Introduction: The efficacy of tranexamic acid (TXA) to reduce red blood cell (RBC) transfusion has previously been demonstrated\(^1\), yet uncertainty persists regarding the need to treat those at lower risk for transfusion\(^2\), and assessment of overall drug safety remains incomplete\(^2\). We assessed the impact of a universal TXA protocol on RBC transfusion, postoperative hemoglobin (Hb) and adverse outcomes in patients undergoing hip and knee arthroplasty to determine whether TXA was effective at reducing RBC transfusion, both overall and in clinically relevant subgroups, without increasing the incidence of adverse outcomes.

Methods: REB ethics approval was obtained, and consent requirements were waived, for this retrospective observational study. All patients undergoing surgery both one year before and after implementation of a Universal TXA protocol were assessed. Protocol patients received TXA 20mg/kg iv, unless at high risk for complications. The primary outcome was the percentage of patients receiving perioperative RBC transfusion. Secondary outcomes included perioperative Hb and adverse events (death, MI, stroke, seizure, PE, DVT, and acute kidney injury). Logistic regression compared adjusted risks of transfusion post- vs pre-protocol for patients with all permutations of putative risk factors\(^3-6\) (anemia, low BMI or female sex). Chi square and logistic regression analysis was used with statistical significance at p < 0.05.

Results: 1996 patients were assessed: 1084 pre- and 912 post-protocol. Patient
characteristics did not differ between groups (age, sex, body mass index, type of surgery or preoperative Hb). Overall TXA utilization increased from 32.3% to 92.2% while the transfusion rate decreased from 10.3% to 4.8% (odds ratio 0.40 [0.21, 0.59]). Reduced transfusion was observed for primary hip and knee arthroplasty (% reduction [95% CI]; -6.7% [-9.8, -3.6] and -5.5% [-7.8, -3.2] and less consistently for revision hip and knee surgery, (3.2% [-7.5, +13.9] and -12.6% [-30.3, +4.8] respectively. Pre-operative anemia increased, and obesity reduced the risk of transfusion. A transfusion sparing effect of the protocol was observed in both anemic patients [15% vs 27%] and non-anemic patients [2.9% vs 7.3%] (p < 0.05). Logistic regression demonstrated reduced transfusion regardless of sex, anemia or low BMI status (Figure). Postoperative day 3 Hb increased from 95.8 to 101.4 g/L after protocol implementation (difference 5.6 [4.3-6.9]) with greatest effect after primary hip and knee replacement (difference; + 8.1 [6.2-9.9] and + 4.8 g/L [4.3-6.9] (p < 0.001). No increase in adverse events was observed overall (p=0.845), or for DVT (p=0.226).

**Discussion:** The Universal TXA protocol was associated with increased TXA utilization and reduced RBC transfusion. Anemia increased transfusion risk and obesity decreased transfusion risk, but all patient subgroups benefitted from the protocol, strengthening the rationale for Universal therapy. Patients undergoing primary joint replacement experienced the most benefit and also had increased postoperative Hb. No increase in adverse events was observed.

**References:**
2. BMJ, 2014. **349**: p. g4829

**FIGURE:** Effect of Protocol Based On Patient Risk Factors Category
Logistic regression is used to show adjusted transfusion risk and protocol effect for transfusion reduction for all permutations of three putative risk factors for transfusion in total joint arthroplasty.