

BACKGROUND

- Over 116,000 TKRs are performed each year in the UK, costing the NHS £750 million annually



1 in 5
dissatisfied



55% ongoing pain



£750M/year NHS

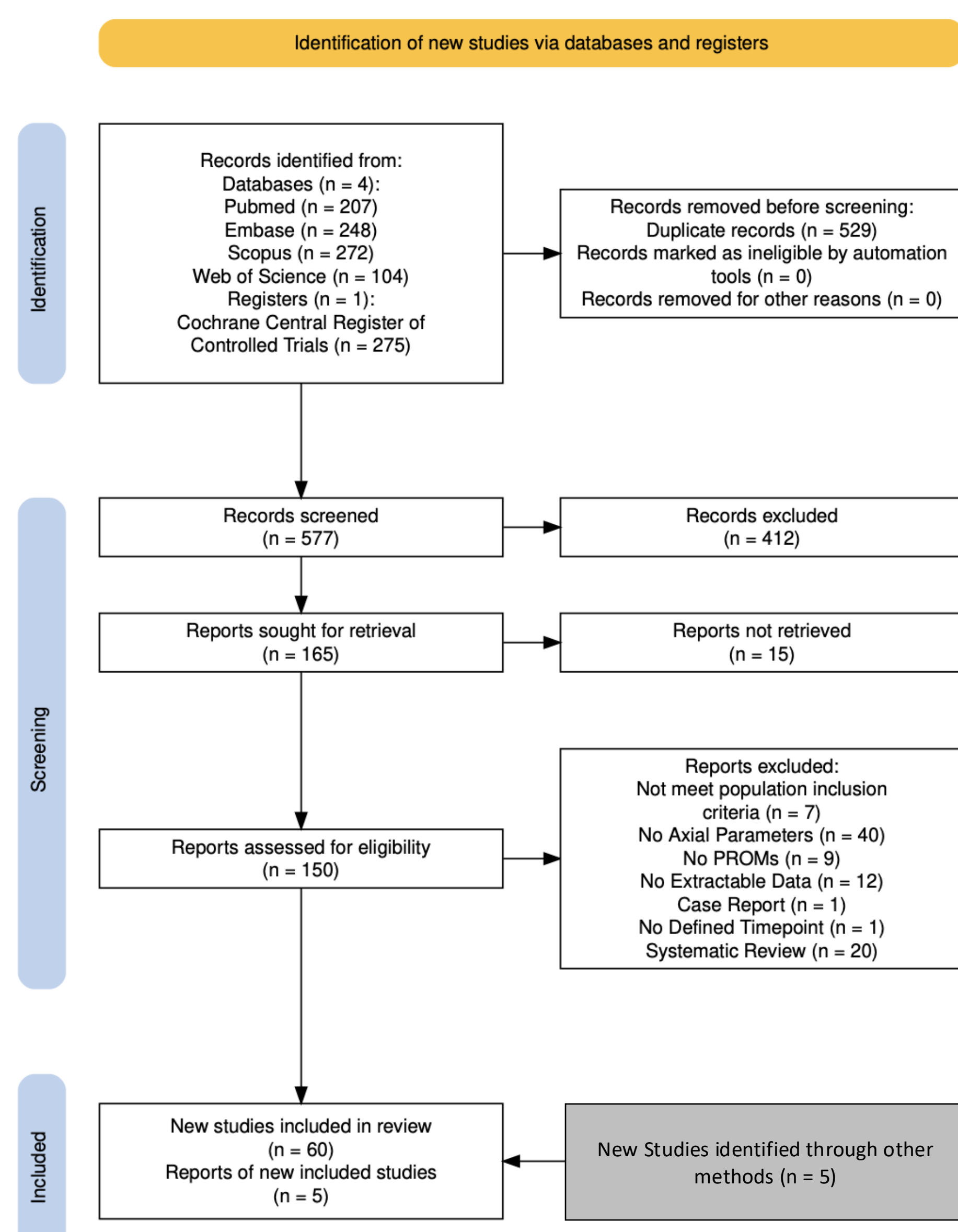
- Post-operative knee alignment** is a key modifiable factor influencing Patient Reported Outcome Measures (PROMs)
- But most research focuses only on coronal (front-view) alignment in 2D.
- We need to assess how **3D axial alignment** impacts what matters most: **patient outcomes**.

OBJECTIVE

To explore the relationship between post-operative alignment from top (axial) and PROMs.

METHODS

- We conducted PROSPERO-registered meta-analysis [CRD42024584335]
- Five electronic databases until 2025 for studies reporting post-TKR sagittal alignment and PROMs.
- Case-weighted meta-regression models assessed axial alignment–PROM relationships
 - across individual timepoints post-TKR,
 - across all timepoints (pooled effects)
- Results are reported as regression coefficient (RC) and 95% confidence intervals (95%CI).



RESULTS

Of 577 studies, 65 were included(N= 8392 TKRs).

Higher femoral-component-rotation (FCR, -2.60 to 2.63°) was associated with improved:

- KSS-Overall at 12 months (RC = 33.2, $p < 0.001$, $n = 323$)
- KSS-Function at 12 months (RC = 11.5, $p < 0.001$, $n = 327$)
- SMD PROM scores across all timepoints (RC = 3.38, $p = 0.042$, $n = 1112$).

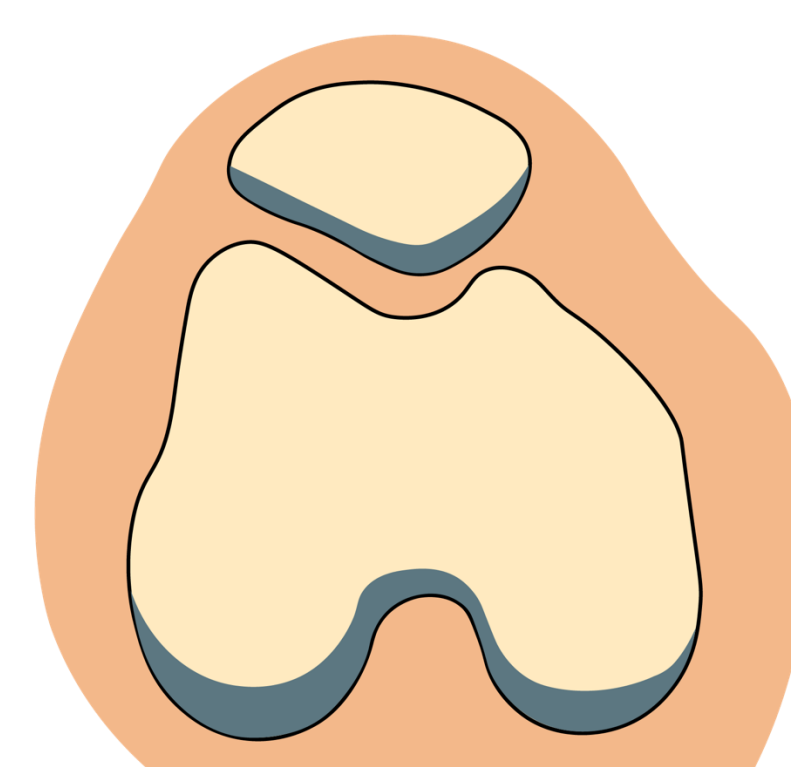
Higher tibial-component-rotation (TCR, -4.30 to 19.0°) was associated with improved:

- KSS-Function at 12 months (RC = 1.90, $p = 0.030$, $n = 234$),
- WOMAC-Total in pooled/time-adjusted analyses (RC = $-4.62/-4.57$, $p < 0.001$, $n = 2221$)
- SMD PROMs at 3 months (RC = 0.57, $p < 0.001$, $n = 149$)

Lower mismatch-rotation (MR) improved SMD PROM in pooled/time-adjusted analysis (RC= $-0.55/-0.52$, $p < 0.001$, $n = 786$, MR Range: -10.5 to 9.30).

Combined-rotation (CR) showed no significant individual timepoint, pooled or time-adjusted effects on PROMs or SD PROMs.

Lower posterior-condylar-angle (PCA, 0.50 to 1.70°) improved WOMAC-Stiffness at 11 months (RC = 11.9, $p = 0.001$, $n = 90$) and WOMAC-Total in pooled/time-adjusted analyses (RC = $-29.5/-31.1$, $p = 0.007$, $n = 223$).



Axial Alignment



Patient Outcomes

Need For This Research & Future Direction

- This review shows that axial alignment influences PROMs, with higher femoral-component-rotation, higher tibial-component-rotation, lower mismatch-rotation and lower posterior-condylar-angle within reported ranges associated with improved PROMs.
- We urge a shift from outdated 2D thinking to a true 3D understanding of knee alignment.
- A clear consensus on what core axial parameters must be reported is now essential to standardise and strengthen future research.

REFERENCES

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- Gardner J, Roman ER, Bhimani R, Mashni SJ, Whitaker JE, Smith LS, et al. Aetiology of patient dissatisfaction following primary total knee arthroplasty in the era of robotic-assisted technology: a review of 674 cases. Bone Jt Open [Internet]. 2024 Sep 12 [cited 2024 Oct 28];5(9):758–65.