NICE National Institute for Health and Care Excellence

NICE guideline

Blood transfusion

NICE guideline
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Your responsibility

The recommendations in this guideline represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, professionals and practitioners are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or the people using their service. It is not mandatory to apply the recommendations, and the guideline does not override the responsibility to make decisions appropriate to the circumstances of the individual, in consultation with them and their families and carers or guardian.

All problems (adverse events) related to a medicine or medical device used for treatment or in a procedure should be reported to the Medicines and Healthcare products Regulatory Agency using the Yellow Card Scheme.

Local commissioners and providers of healthcare have a responsibility to enable the guideline to be applied when individual professionals and people using services wish to use it. They should do so in the context of local and national priorities for funding and developing services, and in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities. Nothing in this guideline should be interpreted in a way that would be inconsistent with complying with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

Contents

This guideline is the basis of QS138.

Overview

This guideline covers assessing for, and managing, blood transfusions in adults, young people and children aged 1 year and over. It covers the general principles of blood transfusion, but does not make recommendations relating to specific conditions.

This guideline does not cover blood transfusions, or use of tranexamic acid for surgery, during pregnancy and labour. For more information on what the guideline does and does not cover, see the section on inclusions and exclusions.

Some people have religious beliefs that do not allow the transfusion of blood. Specific issues relating to these people have been addressed when reviewing the evidence and writing the recommendations.

For guidance on blood transfusions and anticoagulant reversal for people with acute upper gastrointestinal bleeding, see the section on resuscitation and initial management in NICE's guideline on acute upper gastrointestinal bleeding in over 16s.

Who is it for?

- Healthcare professionals who assess for and manage blood transfusions and their alternatives
- Commissioners and providers of transfusion services
- People aged 1 year and over who may need a blood transfusion, their families and carers

Reducing requirement for blood transfusion for people having surgery

People have the right to be involved in discussions and make informed decisions about their care, as described in NICE's information on making decisions about your care.

Making decisions using NICE guidelines explains how we use words to show the strength (or certainty) of our recommendations, and has information about prescribing medicines (including off-label use), professional guidelines, standards and laws (including on consent and mental capacity), and safeguarding.

Healthcare professionals should follow our general guidelines for people delivering care:

- Patient experience in adult NHS services
- Babies, children and young people's experience of healthcare
- Shared decision making
- Medicines adherence
- Medicines optimisation
- Multimorbidity
- Decision making and mental capacity

1.1 Erythropoietin

1.1.1 Do not offer erythropoietin to reduce the need for blood transfusion in people having surgery, unless:

- the person has anaemia and meets the criteria for blood transfusion, but declines it because of religious beliefs or other reasons or
- the appropriate blood type is not available because of the person's red cell antibodies. **[2015]**

1.2 Intravenous and oral iron

1.2.1 Offer oral iron before and after surgery to people with iron-deficiency anaemia. **[2015]**

1.2.2 Consider intravenous iron before or after surgery for people who:

- have iron-deficiency anaemia and cannot tolerate or absorb oral iron, or are unable to adhere to oral iron treatment
- are diagnosed with functional iron deficiency
- are diagnosed with iron-deficiency anaemia, and the interval between the diagnosis of anaemia and surgery is predicted to be too short for oral iron to be effective. **[2015]**

1.2.3 For guidance on managing anaemia in people with chronic kidney disease, see NICE's guideline on chronic kidney disease: assessment and management. **[2015]**

1.3 Tranexamic acid

Use of tranexamic acid during surgery for adults

1.3.1 Offer tranexamic acid to adults having surgery in an operating theatre if:

- there is any risk of bleeding and
- the procedure will breach the skin or mucous membranes. **[2026]**

1.3.2 Offer tranexamic acid to adults having surgery outside an operating theatre (for example, interventional radiology or A&E) who are expected to lose more than 500 ml of blood. **[2026]**

1.3.3 When using tranexamic acid for adults having surgery, administer it just before the start of surgery. Typically give 1 g by slow intravenous injection. **[2026]**

1.3.4 For information about using tranexamic acid for primary hip, knee and shoulder replacement in adults, see NICE's guideline on joint replacement (primary). **[2015]**

Use of tranexamic acid during surgery for children

1.3.5 Consider tranexamic acid for children (aged 1 to 15 years) having surgery in an operating theatre if:

- there is any risk of bleeding and
- the procedure will breach the skin or mucous membranes. **[2026]**

1.3.6 Consider tranexamic acid for children (aged 1 to 15 years) having surgery outside an operating theatre (for example, interventional radiology or A&E) who are expected to lose more than 10% of their blood volume. **[2026]**

1.3.7 When using tranexamic acid for children (aged 1 to 15 years) having surgery, administer it just before the start of surgery. Typically give 15 mg per kg (maximum 1 g) by slow intravenous injection. **[2026]**

Safety measures

1.3.8 If more than 1 dose of tranexamic acid might be beneficial because of the length of surgery or volume of blood loss, balance this against any risks associated with additional doses. Risks may include tranexamic acid accumulating in the blood for people with renal impairment. **[2026]**

1.3.9 Ensure safety measures are in place to prevent tranexamic acid from being accidentally administered via the intrathecal or epidural route rather than

intravenously. **[2026]**

For a short explanation of why the committee made the 2026 recommendations and how they might affect practice, see the rationale and impact section on tranexamic acid.

Full details of the evidence and the committee's discussion are in evidence review A: tranexamic acid for reducing anticipated minor blood loss due to surgery and evidence review B: safety of tranexamic acid during surgery.

1.4 Cell salvage during surgery

1.4.1 Consider intra-operative cell salvage with tranexamic acid for people who are expected to lose a very high volume of blood (for example, in cardiac and complex vascular surgery, and pelvic reconstruction and scoliosis surgery). **[2015]**

1.4.2 Do not routinely use cell salvage without tranexamic acid. **[2015]**

Red blood cell transfusion

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1.5 Thresholds and targets

1.5.1 Use restrictive red blood cell transfusion thresholds for people who need red blood cell transfusions and who do not:

- have major haemorrhage or
- have acute coronary syndrome or

- need regular blood transfusions for chronic anaemia. **[2015]**

1.5.2 When using a restrictive red blood cell transfusion threshold, consider a threshold of 70 g/litre and a haemoglobin concentration target of 70 to 90 g/litre after transfusion. **[2015]**

1.5.3 Consider a red blood cell transfusion threshold of 80 g/litre and a haemoglobin concentration target of 80 to 100 g/litre after transfusion for people with acute coronary syndrome. **[2015]**

1.5.4 Consider setting individual thresholds and haemoglobin concentration targets for each person who needs regular blood transfusions for chronic anaemia. **[2015]**

1.6 Doses

1.6.1 Consider single-unit red blood cell transfusions for adults (or equivalent volumes calculated based on body weight for children or adults with low body weight) who do not have active bleeding. **[2015]**

1.6.2 After each single-unit red blood cell transfusion (or equivalent volumes calculated based on body weight for children or adults with low body weight), clinically reassess and check haemoglobin levels, and give further transfusions if needed. **[2015]**

Platelet transfusion

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1.7 Thresholds and targets

People with thrombocytopenia who are bleeding

1.7.1 Offer platelet transfusions to people with thrombocytopenia who have clinically significant bleeding (grade 2; see the table on World Health Organization [WHO]

Bleeding Grades) – and a platelet count below 30×10^9 per litre. **[2015]**

1.7.2 Use higher platelet thresholds (up to a maximum of 100×10^9 per litre) for people with thrombocytopenia and either of the following:

- severe bleeding (WHO grades 3 and 4)
- bleeding in critical sites, such as the central nervous system (including eyes). **[2015]**

People who are not bleeding or having invasive procedures or surgery

1.7.3 Offer prophylactic platelet transfusions to people with a platelet count below 10×10^9 per litre who are not bleeding or having invasive procedures or surgery, and who do not have any of the following conditions:

- chronic bone marrow failure
- autoimmune thrombocytopenia
- heparin-induced thrombocytopenia
- thrombotic thrombocytopenic purpura. **[2015]**

People who are having invasive procedures or surgery

1.7.4 Consider prophylactic platelet transfusions to raise the platelet count above 50×10^9 per litre in people who are having invasive procedures or surgery. **[2015]**

1.7.5 Consider a higher threshold (for example 50 to 75×10^9 per litre) for people with a high risk of bleeding who are having invasive procedures or surgery, after taking into account:

- the specific procedure the person is having
- the cause of the thrombocytopenia

- whether the person's platelet count is falling
- any coexisting causes of abnormal haemostasis. **[2015]**

1.7.6 Consider prophylactic platelet transfusions to raise the platelet count above 100×10^9 per litre in people having surgery in critical sites, such as the central nervous system (including the posterior segment of the eyes). **[2015]**

When prophylactic platelet transfusions are not indicated

1.7.7 Do not routinely offer prophylactic platelet transfusions to people with any of the following:

- chronic bone marrow failure
- autoimmune thrombocytopenia
- heparin-induced thrombocytopenia
- thrombotic thrombocytopenic purpura. **[2015]**

1.7.8 Do not offer prophylactic platelet transfusions to people having procedures with a low risk of bleeding, such as adults having central venous cannulation or any people having bone marrow aspiration and trephine biopsy. **[2015]**

1.8 Doses

1.8.1 Do not routinely transfuse more than a single dose of platelets. **[2015]**

1.8.2 Only consider giving more than a single dose of platelets in a transfusion for people with severe thrombocytopenia and bleeding in a critical site, such as the central nervous system (including eyes). **[2015]**

1.8.3 Reassess the person's clinical condition and check their platelet count after each platelet transfusion, and give further doses if needed. **[2015]**

Fresh frozen plasma transfusion

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1.9 Thresholds and targets

1.9.1 Only consider fresh frozen plasma transfusion for people with clinically significant bleeding but without major haemorrhage if they have abnormal coagulation test results (for example, prothrombin time ratio or activated partial thromboplastin time ratio above 1.5). **[2015]**

1.9.2 Do not offer fresh frozen plasma transfusions to correct abnormal coagulation in people who:

- are not bleeding (unless they are having invasive procedures or surgery with a risk of clinically significant bleeding)
- need reversal of a vitamin K antagonist. **[2015]**

1.9.3 Consider prophylactic fresh frozen plasma transfusions for people with abnormal coagulation who are having invasive procedures or surgery with a risk of clinically significant bleeding. **[2015]**

1.10 Doses

1.10.1 Reassess the person's clinical condition and repeat the coagulation tests after fresh frozen plasma transfusion to ensure that they are getting an adequate dose, and give further doses if needed. **[2015]**

Cryoprecipitate transfusion

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1.11 Thresholds and targets

1.11.1 Consider cryoprecipitate transfusions for people without major haemorrhage who have:

- clinically significant bleeding and
- a fibrinogen level below 1.5 g/litre. **[2015]**

1.11.2 Do not offer cryoprecipitate transfusions to correct the fibrinogen level in people who:

- are not bleeding and
- are not having invasive procedures or surgery with a risk of clinically significant bleeding. **[2015]**

1.11.3 Consider prophylactic cryoprecipitate transfusions for people with a fibrinogen level below 1.0 g/litre who are having invasive procedures or surgery with a risk of clinically significant bleeding. **[2015]**

1.12 Doses

1.12.1 Use an adult dose of 2 pools when giving cryoprecipitate transfusions (for children, use 5 to 10 ml/kg up to a maximum of 2 pools). **[2015]**

1.12.2 Reassess the person's clinical condition, repeat the fibrinogen level measurement and give further doses if needed. **[2015]**

Prothrombin complex concentrate transfusion

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1.12.3 Offer immediate prothrombin complex concentrate transfusions for the emergency reversal of warfarin anticoagulation in people with either:

- severe bleeding or
- head injury with suspected intracerebral haemorrhage. **[2015]**

1.12.4 For guidance on reversing anticoagulation treatment in people who have a stroke and a primary intracerebral haemorrhage, see the section on reversal of anticoagulation treatment in people with haemorrhagic stroke in NICE's guideline on stroke and transient ischaemic attack in over 16s. **[2015]**

1.12.5 Consider immediate prothrombin complex concentrate transfusions to reverse warfarin anticoagulation in people having emergency surgery, depending on the level of anticoagulation and the bleeding risk. **[2015]**

1.12.6 Monitor the international normalised ratio (INR) to confirm that warfarin anticoagulation has been adequately reversed, and consider further prothrombin complex concentrate.**[2015]**

For advice on reversing direct-acting oral anticoagulants (DOACs), see the MHRA safety advice on DOACs for a list of reversal agents.

Patient safety

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1.13 Monitoring for acute blood transfusion reactions

1.13.1 Monitor the person's condition and vital signs before, during and after blood transfusions, to detect acute transfusion reactions that may need immediate investigation and treatment. **[2015]**

1.13.2 Observe people who are having or have had a blood transfusion in a suitable environment with staff who are able to monitor and manage acute reactions. **[2015]**

1.14 Electronic patient identification systems

1.14.1 Consider using a system that electronically identifies patients to improve the safety and efficiency of the blood transfusion process. **[2015]**

Patient information

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1.14.2 Provide verbal and written information to people who may have or who have had a transfusion, and their family members or carers (as appropriate), explaining:

- the reason for the transfusion
- the risks and benefits
- the transfusion process

- any transfusion needs specific to them
- any alternatives that are available, and how they might reduce their need for a transfusion
- that they are no longer eligible to donate blood
- that they are encouraged to ask questions. **[2015]**

1.14.3 Document discussions in the patient's notes. **[2015]**

1.14.4 Provide the person and their GP with copies of the discharge summary or other written communication that explains:

- the details of any transfusions they had
- the reasons for the transfusion
- any adverse events
- that they are no longer eligible to donate blood. **[2015]**

Terms used in this guideline

Adults, young people and children

These are defined as:

- Adults: aged 18 years and over.
- Young people: aged 16 and 17 years. No evidence was found on transfusions specifically for young people. Recommendations for adults in this guideline will generally apply to young people as well, but healthcare professionals should use their clinical judgement on when this is not appropriate for individual patients.
- Children: aged 1 to 15 years.

Major haemorrhage

This can be defined as any of the following:

- The loss of more than 1 blood volume within 24 hours (around 70 ml/kg, or more than 5 litres in a 70 kg adult).
- A loss of 50% of total blood volume in under 3 hours.
- Bleeding in excess of 150 ml/minute in adults.
- As a practical clinical definition, bleeding which leads to:
  - a systolic blood pressure of less than 90 mm/Hg or
  - a heart rate of more than 110 beats per minute in adults.

The modified World Health Organization (WHO) bleeding scale

This was used to assess bleeding in trials of platelet transfusions. Examples of bleeding at each grade are listed below:

WHO bleeding scale

World Health Organization Bleeding Grade	Examples
1	• Oropharyngeal bleeding, with the total duration of all episodes no more than 30 minutes in the last 24 hours. • Epistaxis, with the total duration of all episodes no more than 30 minutes in the last 24 hours. • Petechiae of oral mucosa or skin. • Purpura up to 2.5 cm (1 inch) in diameter. • Spontaneous haematoma in soft tissue or muscle. • Positive stool occult blood test. • Microscopic haematuria or haemoglobinuria. • Abnormal vaginal bleeding (spotting).

World Health Organization Bleeding Grade	Examples
2	• Epistaxis, with the total duration of all episodes over 30 minutes in 24 hours. • Purpura over 2.5 cm (1 inch) in diameter. • Joint bleeding. • Melanotic stool. • Haematemesis. • Gross/visible haematuria. • Abnormal vaginal bleeding (more than spotting). • Haemoptysis. • Visible blood in body cavity fluid. • Retinal bleeding without visual impairment. • Bleeding at invasive sites.
3	• Bleeding needing red blood cell transfusion over routine transfusion needs. • Bleeding associated with moderate haemodynamic instability.
4	• Bleeding associated with severe haemodynamic instability. • Fatal bleeding. • Central nervous system bleeding on imaging study with or without dysfunction.

Recommendations for research

The guideline committee has made the following recommendations for research.

Key recommendations for research

1 Effectiveness of tranexamic acid for children and young people

What is the clinical and cost-effectiveness of tranexamic acid compared to placebo for children and young people undergoing surgery in reducing the risk of post-operative infection, length of stay and the need for a blood transfusion? **[2026]**

For a short explanation of why the committee made this recommendation for research, see the rationale section on tranexamic acid.

Full details of the evidence and the committee's discussion are in evidence review A: tranexamic acid for reducing anticipated minor blood loss due to surgery and evidence review B: safety of tranexamic acid during surgery.

2 Effectiveness of tranexamic acid for specific vascular surgery procedures

What is the clinical and cost-effectiveness of tranexamic acid compared to placebo for people having specific vascular surgery procedures in reducing vessel-related thromboembolic events and infection? **[2026]**

For a short explanation of why the committee made this recommendation for research, see the rationale section on tranexamic acid.

Full details of the evidence and the committee's discussion are in evidence review A: tranexamic acid for reducing anticipated minor blood loss due to surgery and evidence review B: safety of tranexamic acid during surgery.

3 Red blood cell transfusion thresholds for patients with chronic cardiovascular disease

What is the clinical and cost effectiveness of restrictive compared with liberal red blood cell thresholds and targets for patients with chronic cardiovascular disease? **[2015]**

Why this is important

The literature suggests that there may be some evidence of harm with the use of restrictive red blood cell thresholds in populations with coronary ischaemia at baseline. In this guideline a level of 80 to 100 g/litre was used for patients with acute coronary syndrome, but further studies are needed to determine the optimal transfusion threshold for patients with chronic cardiovascular disease.

4 Electronic Decision Support

What is the clinical and cost effectiveness of an electronic decision support system compared with current practice in reducing inappropriate blood transfusions, overall rates of blood transfusion and mortality? **[2015]**

Why this is important

The clinical evidence evaluating electronic decision support systems is of low quality. There is also no evidence on their cost effectiveness within the NHS, and this is particularly important because of the potentially high setup and running costs of these systems. An evaluation of the clinical and cost effectiveness of electronic decision support systems for blood transfusion is needed. Important outcomes are rates of inappropriate transfusion, overall rates of transfusion, and patient safety outcomes including mortality and transfusion errors. Secondary outcomes should include length of hospital stay and quality of life; and pre-transfusion haemoglobin levels, platelet count and coagulation results.

5 Post-operative cell salvage for patients having cardiac surgery with a significant risk of post-operative blood loss

For patients having cardiac surgery with a significant risk of post-operative blood loss, is post-operative cell salvage and reinfusion clinically and cost effective in reducing red blood cell use and improving clinical outcomes, compared with existing practice? **[2015]**

Why this is important

There was some evidence for benefit from post-operative cell salvage, but the quality was low. Reducing blood loss during cardiac surgery may reduce the risk of complications. However, post-operative cell salvage carries additional cost. Studies are needed to determine whether post-operative cell salvage is more clinically and cost effective than existing practice for patients having cardiac surgery with a significant risk of post-operative blood loss. Important outcomes should include the use of red blood cells and other blood components, clinical outcomes and quality of life.

Other recommendations for research

6 Fresh frozen plasma for patients with abnormal haemostasis who are having invasive procedures or surgery

What dose of fresh frozen plasma is most clinically effective at preventing bleeding in patients with abnormal haemostasis who are having invasive procedures or surgery? **[2015]**

Why this is important

Audits have shown that fresh frozen plasma is widely used for non-bleeding patients in the intensive care unit (ICU) and many other clinical settings. There is a large variation in dose and no real evidence base to guide practice. Fresh frozen plasma transfusions may cause adverse outcomes in people who are critically ill, including transfusion-related acute lung injury, transfusion-related circulatory overload, multi-organ failure and an increased risk of infections.

A multicentre study (2011) of ICUs in the UK showed that 12.7% of patients admitted to the ICU received fresh frozen plasma. The median dose was 10.8 ml/kg, but doses varied widely (range 2.4 to 41.1 ml/kg). This study showed that a high proportion of fresh frozen plasma transfusions had unproven clinical benefit.

Better evidence from clinical trials could significantly alter how fresh frozen plasma is used, and in particular ensure that clinically effective doses are given to patients.

Rationale and impact

This section briefly explains why the committee made the 2026 recommendations and how they might affect practices.

Tranexamic acid

Recommendations 1.3.1 to 1.3.3 and 1.3.5 to 1.3.9

Why the committee made the recommendations

Although the committee recognised that the evidence did not cover all surgical specialties, they agreed it showed that using tranexamic acid during surgery to prevent bleeding is safe at the typical doses stated in the recommendations, and is generally clinically effective and cost effective. As such, they made recommendations for surgery in general rather than making specific recommendations for different types of surgery.

Evidence showed that tranexamic acid can reduce length of hospital stay, as well as the need for blood transfusion, for people having surgery where minor blood loss is anticipated. The committee agreed that the benefit of reducing length of stay may be less for some types of surgery not covered by the evidence, for example, day case surgery.

Separate evidence showed that tranexamic acid was safe for most people, reducing all-cause mortality and further operations. There was an increased risk of thromboembolic events in less than 0.1% of people.

Based on their clinical experience, the committee identified the following additional potential clinical benefits of tranexamic acid:

- a reduction in post-operative pain, especially for surgery involving small cavities
- a reduction in haematomas and infections after surgery
- ability to restart antiplatelets and anticoagulants sooner after surgery for people already on these medications.

While length of stay was found not to have an impact on quality of life in the economic

model, it did reduce hospital costs and meant tranexamic acid was found to be cost effective. When length of stay was excluded from the economic model, tranexamic acid was only cost effective for types of surgery where the probability of a blood transfusion was 2% or more. The committee was confident that tranexamic acid was cost effective for most types of surgery in operating theatres because of other potential benefits not examined by the model. These included:

- better view of the area of the body where surgery is being done because of lower levels of bleeding
- reduced need for surgical drains saving time and money
- reduction in risk of infection
- lower levels of post-operative bleeding.

The committee agreed that tranexamic acid should be offered to adults undergoing surgery that breaches the skin or mucous membranes when there is any risk of bleeding provided it takes place in an operating theatre. This was to exclude quick, low-risk procedures in the community where tranexamic acid does not offer sufficient benefits. By only selecting surgery taking place in an operating theatre, the committee was reassured that staff who were trained to give medicines intravenously would be available, if needed. The requirement for the surgery to breach the skin or mucous membranes was stated since bleeding always occurs here, which is not the case for cornea surgery and some invasive diagnostic procedures such as hysteroscopy. 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 the benefits of tranexamic acid will outweigh the risks for most people having surgery. However, they recognised this will not always be the case, for example, if the person has known active thromboembolic disease or ongoing intravascular clotting.

A separate recommendation was made for adults undergoing surgery outside of operating theatres. This retains part of the 2015 recommendation to offer tranexamic acid to adults undergoing surgery who are expected to have blood loss greater than 500 ml.

There were only a small number of studies on the effectiveness of tranexamic acid for children having surgery where minor blood loss was anticipated, and only 1 study on its safety for this population. The results of this evidence were inconclusive. The committee acknowledged that blood loss can be more significant in children than adults because children have a smaller total blood volume. They also discussed that the margin of error

regarding dosing decisions for children may be more critical. Given all this, the committee agreed that weighing up the benefits of tranexamic acid against the risks is especially important for children. They also agreed that tranexamic acid could be an option for some children undergoing surgery in an operating theatre that breaches the skin or mucous membranes.

In line with the 2015 guideline, the committee agreed that tranexamic acid should be considered for children having surgery where more than 10% of blood loss is expected. Evidence for adults showed clearer benefits of giving tranexamic acid when blood loss was higher and the committee agreed that this could be applied to children. Because children having a lower total blood volume than adults, a value of 10% is used instead of an absolute volume.

There were no studies that only looked at young people. Three studies had a small number of young people. These only reported total blood loss and adverse events, rather than length of hospital stay and the need for blood transfusion. Because of the lack of evidence on young people and in line with the 2015 guideline, the committee decided not to make recommendations for young people and agreed that the recommendations for adults would generally apply to them with healthcare professionals expected to use their clinical judgement about this.

The committee made recommendations about doses of tranexamic acid using information from the trials, the summary of product characteristics and recommendations made by other groups.

They recognised that while an additional dose of tranexamic acid would sometimes be needed, a single dose is usually sufficient because of the length of most operations and level of blood loss. The committee agreed that the decision to give an additional dose should be based on the balance of benefits and harms of doing so. In particular, they discussed that people with renal impairment may not be suitable for an additional dose or may require a reduced additional dose.

Tranexamic acid can be fatal if administered by the wrong route. The committee agreed that it was important to flag the need for safety measures to prevent this from happening.

To inform future recommendations, the committee agreed a recommendation for research on the effectiveness of tranexamic acid in children and young people, acknowledging the current study into its safety for under 18s.

There was no direct evidence on the clinical effectiveness of tranexamic acid for vascular surgery with minimal risk of bleeding but the committee agreed that the results from other evidence looking at cost effectiveness could be applied to this population. Although vascular surgery was covered by 1 study that looked at the safety of tranexamic acid, the results were not reported by surgical specialty and so could not be analysed separately. Uptake of the previous recommendation on using tranexamic acid for surgery where blood loss is greater than 500 ml was lower for vascular surgery. The committee agreed that further research was required to inform future recommendations on vascular surgery and so made a recommendation for research on the effectiveness of tranexamic acid for specific vascular surgery procedures.

How the recommendations might affect practice

In 2015 NICE recommended offering tranexamic acid to adults having surgery where expected blood loss was more than 500 ml. The new recommendations extend use of tranexamic acid to any level of expected blood loss but only for adults having surgery in operating theatres. This is likely to increase the use of tranexamic acid but should not have an impact on staffing requirements since operating theatres should already have staff available to administer the medicine.

For children, the recommendations also extend the use of tranexamic acid from only where expected blood loss is more than 10% to cover any level of expected blood loss in operating theatres. Again, although this is likely to increase the use of tranexamic acid, it should not have staffing implications.

Overall, it is expected that the recommendations will reduce costs because fewer people will have blood transfusions and the average length of stay in hospital after surgery will be reduced.

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Inclusions and exclusions

This guideline contains recommendations about general principles of blood transfusion, and applies to a range of conditions and different settings. It does not include recommendations relating to specific conditions.

The guideline covers:

- the appropriate use of blood components
- alternatives to transfusion for surgical patients
- ensuring patient safety, including monitoring for transfusion reactions
- providing patients with information about transfusion.

This guideline focuses on the general principles of transfusion. To do this, it was necessary to limit the scope by excluding:

- patient groups with special transfusion needs, such as fetuses, neonates and children under 1 year old, pregnant women, and patients with haemoglobinopathies.
- specialist areas already covered by NICE guidelines, for example, anaemia in chronic kidney disease, upper gastrointestinal bleeding and trauma and massive haemorrhage.
- the use and administration of blood products, such as intravenous immunoglobulin, anti-D and recombinant activated factor VII.
- near-patient testing for haemoglobin concentration and haemostasis.
- laboratory procedures relating to the safety and quality of blood, including pre-transfusion compatibility testing.
- the diagnosis of anaemia.
- the management of anaemia in medical patients is out of the scope of this guidance, but it is important to note that the correct approach for managing anaemia in medical patients is important for avoiding unnecessary use of blood.

Despite the lack of specific evidence in the paediatric population, a number of the

recommendations have been considered applicable to children following extrapolation from evidence in adults. This was considered to be a reasonable approach to provide some guidance for this age group. However, it should be noted that the guidelines do not cover transfusion for neonates and infants less than a year of age due to the difficulties in extrapolating adult evidence to very young children.

Finding more information and committee details

To find NICE guidance on related topics, including guidance in development, see the NICE topic page on injuries, accidents and wounds.

For full details of the evidence and the guideline committee's discussions, see the evidence reviews and full guideline. You can also find information about how the guideline was developed, including details of the committees.

NICE has produced tools and resources to help you put this guideline into practice. For general help and advice on putting our guidelines into practice, see resources to help you put NICE guidance into practice.

Update information

February 2026: We have reviewed the evidence and made new recommendations on using tranexamic acid during surgery.

Minor changes since publication

March 2025: In the section on prothrombin complex concentrate we removed the link to NICE's technology appraisal guidance on andexanet alfa (TA697) because the guidance has been updated and no longer applies to this guideline.

August 2023: We added links to the MHRA safety advice on direct-acting oral anticoagulants (DOACs) and NICE's technology appraisal guidance on andexanet alfa for reversing anticoagulation from apixaban or rivaroxaban (TA697) to the section on prothrombin complex concentrate.

March 2022: A link to MHRA advice on intravenous iron was removed.

July 2020: A link to MHRA advice on intravenous iron was added. A link to NICE's guideline on joint replacement (primary) was added to give advice on tranexamic acid in primary hip, knee and shoulder replacement.

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