Effect of anemia on frequency of short- and long-term clinical events in acute coronary syndromes (from the Acute Catheterization and Urgent Intervention Triage Strategy Trial).

Kunadian V¹, Mehran R², Lincoff AM³, Feit F⁴, Manoukian SV⁵, Hamon M⁶, Cox DA⁷, Dangas GD⁸, Stone GW⁹.

Author information

• ¹Faculty of Medical Sciences, Institute of Cellular Medicine, Newcastle University, Newcastle upon Tyne, United Kingdom; Cardiothoracic Centre, Freeman Hospital, Newcastle Upon Tyne Hospitals National Health Service Foundation Trust, Newcastle upon Tyne, United Kingdom.
• ²Icahn School of Medicine at Mount Sinai, New York, New York; Cardiovascular Research Foundation, New York, New York. Electronic address: Roxana.Mehran@mountsinai.org.
• ³Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, Cleveland, Ohio.
• ⁴New York University Medical Center, New York, New York.
• ⁵Sarah Cannon Research Institute, Nashville, Tennessee.
• ⁶Department of Cardiology, University Hospital of Caen, Normandy, France.
• ⁷Lehigh Valley Health Network, Allentown, Pennsylvania.
• ⁸Icahn School of Medicine at Mount Sinai, New York, New York; Cardiovascular Research Foundation, New York, New York.
• ⁹Cardiovascular Research Foundation, New York, New York; Columbia University Medical Center, New York, New York.

Abstract

There are limited data on the impact of anemia on clinical outcomes in unstable angina and non-ST-segment elevation myocardial infarction treated with an early invasive strategy. We sought to determine the short- and
long-term clinical events among patients with and without anemia enrolled in the Acute Catheterization and Urgent Intervention Triage Strategy (ACUITY) trial. Anemia was defined as baseline hemoglobin of <13 g/dl for men and <12 g/dl for women. The primary end points were composite ischemia (death, myocardial infarction, or unplanned revascularization for ischemia) and major bleeding assessed in-hospital, at 1 month, and at 1 year. Among the 13,819 patients in the ACUITY trial, information regarding anemia was available in 13,032 (94.3%), 2,199 of whom (16.9%) had anemia. Patients with anemia compared with those without anemia had significantly increased adverse event rates in-hospital (composite ischemia 6.6% vs 4.8%, p = 0.0004; major bleeding 7.3% vs 3.3%, p <0.0001), at 1 month (composite ischemia 10% vs 7.2%, p <0.0001, major bleeding 8.8% vs 3.9%, p <0.0001), and 1 year (composite ischemia 21.7% vs 15.3%, p <0.0001). Anemia was an independent predictor of death at 1 year (hazard ratio 1.77, 95% confidence interval [CI] 1.29 to 2.44, p = 0.0005). Composite ischemia was significantly more common among patients who developed in-hospital non-coronary artery bypass surgery major bleeding compared with those who did not (anemic patients 1-year relative risk 2.19, 95% CI 1.67 to 2.88, p <0.0001; nonanemic patients relative risk 2.16, 95% CI 1.76 to 2.65, p <0.0001). In conclusion, in the ACUITY trial, baseline anemia was strongly associated with adverse early and late clinical events, especially in those who developed major bleeding.

**ANEMIA MANAGEMENT**

**ERYTHROPOIETIC AGENTS**


Erythropoietin: a novel therapy for hypoxic-ischaemic encephalopathy?

Wu YW1, Gonzalez FF.

Author information

- 'Department of Neurology, University of California, San Francisco, CA, USA; Department of Pediatrics, University of California, San Francisco, CA, USA.

Abstract

Perinatal hypoxic-ischaemic encephalopathy (HIE) occurs in 1 to 3 per 1000 term births. HIE is not preventable in most cases, and therapies are limited. Hypothermia improves outcomes and is the current standard of care. Yet, clinical trials suggest that 44-53% of infants who receive hypothermia will die or suffer moderate to severe neurological disability. In this article, we review the preclinical and clinical evidence for erythropoietin (EPO) as a potential novel neuroprotective agent for the treatment of HIE. EPO is a novel neuroprotective agent, with remarkable neuroprotective and neuroregenerative effects in animals. Rodent and primate models of neonatal brain injury support the safety and efficacy of multiple EPO doses for improving histological and functional outcomes after hypoxia-ischaemia. Small clinical trials of EPO in neonates with HIE have also provided evidence supporting safety and preliminary efficacy in humans. There is currently insufficient evidence to support the use of high-dose EPO in newborns with HIE. However, several ongoing trials will provide much needed data regarding the safety and efficacy of this potential new therapy when given in conjunction with hypothermia for HIE. Novel neuroprotective therapies are needed to further reduce the rate and severity of neurodevelopmental disabilities resulting from HIE. High-dose EPO is a promising therapy that can be administered in conjunction with hypothermia. However, additional data are needed to determine the safety and efficacy of this adjuvant therapy for HIE.

Biol Pharm Bull. 2015 Feb 25. [Epub ahead of print]

**Comparison between Long- and Short-Acting Erythropoiesis-Stimulating Agents in the Period Required for Haemoglobin Stabilisation in Treatment of Anaemia in Patients with Chronic Kidney Disease.**


Author information

- 'Department of Clinical Pharmacy, School of Medicine, Fujita Health University.

Abstract

Comparative studies of the potency of long- and short-acting erythropoiesis-stimulating agents (L-ESAs and S-ESAs) on erythropoietic activity in patients with chronic kidney disease without dialysis have not been performed, although L-ESAs are used in many countries. We performed a retrospective analysis of non-dialysis (ND) patients who had received L-ESA or S-ESA. More days were needed for the S-ESA-treated group (368 days) to reach the haemoglobin (Hb) reference range than for the L-ESA-treated group (126 days). Therefore, we investigated risk factors that influence the period until the Hb level reaches the reference range. Patients were classified into two groups by the period until the Hb level was stabilised within the reference range: the short- and long-term group. Two risk factors for delayed Hb stabilisation were identified: age ≥ 60 years; and administration of an S-ESA for initial treatment. These findings suggest that the Hb level should be carefully monitored during ESA therapy in elderly ND patients, and...
that the ESA dose should be increased or L-ESA therapy should be utilised to treat renal anaemia.

**ANEMIA MANAGEMENT**

**IRON**


**Role of intravenous iron sucrose in correction of anemia in antenatal women with advanced pregnancy.**

Gupta A, Rathore AM, Manaktala U, Gupta A, Gupta S.

**Abstract**

The aim of this study is to observe rise in haematological parameters after treatment with iron sucrose in antenatal patients with moderate anemia with period of gestation 32 to 35 weeks. The study included 45 antenatal patients with period of gestation from 32 to 35 weeks having iron deficiency anemia with haemoglobin levels 7-9 g% and serum ferritin levels less than 12 ng/mL. Intravenous iron sucrose was given in the dose of 200 mg on alternate days, according to the calculated dose. The mean haemoglobin and red blood cell indices were compared on days 7, 14, 21, 28 and at the time of delivery from the baseline value. There was a statistically significant rise in haemoglobin value from baseline on days 14, 21, 28 as well as at the time of delivery (p value <0.0001). The mean rise in haemoglobin values was 0.56 g% on day 14, 1.44 g% on day 21 and 2.0 g% on day 28. At the time of delivery, mean haemoglobin was 11.24 g%. After 28 days of treatment, there was a statistically significant rise in the levels of serum ferritin from 10.33 ± 3.8 ng/mL to 36.89 ± 5.7 ng/mL. Thus, earlier response achieved by iron sucrose can be utilised in the patients presenting at an advanced period of gestation with iron deficiency anemia.

**Author information**

- 1Department of Obstetrics & Gynaecology, Maulana Azad Medical College, House no. 93-94, Pocket 2, Sector 22, Rohini, New Delhi, 110086 India.
- 2Department of Obstetrics & Gynaecology, Maulana Azad Medical College, New Delhi, India.
- 3Department of Medicine, Sarojini Naidu Medical College, Agra, India.

**Iron interventions in children from low-income and middle-income populations: benefits and risks.**

*Curc Opin Clin Nutr Metab Care*. 2015 Mar 24. [Epub ahead of print]

**Baumgartner J, Barth-Jaeggi T.**

**Author information**

- 1Centre of Excellence for Nutrition, North-West University, Potchefstroom, South Africa
- 2Laboratory of Human Nutrition, Institute of Food, Nutrition and Health, ETH Zurich, Zurich, Switzerland.

**Abstract**

**PURPOSE OF REVIEW:**

Children from low- and middle-income countries are particularly vulnerable to develop iron deficiency and iron deficiency anaemia (IDA), which can be prevented or controlled with different iron intervention strategies. However, there is a debate on the efficacy and safety of iron interventions, especially in children from areas with a high infectious disease burden. This review provides an overview of recent trials that investigated the benefits and potential risks of iron interventions in children from low and middle-income countries.

**RECENT FINDINGS:**

Recent studies showed that intermittent iron supplementation is a promising strategy in reducing iron deficiency and IDA. Only a few studies investigated the effect of iron interventions on developmental outcomes, such as growth and cognition, and provided mixed results. An increasing number of studies reported that iron intervention increases morbidity and causes unfavourable shifts in the gut microbial composition along with increases in intestinal inflammation, particularly in children with a high infectious disease burden.

**SUMMARY:**

More studies in children from low and middle-income populations are needed that provide evidence for the beneficial effects of iron interventions on functional outcomes beyond alleviating iron deficiency and IDA, and that explore potential mechanisms underlying the negative effects of iron reported in recent trials.


**A prospective observational cohort study to identify the causes of anaemia and association with outcome in cardiac surgical patients.**

Abstract

OBJECTIVES:

Preoperative anaemia is associated with increased morbidity and mortality. We sought to determine the relative frequencies of the different causes of anaemia including absolute and functional iron deficiency, and the association of different haematological parameters, including plasma hepcidin, a key protein responsible for iron regulation, with outcomes after cardiac surgery.

METHODS:

Prospective observational study between January 2012 and 2013; 200 anaemic cardiac surgical patients were recruited and 165 were studied. Detailed blood and bone marrow analysis was performed. Primary outcome was days alive and out of hospital.

RESULTS:

Mean (SD) haemoglobin (Hb) was 102 (8) g/L for women and 112 (11) g/L for men. Regarding outcomes, 137 (83%) patients were transfused at least one unit of red blood cells; 30-day mortality was 1.8% (three patients). Functional iron deficiency was diagnosed in 78 patients (47%). Plasma hepcidin concentration was the only haematological variable associated with outcome, with mean days alive and out of hospital 2.7 (95% CI 0.4 to 5.1) days less if hepcidin ≥20 ng/mL compared with <20 ng/mL (p=0.024). Multivariable analysis showed that the association between hepcidin and outcome was independent of risk (European System for Cardiac Operative Risk Evaluation), transfusion and Hb.

CONCLUSIONS:

Functional iron deficiency was the most common cause of anaemia but was not associated with outcome. The only haematological parameter that was associated with outcome was hepcidin concentration, which is a novel finding and introduces further complexity into our understanding of the role of iron and its regulation by hepcidin. We propose that future research should target patients with elevated hepcidin.
severity. Anaemia in the elderly is always associated with a poor prognosis that is in terms of mortality, morbidity and risk of fragility. The diagnostic approach to anemia in the elderly is the same as in younger individual. There are many causes of anaemia; anaemia balance is a complex diagnostic process. Most anaemias are due to a deficiency, chronic inflammation or comorbidity. However, in the elderly, the etiology of anaemia is often multifactorial. In a number of cases remain unexplained anaemia. In a number of cases, anaemia remain unexplained. Treatment of anaemia is the treatment of the cause, but specific therapeutic aspects to the elderly should be considered, as among other martial substitution or use of erythropoietin (EPO).

ANEMIA MANAGEMENT

OTHER

A systematic review of pre-operative anaemia and blood transfusion in patients with fractured hips.

Potter LJ, Doleman B, Moppett IK.

Author information

- 1Anaesthesia and Critical Care Research Group, Division of Clinical Neuroscience, University of Nottingham, Nottingham, UK.

Abstract

We systematically reviewed the observational associations of anaemia with outcomes and the effects of interventions to increase haemoglobin concentrations following hip fracture in older people. Anaemia on hospital admission was associated with increased mortality, relative risk 1.64 (95% CI 1.47-1.82), p < 0.0001. After adjustment for co-morbidities, the association of anaemia with increased mortality remained in four of eight observational studies. There was no association of postoperative transfusion with mortality after adjusting for covariates. Transfusion at 80 g.l(-1) vs 100 g.l(-1) increased acute myocardial infarction, relative risk 1.67 (95% CI 1.01-2.77), p = 0.05. Transfusion threshold was not associated with differences in other outcomes. There were insufficient high-quality studies to inform pre-operative blood transfusion or the use of peri-operative iron or erythropoietin. Studies for most interventions recruited too few participants to determine effects on infections, mortality or function.

ANESTHETIC TECHNIQUES

AUTOTRANSFUSION


Early autologous fresh whole blood transfusion leads to less allogeneic transfusions and is safe.


Author information

- 1From the Division of Trauma, Critical Care, Burns, and Emergency Surgery (B.J., V.P., M.K., G.V., N.K., A.T., A.A., T.O., P.R.), Department of Surgery, University of Arizona, Tucson, Arizona; and Division of Acute Care Surgery and Surgical Critical Care (K.I., S.S.), LAC County+ USC Medical Center, University of Southern California, Los Angeles, California.

Abstract

BACKGROUND:

The practice of transfusing ones' own shed whole blood has obvious benefits such as reducing the need for allogeneic transfusions and decreasing the need for other fluids that are typically used for resuscitation in trauma. It is not widely adopted in the trauma setting because of the concern of worsening coagulopathy and the inflammatory process. The aim of this study was to assess outcomes in trauma patients receiving whole blood autotransfusion (AT) from hemothorax.

METHODS:

This is a multi-institutional retrospective study of all trauma patients who received autologous whole blood transfusion from hemothorax from two Level I trauma centers. Patients who received AT were matched to patients who did not receive AT (No-AT) using propensity score matching in a 1:1 ratio for admission age, sex, mechanism, type of injury, Injury Severity Score (ISS), Glasgow Coma Scale (GCS) score, systolic blood pressure, heart rate, hemoglobin, international normalized ratio (INR), prothrombin time, partial prothrombin time, and lactate. AT was defined as transfusion of autologous blood from patient's hemothorax, which was collected from the chest tubes and anticoagulated with citrate phosphorous dextrose. Outcome measures were in-hospital complications, 24-hour INR, and mortality. In-hospital complications were defined as adult respiratory distress syndrome, sepsis, disseminated intravascular coagulation, renal insufficiency, and transfusion-related acute lung injury.
RESULTS:

A total of 272 patients (AT, 136; No-AT, 136) were included. There was no difference in admission age (p = 0.6), ISS (p = 0.56), head Abbreviated Injury Scale (AIS) score (p = 0.42), systolic blood pressure (p = 0.88), and INR (p = 0.62) between the two groups. There was no significant difference in in-hospital complications (p = 0.61), mortality (p = 0.51), and 24-hour postadmission INR (0.31) between the AT and No-AT groups. Patients who received AT had significantly lower packed red blood cell (p = 0.01) and platelet requirements (p = 0.01). Cost of transfusions (p = 0.01) was significantly lower in the AT group compared with the No-AT group.

CONCLUSION:

The autologous transfusion of the patient's shed blood collected through chest tubes for hemothorax was found to be safe without complications in this study. It also reduced the need for allogeneic transfusions and decreased hospital costs. This study demonstrates safety data that would help in designing larger prospective multicenter studies to determine whether this practice is truly safe and effective.


Red blood cell salvage during obstetric hemorrhage.

Milne ME¹, Yazer MH, Waters JH.

Author information

¹The University of Pittsburgh School of Medicine, the Departments of Pathology, Anesthesiology, and Bioengineering, University of Pittsburgh, the Institute for Transfusion Medicine, and the Department of Anesthesiology, Magee-Women's Hospital of UPMC, Pittsburgh, Pennsylvania.

Abstract

OBJECTIVE:

To describe which obstetric patients lose enough blood during postpartum hemorrhage to receive a reinfusion of intraoperative blood salvage.

METHODS:

Eight years of intraoperative blood salvage data from a regional tertiary care maternity hospital were analyzed. The volume of blood returned through intraoperative blood salvage was standardized to the volume of red blood cells in an allogeneic red blood cell unit from the blood bank.

CONCLUSION:

Although intraoperative blood salvage was attempted on many patients, on only 21% of the women was a sufficient amount of intraoperative shed blood collected to proceed with reinfusion. Patients who experienced bleeding or who underwent a cesarean hysterectomy were the most likely to receive a reinfusion of intraoperative blood salvage-processed blood.

LEVEL OF EVIDENCE:

II.


Evaluation of erythrocyte and reticulocyte parameters as indicative of iron deficiency in patients with anemia of chronic disease.

Torino AB¹, Gilberti Mde F¹, da Costa E¹, de Lima GA¹, Grotto HZ².

Author information

¹Universidade Estadual de Campinas (UNICAMP), Campinas, SP, Brazil.
²Universidade Estadual de Campinas (UNICAMP), Campinas, SP, Brazil. Electronic address: lenagrotto@gmail.com.

Abstract

OBJECTIVE:

The aim of this study was to evaluate the effectiveness of mature red cell and reticulocyte parameters to identify
three conditions: iron deficiency anemia, anemia of chronic disease, and anemia of chronic disease associated with absolute iron deficiency.

METHODS:

Peripheral blood cells from 117 adult patients with anemia were classified according to iron status, inflammation, and hemoglobinopathies as: iron deficiency anemia (n=42), anemia of chronic disease (n=28), anemia of chronic disease associated with iron deficiency anemia (n=22), and heterozygous β-thalassemia (n=25). The percentage of microcytic erythrocytes, hypochromic erythrocytes, and the levels of hemoglobin in both reticulocytes and mature red cells were determined. Receiver operating characteristic analysis was used to evaluate the accuracy of the parameters in differentiating anemia.

RESULTS:

There was no difference between the groups of iron deficiency and anemia of chronic disease associated with absolute iron deficiency for any of the parameters. The percentage of hypochromic erythrocytes was the best parameter to identify absolute iron deficiency in patients with anemia of chronic disease (area under curve=0.785; 95% confidence interval: 0.661-0.909 with sensitivity of 72.7%, and specificity of 70.4%; cut-off value 1.8%). The formula microcytic erythrocyte count minus hypochromic erythrocyte count was very accurate to differentiate iron deficiency anemia from heterozygous β-thalassemia (area under curve=0.977; 95% confidence interval: 0.950-1.005 with a sensitivity of 96.2%, and specificity of 92.7%; cut-off value 13.8).

CONCLUSION:

The erythrocyte and reticulocyte indices are moderately good to identify absolute iron deficiency in patients with anemia of chronic disease.


Author information

Abstract

BACKGROUND:

Cell-saving devices (CS) are frequently used in cardiac surgery to reduce transfusion requirements, but convincing evidence from randomized clinical trials is missing. Filtration of salvaged blood in combination with the CS is widely used to improve the quality of retransfused blood, but there are no data to justify this approach.

METHODS:

To determine the contribution of CS and filters on transfusion requirements, we performed a multicenter factorial randomized clinical trial in two academic and four nonacademic hospitals. Patients undergoing elective coronary, valve, or combined surgical procedures were included. The primary end point was the number of allogeneic blood products transfused in each group during hospital admission.

RESULTS:

From 738 included patients, 716 patients completed the study (CS+filter, 175; CS, 189; filter, 175; neither CS nor filter, 177). There was no significant effect of CS or filter on the total number of blood products (fraction [95% confidence interval]: CS, 0.96 [0.79, 1.18]; filter, 1.17 [0.96, 1.43]). Use of a CS significantly reduced red blood cell transfusions within 24 hours (0.75 [0.61,0.92]), but not during hospital stay (0.86 [0.71, 1.05]). Use of a CS was significantly associated with increased transfusions of fresh frozen plasma (1.39 [1.04, 1.86]), but not with platelets (1.25 [0.93, 1.68]). Use of a CS significantly
reduced the percentage of patients who received any transfusion (odds ratio [95% confidence interval]: 0.67 [0.49, 0.91]), whereas filters did not (0.92 [0.68, 1.25]).

CONCLUSIONS:

Use of a CS, with or without a filter, does not reduce the total number of allogeneic blood products, but reduces the percentage of patients who need blood products during cardiac surgery.

BLOOD UTILIZATION

Transfusion and Management of Surgical Patients with Hematologic Disorders.

Douglas WG¹, Uffort E², Denning D².

Author information

- ¹Department of Clinical Sciences, Florida State University College of Medicine, 1401 Centerville Road, Suite 107, Tallahassee, FL 32308, USA. Electronic address: wade.douglas@med.fsu.edu.
- ²Department of Surgery, Marshall University Joan C. Edwards School of Medicine, 1600 Medical Center Drive, Huntington, WV 25701, USA.

Abstract

Clinical trials have provided guidance in developing triggers for transfusing in the hemodynamically stable patient. These studies have identified that improved outcomes can be obtained in the massively transfused patient when platelets and fresh frozen plasma are transfused with packed red blood cells. Studies that characterize the complications of transfusions, such as transfusion-related acute lung injury and poor cancer-related outcomes, are discussed. Emerging data that characterize the risk factors associated with transfusion-related acute lung injury and suggest metastasis and local recurrence occur at a higher rate in the transfused patient are discussed. Hematologic disorders commonly encountered by surgeons are discussed.


Restrictive versus liberal transfusion strategy for red blood cell transfusion: systematic review of randomised trials with meta-analysis and trial sequential analysis.

Holst LB¹, Petersen MW², Haase N², Perner A², Wetterslev J³.

Author information

- ¹Department of Intensive Care 4131, Copenhagen University Hospital, Rigshospitalet, Blegdamsvej 9, DK-2100 Copenhagen, Denmark lars.broksoe.holst@regionh.dk.
- ²Department of Intensive Care 4131, Copenhagen University Hospital, Rigshospitalet, Blegdamsvej 9, DK-2100 Copenhagen, Denmark.
- ³Copenhagen Trial Unit, Centre for Clinical Intervention Research 7812, Copenhagen University Hospital, Rigshospitalet, Copenhagen, Denmark.

OBJECTIVE:

To compare the benefit and harm of restrictive versus liberal transfusion strategies to guide red blood cell transfusions.

DESIGN:

Systematic review with meta-analyses and trial sequential analyses of randomised clinical trials.

DATA SOURCES:

Cochrane central register of controlled trials, SilverPlatter Medline (1950 to date), SilverPlatter Embase (1980 to date), and Science Citation Index Expanded (1900 to present). Reference lists of identified trials and other systematic reviews were assessed, and authors and experts in transfusion were contacted to identify additional trials.

TRIAL SELECTION:

Published and unpublished randomised clinical trials that evaluated a restrictive compared with a liberal transfusion strategy in adults or children, irrespective of language, blinding procedure, publication status, or sample size.

DATA EXTRACTION:

Two authors independently screened titles and abstracts of trials identified, and relevant trials were evaluated in full text for eligibility. Two reviewers then independently extracted data on methods, interventions, outcomes, and risk of bias from included trials. random effects models
RESULTS:

31 trials totalling 9813 randomised patients were included. The proportion of patients receiving red blood cells (relative risk 0.54, 95% confidence interval 0.47 to 0.63, 8923 patients, 24 trials) and the number of red blood cell units transfused (mean difference -1.43, 95% confidence interval -2.01 to -0.86) were lower with the restrictive compared with liberal transfusion strategies. Restrictive compared with liberal transfusion strategies were not associated with risk of death (0.86, 0.74 to 1.01, 5707 patients, nine lower risk of bias trials), overall morbidity (0.98, 0.85 to 1.12, 4517 patients, six lower risk of bias trials), or fatal or non-fatal myocardial infarction (1.28, 0.66 to 2.49, 4730 patients, seven lower risk of bias trials). Results were not affected by the inclusion of trials with unclear or high risk of bias. Using trial sequential analyses on mortality and myocardial infarction, the required information size was not reached, but a 15% relative risk reduction or increase in overall morbidity with restrictive transfusion strategies could be excluded.

CONCLUSIONS:

Compared with liberal strategies, restrictive transfusion strategies were associated with a reduction in the number of red blood cell units transfused and number of patients being transfused, but mortality, overall morbidity, and myocardial infarction seemed to be unaltered. Restrictive transfusion strategies are safe in most clinical settings. Liberal transfusion strategies have not been shown to convey any benefit to patients.


Liberal or restrictive transfusion after cardiac surgery.

Murphy GJ1, Pike K, Rogers CA, Wordsworth S, Stokes EA, Angelini GD, Reeves BC; TITRe2 Investigators.

Collaborators (79)


Author information

1 'From the British Heart Foundation, Department of Cardiovascular Sciences, University of Leicester, and Glenfield General Hospital, Leicester (G.J.M.), Bristol Heart Institute, School of Clinical Sciences, University of Bristol, Bristol Royal Infirmary, Bristol (K.P., C.A.R., G.D.A., B.C.R.), and Health Economics Research Centre, Nuffield Department of Population Health, University of Oxford, Oxford (S.W., E.A.S.) - all in the United Kingdom.

Abstract

BACKGROUND:

Whether a restrictive threshold for hemoglobin level in red-cell transfusions, as compared with a liberal threshold, reduces postoperative morbidity and health care costs after cardiac surgery is uncertain.

METHODS:

We conducted a multicenter, parallel-group trial in which patients older than 16 years of age who were undergoing nonemergency cardiac surgery were recruited from 17 centers in the United Kingdom. Patients with a postoperative hemoglobin level of less than 9 g per deciliter were randomly assigned to a restrictive transfusion threshold (hemoglobin level <7.5 g per deciliter) or a liberal transfusion threshold (hemoglobin level <9 g per deciliter). The primary outcome was a serious infection (sepsis or wound infection) or an ischemic event (permanent stroke [confirmation on brain imaging and deficit in motor, sensory, or coordination functions], myocardial infarction, infarction of the gut, or acute kidney injury) within 3 months after randomization. Health care costs, excluding the index surgery, were estimated from the day of surgery to 3 months after surgery.

RESULTS:

A total of 2007 patients underwent randomization; 4 participants withdrew, leaving 1000 in the restrictive-threshold group and 1003 in the liberal-threshold group. Transfusion rates after randomization were 53.4% and 92.2% in the two groups, respectively. The primary outcome occurred in 35.1% of the patients in the restrictive-threshold group and 33.0% of the patients in the liberal-threshold group (odds ratio, 1.11; 95% confidence interval [CI], 0.91 to 1.34; P=0.30); there was no indication of heterogeneity according to subgroup. There were more deaths in the restrictive-threshold group than in the liberal-
A restrictive transfusion threshold after cardiac surgery was not superior to a liberal threshold with respect to morbidity or health care costs.

**CONCLUSIONS:**

Massive Transfusion for Hemorrhagic Shock: What Every Critical Care Nurse Needs to Know.

**Thibeault S**

**Author information**

- 'Department of Anesthesiology, Yale-New Haven Hospital, 20 York Street, New Haven, CT 06510, USA. Electronic address: SusanThibeault@hotmail.com.

**Abstract**

Massive transfusion is defined as complete replacement of a patient's blood volume or approximately 10 units of packed red blood cells within a 24-hour period or one red blood cells volume in 24 hours for a pediatric patient. This article reviews the most recent understanding and recommendations in massive transfusion along with the unintended consequences in the management of patients with profound hemorrhage.

**COAG/ANTI COAG**


Perioperatively acquired disorders of coagulation.

**Grottke O**, **Fries D**, **Nascimento B**.

**Author information**

- 'aDepartment of Anaesthesiology, RWTH Aachen University Hospital, Aachen, Germany
- bDepartment of Surgical and General Critical Care Medicine, Medical University Innsbruck, Innsbruck, Austria
- cDepartment of Surgery, Sunnybrook Health Sciences Centre, University of Toronto, Toronto, Canada.

**Abstract**

**PURPOSE OF REVIEW:**

To provide an overview of acquired coagulopathies that can occur in various perioperative clinical settings. Also described are coagulation disturbances linked to antithrombotic medications and currently available strategies to reverse their antithrombotic effects in situations of severe hemorrhage.

**RECENT FINDINGS:**

Recent studies highlight the link between low fibrinogen and decreased fibrin polymerization in the development of acquired coagulopathy. Particularly, fibrinogen deficits are observable after cardiopulmonary bypass in cardiac surgery, on arrival at the emergency room in trauma patients, and with ongoing bleeding after child birth. Regarding antithrombotic therapy, although new oral anticoagulants offer the possibility of efficacy and relative safety compared with vitamin K antagonists, reversal of their anticoagulant effect with nonspecific agents, including prothrombin complex concentrate, has provided conflicting results. Specific antidotes, currently being developed, are not yet licensed for clinical use, but initial results are promising.

**SUMMARY:**

Targeted hemostatic therapy aims to correct coagulopathies in specific clinical settings, and reduce the need for allogeneic transfusions, thus preventing massive transfusion and its deleterious outcomes. Although there are specific guidelines for reversing anticoagulation in patients treated with antiplatelet agents or warfarin, there is currently little evidence to advocate comprehensive recommendations to treat drug-induced coagulopathy associated with new oral anticoagulants.

**An Exploratory Cohort Study Comparing Prothrombin Complex Concentrate and Fresh Frozen Plasma for the Treatment of Coagulopathy After Complex Cardiac Surgery.**

Abstract

BACKGROUND:
Administration of coagulation factor concentrates to treat bleeding after cardiac surgery with cardiopulmonary bypass might be a strategy for reducing allogeneic blood transfusions, particularly for patients treated with warfarin preoperatively. We performed an exploratory analysis on whether the use of prothrombin complex concentrate (PCC) is safe and effective compared with fresh frozen plasma (FFP) to treat coagulopathy after pulmonary endarterectomy surgery with deep hypothermic circulatory arrest.

METHODS:
Consecutive adult patients who underwent pulmonary endarterectomy surgery between January 2010 and September 2012 and received PCC or FFP to treat coagulopathy were studied. Blood loss during the first 12 hours of admission to the intensive care unit and patient outcomes were compared with propensity score adjustment.

RESULTS:
Three hundred fifty-one patients underwent pulmonary endarterectomy surgery, all of whom had warfarin discontinued for up to 5 days before surgery; bleeding complications requiring transfusion of blood products were observed in 108 (31%) patients. Of those, 55 received only FFP and 45 received only PCC, whereas 8 received both. Blood loss was significantly greater in the FFP group compared with the PCC group after 12 hours (median [interquartile range], 650 mL [325-1075] vs 277 mL [175-608], \( P = 0.008 \)). However, there was no difference in the frequency of patients receiving a red blood cell transfusion (number [percent], 44 [80%] vs 34 [76%], \( P = 0.594 \)) or in the number of units of red blood cells transfused (median [interquartile range], 2 [1-4] vs 3 [1-5] units, \( P = 0.181 \)).

The final propensity score included preoperative international normalized ratio, postoperative activated partial thromboplastin time, and postoperative platelet count. After inclusion of the propensity score in the regression analyses, there were no differences between patients receiving only PCC and patients receiving only FFP in the need for renal replacement therapy (odds ratio [OR] 2.39, 95% confidence interval [CI] 0.51-11.20, \( P = 0.27 \)), 30-day-mortality (OR 0.32, 95% CI 0.03-3.36, \( P = 0.35 \)), intracranial hemorrhage (OR 0.73, 95% CI 0.14-3.89, \( P = 0.71 \)), hospital length of stay (hazard ratio 0.77, 95% CI 0.50-1.19, \( P = 0.24 \)), or duration of intensive care stay (hazard ratio 0.91, 95% CI 0.59-1.40, \( P = 0.66 \)).

CONCLUSIONS:
This retrospective analysis suggests that PCC may be an alternative to FFP in patients previously treated with warfarin who are coagulopathic after major cardiac surgery. Randomized controlled studies powered to evaluate efficacy and important postoperative outcomes for patients receiving PCC versus FFP for coagulopathic bleeding after cardiopulmonary bypass are warranted.
Robertson et al. (JAMA 2014; 312:36--47) investigated the effects of two different thresholds of hemoglobin (Hb) to guide red blood cells transfusions (RBCT; 7 g/dL vs. 10 g/dL) in patients suffering from traumatic brain injury (TBI). In a two-center, controlled, open-label trial (from May 2006 and August 2012), comatose patients with a closed TBI were randomized within 6 hours since initial resuscitation to one of the two RBCT strategies and, in a factorial design (2x2), to receive erythropoietin (EPO) or placebo. Patients were excluded if they had a Glasgow Coma Scale (GCS) score of 3 with fixed and dilated pupils, penetrating trauma, pregnancy, life-threatening systemic injuries and severe preexisting diseases. A total of 200 patients (7 g/dL with [n=49] or without EPO [n=50]; 10 g/dL with [n=53] or without EPO [n=48]) were enrolled among 598 who were screened. There was no interaction between EPO and Hb thresholds on the primary outcome, which was the occurrence of favorable neurological outcome, assessed using the Glasgow Outcome Scale (GOS) at 6 months after the injury (favorable = GOS 4--5). Favorable outcome was similar between patients included in the 7g/dL (37/87 - 43%) and the 10g/dL group (31/94 - 33%) as if receiving EPO or placebo, even after adjustment for several covariates. Thromboembolic events were significantly more frequent in the group transfused at 10 g/dL (22/101 [22%] vs. 8/99 [8%]; p = 0.009). We discussed how these results might influence the management of such patients as well as the methodological limitations that underline the need for further investigations.

## Multimodal approach to blood conservation in the surgical patient.

**Nwosu AD**

### Author information

- 'Department of Anaesthesia, Consultant Anesthetist, National Orthopaedic Hospital, Enugu, Nigeria.

### Abstract

Allogeneic blood remains a scarce and expensive resource, even as the risks of disease transmission and other complications associated with blood transfusion are well known. Blood conservation, however, is a quality-of-care concept that transcends these and other known and unknown complications of transfusion, to involve a gamut of strategies meant to prevent exposure of patients to allogeneic blood. In urging a halt to incessant allogeneic blood transfusion, we report three cases to highlight the benefits of multimodal multidisciplinary collaboration in blood conservation. The three patients were chosen on account of either religious objection to any blood transfusion or the likelihood of exposure to several units of allogeneic blood. The blood conservation plan proposed for each patient was discussed with the respective surgeon and patient. Multimodal multidisciplinary approach to blood conservation utilizing combination of strategies best suited for each individual patient will remarkably reduce the exposure of patients to allogeneic blood thereby ensuring better use of the scarce resource, and preventing potential clinical complications and spiritual trespass of Jehovah's Witnesses.

## Risk of bleeding and use of platelet transfusions in patients with hematological malignancies: recurrent event analysis.

**Stanworth SJ**, **Hudson CL**, **Estcourt LJ**, **Johnson RJ**, **Wood EM**

### Author information

- 'NHSBT/Oxford University Hospitals NHS Trust; simon.stanworth@nhsbt.nhs.uk.
- 'NHS Blood and Transplant;
- 'Monash University.

### Abstract

A recent randomized trial (TOPPS) compared prophylactic platelet transfusions (for counts <10x109/L) with a strategy of no-prophylaxis in adults with hematologic malignancies. 70% of enrolled patients received autologous hematopoietic stem cell transplant (HSCT). In this analysis, statistical models were developed to explore which patient factors or clinical characteristics are important prognostic factors for bleeding. These models were presented for baseline characteristics and for recurrent analysis of bleeding to assess the risks of WHO grade 2-4 bleeding on any given day. Additional analyses explored the importance of fever. Treatment plan (chemotherapy/allogeneic hematopoietic stem cell transplant), female sex, and treatment arm (no-prophylaxis) were significantly associated with increased...
number of days of bleeding. The number of days with a platelet count <10x10^9/L was significantly associated with a grade 2-4 bleed (p<0.0001). Patients with a temperature of at least 38°C had the highest hazard of a grade 2-4 bleed (HR: 1.7, 95% CI: 1.3 to 2.4, versus temp <37.50°C). There was no evidence that minor bleeding predicted a grade 2-4 bleed. The results highlighted the limited role of correction of thrombocytopenia by platelet transfusion to reduce risk of bleeding. Clinically stable patients undergoing autologous HSCT had the lowest risk of bleeding and benefited least from prophylactic platelet transfusions. Prospective studies are required to address the usefulness of risk factors to support better targeted platelet transfusions.


Platelet transfusion: a clinical practice guideline from the AABB.


Abstract

BACKGROUND:

The AABB (formerly, the American Association of Blood Banks) developed this guideline on appropriate use of platelet transfusion in adult patients.

METHODS:

These guidelines are based on a systematic review of randomized, clinical trials and observational studies (1900 to September 2014) that reported clinical outcomes on patients receiving prophylactic or therapeutic platelet transfusions. An expert panel reviewed the data and developed recommendations using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework.

RECOMMENDATION 1:

The AABB recommends that platelets should be transfused prophylactically to reduce the risk for spontaneous bleeding in hospitalized adult patients with therapy-induced hypoproliferative thrombocytopenia. The AABB recommends transfusing hospitalized adult patients with a platelet count of 10 × 10^9 cells/L or less to reduce the risk for spontaneous bleeding. The AABB recommends transfusing up to a single apheresis unit or equivalent. Greater doses are not more effective, and lower doses equal to one half of a standard apheresis unit are equally effective. (Grade: strong recommendation; moderate-quality evidence).

RECOMMENDATION 2:

The AABB suggests prophylactic platelet transfusion for patients having elective central venous catheter placement with a platelet count less than 20 × 10^9 cells/L. (Grade: weak recommendation; low-quality evidence).

RECOMMENDATION 3:

The AABB suggests prophylactic platelet transfusion for patients having elective diagnostic lumbar puncture with a platelet count less than 50 × 10^9 cells/L. (Grade: weak recommendation; very-low-quality evidence).

RECOMMENDATION 4:

The AABB suggests prophylactic platelet transfusion for patients having major elective nonneuraxial surgery with a platelet count less than 50 × 10^9 cells/L. (Grade: weak recommendation; very-low-quality evidence).

RECOMMENDATION 5:

The AABB recommends against routine prophylactic platelet transfusion for patients who are nonthrombocytopenic and have cardiac surgery with cardiopulmonary bypass. The AABB suggests platelet transfusion for patients having bypass who exhibit perioperative bleeding with thrombocytopenia and/or evidence of platelet dysfunction. (Grade: weak recommendation; very-low-quality evidence).

RECOMMENDATION 6:

The AABB cannot recommend for or against platelet transfusion for patients receiving antiplatelet therapy who have intracranial hemorrhage (traumatic or spontaneous). (Grade: uncertain recommendation; very-low-quality evidence).


Transfusion requirements in surgical oncology patients: a prospective, randomized controlled trial.

Abstract

BACKGROUND:

Several studies have indicated that a restrictive erythrocyte transfusion strategy is as safe as a liberal one in critically ill patients, but there is no clear evidence to support the superiority of any perioperative transfusion strategy in patients with cancer.

METHODS:

In a randomized, controlled, parallel-group, double-blind (patients and outcome assessors) superiority trial in the intensive care unit of a tertiary oncology hospital, the authors evaluated whether a restrictive strategy of erythrocyte transfusion (transfusion when hemoglobin concentration <7 g/dl) was superior to a liberal one (transfusion when hemoglobin concentration <9 g/dl) for reducing mortality and severe clinical complications among patients having major cancer surgery. All adult patients with cancer having major abdominal surgery who required postoperative intensive care were included and randomly allocated to treatment with the liberal or the restrictive erythrocyte transfusion strategy. The primary outcome was a composite endpoint of mortality and morbidity.

RESULTS:

A total of 198 patients were included as follows: 101 in the restrictive group and 97 in the liberal group. The primary composite endpoint occurred in 19.6% (95% CI, 12.9 to 28.6%) of patients in the liberal-strategy group and in 35.6% (27.0 to 45.4%) of patients in the restrictive-strategy group (P = 0.012). Compared with the restrictive strategy, the liberal transfusion strategy was associated with an absolute risk reduction for the composite outcome of 16% (3.8 to 28.2%) and a number needed to treat of 6.2 (3.5 to 26.5).

CONCLUSION:

A liberal erythrocyte transfusion strategy with a hemoglobin trigger of 9 g/dl was associated with fewer major postoperative complications in patients having major cancer surgery compared with a restrictive strategy.

Rinsho Ketsueki. 2015;56(2):177-84. doi: 10.11406/rinketsu.56.177.

Recent advances in pathophysiology and treatment of immune thrombocytopenia.

Kashiwagi H1, Tomiyama Y.

Author information

• 'Department of Hematology and Oncology, Graduate School of Medicine, Osaka University.

Abstract

Immune thrombocytopenia (ITP) is an autoimmune disorder characterized by isolated thrombocytopenia caused by immune-mediated platelet destruction and impairment of platelet production. Recent studies have uncovered details involving the target regions of platelet-associated anti-GPIIb/IIIa antibodies, pathological differences depending on the specificity of target antigens, and cellular abnormalities, especially impairment of regulatory T cells contributing to the pathogenesis of ITP. Treatment of ITP has been changed dramatically by the application of thrombopoietin receptor agonists, TPO-RAs, in patients unresponsive to traditional steroids and splenectomy. Rituximab has also been used in Western countries for ITP patients and its long-term efficacy has become increasingly clear. Clinical problems awaiting solution in ITP management include improving the efficacy of treatments for newly-diagnosed ITP, confirmation of the long-term efficacy and safety of TPO-RAs, and determination of the positioning of rituximab in the treatment sequence of ITP.
Abstract

There is still debate on how platelet transfusions should be used to prevent severe bleeding. The aim of our study is to assess the clinical efficacy of thromboelastometry in reducing number of prophylactic platelet transfusions in patients with hematological malignancies. One hundred hematological malignancy patients were included in the study. Six units random donor platelets (RDPs) was given to the first group, three units RDPs was given to the second group, one unit single donor platelets (SDPs) was given to the third group, and 1/2 unit SDPs was given to the fourth group. Before and 15 minutes after transfusion, rotation thromboelastometry (ROTEM) was performed (Pentapharm GmbH, Munich, Germany). ROTEM® parameters did not show any statistical difference between 'low dose' and 'high dose' random or single donor platelet transfusions. Therefore, low dose platelet transfusion can be considered because of its reduced adverse transfusion reactions and economic burden.

HEMOSTATIC MANAGEMENT

DRUGS


The beneficial effect of Batroxobin on blood loss reduction in spinal fusion surgery: a prospective, randomized, double-blind, placebo-controlled study.


Author information

• 'Department of Spine Surgery, Honghui Hospital, Xi'an Jiaotong University College of Medicine, No.
safely and effectively reduced the total amount of perioperative blood loss

**HEMOSTATIC MANAGEMENT**

**SURGICAL**


Tranexamic Acid Treatment Decreases Hidden Blood Loss in Total Knee Arthroplasty.

Chen X†, Zhu X, Yang S, Lin W, Wang L.

Author information

- †Department of Orthopaedics, The First Affiliated Hospital of Wenzhou Medical University, Wenzhou, China.

Abstract

The aim of our meta-analysis is to investigate the effect of tranexamic acid (TXA) on hidden blood loss (HBL) in total knee arthroplasty (TKA). A literature search was undertaken to identify all cohort studies that investigated the effect of TXA on HBL in TKA. Both electronic database search and manual search were used to retrieve studies related to the topic, and the retrieved studies were screened according to our stringent inclusion and exclusion criteria. Comprehensive Meta-analysis 2.0 software (CMA 2.0) was used for statistical analysis of the data retrieved from selected case-cohort studies. A total of 480 studies were initially retrieved, and after further screening and selection, 7 studies were eventually incorporated into our meta-analysis. The 7 studies included a total of 530 osteoarthritis or rheumatic arthritis patients who had TKA, and among them, 250 patients received an intravenous injection of TXA as cases and 280 patients received an intravenous injection of sodium chloride as sterile placebo controls. Our meta-analysis revealed that the volume of HBL of cases was lower than that of controls, which was statistically significant. The ethnicity-stratified analysis suggested that the volume of HBL of cases was significantly lower than that of controls in both the Asians and whites, also at statistically significant levels. Our meta-analysis provides strong evidence that TXA significantly reduces HBL in TKA, thus TXA can be used as a standard drug to prevent/reduce HBL in TKA.

**IMMUNOMODULATION / STORAGE LESION**


The Impact of Perioperative Red Blood Cell Transfusions on Long-Term

**Outcomes after Hepatectomy for Colorectal Liver Metastases.**


Author information

- †Division of General Surgery, Sunnybrook Health Sciences Centre - Odette Cancer Centre, Toronto, ON, Canada, julie.hallet@sunnybrook.ca.

Abstract

BACKGROUND:

Red blood cell transfusions (RBCTs) are associated with cancer recurrence following resection of colorectal cancer. Their impact after colorectal liver metastases (CRLM) resection remains debated. We sought to explore the association between perioperative RBCT and oncologic outcomes following resection of CRLM.

METHODS:

We reviewed patients undergoing partial hepatectomy for CRLM from 2003 to 2012 at a single institution. Date of death was abstracted from a validated population-based cancer registry. Primary outcome was overall survival (OS). Secondary outcome was recurrence-free survival (RFS). Survivals were estimated using Kaplan-Meier methods and compared with log-rank test based on transfusion status. Cox regression analysis examined the association of RBCT with OS and RFS, while adjusting for age, preoperative chemotherapy, Clinical Risk Score, and period of treatment (2003-2007 vs. 2008-2012).

RESULTS:

Among 483 patients, 27.5 % received RBCT. Ninety-day postoperative mortality was 4.8 %. At median follow-up of 33 (interquartile range 20.1-54.8) months, 5-year OS was inferior in transfused patients (45.9 vs. 61.0 %; p < 0.0001). Five-year RFS was decreased with RBCT (15.5 vs. 31.6 %; p < 0.0001). The difference persisted when considering only 90-day survivors for 5-year OS (53.1 vs. 61.9 %, p = 0.023) and RFS (15.6 vs. 31.6 %; p < 0.0001). After adjustment for prognostic factors, RBCT was independently associated with decreased OS (hazard ratio 2.24; 95 % confidence interval 1.60-3.15) and RFS (hazard ratio 1.71; 95 % confidence interval 1.28-2.28).

CONCLUSIONS:

Perioperative RBCT is independently associated with decreased OS and RFS following hepatectomy for CRLM. Interventions to minimize and rationalize the use of RBCT
for hepatectomy are warranted to mitigate this detrimental effect on long-term outcomes.

**OB/GYN**


**Post-partum anemia and factors that work against alleviation of the anemia.**

Kobiyama A¹, Suzuki E, Takayama Y.

**Author information**

• ¹Graduate School of Health and Welfare Sciences, International University of Health and Welfare Graduate School, Tokyo, Japan.

**Abstract**

**AIM:**

This study aimed to clarify conditions of women experiencing post-partum anemia and identify factors that work against the alleviation of anemia.

**METHODS:**

This was a retrospective longitudinal study, involving 246 women giving birth at five participating institutions, diagnosed with anemia on day 3 post-partum, and given a blood sample at the medical examination 1 month after the birth. With answers about alleviation of anemia during the 1 month post-partum period as an objective variable, and explanatory variables, multiple logistic regression analysis was performed. The explanatory variables included demographic data of the participants, information about anemia, following the nutrition instruction advice for anemia alleviation, family structure and others assisting the participants, and self-management skills (measured by the Self-Management Skill [SMS] scale).

**RESULTS:**

The present authors collected 211 valid responses; the average age was 32.6 years. The mean hemoglobin values on the 3rd and 30th days post-partum were 9.6 and 12.0 g/dL, respectively. One fifth of the participants (21.3%) showed no anemia alleviation. The mean value on the SMS scale was 28.35, and the anemia alleviated group (30.78) was significantly higher than the non-alleviated group (19.38). Results of the multiple logistic regression analysis showed a strong relationship between anemia risk and self-management skills. The absence of anemia alleviation increased 2.51 times as the total score of the SMS decreased 1 point.

**CONCLUSION:**

There is an urgent need to develop an intervention program to alleviate post-partum anemia focusing on the low score items because self-management skills strongly affect alleviation improvement.


**Recommendations for postpartum hemorrhage in women who decline blood transfusion.**

Kim TH¹, Lee HH, Kim JM.

**Author information**

• ¹Departments of Obstetrics and Gynecology, Soonchunhyang University College of Medicine, Bucheon, Republic of Korea.

**Abstract**

We read Thomas's recommendation (1) concerning emergency management to reduce the mortality and morbidity of women who decline blood transfusion, particularly Jehovah's witnesses. Our hospital is a tertiary university center that performs bloodless surgical techniques on patients, including Jehovah's witnesses. We provide some recommendations for postpartum hemorrhage (PPH) in Jehovah's witnesses based on our experience.


**Perioperative blood transfusion in gynecologic oncology surgery: analysis of the National Surgical Quality Improvement Program Database.**

Prescott LS¹, Aloia TA², Brown AJ³, Taylor JS³, Munsell MF⁴, Sun CC³, Schmeler KM³, Levenback CF³, Bodurka DC³.

**Author information**

• ¹Department of Gynecologic Oncology and Reproductive Medicine, The University of Texas MD Anderson Cancer Center, Houston, TX, United
Abstract

OBJECTIVE:

To use a large-scale multi-institutional dataset to quantify the prevalence of packed red blood cell transfusions and examine the associations between transfusion and perioperative outcomes in gynecologic cancer surgery.

METHODS:

The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) participant use file was queried for all gynecologic cancer cases between 2010 and 2012. Demographic, preoperative and intraoperative variables were compared between transfusion and non-transfusion groups using chi-squared, Fisher's exact and Wilcoxon rank-sum tests. The primary endpoint was 30-day composite morbidity. Secondary endpoints included composite surgical site infections, mortality and length of stay.

RESULTS:

A total of 8519 patients were analyzed, and 13.8% received a packed red blood cell transfusion. In the multivariate analysis, after adjusting for key clinical and perioperative factors, including preoperative anemia and case magnitude, transfusion was associated with higher composite morbidity (OR = 1.85, 95% CI 1.5-2.24), surgical site infections (OR 1.80, 95% CI 1.39-2.35), mortality (OR 3.38, 95% CI 1.80-6.36) and length of hospital stay (3.02 days v. 7.17 days, P < 0.001).

CONCLUSIONS:

Blood transfusions are associated with increased surgical wound infections, composite morbidity and mortality. Based on our analysis of the NSQIP database, transfusion practices in gynecologic cancer should be scrutinized. Examination of institutional practices and creation of transfusion guidelines for gynecologic malignancies could potentially result in better utilization of blood bank resources and clinical outcomes among patients.

Age of Transfused Blood in Critically Ill Adults.


Abstract

Background Fresh red cells may improve outcomes in critically ill patients by enhancing oxygen delivery while minimizing the risks of toxic effects from cellular changes and the accumulation of bioactive materials in blood components during prolonged storage. Methods In this multicenter, randomized, blinded trial, we assigned critically ill adults to receive either red cells that had been stored for less than 8 days or standard-issue red cells (the oldest compatible units available in the blood bank). The primary outcome measure was 90-day mortality. Results Between March 2009 and May 2014, at 64 centers in Canada and Europe, 1211 patients were assigned to receive fresh red cells (fresh-blood group) and 1219 patients were assigned to receive standard-issue red cells (standard-blood group). Red cells were stored a mean (±SD) of 6.1±4.9 days in the fresh-blood group as compared with 22.0±8.4 days in the standard-blood group (P<0.001). At 90 days, 448 patients (37.0%) in the fresh-blood group and 430 patients (35.3%) in the standard-blood group had died (absolute risk difference, 1.7
percentage points; 95% confidence interval [CI], -2.1 to 5.5). In the survival analysis, the hazard ratio for death in the fresh-blood group, as compared with the standard-blood group, was 1.1 (95% CI, 0.9 to 1.2; P=0.38). There were no significant between-group differences in any of the secondary outcomes (major illnesses; duration of respiratory, hemodynamic, or renal support; length of stay in the hospital; and transfusion reactions) or in the subgroup analyses. Conclusions Transfusion of fresh red cells, as compared with standard-issue red cells, did not decrease the 90-day mortality among critically ill adults.

Blood management in total hip replacement: an analysis of factors associated with allogenic blood transfusion.

Wong S1, Tang H, de Steiger R.

Author information

• 1Western Hospital, Melbourne, Victoria, Australia.

Abstract

BACKGROUND:

The aim of this study was to audit the blood transfusion practice throughout the Epworth Healthcare Hospitals for patients undergoing primary total hip replacement (THR). We determined if blood-saving techniques were having an impact on the risk of allogenic blood transfusion and which patients were at risk of receiving allogenic blood transfusion.

METHODS:

This study uses a retrospective audit of 787 patients who had undergone primary THR surgery at three Melbourne hospitals: Epworth Richmond, Epworth Eastern and Epworth Freemasons in 2010. Patient demographics, transfusion requirements and blood-conserving techniques were recorded.

RESULTS:

One hundred and eighty (23%) patients received allogenic blood transfusion and 18 (2.3%) patients received autologous blood transfusion. On multivariate analysis, preoperative anaemia (odds ratio (OR) 4.7, P < 0.0001), female gender (OR 3.1, P < 0.0001) and patient age (OR 1.07 per year of age increase, P < 0.0001) were shown to be significantly associated with higher risk of allogenic blood transfusion. Use of spinal anaesthetics was found to be associated with lower risk of transfusion (OR 0.6, P = 0.0180) compared with general anaesthetics alone. Cell saver, acute normovolaemic haemodilution and re-infusion drain tube usage did not have a significant impact on reducing the risk of allogenic blood transfusion.

CONCLUSION:

Identification of patients at risk of blood transfusion, correction of preoperative anaemia and a restrictive transfusion policy are important factors to consider in effective perioperative blood management.

Intravenous iron sucrose for children with iron deficiency anaemia: a single institution study.

Mantadakis E1, Tsouvala E, Xanthopoulou V, Chatzimichael A.

Author information

• 1Department of Pediatrics, Democritus University of Thrace Faculty of Medicine and University General Hospital of Evros, Alexandroupolis, Thrace, Greece, emantada@med.duth.gr.

Abstract

BACKGROUND:

Intravenous iron sucrose is not recommended by its manufacturers for use in children despite extensive safety and efficacy data in adults.

METHODS:

We reviewed the experience of our department between January, 2011 and February, 2014 with the use of intravenous iron sucrose in children ≤14 years of age who failed in oral iron therapy for iron deficiency anaemia (IDA).

RESULTS:

Twelve children (6 females) aged 1.2-14 years (median age 8.9 years) received at least one dose of intravenous iron sucrose. Ten patients had IDA inadequately treated or...
non-responsive to oral iron therapy. One patient received therapy for blood transfusion avoidance and one for presumed iron refractory iron deficiency anemia (IRIDA). Iron sucrose infusions were given on alternate days up to three times per week. The number of infusions per patient ranged from 2 to 6 (median, 3), the individual doses from 100 mg to 200 mg (median, 200 mg), and the total doses from 200 mg to 1200 mg (median, 400 mg). Iron sucrose was effective in raising the hemoglobin concentration to normal in all patients with IDA, i.e., from 7.6±2.38 g/dL to 12.4±0.64 g/dL, within 31-42 days after the first infusion. The single patient with IRIDA demonstrated a 1.8 g/dL rise. Injection site disorders in three cases and transient taste perversion in one case were the only side effects.

CONCLUSION:

Intravenous iron sucrose appears to be safe and very effective in children with IDA who do not respond or cannot tolerate oral iron therapy.

**SURGICAL TECHNIQUES**


Effects of anesthetic technique on blood loss and complications after simultaneous bilateral total knee arthroplasty.

Zhu M¹, Chen JY, Tan YR, Yew AK, Chong HC, Chia SL, Lo NN, Yeo SJ.

Author information

• ¹Duke-NUS Graduate Medical School, 8 College Road, Singapore, 169857, Singapore, meng.zhu@u.duke.nus.edu.

Abstract

AIMS:

Anesthetic technique affects perioperative outcomes, but less was known in simultaneous bilateral total knee arthroplasty (BTKA). A single center, retrospective analysis was carried out to prove the hypothesis that utilization of regional anesthesia would result in favorable perioperative outcomes.

METHODS:

Medical records of patients admitted for simultaneous BTKA between 2004 and 2013 were analyzed. Two groups, the general anesthesia (GA) and regional anesthesia (RA) group, were identified. Patient preoperative characteristics were compared. Perioperative outcomes measured included blood loss, transfusion requirement, length of hospitalization, operating time, and 30-day perioperative complications.

RESULTS:

A total of 513 patients were identified, 54.6 % were performed under GA, and 45.4 % under RA. Patient characteristics were similar between the two groups, except that patients operated under GA were younger than those under RA. RA was associated with significantly less perioperative blood loss (981 vs. 1075 mL, p = 0.017) and 30-day complications (6.4 vs. 13.2 %, p = 0.016). Systemic and organ specific infections were particularly lower in the RA group (0.4 vs. 3.9 %, p = 0.009). Transfusion requirement, length of hospitalization, and operating time were similar between the two groups. After correcting for covariates, RA offered a 92 mL (p = 0.023) reduction in blood loss and 49 % less overall complications (p = 0.047), compared to GA.

CONCLUSION:

Patients who underwent simultaneous BTKA under RA had lesser blood loss and lower complication rate than GA. The impact of RA can be further exploited to improve perioperative outcomes of simultaneous BTKA in addition to various other interventions.

**TRANSFUSION HAZARDS**


Hypotensive transfusion reactions in the era of prestorage leukoreduction.

Pagano MB¹, Ness PM, Chajewski OS, King KE, Wu Y, Tobian AA.

Author information

• ¹Transfusion Services, Puget Sound Blood Center, Seattle, Washington.

Abstract

BACKGROUND:

Clinical characteristics of hypotensive transfusion reactions (HyTRs) have not been evaluated in the context of universal prestorage leukoreduction.
STUDY DESIGN AND METHODS:

A retrospective review of medical records of patients with HyTRs during the years 2011 and 2012 was performed at two academic medical institutions.

RESULTS:

Thirty-five patients with 35 HyTRs were identified, with an incidence of 1.33 per 10,000 transfusions. Red blood cells (RBCs) were implicated in 21 (60.0%) reactions and platelets (PLTs) and plasma (PL) in 11 (31.4%) and three (8.6%), respectively. The HyTR rate per blood component was 0.019% for PLTs, 0.015% for RBCs, and 0.006% for PL. Mean patient age was 65 years (range, 2 months-87 years), five (14.3%) were pediatric (<18 years), and 20 (57.1%) were male. The most frequent clinical settings associated with HyTRs were cardiac surgery (n = 13; 37.1%), hematology-oncology diseases (n = 11; 31.4%), and general surgery (n = 7; 20.0%). Extracorporeal circuits were used within 24 hours before the reaction in 16 patients (45.7%), including nine patients on cardiopulmonary bypass, four on dialysis or continuous venous-venous hemodialysis, and three on extracorporeal membrane oxygenation. Four patients (11.4%) received an angiotensin-converting enzyme inhibitor within 24 hours before the HyTR. Seventeen patients (48.6%) responded to stopping the transfusion and supportive treatment. Thirteen patients (37.1%) had severe reactions. No HyTR resulted in death.

CONCLUSION:

In the absence of bedside leukoreduction filters, several medical situations are associated with HyTRs. The pathophysiology of HyTRs is yet to be defined. The US hemovigilance system allows for standardization of transfusion reactions, which facilitates their classification and study.

Abstract

AIM:

The aim of this study was to reduce crossmatch to transfusion ratio through development of a new Blood Utilization Committee.

BACKGROUND:

Blood utilization hinges on the cooperation between transfusion services, medical staff, nursing and administration. Transfusion committees have attempted to bring about better oversight and bridge the gap between departments but in our institution this did not work until we had a catalyst to drive the effort. The unabashed desire and enthusiasm of one of our cardiac surgeons for self-improvement led to the formation of a new Blood Utilization Committee in October of 2012.

STUDY DESIGN AND METHODS:

Crossmatch and transfusion data were gathered from our blood bank information system starting with the 4th quarter of 2011 through the 1st quarter of 2013. The crossmatch to transfusion ratio (C:T) was calculated and comparisons were made between the results from before and after the initiation of the committee.

RESULTS:

At the commencement of the committee the initial C:T for the cardiac team was 2.48. We calculated a decrease of the C:T to 1.5 four months after the November 2012 formation of the new committee. The P-value calculated (P<0.0005) proved that the decrease was statistically significant.

CONCLUSION:

The initial impulse generated by the cardiothoracic surgery team is now spreading to other DRG groups in our hospital and we are seeing a drop in their C:T as well. Better blood
utilization is attainable when the physicians who perform most transfusions lead the charge

**Accuracy of continuous noninvasive hemoglobin monitoring for the prediction of blood transfusions in trauma patients.**


**Abstract**

Early detection of hemorrhagic shock is required to facilitate prompt coordination of blood component therapy delivery to the bedside and to expedite performance of lifesaving interventions. Standard physical findings and vital signs are difficult to measure during the acute resuscitation stage, and these measures are often inaccurate until patients deteriorate to a state of decompensated shock. The aim of this study is to examine a severely injured trauma patient population to determine whether a noninvasive SpHb monitor can predict the need for urgent blood transfusion (universal donor or additional urgent blood transfusion) during the first 12 h of trauma patient resuscitation. We hypothesize that trends in continuous SpHb, combined with easily derived patient-specific factors, can identify the immediate need for transfusion in trauma patients. Subjects were enrolled if directly admitted to the trauma center, >17 years of age, and with a shock index (heart rate/systolic blood pressure) >0.62. Upon admission, a Masimo Radical-7 co-oximeter sensor (Masimo Corporation, Irvine, CA) was applied, providing measurement of continuous non-invasive hemoglobin (SpHb) levels. Blood was drawn and hemoglobin concentration analyzed and conventional pulse oximetry photoplethysmograph signals were continuously recorded. Demographic information and both prehospital and admission vital signs were collected. The primary outcome was transfusion of at least one unit of packed red blood cells within 24 h of admission. Eight regression models (C1-C8) were evaluated for the prediction of blood use by comparing area under receiver operating curve (AUROC) at different time intervals after admission. 711 subjects had continuous vital signs waveforms available, to include heart rate (HR), SpHb and SpO\(_2\) trends. When SpHb was monitored for 15 min, SpHb did not increase AUROC for prediction of transfusion. The highest ROC was recorded for model C8 (age, sex, prehospital shock index, admission HR, SpHb and SpO\(_2\)) for the prediction of blood products within the first 3 h of admission. When data from 15 min of continuous monitoring were analyzed, significant improvement in AUROC occurred as more variables were added to the model; however, the addition of SpHb to any of the models did not improve AUROC significantly for prediction of blood use within the first 3 h of admission in comparison to analysis of conventional oximetry features. The results demonstrate that SpHb monitoring, accompanied by continuous vital signs data and adjusted for age and sex, has good accuracy for the prediction of need for transfusion; however, as an independent variable, SpHb did not enhance predictive models in comparison to use of features extracted from conventional pulse oximetry. Nor was shock index better than conventional oximetry at discriminating hemorrhaging and prediction of casualties receiving blood. In this population of trauma patients, noninvasive SpHb monitoring, including both trends and absolute values, did not enhance the ability to predict the need for blood transfusion.

**The effect of body mass index on posttraumatic transfusion after pelvic trauma.**

Richards JE\(^1\), Morris BJ, Guillamondegui OD, Sweeney KR, Tressler MA, Obremskey WT, Kregor PJ.

**Abstract**

The impact of body mass index (BMI) on posttraumatic blood transfusion after pelvic trauma is not well known. We conducted a retrospective review of trauma registry data over a 5-year period. Patients were stratified by BMI as normal: less than 25 kg/m\(^2\), overweight: 25 to 29.9 kg/m\(^2\), obese: 30 to 39.9 kg/m\(^2\), and morbidly obese: 40 kg/m\(^2\) or greater. Fractures were identified as "likely to receive transfusion" based on literature. Multivariable logistic regression modeling evaluated the relationship between BMI and initial posttraumatic transfusion. A second regression model was created to test the effect of BMI after adjusting for fractures "less likely to receive transfusion." Sixty-six of 244 patients (27.3%) received transfusion (mean: 1.1 ± 2.3 units). Morbid obesity was associated with transfusion (less than 55.6 vs 24.8%; P < 0.05) and units of total blood transfused (2.2 ± 2.9 vs 1.0 ± 2.2 mL; P < 0.05). The average age of patients who received a blood transfusion was significantly older compared with patients who did not receive a transfusion (45.4 ± 18.8 vs 36.1 ± 16.1 years; P < 0.05). After
adjusting for potential confounders, morbid obesity was a significant risk factor for transfusion (odds ratio [OR], 4.1; 95% confidence interval [CI], 1.4 to 12.0). Adjusting by age and fracture patterns "less likely to receive transfusion," morbid obesity remained a risk factor for transfusion (OR, 4.5; 95% CI, 1.5 to 12.9). Morbid obesity represented a significant risk factor for posttraumatic transfusion in isolated pelvic trauma, even for fracture patterns "less likely to receive transfusion."