National Institute for Health and Care Excellence

Blood transfusion (update)

[A] Evidence review for tranexamic acid for reducing anticipated minor blood loss due to surgery

NICE guideline NG24

Evidence underpinning recommendations 1.3.1 to 1.3.3 and 1.3.5 to 1.3.9 and research recommendations

February 2026

FINAL

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Contents

Tranexamic acid for anticipated minor blood loss after surgery

1.1 Review question

This evidence review summarises the evidence for:

Is tranexamic acid clinically and cost-effective in reducing the number of blood transfusions required and length of hospital stay in people with anticipated minor blood loss from surgery compared to placebo or no additional treatment?

Further technical detail can be found in the separate technical appendices for this review.

1.1.1 Summary of the protocol

Table 1: Summary of the protocol

Population	Surgical patients (adults and children over the age of 1) with low anticipated blood loss (less than 500 mL or 1 unit of expected blood loss)
Interventions	Tranexamic acid given in the peri-operative period using any mode of application
Comparator	Placebo or no additional treatment
Outcomes	• Proportion of patients requiring transfusion • All-cause mortality at 30 days • Quality of life (all timepoints) • Length of stay (hospitalisation) • Number of units of allogenic blood transfused/volume of allogenic blood transfusion (in mL) • Surgical bleeding • Serious adverse events as defined by the study including thrombotic complications and infection
Study type	Randomised controlled trials (and systematic reviews to identify them)

The full protocol for the NIHR review has been published on PROSPERO. Registration number CRD42023467639.

1.1.2 Methods and process

This evidence review was developed using the methods and process described in Developing NICE guidelines: the manual. Methods specific to this review question are described in the review protocol and in the methods document.

Jaiswal et al. 2025 was included in this review in partnership with the National Institute for Health and Care Research (NIHR), where agreement had been reached after the publication of the previous NICE Blood Transfusion guideline for research to be conducted in this area. This review was incorporated without further searching of the literature after being identified through contact with NICE's surveillance team.

Declarations of interest were recorded according to NICE's conflicts of interest policy.

1.1.2.1 Search methods

For more information see Jaiswal, et al 2025. No additional searches were conducted from this material.

1.1.2.2 Protocol deviations

Jaiswal, et al 2025 report three protocol deviations:

A) Adding outcomes - They had planned to analyse only number of transfusions as primary outcome, but they later changed to include an additional primary outcome – total blood volume loss and the safety outcome - Deep vein thrombosis
B) Analysis - They had planned to analyse the mean difference for total blood volume loss, but they used ratio of mean volume loss as the primary analysis due to it fitting the data better.
C) They did not analyse outcomes - Mortality, Quality of life, Blood volume transfused, Surgical bleeding, Post operative bleeding, Adverse events: Acute Myocardial infarction; postoperative thrombosis and rate of serious

adverse event due to unavailability of such data from published papers and reports

In our methods, point A) is considered in our risk of bias assessment of Jaiswal, et al 2025, however, the concern about primary or secondary outcomes is not relevant as all outcomes are considered critical outcomes for decision making in this review. Point B) has been maintained and is a protocol deviation present in the work used in this review. Regarding point C), we re-examined the studies and identified that data for all outcomes except quality of life was available. Therefore, we have undertaken further data analyses so that all outcomes stated in the original PROSPERO record have been extracted and analysed. The only outcome that was not reported in any published paper or report included in the review was quality of life. Therefore, this protocol deviation is no longer present.

For clarity, the outcome for thrombotic complications includes all thrombotic complications (not just deep vein thrombosis).

1.1.2.3 Methods specific to this review

This review incorporates the findings from a review conducted by Jaiswal, et al 2025 who received funding from the National Institute of Health Research (NIHR). The review methods and findings were reviewed by the guideline development team to align with the methods and processes described in Developing NICE guidelines: the manual and it was presented to the committee for their consideration.

The clinical importance of outcomes was decided by the committee upon seeing the results (as this was unavoidable in this scenario due to the committee not agreeing the protocol and so seeing the review results as their first exposure to the review). They agreed that:

- If mortality: a value exceeding 1 per 1,000 was clinically important

- If a dichotomous outcome: a risk difference value had to be sufficiently large to have an important effect when compared to the control group rate to be considered clinically important (for example: 10% of the control group rate)

- If a continuous outcome: any decrease or increase in the amount of blood transfused was clinically important. However, the decision to recommend would not be made solely on this.

- For length of stay: a decrease of half a day or more would be considered important

- If a ratio of means: a change of 25% was clinically important (values less than 0.8 or greater than 1.25).

1.1.3 Effectiveness evidence

1.1.3.1 Included studies

Study selection

A systematic search was carried out by the authors of the Jaiswal, et al 2025 study to identify potentially relevant studies as detailed in the methods document. See Jaiswal, et al 2025 for the literature search strategy. No additional searches were conducted as a part of this guideline update. The study selection process is presented as a PRISMA diagram in **appendix C** in the technical appendices document.

1 systematic review (Jaiswal et al. 2025) was included. From this review, 9 included studies were found to not be eligible for inclusion:

B) 6 included populations who had moderate blood loss
C) 3 included comparisons between different routes of administration of tranexamic acid).

A further 7 studies were ultimately not included as they either did not report any outcome data that could be used in the report or did not report outcome data in a form that could be meta-analysed for the review.

Therefore, a total of sixty-six studies, 1 systematic review and sixty-five randomised controlled trials, were included in the review. The included studies are summarised in Table 2.

1.1.3.2 Excluded studies

Details of studies excluded at full text, along with the primary reason for exclusion, are given in **appendix H** in the technical appendices document.

1.1.4 Summary of studies included in the effectiveness evidence

Table 2 Summary of randomised controlled trial studies included in the effectiveness evidence

Study details	Population	Intervention and comparators	Outcomes
Ahmadi 2023 Country: Iran	N = 72 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Around 100mL in surgery Surgical speciality: Otolaryngology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Dexmedetomidine Type of surgery: Endoscopic sinus surgery	Serious adverse events Timepoint = After surgery (til discharge)
Akkaranurakkul 2021 Country: Thailand	N = 40 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) 50-100mL dependent on whether there is a uni or bilateral cyst. Surgical speciality: Gynaecology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) No additional treatment Type of surgery: Laparoscopic cystectomy (endometriosis)	Proportions of patients requiring transfusion Serious adverse events Surgical bleeding Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
Alam 2022 Country: India	N = 96 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <100mL Surgical speciality: Otolaryngology Prior use of anticoagulants: None Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: External dacryocystorhinostomy	Surgical bleeding Timepoint = After surgery (til discharge)
Alimian 2011 Country: Iran	N = 384 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) No additional comment Surgical speciality: Otolaryngology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Endoscopic sinus surgery	Surgical bleeding Thrombotic complications Timepoint = After surgery (til discharge)
Bansal 2017 Country: India	N = 400 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) No additional comment	Tranexamic acid (intravenous) Placebo	Length of stay (days) Serious adverse events Infection Surgical bleeding

Study details	Population	Intervention and comparators	Outcomes
	Surgical speciality: Urology Prior use of anticoagulants: Not reported Preoperative anaemia: Mean haemoglobin above threshold	Type of surgery: Percutaneous nephrolithotomy	Timepoint = After surgery (til discharge)
Baradaranfar 2017 Country: Iran	N = 60 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) No additional comment Surgical speciality: Otolaryngology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Endoscopic sinus surgery	Serious adverse events Timepoint = After surgery (til discharge)
Bayram 2021 Country: Turkey	N = 90 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) No additional comment Surgical speciality: Orthopaedics Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Epinephrine Type of surgery: Arthroscopic rotator cuff repair	Thrombotic complications Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
Bhutani 2020 Country: India	N = 150 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Around 500mL, some under some over Surgical speciality: Gynaecology Prior use of anticoagulants: Not reported Preoperative anaemia: Preoperative anaemia	Tranexamic acid (intravenous) Placebo Type of surgery: Hysterectomy	Length of stay (days) Number of units of allogenic blood transfused (units) Serious adverse events Thrombotic complications Surgical bleeding Timepoint = After surgery (til discharge)
Celebi 2006 Country: Turkey	N = 105 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) No additional comment Surgical speciality: Gynaecology Prior use of anticoagulants: Not reported Preoperative anaemia: Mean haemoglobin above threshold	Tranexamic acid (intravenous) Epsilon aminocaproic acid Placebo Type of surgery: Type III hysterectomy	Surgical bleeding Timepoint = After surgery (til discharge)
Chiang 2019 Country: Taiwan	N = 300 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) No additional comment	Tranexamic acid (topical) No additional treatment	Serious adverse events Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
	Surgical speciality: Orthopaedics Prior use of anticoagulants: None Preoperative anaemia: Not reported	Type of surgery: Arthroscopic anterior cruciate ligament reconstruction	
Dongare 2020 Country: India	N = 60 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) During surgery estimated blood loss around 100-150mL dependent on the group. Surgical speciality: Otolaryngology Prior use of anticoagulants: None Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Endoscopic sinus surgery	Proportions of patients requiring transfusion Thrombotic complications Surgical bleeding Timepoint = After surgery (til discharge)
Eftekharian 2016 Country: Iran	N = 50 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <200mL loss Surgical speciality: Otolaryngology Prior use of anticoagulants: None Preoperative anaemia: Not reported	Tranexamic acid (oral) Placebo Type of surgery: Rhinoplasty	Surgical bleeding Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
El Shal 2015 Country: Egypt	N = 90 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) No additional comment Surgical speciality: Otolaryngology Prior use of anticoagulants: None Preoperative anaemia: Mean haemoglobin above threshold	Tranexamic acid (intravenous) Epsilon aminocaproic acid Placebo Type of surgery: Endoscopic sinus surgery	Thrombotic complications Surgical bleeding Timepoint = After surgery (til discharge)
Eldaba 2013 Country: Egypt	N = 100 Children (<16 years) with a small amount of surgical blood loss (<500mL) No additional comment Surgical speciality: Otolaryngology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Endoscopic sinus surgery	Serious adverse events Thrombotic complications Infection Surgical bleeding Timepoint = After surgery (til discharge)
Felli 2019 Country: Taiwan	N = 80 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) No additional comment	Tranexamic acid (intravenous) Placebo	Serious adverse events Thrombotic complications Infection

Study details	Population	Intervention and comparators	Outcomes
	Surgical speciality: Orthopaedics Prior use of anticoagulants: None Preoperative anaemia: Not reported	Type of surgery: Open anterior cruciate ligament reconstruction	Timepoint = After surgery (til discharge)
Fornazieri 2021 Country: Brazil	N = 63 Children (<16 years) with a small amount of surgical blood loss (<500mL) Around 100mL Surgical speciality: Otolaryngology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Adenotonsillectomy	Serious adverse events Surgical bleeding Timepoint = After surgery (til discharge)
Fried 2021 Country: United States	N = 110 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Around 40mL Surgical speciality: Orthopaedics Prior use of anticoagulants: None Preoperative anaemia: Not reported	Tranexamic acid (intravenous) No additional treatment Type of surgery: Open anterior cruciate ligament reconstruction	Infection Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
Ghaffari 2021 Country: Iran	N = 80 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) No additional comment Surgical speciality: General Surgery Prior use of anticoagulants: Yes Preoperative anaemia: Not reported	Tranexamic acid (topical) No additional treatment Type of surgery: Inguinal hernia surgery	Proportions of patients requiring transfusion Infection Timepoint = After surgery (til discharge)
Ghavimi 2017 Country: Iran	N = 50 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Around 300 mL Surgical speciality: Otolaryngology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Rhinoplasty	Serious adverse events Surgical bleeding Timepoint = After surgery (til discharge)
Habibi 2022 Country: Iran	N = 198 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <375mL	Tranexamic acid (topical) Placebo Type of surgery: Septorhinoplasty	Thrombotic complications Infection Surgical bleeding

Study details	Population	Intervention and comparators	Outcomes
	Surgical speciality: Otolaryngology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported		Timepoint = After surgery (til discharge)
Hamed 2020 Country: Egypt	N = 60 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <50mL Surgical speciality: Otolaryngology Prior use of anticoagulants: None Preoperative anaemia: Not reported	Tranexamic acid (topical) Epinephrine Type of surgery: Exploratory tympanotomy	Surgical bleeding Timepoint = After surgery (til discharge)
Hazrati 2021 Country: Iran	N = 60 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <400 mL Surgical speciality: Otolaryngology Prior use of anticoagulants: Not reported	Tranexamic acid (topical) No additional treatment Type of surgery: Septoplasty	Surgical bleeding Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
	Preoperative anaemia: Not reported		
Iskakov 2016 Country: Kazakhstan	N = 164 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) No additional comment Surgical speciality: Urology Prior use of anticoagulants: Not reported Preoperative anaemia: Mean haemoglobin above threshold	Tranexamic acid (intravenous) No additional treatment Type of surgery: Percutaneous nephrolithotomy	Proportions of patients requiring transfusion All-cause mortality at 30 days Length of stay (days) Thrombotic complications Acute myocardial infarction Infection Timepoint = After surgery (til discharge)
Jabalameli 2006 Country: Iran	N = 56 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <250mL Surgical speciality: Otolaryngology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (topical) Placebo Type of surgery: Endoscopic sinus surgery	Surgical bleeding Timepoint = After surgery (til discharge)
Jahanshahi 2014 Country: Iran	N = 60 Adults (at least 16 years) with a small amount of surgical blood	Tranexamic acid (topical) No additional treatment	Serious adverse events Surgical bleeding

Study details	Population	Intervention and comparators	Outcomes
	loss (<500mL) <200 mL blood loss Surgical speciality: Otolaryngology Prior use of anticoagulants: None Preoperative anaemia: Mean haemoglobin above threshold	Type of surgery: Endoscopic sinus surgery	Timepoint = After surgery (til discharge)
Karaaslan 2015 Country: Turkey	N = 123 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Less than 200 mL Surgical speciality: Orthopaedics Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) No additional treatment Type of surgery: Arthroscopic anterior cruciate ligament reconstruction	Length of stay (days) Thrombotic complications Infection Surgical bleeding Timepoint = After surgery (til discharge)
Kulkarni 2018 Country: Iran	N = 100 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <150 mL Surgical speciality: Otolaryngology	Tranexamic acid (intravenous) Ethamsylate Type of surgery: Endoscopic sinus surgery	Surgical bleeding Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
	Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported		
Kumar 2013 Country: India	N = 200 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <250mL Surgical speciality: Urology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous and oral) No additional treatment Type of surgery: Percutaneous nephrolithotomy	Proportions of patients requiring transfusion Length of stay (days) Serious adverse events Thrombotic complications Infection Timepoint = After surgery (til discharge)
Langille 2013 Country: Canada	N = 28 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <250mL Surgical speciality: Otolaryngology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Endoscopic sinus surgery	Surgical bleeding Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
Lee 2020 Country: Republic of Korea	N = 47 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Around 500mL (dependent on the arm - it can vary between low and moderate though - so downgrade for indirectness?) Surgical speciality: Orthopaedics Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (topical) No additional treatment Type of surgery: Open anterior cruciate ligament reconstruction	Serious adverse events Surgical bleeding Timepoint = After surgery (til discharge)
Liu 2020 Country: China	N = 72 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Around 300mL Surgical speciality: Orthopaedics Prior use of anticoagulants: None Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Arthroscopic shoulder surgery	Length of stay (days) Thrombotic complications Infection Timepoint = After surgery (til discharge)
Lundin 2014 Country: Sweden	N = 100 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Around 300mL (though some got	Tranexamic acid (intravenous) Placebo	Proportions of patients requiring transfusion Thrombotic complications Infection

Study details	Population	Intervention and comparators	Outcomes
	up to 4000mL so downgrade for indirectness) Surgical speciality: Gynaecology Prior use of anticoagulants: Not reported Preoperative anaemia: Mean haemoglobin above threshold, range varied	Type of surgery: Radical debulking surgery	Timepoint = After surgery (til discharge)
Ma 2021 Country: China	N = 120 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <150mL Surgical speciality: Orthopaedics Prior use of anticoagulants: None Preoperative anaemia: Not reported.	Tranexamic acid (intravenous) Tranexamic acid (topical) Placebo Type of surgery: Anterior cruciate ligament reconstruction	Thrombotic complications Infection Timepoint = After surgery (til discharge)
Ma 2022 Country: China	N = 49 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Around 400-500mL Surgical speciality: Orthopaedics Prior use of anticoagulants: None	Tranexamic acid (intravenous and topical) No additional treatment Type of surgery: Gluteal muscle contraction surgery	Length of stay (days) Surgical bleeding Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
	Preoperative anaemia: Exclusion criteria for anaemia		
Mohammadi 2019 Country: Iran	N = 120 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) 300-500mL Surgical speciality: Urology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Percutaneous nephrolithotomy	Length of stay (days) Volume of allogenic blood transfused (mL) Timepoint = After surgery (til discharge)
Mokhtari 2021 Country: Iran	N = 108 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Unclear. Potentially low based on haemoglobin. Downgrade for indirectness. Surgical speciality: Urology Prior use of anticoagulants: None Preoperative anaemia: Mean haemoglobin above threshold	Tranexamic acid (intravenous and oral) Placebo Type of surgery: Percutaneous nephrolithotomy	Proportions of patients requiring transfusion All-cause mortality at 30 days Length of stay (days) Thrombotic complications Timepoint = After surgery (til discharge)
Moradi 2022 Country: Iran	N = 90 Adults (at least 16 years) with a small amount of surgical blood	Tranexamic acid (intravenous) Remifentanil and hydralazine	Proportions of patients requiring transfusion Thrombotic complications

Study details	Population	Intervention and comparators	Outcomes
	loss (<500mL) <150mL Surgical speciality: Ophthalmology Prior use of anticoagulants: None Preoperative anaemia: Not reported	Type of surgery: Dacryocystorhinostomy	Timepoint = After surgery (til discharge)
Nalamate 2022 Country: India	N = 80 Children (<16 years) with a small amount of surgical blood loss (<500mL) <150mL Surgical speciality: Otolaryngology Prior use of anticoagulants: None Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Tonsillectomy/ adenotonsillectomy	Length of stay (days) Surgical bleeding Timepoint = After surgery (til discharge)
Ngichabe 2015 Country: Kenya	N = 34 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <400mL (some >500mL so downgrade for indirectness) Surgical speciality: Gynaecology Prior use of anticoagulants: None	Tranexamic acid (intravenous) Placebo Type of surgery: Open myomectomy	Surgical bleeding Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
	Preoperative anaemia: Mean haemoglobin above threshold		
Nivedhana 2018 Country: India	N = 100 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Mostly <500mL Surgical speciality: Gynaecology Prior use of anticoagulants: None Preoperative anaemia: Preoperative anaemia	Tranexamic acid (intravenous) Placebo Type of surgery: Abdominal hysterectomy	Proportions of patients requiring transfusion Serious adverse events Thrombotic complications Surgical bleeding Timepoint = After surgery (til discharge)
Nugent 2019 Country: New Zealand	N = 41 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Very unclear. Downgrade for indirectness. Surgical speciality: Orthopaedics Prior use of anticoagulants: None Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Arthroscopic meniscectomy	Thrombotic complications Timepoint = After surgery (til discharge)
Nuhi 2015 Country: Iran	N = 170 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <200 mL	Tranexamic acid (intravenous) Placebo	Length of stay (days) Thrombotic complications Surgical bleeding

Study details	Population	Intervention and comparators	Outcomes
	Surgical speciality: Otolaryngology Prior use of anticoagulants: None Preoperative anaemia: Mean haemoglobin above threshold	Type of surgery: Endoscopic sinus surgery	Timepoint = After surgery (til discharge)
Opoku-Anane 2020 Country: United States	N = 60 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Mostly around 200 mL (some are above 500 mL so downgrade for indirectness) Surgical speciality: Gynaecology Prior use of anticoagulants: None Preoperative anaemia: Mean haemoglobin above threshold	Tranexamic acid (intravenous) Placebo Type of surgery: Myomectomy	Proportions of patients requiring transfusion Serious adverse events Thrombotic complications Surgical bleeding Timepoint = After surgery (til discharge)
Padhy 2019 Country: India	N = 30 Adults and children with a small amount of surgical blood loss (<500mL) <500mL Surgical speciality: Otolaryngology Prior use of anticoagulants: None	Tranexamic acid (intravenous) Placebo Type of surgery: Endoscopic sinus surgery	Thrombotic complications Surgical bleeding Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
	Preoperative anaemia: Not reported		
Pande 2019 Country: India	N = 48 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Most likely from the effusion description Surgical speciality: Orthopaedics Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Arthroscopic anterior cruciate ligament reconstruction	Length of stay (days) Thrombotic complications Timepoint = After surgery (til discharge)
Pannerselvam 2019 Country: India	N = 84 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <100mL Surgical speciality: Otolaryngology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Endoscopic sinus surgery	Surgical bleeding Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
Poonam 2021 Country: United States	N = 100 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Around 50mL predicted Surgical speciality: Orthopaedics Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Ambulatory foot and ankle surgery	Thrombotic complications Infection Surgical bleeding Timepoint = After surgery (til discharge)
Prashanth 2016 Country: India	N = 50 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <100mL Surgical speciality: Otolaryngology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) No additional treatment Type of surgery: Tonsillectomy	Serious adverse events Surgical bleeding Timepoint = After surgery (til discharge)
Quiroga 2018 Country: Philippines	N = 10 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <300mL blood loss	Tranexamic acid (intravenous) Placebo	Thrombotic complications Surgical bleeding Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
	Surgical speciality: Otolaryngology Prior use of anticoagulants: None Preoperative anaemia: Not reported	Type of surgery: Endoscopic sinus surgery	
Ramström 1993 Country: Sweden	N = 89 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Likely low level from description Surgical speciality: Dentistry Prior use of anticoagulants: Yes Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Tooth extraction	Proportions of patients requiring transfusion Infection Timepoint = After surgery (til discharge)
Rashid 2018 Country: Iraq	N = 50 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Around 100 mL Surgical speciality: Urology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Percutaneous nephrolithotomy	Proportions of patients requiring transfusion Infection Surgical bleeding Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
Rodríguez-García 2022 Country: Mexico	N = 50 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Amount of blood loss unclear - potentially low or moderate dependent on group. Downgrade for indirectness. Surgical speciality: Liposuction Prior use of anticoagulants: None Preoperative anaemia: Mean haemoglobin above threshold	Tranexamic acid (topical) No additional treatment Type of surgery: Liposuction	Proportions of patients requiring transfusion Timepoint = After surgery (til discharge)
Rybo 1972 Country: Sweden	N = 50 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <100 mL Surgical speciality: Gynaecology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (oral) Placebo Type of surgery: Cone biopsy	Proportions of patients requiring transfusion Timepoint = After surgery (til discharge)
Sakallioğlu 2015 Country: Turkey	N = 50 Adults (at least 16 years) with a small amount of surgical blood	Tranexamic acid (intravenous) Placebo	Thrombotic complications Surgical bleeding

Study details	Population	Intervention and comparators	Outcomes
	loss (<500mL) <150mL Surgical speciality: Otolaryngology Prior use of anticoagulants: None Preoperative anaemia: Not reported	Type of surgery: Septorhinoplasty	Time point = after surgery (til discharge)
Salamah 2023 Country: Egypt	N = 30 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) No additional comment Surgical speciality: Ophthalmology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) No additional treatment Type of surgery: External dacryocystorhinostomy	Surgical bleeding Timepoint = After surgery (til discharge)
Sallam 2019 Country: Egypt	N = 129 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Indirect, mostly low but some above 500mL	Tranexamic acid (intravenous) Tranexamic acid (topical) Placebo Type of surgery: Hysterectomy	Proportions of patients requiring transfusion Length of stay (days) Surgical bleeding Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
	Surgical speciality: Gynaecology Prior use of anticoagulants: None Preoperative anaemia: Preoperative anaemia		
Shaaban 2016 Country: Egypt	N = 132 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Around 500 mL, some were above that level in the control group so downgrade for indirectness Surgical speciality: Gynaecology Prior use of anticoagulants: None Preoperative anaemia: Preoperative anaemia	Tranexamic acid (intravenous) No additional treatment Type of surgery: Myomectomy	Proportions of patients requiring transfusion Serious adverse events Thrombotic complications Surgical bleeding Timepoint = After surgery (til discharge)
Shehata 2014 Country: Egypt	N = 75 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Around 200-300 mL Surgical speciality: Otolaryngology Prior use of anticoagulants: Not reported	Tranexamic acid (topical) Indirect - same drug as placebo, just warm Placebo Type of surgery: Endoscopic sinus surgery	Thrombotic complications Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
	Preoperative anaemia: Not reported		
Siddiq 2017 Country: Pakistan	N = 240 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Not clear, but likely <500mL from change in haemoglobin - downgrade for indirectness Surgical speciality: Urology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Percutaneous nephrolithotomy	Proportions of patients requiring transfusion Timepoint = After surgery (til discharge)
Soliman 2015 Country: Saudi Arabia	N = 225 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Around 50 mL Surgical speciality: Otolaryngology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) No additional treatment Type of surgery: Tonsillectomy	Surgical bleeding Timepoint = After surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
Takahashi 2023 Country: Japan	N = 66 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <15 mL Surgical speciality: Orthopaedics Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Arthroscopic rotator cuff repair	Surgical bleeding Timepoint = After surgery (til discharge)
Topsoee 2016 Country: Denmark	N = 331 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Around 100-150 mL (500-300 mL) Surgical speciality: Gynaecology Prior use of anticoagulants: Not reported Preoperative anaemia: Preoperative anaemia	Tranexamic acid (intravenous) Placebo Type of surgery: Hysterectomy	Proportions of patients requiring transfusion Thrombotic complications Surgical bleeding Timepoint = After surgery (til discharge)
Volodymyr 2021 Country: Ukraine	N = 115 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL)	Tranexamic acid (intravenous) Placebo	Surgical bleeding Time point = after surgery (til discharge)

Study details	Population	Intervention and comparators	Outcomes
	Surgical speciality: Otolaryngology Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Type of surgery: Tonsillectomy	
Yang 2021 Country: China	N = 60 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) <500 mL (150-500) Surgical speciality: Otolaryngology Prior use of anticoagulants: None Preoperative anaemia: Not reported	Tranexamic acid (intravenous) Placebo Type of surgery: Endoscopic sinus surgery	Serious adverse events Thrombotic complications Surgical bleeding Timepoint = After surgery (til discharge)
Zhang 2020 Country: China	N = 61 Adults (at least 16 years) with a small amount of surgical blood loss (<500mL) Around 200mL Surgical speciality: Orthopaedics Prior use of anticoagulants: Not reported Preoperative anaemia: Not reported	Tranexamic acid (topical) Placebo Type of surgery: Open arthrolysis	Surgical bleeding Timepoint = After surgery (til discharge)

See **appendix D** in the technical appendices document for a full evidence table of the systematic review associated with the studies. For details about the studies please see Jaiswal, et al 2025.

1.1.5 Summary of effectiveness evidence

The evidence shows that tranexamic acid reduces the volume of blood transfusion required and suggests that it may reduce the number of people who need blood transfusions and the number of units of blood transfused compared to control treatments for people with small amounts of bleeding. The evidence for the number of people who need blood transfusions is more substantial compared to the other outcomes.

The evidence shows that tranexamic acid has little or no effect on serious adverse events and suggests that it has little or no effect on all-cause mortality at 30 days and rates of infection compared to control treatments for people with small amounts of bleeding. This is somewhat uncertain given the limited number of events in studies and the limited sample size of included studies, suggesting they are underpowered to assess these outcomes. The evidence was very uncertain about the effect of tranexamic acid on thrombotic complications and acute myocardial infarction, which is likely for the same reason.

The evidence is very uncertain about the effect of tranexamic acid on surgical bleeding compared to control for people with small amounts of bleeding. This is related to extreme heterogeneity, the meaningful nature of which can be debated. If considered less relevant, the evidence suggests that tranexamic acid may reduce surgical bleeding compared to control treatments for people with small amounts of bleeding.

The evidence is also very uncertain about the effect of tranexamic acid on length of hospital stay compared to control treatments based on the studies included.

Informative statements were adapted from GRADE (Grading of Recommendations, Assessment, Development, and Evaluations) Guidance 26. See **appendix F** in the technical appendices document for a GRADE summary table.

1.1.6 Economic evidence

As part of the review conducted by Jaiswal, et al 2025, a health economic model was developed to assess the cost-effectiveness of tranexamic acid for surgeries classified as low risk of blood loss.

An overview of the study characteristics and results are presented below in Table 3 and Table 4 respectively. For further details please see the economic evidence table in Appendix H of this report.

No original health economic literature search was conducted for this review because Jaiswal, et al. 2025 conducted their own health economic analysis as part of their NIHR funded review. The health economic evidence conducted by Jaiswal, et al. 2025 was, a priori, deemed to be the most applicable at answering the question – is the use of tranexamic acid (TXA) cost-effective for surgeries classified as low risk of blood loss. The applicability and methodological quality of the health economic analysis conducted by Jaiswal, et al. 2025 was assessed in line with the health economic protocol which can be found in Appendix A.

Table 3: Summary of characteristics of economic study used in decision-making

Study details	Study design and type of analysis	Population	Interventions and comparators	Perspective	Primary outcome	Time horizon
Jaiswal, 2025 UK	Study design: Decision analytic model – decision tree Source of effectiveness data: Jaiswal, 2024 systematic review and meta-analysis Type of analysis: cost-utility	Adults undergoing surgery classified as low risk for blood loss. Low risk for blood loss was classified based on the risk stratification for procedural bleed as suggested by the ISTH.	Standard care without the administration of TXA. This included the usual surgical and peri-operative practices without the use of TXA. TXA, which was administered peri-operatively. 1 gram of TXA was given by slow intravenous injection at the start and end of surgery – totalling 2 grams of TXA per surgery.	NHS/PSS	QALY	30 days

Abbreviations: ISTH: Internation Society on Thrombosis and Haemostasis; NHS: national health service; PSS: personal social services; QALY: quality-adjusted life year; TXA: Tranexamic acid

1.1.7 Summary of economic evidence used in decision-making

See **Table 4** for a summary of the economic evidence used by the committee in decision-making and Appendix A in the technical appendices document for the economic evidence study extraction table.

Table 4: Economic evidence summary table: Tranexamic acid versus standard care

Study	Applicability and limitations	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty	Economic evidence statement
Jaiswal, 2025 (UK)	Directly applicable[1] Minor limitations[2]	Saves £155.95 Cost year: 2024	0 QALYs 0.398 fewer transfusions 0.095 fewer days LOS	Dominant	Probability of TXA being cost-effective at £20K threshold: 99% Several sensitivity and scenario analyses were undertaken. These generally did not change the conclusion of the results. Exclusion of any impact of LOS had the greatest effect, although TXA remained cost-effective even at very low levels of anticipated blood loss. Only at blood transfusion levels of <2% does the conclusion change and TXA was no longer cost-effective.	• TXA was cost effective compared to standard care as it was dominant (less costly and more effective) when administered peri-operatively. TXA reduced the number of blood transfusions, and the length of hospital stay for those undergoing surgery who were identified as low risk for blood loss.

Abbreviations: ICER: incremental cost-effectiveness ratio; LOS: length of stay; NMB: net monetary benefit; QALY: Quality-adjusted life-year; RCT: randomised controlled trial, TXA: Tranexamic acid

1. UK study, QALYs

2. 30-day time horizon, mortality not included, many included studies observed volumes of blood loss greater than those defined as low-risk blood loss, length of stay can be heavily influenced by the healthcare system the study is conducted in, no mention of thrombotic complications, pain for those receiving TXA vs no TXA post operatively could have been used to estimate QoL.

NMB is calculated as the incremental QALYs multiplied by the £20,000 per QALY threshold minus the incremental costs. A positive NMB indicates the intervention is cost-effective.

1.1.8 Economic model

No original economic modelling was completed for this review question.

1.1.9 Committee discussion and interpretation of the evidence

1.1.9.1 What are the key issues and priorities relating to this question?

Bleeding during and after surgery can vary in significance. For the majority of adults, losing less than 1 unit of blood (500 ml) will likely lead to no important functional effect. However, bleeding a small amount in areas with the lack of room for expansion or where blood can have a toxic effect (for example: brain, eye, neck), can have important effects (for example: stroke, visual loss, airway compromise). Additionally, if their initial haemoglobin was low or if they are more susceptible to adverse effects from blood loss (for example: due to comorbidities) then a small amount of blood loss can be very important and can mean that they require a blood transfusion.

Blood transfusion can be a costly procedure, as blood donation levels are generally lower than the supply available in the UK. It is also associated with potential risks such as transfusion reactions, serious allergic reactions and rarely infection. Therefore, where possible, finding alternatives to blood transfusion so that it can be provided to those who require it the most when they need it is preferable.

In 2015, the blood transfusion guideline recommended to “Offer tranexamic acid to adults undergoing surgery who are expected to have at least moderate blood loss (greater than 500 ml).” It recommended to ‘consider’ tranexamic acid for children with at least moderate blood loss (greater than 10% blood volume). Implementation has been complicated due to multiple factors, including:

- lack of knowledge about the benefits of tranexamic acid
- difficulty assessing amount of expected blood loss ahead of time

- uncertainty about who is responsible for considering administration of the medicine
- concerns over risks from tranexamic acid outweighing benefits.

A systematic review was conducted by Jaiswal, et al. in 2025 which indicated that additional evidence had been identified for people with expected minor blood loss, a group where insufficient evidence was identified in 2015. Given this, the potential to widen the recommendation was presented which may reduce the implementation barrier of assessing the amount of blood loss required before administering tranexamic acid.

Given the nature of the update, the same outcomes used in the 2015 review were maintained and any additional outcomes reported from the Jaiswal, et al. 2025 review were incorporated.

1.1.9.2 Certainty of evidence and the balance of effects

The Jaiswal, et al 2025 review was assessed to be of high risk of bias. This was due to:

- concerns about study eligiblity criteria – as the original primary objective was about finding the level of expected blood loss from surgery where tranexamic acid is effective at reducing the need for blood transfusion. The study ultimately did not include have a range of different surgery types with moderate and severe blood loss that were comparable with those having minor blood loss – only selecting orthopaedic studies, making it difficult to draw conclusions on this.

- concerns about data collection and study appraisal

    - the systematic review excluded outcomes when data was available from studies – including thrombotic events, transfusion volume, transfusion units, infection, myocardial infarctions and all-cause mortality. While for dichotomous outcomes, this was often zero events data, given this is a group with anticipated

minor blood loss, zero events data may be important and a true reflection of the effect of minor blood loss in people having surgery.

  - summation of risk of bias likely favourable to the included studies – studies were only counted as high risk of bias if they explicitly had domains with high risk of bias, rather than including studies with unclear results in the determination of overall risk of bias – leading to likely lower risk of bias results in GRADE outcomes than appropriate

- concerns in synthesis and findings
  - an excluded studies table/full reference list was not included
  - the reason for not completing analyses was not explained
  - between-study variation was not fully investigated – while some factors were investigated with meta-regression (for example: surgical speciality, anticoagulant use), others were not (for example: comparator, formulation)

Following this, the GRADE was redone. The majority of the evidence was of low risk of bias, ranging from high to very low. The committee acknowledged that no studies were conducted in a UK NHS based healthcare context, making the evidence difficult to apply.

The desirable effects for people who are having surgery (showing benefits to reducing the number of people who need transfusions, the volume and number of units of transfusions required, length of stay and the total blood loss) are clinically important effects and the outcomes were of moderate to very low certainty according to GRADE ratings.

The committee agreed that while the total blood loss was very seriously inconsistent, the majority of studies were all inconsistent in the same direction

of effect and so this inconsistency did not matter and so this could be considered moderate certainty.

The evidence for length of stay was more heterogenous and was maintained at very low certainty. However, the committee agreed that this was still a usable outcome and likely the heterogeneity reflected the variations in surgeries being performed. This was highlighted as a potential strength of the outcome compared to others in the dataset (for example: number of blood transfusions received) as it likely reflects a holistic benefit from receiving tranexamic acid that may capture benefits from studies with very small amounts of bleeding where a blood transfusion may not be required. Given there was no data for quality of life, this was particularly helpful. While a subgroup analysis for surgical speciality did not fully resolve the heterogeneity, the committee acknowledged it as an important factor when evaluating the data qualitatively.

The effect on the number of people who need transfusions was uncertain. The committee acknowledged the large magnititude in the beneficial effect seen in the outcome (70 fewer events per 1000 people, from 95 fewer to 45 fewer) but noted that the majority of studies where blood transfusions were given were ones where there was more significant blood loss (for example: abdominal hysterectomies, percutaneous nephrolithotomies) where the baseline risk of blood transfusion is higher than what the committee would consider typical for procedures with an anticipated minor blood loss (131 people with events per 1000 people). Given this, a sensitivity analysis was performed where the baseline risk for the most common surgical procedure included in the review (endoscopic sinus surgery) was used for the calculation of absolute risk (0.43%). After this assumption, the number of people requiring blood transfusions was 3 fewer per 1000 (from 3 fewer to 2 fewer). This indicated that, if the proportion of people having a benefit was maintained, then there would likely be a small benefit for this population. However, the committee acknowledged that there is still uncertainty in this as there were small sample sizes in the study and it is not possible to see the reductions in blood

transfusion rates in studies where surgeries were performed that are less likely to lead to blood transfusions.

The adverse events included (all-cause mortality, serious adverse events, thrombotic complications, acute myocardial infarction and infection) were all not clinically important effects. These are likely due to the small sample sizes included in the trials meaning that the effects could not be properly studied. The committee agreed they would consider adverse effects as a part of the safety review [B].

There were no undesirable effects identified in the clinical evidence for review [A]. When considering the results from review [A] and [B] in conjunction, the committee agreed that there is a very small increased risk of thromboembolic events (including deep vein thrombosis and myocardial infarction) and seizures (particularly when higher doses of tranexamic acid are administered, such as those greater than 50 mg/kg).

The increased risk of thromboembolic events was not seen with pregnant women, trans men and non-binary people, where evidence was more limited. Very small important increases were seen for this group in the risk of all-cause readmission and infections, and decreases in the risk of all-cause mortality.

The committee considered the evidence for children separate to the evidence for adults. They noted that the evidence was much more limited in both the effectiveness and safety review. In the effectiveness review the evidence was generally for otolaryngological surgeries and did not show beneficial reductions in the number of blood transfusions required. In the safety review, there was only one study that included only children that was very high risk of bias, indirect (as it did not include all key confounding variables, though the committee acknowledged this may be due to the nature of the population) and showed an increase in all-cause mortality and the number of seizures. The committee agreed that further evidence was required before drawing any firm conclusions based on the available evidence.

There was no evidence identified that included only young people having surgery where minor blood loss was anticipated. 3 studies were included where a small group of people in the study were young people. The studies only reported total blood loss and adverse events, rather than length of hospital stay and the need for blood transfusion. It was agreed that the recommendations for adults would be appropriate for most young people. However, clinical judgement should be used to assess if this is appropriate for individuals (for example: considering weight and whether 500 ml of blood loss is a more substantial amount of blood loss than 10% of their blood volume).

Weighing up the benefits and the harms, the committee agreed that tranexamic acid is safe for most people having surgery. While there are potential risks, these are outweighed by the benefits in most cases. While there is uncertainty in the benefits for people with minor blood loss, the committee agreed that these are likely a reflection of the limitations of meta analysing very different studies together. They agreed that people with mean blood loss closer to 0 ml and closer to 500 ml can have very different clinical outcomes which makes it harder to compare the two.

1.1.9.3 Resources and cost-effectiveness

As part of the NIHR review produced by Jaiswal, et al. 2025, original health economic modelling was conducted to assess the cost-effectiveness of Tranexamic Acid (TXA). The health economic model was based on the previous decision analytic model produced for the NICE guideline on moderate-risk and high-risk blood loss surgeries. The model produced by Jaiswal, et al. 2025 compared TXA to standard care (No TXA) for adults undergoing surgery with low risk of blood loss and the overall results indicated that TXA was dominant (less costly and more effective). Model results were, however, dependent on Length of Stay (LoS). Notably when LoS was excluded from the analysis, TXA was only cost-effective when the risk of a blood transfusion was greater than or equal to 2%. In other words, if there were no observed differences between LoS for those receiving TXA or standard care, TXA was no longer cost-effective when the risk of a blood

transfusion was less than 2%. The committee therefore discussed the applicability of the assumptions in the model for LoS in relation to a UK healthcare setting.

The health economic model used LoS as a proxy for quality of life (QoL), but the results of the model indicated no differences in QoL for TXA and standard care due to the small differences in LoS and the associated disutility of LoS. LoS was, however, a key driver of the model results, but this was due to the cost savings associated with LoS rather than differences in QoL.

Initially the committee noted that in the context of a UK healthcare setting the LoS value employed in the model for TXA may be an overestimate of what is observed in clinical practice for low blood loss surgeries due to the studies in the clinical review being conducted in non-UK healthcare settings – with the model assuming a LoS of 0.00 days for TXA and 0.397 days for standard care. However, the committee did emphasise that the magnitude of difference for LoS was obtained using RCT data. The committee also noted that in the re-analysis of the data, conducted as part of the clinical review, the LoS difference was estimated to be 0.55 days and was therefore higher than the value employed in the health economic model. It was acknowledged that if the difference of 0.55 days for LoS was used in the model, this would result in greater cost savings for TXA, thus favouring the results of the model.

The committee also acknowledged the potential limitations with LoS being used as the only outcome to capture Quality Adjusted Life Years (QALYs) for TXA and standard care. It was noted that other outcomes, such as pain could have been used to capture QoL. As the direction of effect for pain (reduction for those with TXA compared to standard care) is the same as that seen for LoS, using pain instead of LoS would unlikely change the conclusion of the model. Similarly, a number of uncaptured benefits of TXA were noted by the committee such as better operative field vision, lower post operative bleeding, the potential for a reduction in surgical time, the time and cost associated with adding and removing a drain and reducing infection risks. However, the committee conclude that these would likely be in the same direction of effect

as LoS, that is in favour of TXA, and if captured directly in the economic model would reinforce the conclusions.

As the health economic model produced by Jaiswal, et al. 2025 was conducted in an adult population, the applicability of the model results for a paediatric population was discussed qualitatively with the committee alongside the clinical evidence. Overall, the committee concluded that TXA was cost-effective for adults undergoing surgery with a low risk of blood loss. They clarified that TXA should be offered for surgeries undertaken in an operating theatre if the procedure will breach the skin or mucous membranes, and there is a risk of bleeding. The committee made an offer recommendation to reflect their certainty in both the clinical and cost-effectiveness evidence underpinning this recommendation. Although the committee concluded that TXA was cost-effective for adults undergoing surgery with a low risk of blood loss undertaken in an operating theatre with a breach of skin or mucous membranes, they acknowledged that TXA is unlikely to be cost-effective for adults undergoing surgery outside of an operating theatre when a person is expected to lose less than 500ml of blood as the risk of a blood transfusion for this cohort would likely be less than 2%.

Considering a paediatric population, the committee noted that the dose of TXA would be lower in a paediatric population and the threshold for which a blood transfusion is required would differ significantly. For example, the low blood loss definition of less than 500ml for an adult population would likely relate to a high degree of blood loss in a paediatric population – although this would be dependent on the age and weight of the person undergoing surgery. Considering the above, the committee made a recommendation to consider TXA for children undergoing surgery if there is a risk of bleeding. To supplement this recommendation the committee also made a research recommendation to determine the clinical and cost-effectiveness of TXA for children.

The recommendations the committee made on dosing were informed by the clinical review, health economic model, and committee opinion. In the health

economic model 2g of TXA was provided via slow intravenous (IV) injection by the anaesthetist – 1g prior to surgery and 1g after surgery. The committee noted that sometimes TXA may be provided orally instead of intravenously, especially in children. It was noted that the drug costs oral TXA may be cheaper than intravenous TXA, but the majority of the clinical evidence was based on IV dosing. Although the drug cost of oral TXA may be cheaper, the committee acknowledged that an oral formulation could take more than 2 hours to reach peak plasma concentration (Kane, 2021). Therefore, oral TXA may need to be provided prior to admission for surgery which would have associated clinician, administrative staff time and dispensing costs, thus impacting cost-effectiveness. It was however, noted the need for oral TXA to be provided prior to hospital admission will vary depending on local practices – specifically how long a person is expected to be at hospital prior to surgery. If a person is expected to be at the hospital for over two hours prior to surgery, TXA will not need to be provided prior to admission. However, an outpatient prescription would be required if TXA was indicated for the surgery due to take place, but the person receiving surgery was not required to be at the hospital for two or more hours prior to their procedure. In which case, for this cohort, a dispensing fee associated with TXA would apply thus increasing the cost of providing TXA.

1.1.9.4 Equity

The committee made recommendations that are expected to have a positive impact on health equity. They will likely reduce health inequalities for people who are more likely to bleed (for example: Women; people from East, South and South East Asia, Mediterranean, Black African and Black Caribbean backgrounds;; people at the extremes of age; people living with multimorbidity; people with more socioeconomic deprivation), would otherwise need blood products or who would refuse blood products by providing an alternative option for people with fibrinolysis. Widening access to the medicine and providing equitable care across the NHS will help to reduce geographical variations in care and across services.

The committee highlighted that the guideline does not cover the use of tranexamic acid during pregnancy and the equity concerns for this. Evidence was identified for pregnant women in the safety review, which highlighted that tranexamic acid did not appear to increase the risk of thromboembolic events, even though pregnancy leads to a prothrombotic state.

The committee did not identify any additional groups that may be disadvantaged in relation to the recommendations being made. However, they highlighted the need for caution in people with lower body weights due to the narrow margin of blood loss that is required before entering hypovolaemic shock. This was noted particularly with children, where the recommendations made were different, but was also noted for people with frailty and low body weights.

The committee noted the limited evidence for children and agreed that further research should be done in this area. They acknowledged that the TIC-TOC trial is being conducted to investigate the safety of tranexamic acid in a trauma setting. Given this, a research recommendation was prioritised to investigate the effectiveness of tranexamic acid for children after surgery instead.

1.1.9.5 Acceptability and values

The committee members with lived experience reflected that the outcomes chosen included the most important ones to people having surgery. They were concerned about the low certainty of the evidence. However, when weighing up the benefits and risks from what was available, they agreed with the recommendations.

The committee acknowledged that providing the medicine to all people having surgery would not be appropriate or necessary. While they agreed that the benefits generally outweighed the harms, they noted:

- there would be surgeries that involve very little blood loss where the risk outweighs the benefits for almost all people (for example: low risk surgeries performed in GP practices like skin lesion removals);
- there would be procedures that would not breach the skin or mucous membranes where tranexamic acid would not be necessary (for example: hysteroscopy, diagnostic laryngoscopy).

They agreed that there may be reasons dependent on the surgery and condition, that tranexamic acid may not be appropriate. The intention of the recommendations in this guidance was to acknowledge the use of tranexamic acid in surgery in general, rather than speciality and condition specific use, and so they weighed this up against the risks to acceptability for surgeries where this may not be appropriate when making the recommendations (for example: vascular surgeries where there was limited evidence). They ultimately agreed to make a more general recommendation for all groups but emphasise the importance of person centred care. They reinforced this when considering dose, while providing examples for when additional doses may be required, including when:

- the duration of surgery is longer
- the volume of blood loss suggests an additional dose may be required (for example: if they have lost more than 500 ml of blood, reducing the concentration of tranexamic acid)

They reiterated that renal impairment may mean reduced additional doses are required.

The committee discussed that while the adverse events are very unlikely, the chance of having a blood transfusion may also be highly unlikely for some people and this should be considered when counselling people about whether to take the medicine or not. The committee discussed how pregnant women, trans men and non-binary people giving birth had a very low risk of adverse events in the safety review, but if they also were unlikely to need a blood

transfusion or tranexamic acid was unlikely to help with the mechanism of bleeding that they were having then it was not worth the risk to offer it.

While taking this into account, the committee agreed that in most cases where surgery is being performed in an operating theatre, involving breach of skin or a mucous membrane and any amount of blood loss that offering tranexamic acid is likely to be beneficial.

1.1.9.6 Feasibility

The committee acknowledged that providing the medicine to all people having surgery would not be appropriate or necessary. While they agreed that the benefits generally outweighed the harms, they noted:

- there would be some settings where providing tranexamic acid would not be feasible (for example: GP practices where an anaesthetist or another staff trained in providing intravenous medicines are not available and procedures are often quick and low risk)
- while the committee acknowledged oral formulations may have a role, they take 2 or more hours to reach peak plasma concentration and will have associated healthcare professional and administrative staff time and dispensing costs, impacting the feasibility.

The committee noted that by stipulating the requirement for the surgery to breach the skin or mucous membranes meant that this ensured that only surgeries where bleeding always occurred at a meaningful amount were included (excluding diagnostic procedures like hysteroscopies). Other types of surgery that cause bleeding were excluded because the amount of bleeding would be expected to be much lower.

The committee agreed that tranexamic acid should be offered to adults having surgery where more than 500 ml of blood loss was expected regardless of where the operation was taking place. This was based on evidence from the

2015 guideline for people with anticipated high and moderate levels of blood loss because evidence showed clearer benefits of giving tranexamic acid.

Altogether, they agreed recommendations to reduce barriers to implementation:

- they agreed that the work conducted had strengthened the certainty on the safety of tranexamic acid
- the committee agreed recommendations that, where possible, removed mention of predicting the amount of expected blood loss ahead of time to aid implementation
- they recommended that, unless the amount of bleeding was moderate or severe, tranexamic acid was provided in an operating theatre ensuring the presence of an anaesthetist or a suitably trained person who could be responsible for providing the medicine improving the choice in routes of administration as options to aid implementation
- they acknowledged there was still a gap in the evidence regarding the efficacy of tranexamic acid for people undergoing vascular surgery and so agreed a research recommendation in this scenario.

1.1.9.7 Strength of the recommendations

The committee made strong recommendations for the use of tranexamic acid for adults and weak recommendations for the use of tranexamic acid for children.

The extension of the recommendations for adults was based on low certainty evidence of efficacy (on the background of a strong recommendation from low to very low certainty evidence of efficacy for people at moderate and high risk of blood loss) and high and moderate certainty evidence showing safety.

The committee considered the certainty of the evidence and accounted for elements of uncertainty in their evaluation. They ultimately agreed that, while there is uncertainty in the magnitude of the benefits from tranexamic acid, there is likely to be a beneficial effect from tranexamic acid for reducing

bleeding that can be extended wider than the current recommendation for people having surgery.

They took into account the current UK healthcare context and the challenges in implementing the current recommendations. Given this and the stronger evidence indicating that the medicine is safe for most people, that there is a greater benefit to the healthcare system to recommending wider use with a stronger recommendation that will reduce the barriers for implementation and reinforce this message that it is safe to use.

Given the lower certainty evidence base for children having surgery, the committee agreed that this should not be the case for this population and so made weaker recommendations for this group.

1.1.10 Recommendations supported by this evidence review

This evidence review supports recommendations 1.3.1 to 1.3.3 and 1.3.5 to 1.3.9 and the research recommendation on the effectiveness of tranexamic acid for children and the effectiveness of tranexamic acid for specific vascular surgeries. Other evidence supporting these recommendations can be found in the evidence review on the safety of tranexamic acid (B).

1.1.11 References

1.1.11.1 Effectiveness evidence

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1.1.11.2 Economic evidence used in decision-making

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