

When should blood transfusions be given after cardiac surgery?

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Heart Attack

Myocardial Infarction or Heart Attack. Credit: Blausen Medical Communications/Wikipedia/CC-A 3.0

New research has shown that patients having heart surgery do not benefit if doctors wait until a patient has become substantially anaemic before giving a transfusion.

In the UK, about half of all [patients](#) having cardiac surgery are given a red blood cell transfusion after the operation, using up to ten per cent of the nation's blood supply. The proportion of patients having a transfusion is high because blood loss and severe anaemia are common after cardiac surgery and transfusion is the preferred treatment. Blood loss causes anaemia which doctors detect by measuring the red cell count or [haemoglobin level](#) - a low level triggers transfusion.

The trial, led by academics at the University of Bristol, and published in the *New England Journal of Medicine*, was carried out to resolve uncertainty about when to give blood transfusions after heart surgery. The trial, which also included researchers from the University of Oxford, compared two groups of patients, one which had transfusions at a low haemoglobin level and the other which had transfusions at a higher haemoglobin level.

It was funded by the National Institute for Health Research Health Technology Assessment (NIHR HTA) Programme.

Cardiac surgery patients who receive blood transfusions are believed to have more complications such as infections, heart attacks and strokes, and this has led to speculation that avoidance of transfusion will improve clinical outcomes.

Unnecessary blood transfusions may also increase healthcare costs both directly, because blood is an increasingly scarce and expensive resource, and indirectly due to the complications associated with transfusion. However, the association between transfusions and complications does not necessarily mean that transfusions are bad for patients because sicker patients are more likely to have a transfusion. Better evidence is needed to guide transfusion decisions.

To resolve this issue doctors and researchers from the universities of

Bristol and Oxford conducted a randomised controlled trial to compare policies of transfusing cardiac surgery patients at a 'low' or 'high' haemoglobin level. The aim of the study was to determine whether transfusing at a low level was safer, or more cost-effective, as has been shown in other patient groups.

Patients over 16 years of age undergoing non-emergency cardiac surgery were recruited to the clinical trial at 17 UK hospitals. Participants with a haemoglobin (Hb) level of less than 9 g/dL after their operations were randomised to have a transfusion either when they became substantially anaemic (transfuse when Hb is 'low,' i.e. less than 7.5 g/dL) or straightaway, when they were mildly anaemic (transfuse when Hb is 'high,' i.e. less than 9 g/dL).

To compare the two transfusion strategies the research team counted the number of patients who had a serious infection, stroke, heart attack, dead gut or kidney failure during the first three months after the operation. The trial analysed information for 2,003 participants, about four times more than the next largest similar trial of low and high thresholds for transfusion in patients having heart surgery.

The researchers found almost all the patients in the 'high' group had a [blood transfusion](#) (92 per cent), whereas just over half of the patients in the 'low' group had a blood transfusion (53 per cent).

Slightly more patients had one or more of the serious complications listed above in the 'low' group (35 per cent) than the 'high' group (33 per cent). Moreover, more patients died in the 'low' group (4.2 per cent) than the 'high' group (2.6 per cent). This latter finding is clearly very important but it is difficult to interpret because the trial was not primarily designed to compare the difference in the number of deaths.

There were no substantial differences between the 'high' and 'low' groups

with respect to other information measured to assess recovery but some of the other findings in the trial showed a trend in the same direction. Health care costs up to three months after surgery were similar in the 'high' and 'low' groups. Based on the overall pattern of findings, the researchers propose a new theory that a 'high' or liberal threshold is better after cardiac surgery. This challenges most prevailing guidelines and current health policy.

Barnaby Reeves, Professorial Research Fellow in Health Services Research in the School of Clinical Sciences at the University of Bristol and corresponding author on the paper, said: "Although only a hypothesis, the suggestion that it might be better rather than worse to transfuse patients who are only mildly anaemic goes against the evidence about when to transfuse in non-cardiac surgery settings.

"Transfusing more rather than fewer patients would create a challenge for hospitals. With an ageing population and possibly an increase in heart disease, obesity and diabetes, it can only become more difficult in the future to maintain the national blood supply in the UK and in other developed countries around the world. Our findings emphasise the importance of interventions to reduce blood loss in the first place."

Gavin Murphy, British Heart Foundation (BHF) Professor of Cardiac Surgery, formerly of Bristol's School of Clinical Sciences and now at the University of Leicester, who led the trial, added: "Existing national and international transfusion guidelines recommend that blood transfusions only be given to patients who develop very low haemoglobin concentrations. We have shown that this strategy may increase the number of deaths in cardiac surgery.

"This was the largest randomised trial ever conducted in the UK in a surgical or cardiac surgery population. It was the largest trial ever conducted that has considered indications for transfusion in cardiac

surgery, and recruited over twice the number of patients recruited in all the previous trials put together. It was a pragmatic effectiveness trial that recruited patients from the majority of NHS [cardiac surgery](#) centres in the UK and therefore reflects current UK practice and is relevant to UK patients."

The economic evaluation for the trial was conducted by Dr Sarah Wordsworth and Elizabeth Stokes at the Health Economics Research Centre, Nuffield Department of Population Health, University of Oxford. Sarah Wordsworth, Associate Professor of Health Economics, said "Even though the 'high' group were given more blood, it was interesting that this did not lead to them costing more once the costs of treating complications were added to the analysis."

Professor Peter Weissberg, Medical Director at the British Heart Foundation (BHF), commented: "Donated blood is a precious commodity and needs to be used safely and effectively. While emergency blood transfusions are life-saving in patients who are bleeding heavily, it is unclear whether 'topping up' blood levels in patients with reduced blood counts after major surgery is beneficial. Indeed, some previous studies have suggested it may be harmful.

"This research did not show that topping up patients with modestly low [blood](#) counts was harmful. The results showed that it may actually reduce deaths in the weeks following surgery, although more research is needed to determine if this was a direct consequence of their transfusion or something else. Patients undergoing [heart surgery](#) in the UK can be reassured that they have a very good outcome regardless of the [transfusion](#) policy of their surgical unit."

More information: 'Liberal or restrictive transfusion after cardiac surgery' by Gavin Murphy, Katie Pike, Chris Rogers, Sarah Wordsworth, Elizabeth Stokes, Gianni Angelini and Barnaby Reeves in the *New*

England Journal of Medicine.

Provided by Oxford University

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