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[Intervention Review]

Low versus high haemoglobin concentration threshold for blood transfusion for preventing morbidity and mortality in very low birth weight infants

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ABSTRACT

Background

Infants of very low birth weight often receive multiple transfusions of red blood cells, usually in response to predetermined haemoglobin or haematocrit thresholds. In the absence of better indices, haemoglobin levels are imperfect but necessary guides to the need for transfusion. Chronic anaemia in premature infants may, if severe, cause apnoea, poor neurodevelopmental outcomes or poor weight gain. On the other hand, red blood cell transfusion may result in transmission of infections, circulatory or iron overload, or dysfunctional oxygen carriage and delivery.

Objectives

To determine if erythrocyte transfusion administered to maintain low as compared to high haemoglobin thresholds reduces mortality or morbidity in very low birth weight infants enrolled within three days of birth.

Search methods

Two review authors independently searched the Cochrane Central Register of Controlled Trials (*The Cochrane Library*), MEDLINE, EMBASE, and conference proceedings through June 2010.

Selection criteria

We selected randomised controlled trials (RCTs) comparing the effects of early versus late, or restrictive versus liberal erythrocyte transfusion regimes in low birth weight infants applied within three days of birth, with mortality or major morbidity as outcomes.

Data collection and analysis

Two review authors independently selected the trials.

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Main results

Four trials, enrolling a total of 614 infants, compared low (restrictive) to high (liberal) haemoglobin thresholds. Restrictive thresholds tended to be similar, but one trial used liberal thresholds much higher than the other three. There were no statistically significant differences in the combined outcomes of death or serious morbidity at first hospital discharge (typical risk ratio (RR) 1.19; 95% confidence interval (CI) 0.95 to 1.49) or in component outcomes. Only the largest trial reported follow-up at 18 to 21 months corrected gestational age; in this study there was no statistically significant difference in a composite of death or adverse neurodevelopmental outcome (RR 1.06; 95% CI 0.95 to 1.19). One additional trial comparing transfusion for clinical signs of anaemia versus transfusion at a set level of haemoglobin or haematocrit, reported no deaths and did not address disability.

Authors' conclusions

The use of restrictive as compared to liberal haemoglobin thresholds in infants of very low birth weight results in modest reductions in exposure to transfusion and in haemoglobin levels. Restrictive practice does not appear to have a significant impact on death or major morbidities at first hospital discharge or at follow-up. However, given the uncertainties of these conclusions, it would be prudent to avoid haemoglobin levels below the lower limits tested here. Further trials are required to clarify the impact of transfusion practice on long term outcome.

PLAIN LANGUAGE SUMMARY

Low versus high haemoglobin concentration threshold for blood transfusion for preventing morbidity and mortality in very low birth weight infants

Very premature infants are extremely vulnerable and often require intensive care to survive. Anaemia is a condition in which the blood does not contain enough haemoglobin, the component of red blood cells which carries oxygen around the body. These babies become anaemic very quickly due to blood sampling and because they are unable to make blood cells quickly the haemoglobin level in the blood falls rapidly in the weeks after birth. Generally, the treatment for anaemia is blood transfusion, and many of these babies receive multiple transfusions of blood. The decision to give a transfusion usually depends on the measured amount of haemoglobin in the blood.

Physicians looking after very premature infants are unsure as to the level of haemoglobin at which they should give a transfusion. As transfusion is the introduction of another person's blood cells into the blood stream, there is a risk of infection and a risk of reaction to foreign blood components; the process requires careful monitoring and supervision to ensure safety. Some people find blood transfusion offensive or contrary to their religious values. Giving few or no transfusions reduces the risks of transfusion, but may result in low levels of haemoglobin and consequently a reduced supply of oxygen to the body which could have effects on survival, growth or development.

This review of five studies compares the effects of blood transfusion at low levels of haemoglobin to transfusion at high levels. Within the levels tested, there were no differences seen in survival, in the serious complications of prematurity, or in longer term development as measured at 18 to 21 months past the baby's due date. Allowing the baby to become a little more anaemic did not affect the baby's weight gain or breathing patterns. These conclusions are not firm, because too few babies have been studied. Our overall recommendation is not to exceed the higher levels of haemoglobin used in these trials, and thus diminish the risks of over-transfusion, but not to allow the level of haemoglobin to fall below the lower limits tested in these studies until further studies are completed.