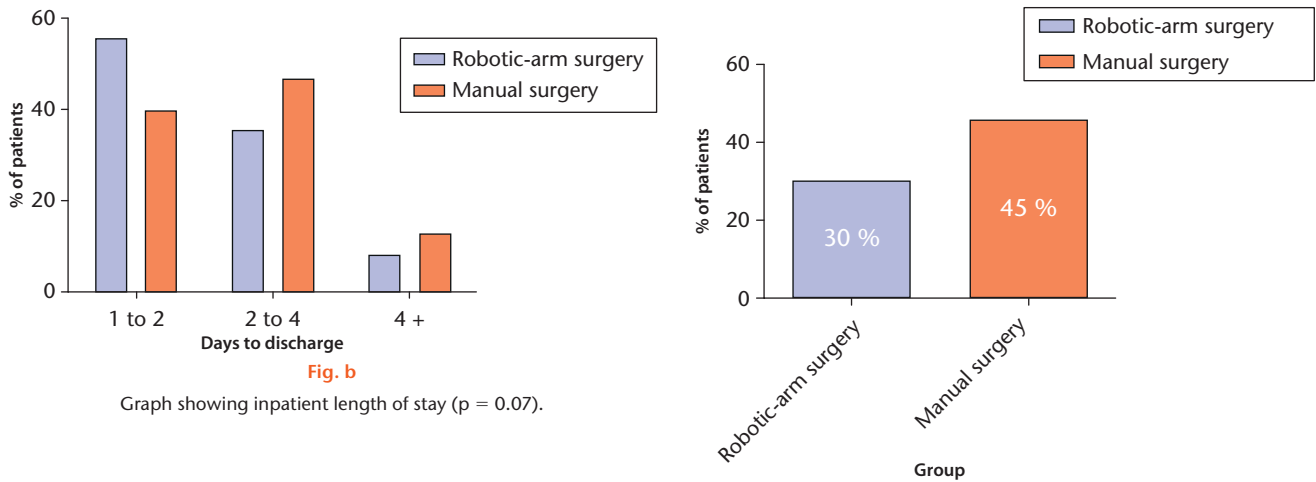
**Table vii.** *Post hoc* power calculation was carried out on the population means, sample deviations and sample numbers to determine the power  $((1-\beta)*100)\%$  of the study at three months and one year to detect the minimally important clinical difference (MICD)<sup>18</sup> for the American Knee Society Score (AKSS) and Oxford Knee Score (OKS). Powers over 80% would be considered to have a suitable number of participants to show a MCID if present

$(1-\beta) * 100$	Minimally important clinical difference (95% CI) <sup>18</sup>	Power analysis (3 mths) (%)	Power analysis (1 yr post-operative) (%)
American Knee Society Score Function	6.1 to 6.4	35.6	23.2
American Knee Society Score	5.3 to 5.9	50.8	36.3
Oxford Knee Score	5	99.9	99.5



**Fig. a**

Graphs showing use of analgesia during the first 14 (left) and 90 (right) days post-operatively ( $p = 0.99$  and  $p = 0.842$ , respectively).



**Fig. b**

Graph showing inpatient length of stay ( $p = 0.07$ ).

**Fig. c**

Graph showing use of post-operative primary care – the proportion of patients visiting their GP within three months of surgery ( $p = 0.092$ ).