

Classification Systems as Predictors of Perioperative Blood Loss in Osteoarticular Infection Surgery

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OBJECTIVE To assess whether the BACH/JS-BACH and PJI-TNM classification systems predict perioperative blood loss and transfusion requirements in osteoarticular infection (OAI) surgery.

INTRODUCTION

Osteoarticular infections (OAI) — osteomyelitis and periprosthetic joint infection (PJI) — often require extensive debridement and staged revisions, with substantial blood loss and transfusion. Two-stage hip revision can lose ~3,700 mL at resection and ~5,150 mL at reimplantation, with transfusion above 80% at both stages ^{6,11}; transfusion itself raises morbidity and mortality in PJI ⁵.

This haematological impact is rarely a primary outcome. BACH/JS-BACH stratifies complexity and predicts prognosis, validated in 653 patients ^{2,3}; PJI-TNM predicts invasiveness at diagnosis ¹. Neither had been validated for haematological outcomes.

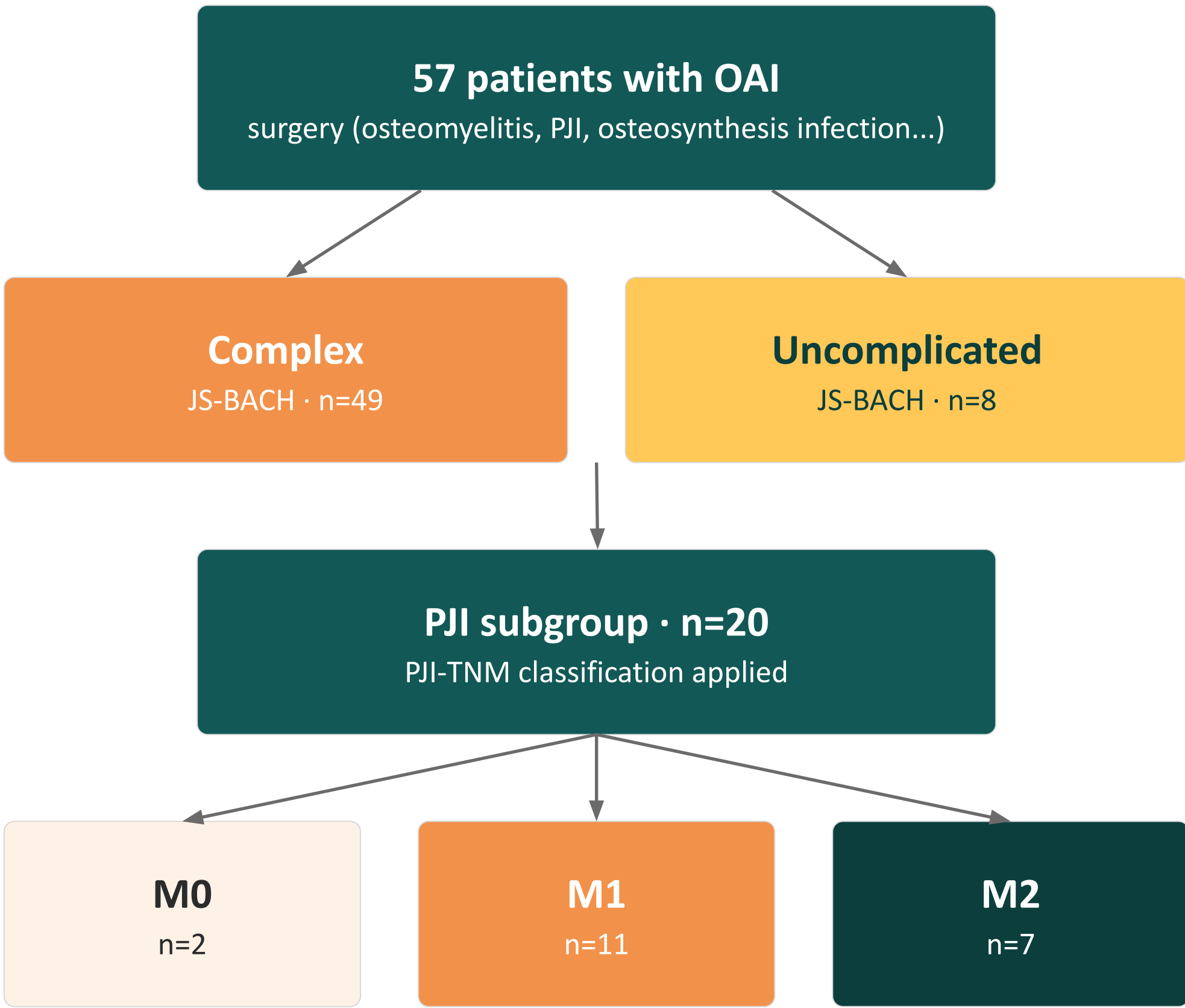
METHODS

Retrospective study of **57 patients** undergoing surgery for OAI. Demographics, anatomical location and BACH/JS-BACH classification were collected; PJI cases (**n=20**) additionally received PJI-TNM.

Outcomes: estimated blood loss (EBL), 24h/48h haemoglobin (Hb) drop, and transfusion rate — knee procedures used the 48h Hb drop, due to tourniquet use.

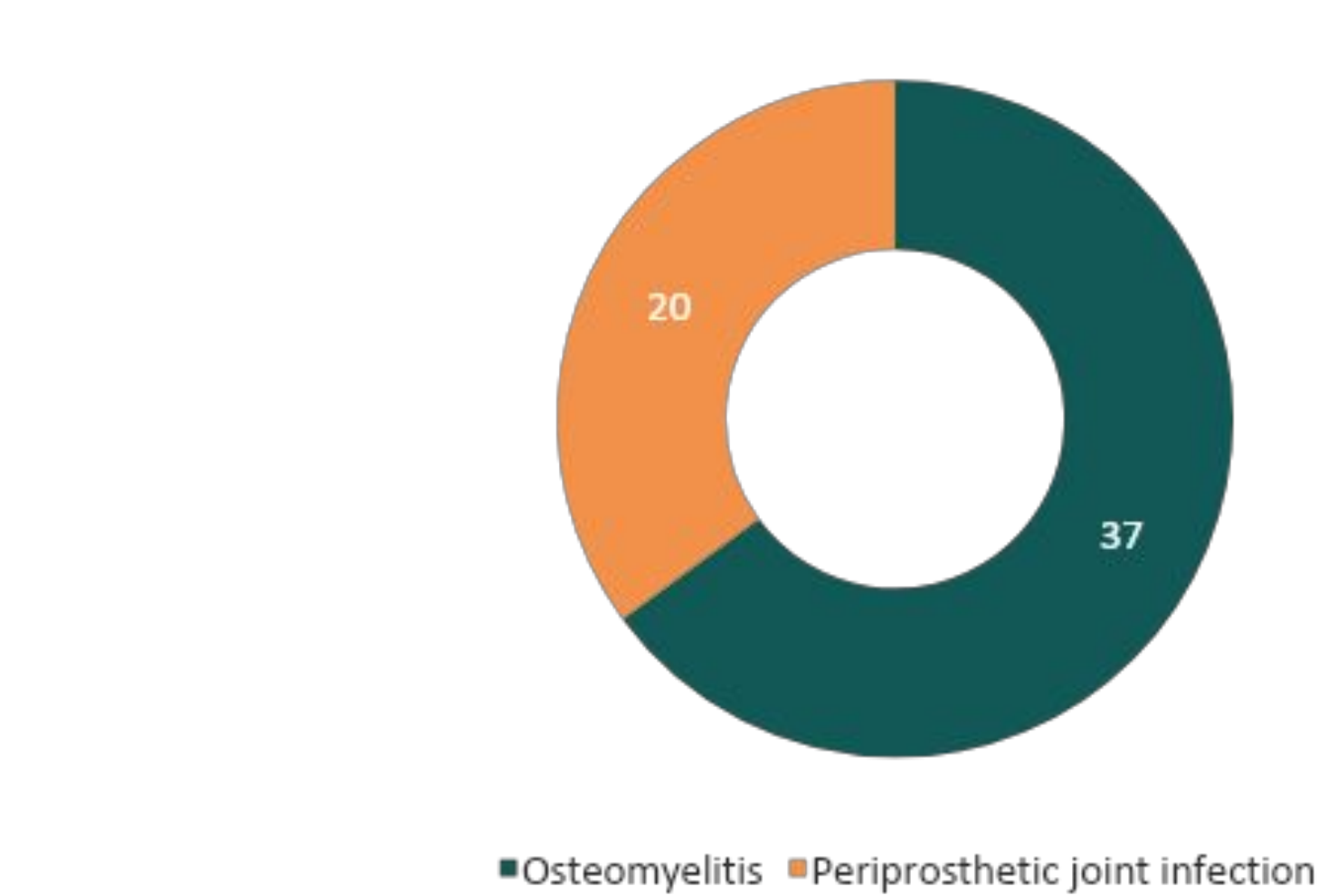
Statistics: Mann–Whitney U, Kruskal–Wallis and Spearman correlation (p<0.05).

STUDY DESIGN



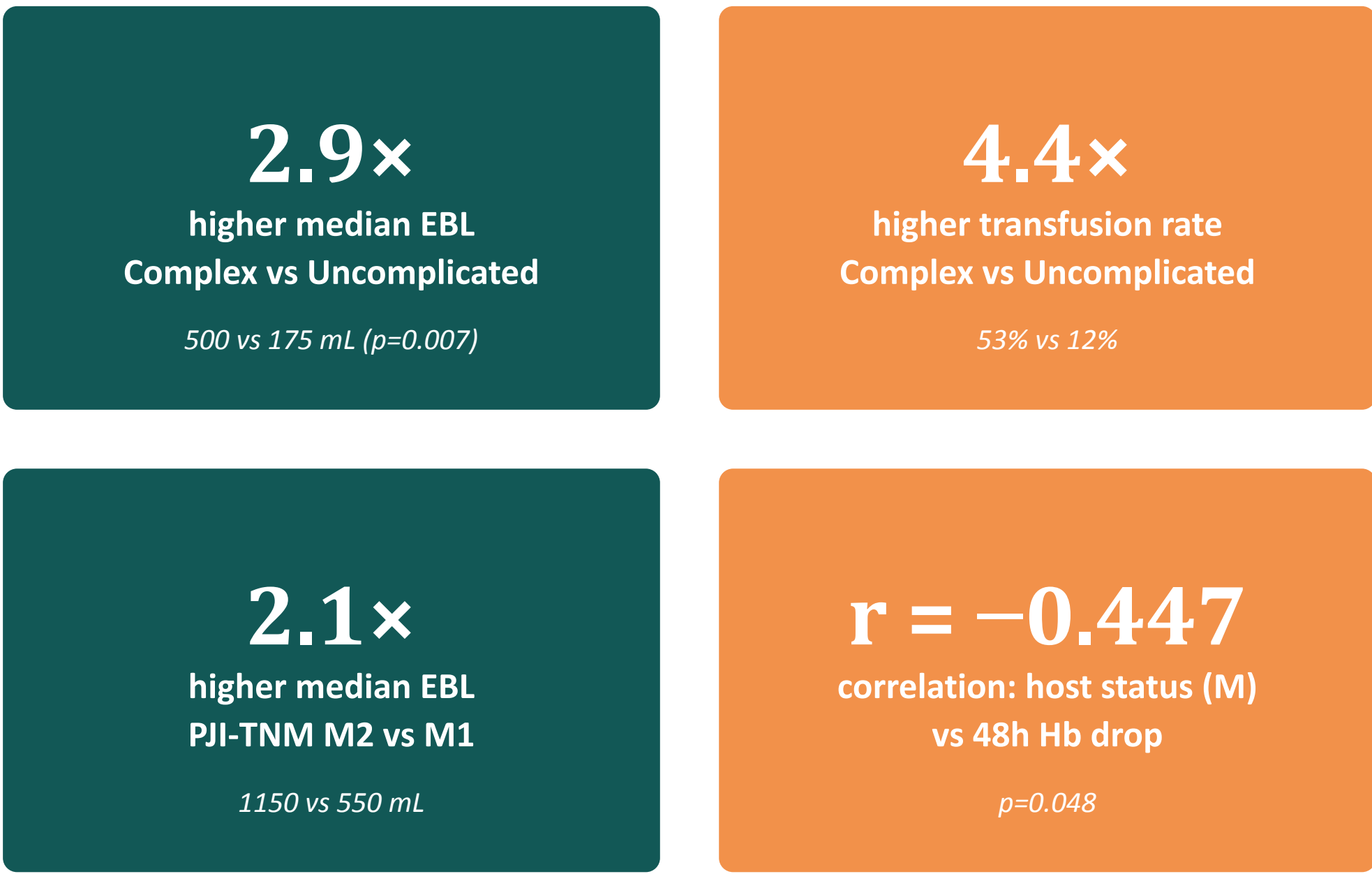
PJI-TNM — M component (host status, by Charlson Comorbidity Index)
M0 not/mildly compromised (CCI 0–1).
M1 moderately compromised (CCI 2–3).
M2 severely compromised (CCI 4–5) — higher EBL, more transfusion, lower baseline Hb.

Diagnostic distribution (n=57)



RESULTS

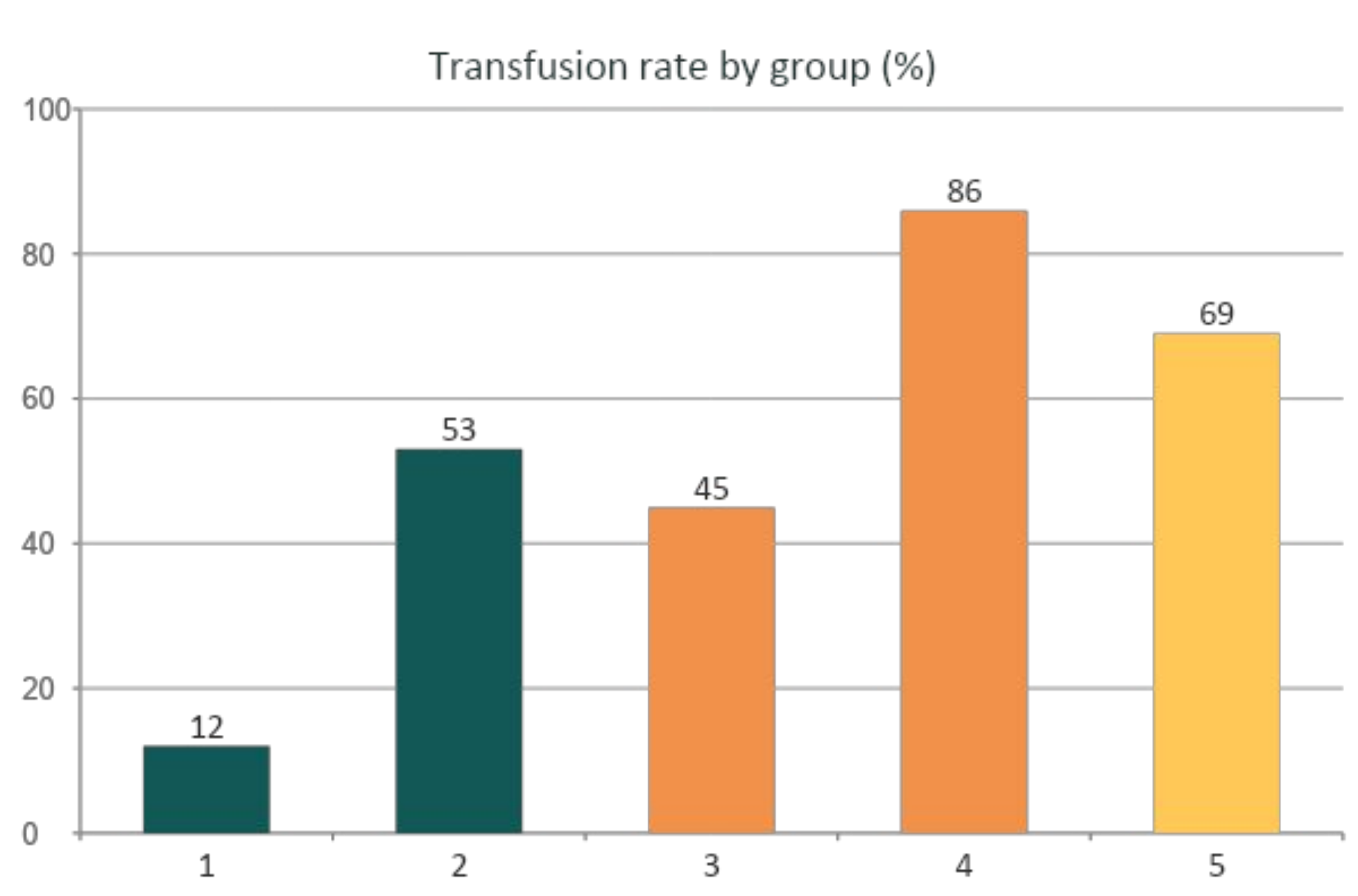
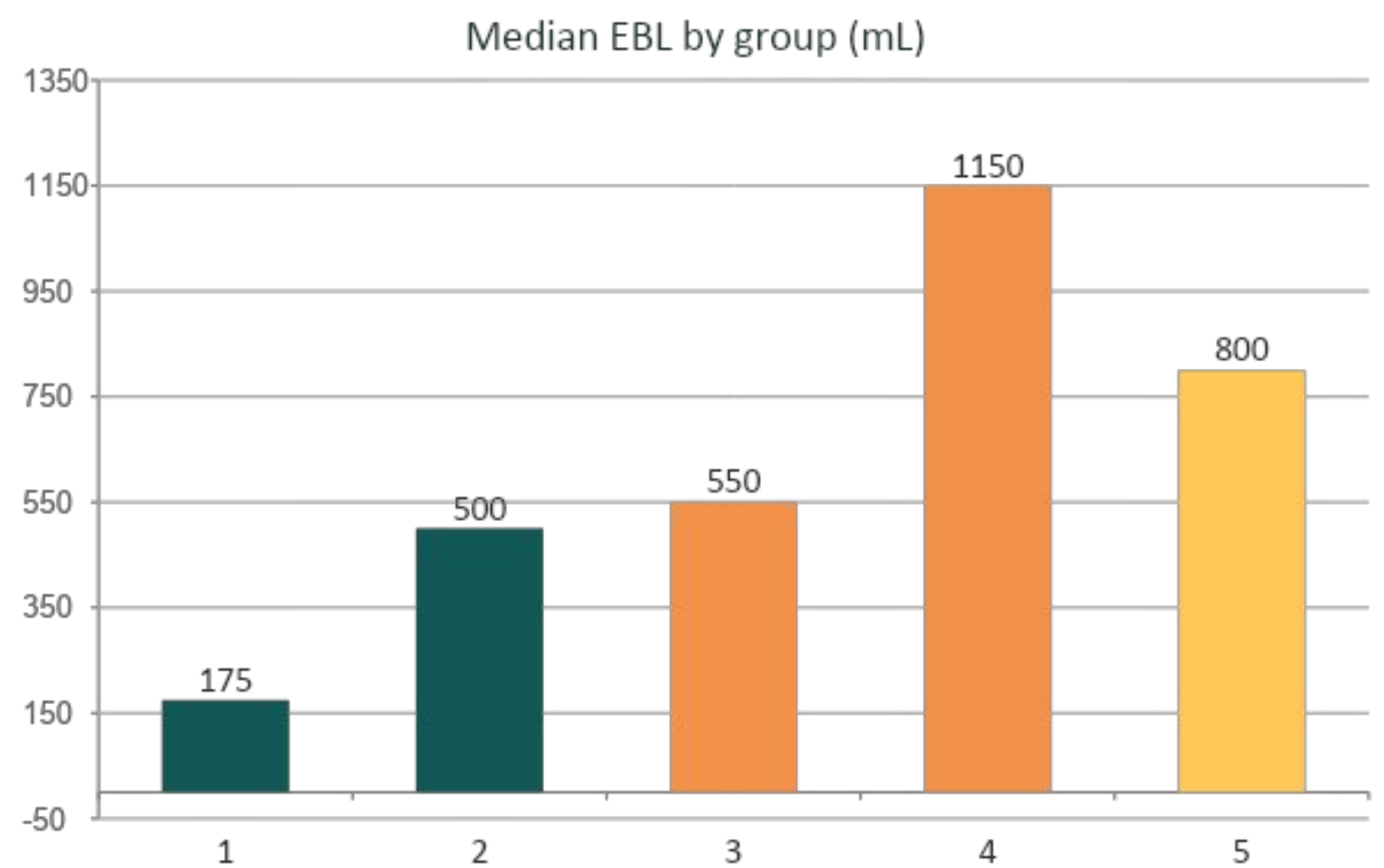
BACH/JS-BACH and PJI-TNM were significantly associated with perioperative blood loss and transfusion in OAI surgery — the headline comparisons:



Blood loss and transfusion — key comparisons

Group	n	Median EBL	48h Hb drop	Transfusion
Uncomplicated (JS-BACH)	8	175 mL	1.55 g/dL	12%
Complex (JS-BACH)	49	500 mL	2.60 g/dL	53%
PJI-TNM · M1	11	550 mL	2.50 g/dL	45%
PJI-TNM · M2	7	1150 mL	1.40 g/dL	86%
Hip (location)	13	800 mL	2.50 g/dL*	69%

*not significant across anatomical locations (p=0.68).



Anatomical location. Significantly influenced EBL (p=0.017), with the hip carrying the highest risk (median 800 mL; 69% transfusion).

KEY FINDINGS

- **Complex vs Uncomplicated (JS-BACH):** 2.9× EBL (p=0.007); 4.4× transfusion (n.s.).
- **PJI-TNM M2 vs M1:** 2.1× EBL (1150 vs 550 mL); transfusion 86% vs 45%.
- **Host status (M) vs 48h Hb drop:** r = −0.447 (p=0.048).
- **Anatomical location:** the hip carries the highest EBL and transfusion risk (p=0.017).

DISCUSSION

First evidence, and the driver identified: JS-BACH was validated for treatment failure and mortality in 653 patients ^{2,3,4} — this is, to our knowledge, its first use as a predictor of perioperative blood loss. Of the three PJI-TNM axes, the host-status (M) component was the strongest predictor, ahead of T (implant/tissue) and N (pathogen/biofilm) — pointing to comorbidity and immunocompetence, rather than the infection itself, as the main driver of bleeding risk.

Why EBL and Hb drop diverge: comorbidity and chronic inflammation lower baseline haemoglobin ¹⁵, prompting earlier transfusion that blunts the measured Hb drop despite greater true blood loss. Moreover tourniquet use in knee procedures further limits EBL as a reliable bleeding measure there, reinforcing the choice of the 48h Hb drop as the reference parameter for that subgroup.

A route to individualised blood management: Because host status is known already at diagnosis, complex/M2 patients could be flagged early for preoperative anaemia correction and blood-sparing strategies such as tranexamic acid ^{10,12,16}, rather than reacting to blood loss only once it occurs.

Limitations & next steps: This was a retrospective, single-centre study of 57 patients, not adjusted for operative time or tranexamic acid use ^{13,14,16}; the M2 and PJI subgroups were also relatively small. Prospective, multicentre validation — ideally with standardised transfusion triggers — is needed before these findings can guide practice directly.

CONCLUSION

OAI classification systems are useful predictors of perioperative blood loss. BACH/JS-BACH effectively stratifies transfusion risk; in PJI, host status (PJI-TNM M component) is the primary determinant of haematological impact. These findings support the use of these classification systems, already at diagnosis, for preoperative blood management and individualised transfusion planning.

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