**Supplemental table 1. Characteristics of the included trials (in more detail).**

|  |  |  |
| --- | --- | --- |
| **Studies** | **Participants** | **Interventions** |
| **First author** | **year** | **Location of study** | **Type of Surgery** | **Sample (PANH/Control)** | **Age (Mean)** | **Male (%)** | **Baseline Hct or Hb** | **Target Hct (%) or (Hb)** | **Average volume of blood withdrawn** | **Fluid to replace the withdraw blood** |
|
| Bennett et al. | 1994 | Sweden | Total hip prosthesis replacement | 20/20 | 64.0  | - | 42% | 25% | 900 ml | Gelatin |
| Bennett et al. | 2006 | UK | Hip surgery | 78/77 | 66.0  | 47.1  | ≥12 g/dL | 11.0 g/dL | 420 ml | Crystalloids |
| Beveniste et al. | 1978 | Denmark | Abdominal hysterectomy surgery | 39/44 | 45.1  | - | 32.4% or 8.64 g/dL | - | 600-700 ml | Lactated Ringer's |
| Boldt et al. | 1991 | Germany | Aortocoronary bypass grafting surgery | 15/15 | - | - | 13.6 g/dL | 11.4 g/dL | 890 ml | 6% HES |
| Bonnet et al.a | 1986 | France | Repair craniofacial disjunction surgery | 10/10 | 31.3  | - | 43.50% | 29% | 1015 ml | Colloid |
| Bonnet et al.b | 1986 | France | Excision of squamous carcinomas of the mouth surgery | 10/10 | 58.0  | - | 40% | 30% | 870 ml | Colloid |
| Boussofara et al. | 2002 |  Switzerland | Cervico-facial oncologic surgery | 17/21 | 64.8  | 100.0  | 41% or 13.4 g/dL | 33.6% or 10.8 g/dL | 341-496 ml | Colloid |
| Casati et al. | 2002 | Italy | Open heart surgery | 102/100 | 63.0  | 53.0  | 41.8% or 13.8 g/dL  | - | 360–576 ml | Colloid |
| Casati et al. | 2004 | Italy | Off-pump coronary artery bypass surgery | 50/50 | 64.0  | 85.0  | 41.2% or 13.8 g/dL | - | 850 ml | 4% Succinylated gelatin |
| Catoire et al. | 1992 | France | Abdominal aortic surgery | 10/10 | 66.7  | 100.0  | 40% | 30% | 875 ml | Dextran 60,000 |
| Chen et al. | 2007 | China | Radical resection for stomach cancer surgery | 30/30 | 50.3  | 55.0  | > 33% or 11.0 g/dL | - | 400 ml | Plasma substitute |
| Daif et al. | 2012 | Egypt | Brain tumor resection surgery | 20/20 | 20-60 | 50.0  | 39.4% or 13.25 g/dL | 33.7% or 11.7 g/dL | 900-1000 ml | 6% HES |
| Durmus et al. | 2003 | Turkey | Coronary artery bypass grafting surgery | 20/20 | 57.4  | 72.5  | 42% | 33.60% | 612.5 ml | 6% HES |
| Dietrich et al. | 1989 | Germany | Coronary artery bypass grafting surgery | 25/25 | 55.0  | 100.0  | 42% | 30% | 731 ml | HES |
| EI-Dessouky et al. | 2011 | Egypt | Spinal fusion surgery | 20/20 | 39.1  | 82.5  | 38.8% or 13.2 g/dL | 33.3% or 11.9 g/dL | 900 ml | 6% HES |
| Ela et al. | 2009 | Turkey | Off-pump coronary artery bypass surgery | 28/29 | 63.1  | 80.7  | 45.2% or 14.9 g/dL | 28% | - | HES |
| Ervena et al. | 2010 | Germany | Orthognathic surgery | 20/21 | 25.4  | 34.1  | 13.5 g/dL | 9 g/dL | 900 ml | 6% HES |
| **Interventions** | **Outcomes** | **Jadad Scale** |
| **Other active intervention** **in both groups** | **Transfusion protocal** | **Trigger Hb or Hct** | **Extractable Outcomes****(1.No. exposed to allogeneic blood 2.Units of Allogeneic Blood 3.Volume of Blood Loss 4.Adverse Events)** | **Randomization** | **Blind** | **Withdrawals and** **Dropouts Described (n)** | **Jadad Score** |
| Intraoperative | Postoperative |
| None | Yes | 8 g/dL | 8 g/dL | 1 | 1 | 0 | 1(0) | 2 |
| None | Yes | 25% | 30% | 1,4 | 2 | 0 | 1(0) | 3 |
| None | No | - | - | 3,4 | 1 | 0 | 1(0) | 2 |
| None | Yes | 7 g/dL | - | 1,3,4 | 2 | 0 | 1(0) | 3 |
| None | Yes | 28% | 30% | 1,2,3,4 | 1 | 0 | 1(0) | 2 |
| None | Yes | 28% | 30% | 1,2,3,4 | 1 | 0 | 1(0) | 2 |
| Iron and folic acid | Yes | 10 g/dL | 10 g/dL | 1,3,4 | 1 | 0 | 1(0) | 2 |
| Tranexamic acid and cell salvage | Yes | 6.5 g/dL or 20% | 8.5 g/dL or 25% | 1,4 | 2 | 0 | 1(2) | 3 |
| Tranexamic acid and cell salvage | Yes | 8 g/dLor 24%  | 8 g/dL or 24% | 1,4 | 2 | 0 | 1(0) | 3 |
| None | No | - | - | 2,3,4 | 1 | 0 | 1(0) | 2 |
| None | No | - | - | 3 | 1 | 0 | 1(0) | 2 |
| None | Yes | 10 g/dL | - | 1,3 | 2 | 0 | 1(0) | 3 |
| None | Yes | 29(18)%\* | - | 2  | 1 | 0 | 1(0) | 2 |
| None | Yes | - | - | 1,2,4 | 1 | 0 | 1(0) | 2 |
| None | Yes | 9 g/dL or 25% | - | 3 | 2 | 0 | 1(0) | 3 |
| None | Yes | 8 g/dL or 25% | 8 g/dL or 25% | 1,2,3,4 | 2 | 0 | 1(3) | 3 |
| Induced hypotension | Yes | 6.5 g/dL | 7 g/dL | 1,2  | 1 | 0 | 1(0) | 2 |

**Table 1 (Continued)**

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| **Studies** | **Participants** | **Interventions** |
| **First author** | **year** | **Location of study** | **Type of Surgery** | **Sample (PANH/Control)** | **Age (Mean)** | **Male (%)** | **Baseline Hct or Hb** | **Target Hct (%) or (Hb)** | **Average volume of blood withdrawn** | **Fluid to replace the withdraw blood** |
|
| Fayed et al. | 2013 | Egypt | Liver resection surgery | 80/80 | 49.3  | 78.1  | 41% | 27% | 1750 ml | 6% HES |
| Fischer et al. | 2010 | USA | Pancreaticoduodenectomy surgery | 65/65 | 64.5  | 53.1  | 13.2 g/dL | 7.9 g/dL | 2250 ml | 5% Albumin and crystalloid |
| Gombotz et al. | 2000 | Austria | Hip replacement surgery | 20/20 | 57.5  | 0.0  | 11.0 g/dL | 8 g/dL | 1440 ml | 6% HES and Ringer’s lactate |
| Guo et al. | 2010 | China | Hepatic carcinectomy surgery | 15/15 | 65.0  | 73.3  | >35% | 28% | - | 6% HES |
| Hallowell et al. | 1972 | USA | Cardiac surgery | 25/25 | - | - | 38% | - | 1252 ml | Ringer’s/5% albumin/5% PPF or blood |
| Hans et al. | 2000 | Belgium | Repair craniosynostosis surgery | 17/17 | 0.6  | 70.6  | 33.20% | 25% | 122 ml | 5% Albumin |
| Hensel et al. | 1996 | Germany | Gastric surgery | 30/20 | 49.2  | 58.0  | 40.50% | 35% | 672 ml | 6% HES |
| Herregods et al. | 1995 | Belgium | Coronary artery bypass grafting surgery | 15/15 | 61.9  | 90.0  | 39.70% | 34.80% | 785 ml | Succiny-linked gelatin |
| Herregods et al. | 1997 | Belgium | Coronary artery bypass grafting surgery | 39/32 | 61.9  | 93.0  | 39.60% | 35% | 750 ml | Succiny-linked gelatin |
| Hohn et al. | 2002 | Switzerland | Cardiac surgery | 36/41 | 63.4  | 77.9  | 43.25% | 27.90% | 1099 | HES |
| Hurpe et al. | 1987 | France | Cardiac surgery | 79/81 | 56.0  | 71.9  | 37.30% | 36.90% | 734.4 | Gelatin |
| Jalali et al. | 2008 | Iran | Coronary artery bypass grafting surgery | 50/50 | 56.7  | 93.0  | 44.60% | 9 g/dL | - | 0.9% saline |
| Jarnagin et al. | 2008 | USA | Hepatic resection surgery | 63/67 | 53.5  | 53.1  | 13.25 g/dL | 8 g/dL | 2250 ml | 5% albumin and crystalloid |
| Juelsgaard et al. | 2002 | Denmark | Total knee arthroplasty surgery | 14/14 | 73.0  | 75.0  | 38.40% | 30.40% | 877 ml | 6% HES |
| Kahraman et al.a | 1997 | Turkey | Coronary artery bypass grafting surgery | 14/7 | 41-69 | 67.9  | 41.80% | - | 369-590 ml  | Crystalloid and 3.5% polygeline |
| Kahraman et al.b | 1997 | Turkey | Coronary artery bypass grafting surgery | 14/7 | 45-70 | 67.9  | 41.80% | - | 743-1114.5 ml | Crystalloid and 3.5% polygeline |
| Karakaya et al. | 1999 | Turkey | Primary total hip arthroplasty surgery | 10/10 | 62.7  | 50.0  | 35.75% or 11.95 g/dL | 29.3% or 9.8 g/dL | 1000 ml | 6% HES |
| Khanna et al. | 1998 | India | Major general surgical | 20/20 | - | - | - | 9.19 g/dL | 836.6 ml | 3% Polygeline |
| Licker et al. | 2005 | Switzerland | Coronary artery bypass grafting surgery | 41/39 | 66.0  | 82.5  | 40.50% | 28% | - | 6% HES |
| Licker et al. | 2007 | Switzerland | Aortic valve replacement | 19/21 | 66.4  | 70.0  | 14.4 g/dL | 9 g/dL | - | 6% HES |
| **Interventions** | **Outcomes** | **Jadad Scale** |
| **Other active intervention** **in both groups** | **Transfusion protocal** | **Trigger Hb or Hct** | **Extractable Outcomes****(1.No. exposed to allogeneic blood 2.Units of Allogeneic Blood 3.Volume of Blood Loss 4.Adverse Events)** | **Randomization** | **Blind** | **Withdrawals and** **Dropouts Described (n)** | **Jadad Score** |
| Intraoperative | Postoperative |
| None | Yes | 24% | 24% | 1,2,4 | 1 | 0 | 1(0) | 2 |
| None | Yes | 7 g/dL | 8 g/dL | 1,4 | 1 | 0 | 1(0) | 2 |
| rHuEPO and iron | Yes | 8 g/dL | 8 g/dL | 1,2,3,4 | 1 | 0 | 1(0) | 2 |
| None | Yes | 8 g/dL or 25% | - | 2,3 | 1 | 0 | 1(0) | 2 |
| None | No | - | - | 1  | 1 | 0 | 1(0) | 2 |
| None | Yes | 21% | 21% | 1,2  | 1 | 0 | 1(0) | 2 |
| None | Yes | 30% | 30% | 1,4 | 1 | 0 | 1(0) | 2 |
| None | No | - | - | 1,4  | 1 | 0 | 1(0) | 2 |
| None | No | - | - | 1,2,3,4 | 2 | 0 | 1(0) | 3 |
| Aprotinin and cell salvage | Yes | 25(17)% | - | 1,3,4 | 2 | 0 | 1(3) | 3 |
| None | No | - | - | 2,3,4 | 1 | 0 | 1(0) | 2 |
| None | Yes | 8 g/dL | 8 g/dL | 1,2,3  | 2 | 0 | 1(0) | 3 |
| None | Yes | 7 g/dL | 8 g/dL | 1,2,4 | 2 | 0 | 1(0) | 3 |
| Controlled hypotension | Yes | 28% | 28% | 1,2,3,4 | 2 | 0 | 1(5) | 3 |
| None | Yes | - | 30% | 1,2,3,4 | 1 | 0 | 1(0) | 2 |
| None | Yes | - | 30% | 1,2,3,4 | 1 | 0 | 1(0) | 2 |
| None | Yes | 25% | 30% | 2  | 1 | 0 | 1(0) | 2 |
| None | Yes | - | - | 1,2  | 1 | 0 | 1(0) | 2 |
| Aprotinin and cell salvage | Yes | 25(18)% | - | 1,2,3,4 | 2 | 0 | 1(4) | 3 |
| Aprotinin and cell salvage | Yes | 25(18)% | - | 1,2,3,4 | 2 | 0 | 1(3) | 3 |

**Table 1 (Continued)**

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| --- | --- | --- |
| **Studies** | **Participants** | **Interventions** |
| **First author** | **year** | **Location of study** | **Type of Surgery** | **Sample (PANH/Control)** | **Age (Mean)** | **Male (%)** | **Baseline Hct or Hb** | **Target Hct (%) or (Hb)** | **Average volume of blood withdrawn** | **Fluid to replace the withdraw blood** |
|
| Lim et al. | 2003 | Korea | Spinal surgery | 15/15 | 49.0  | 56.7  | 40% | 28% | 717 ml | 6% HES and Ringer’s lactate |
| Lisander et al.a  | 1996 | Sweden | Idiopathic scoliosis | 10/13 | 14.4  | 17.4  | 13.65 g/dL | 8 g/dL | 1125 ml | 6% dextran 70 or 3%dextran or 4% albumin |
| Lisander et al.b | 1996 | Sweden | Idiopathic scoliosis | 13/11 | 14.5  | 16.7  | 14.1 g/dL | 8 g/dL | 1215 ml | 6% dextran 70 or 3% dextran or 4% albumin |
| Lorentz et al. | 1991 | Germany | Total hip arthroplasty surgery | 16/15 | - | - | - | 9 g/dL | 700 ml | Polygeline |
| Mahoori et al. | 2009 | Iran | Coronary artery bypass grafting surgery | 54/47 | 56.4  | 85.1  | 39.5% or 13.45 g/dL  | - | 490 ml | Gelatin |
| Matot et al. | 2002 | Israel | Major liver resections surgery | 39/39 | 56.5  | 39.7  | 41.20% | 23.50% | 2020 ml | 6% dextran and 5% albumin |
| McGill et al. | 2002 | USA | Cardiac surgery | 84/84 | 84.4  | 88.7  | >36% or 12 g/dL | - | 843 ml | Gelatin |
| Moyes et al. | 1985 | South Africa | Thoracic surgery | 10/10 | 39.0  | 85.0  | - | 28.20% | 500 ml | Dextran 70 |
| Nuttall et al. | 2000 | USA | Coronary artery bypass grafting or/and cardiac valve surgery | 32/45 | 69.5  | 76.6  | - | - | 859 ml | - |
| Naqash et al. | 2011 | India | Intracranial meningioma surgery | 20/20 | 45.1  | 45.0  | 12.98 g/dL | 10.44 g/dL | 802 ml | 6% HES |
| Oishi et al. | 1997 | USA | Primary total hip arthroplasty surgery | 16/16 | 62.5  | 57.6  | 37.50% | 28.80% | - | Crystalloids and/or colloids |
| Olsfanger et al.a | 1997 | Israel | Total knee replacement surgery | 10/5 | 71.5  | 20.0  | - | 28%-30% | 1003 ml | Lactated Ringer's |
| Olsfanger et al.b | 1997 | Israel | Total knee replacement surgery | 10/5 | 68.5  | 15.0  | - | 28%-30% | 985 ml | Lactated Ringer's |
| Payen et al. | 1997 | France | Maxillofacial surgery | 13/13 | 25.5  | 57.7  | 37.50% | 30% | 862.5 ml | 4% Albumin |
| Peillon et al. | 1995 | France | Mandibular osteotomy surgery | 16/16 | 25.0  | 65.6  | 41.80% | 30% | 828 ml | 4% Albumin |
| Saricaoglu et al. | 2005 | Turkey | Hip arthroplasty surgery | 10/10 | 59.0  | 80.0  | 41.20% | 32.50% | 1065 ml | 6% HES |
| Sanders et al. | 2004 | UK | Major gastrointestinal surgery | 78/82 | 62.3  | 52.5  | 13.5 g/dL | 8 g/dL | - | Gelofusine and Lactated Ringer's  |
| Soltanzadeh et al. | 2012 | Iran | Coronary artery bypass grafting surgery | 50/50 | < 70 | 100.0  | > 12 g/dL | - | 500 ml | Lactated Ringer's |
| Triulzi et al. | 1995 | Zimbabwe | Cardiac surgery | 18/28 | 60.4  | 82.6  | 14.1 g/dL | 10.6 g/dL | 924 ml | Colloid and/or crystalloid |
| Van der Linden et al. | 1994 | Belgium | Total hip replacement surgery | 10/10 | 59.5  | 45.0  | 42.20% | 28.20% | 880 ml | 6% HES or/and 4.5% albumin |
| Vedrinne et al. | 1992 | France | Cardiac surgery | 30/30 | 58.0  | 73.3  | 14.16 g/dL | 11.61 g/dL | 400 ml | 4% Albumin |
| **Other active intervention** **in both groups** | **Transfusion protocal** | **Trigger Hb or Hct** | **Extractable Outcomes****(1.No. exposed to allogeneic blood 2.Units of Allogeneic Blood 3.Volume of Blood Loss 4.Adverse Events)** | **Randomization** | **Blind** | **Withdrawals and** **Dropouts Described (n)** | **Jadad Score** |
| **Intraoperative** | **Postoperative** |
| Controlled hypotension | Yes | 20% | - | 1,2,3,4 | 1 | 0 | 1(0) | 2 |
| None | Yes | 8 g/dL | 8 g/dL | 2,3,4 | 1 | 0 | 1(0) | 2 |
| Cell salvage | Yes | 8 g/dL | 8 g/dL | 2,3,4 | 1 | 0 | 1(0) | 2 |
| None | Yes | - | - | 1  | 1 | 0 | 1(0) | 2 |
| None | Yes | 10g/dL or 30% | - | 1,2,3,4 | 2 | 0 | 1(0) | 3 |
| None | Yes | 20% | - | 1,2,3,4 | 2 | 0 | 1(0) | 3 |
| Cell salvage | Yes | 20(20)% | 9 g/dL or 27% | 2,3,4 | 2 | 0 | 1(0) | 3 |
| None | No | - | - | 2,3,4 | 1 | 0 | 1(0) | 2 |
| Tranexamic acid and cell salvage and reinfusion of shed mediastinal blood | Yes | 8(7) g/dL | - | 1  | 2 | 1 | 1(8) | 4 |
| None | Yes | - | - | 2,3,4 | 1 | 0 | 1(0) | 2 |
| PAD and cell salvage | No | - | - | 1 | 2 | 0 | 1(1) | 3 |
| None | Yes | - | 28% | 1,2,3,4 | 2 | 0 | 1(0) | 3 |
| None | Yes | - | 28% | 1,2,3,4 | 2 | 0 | 1(0) | 3 |
| None | No | - | - | 3 | 1 | 0 | 1(0) | 2 |
| None | Yes | 25% | - | 1 | 1 | 0 | 1(0) | 2 |
| None | Yes | 9 g/dL | - | 1,2,3 | 1 | 0 | 1(0) | 2 |
| None | Yes | 8 g/dL | 8 g/dL | 1,4 | 1 | 0 | 1(0) | 2 |
| None | No | - | - | 2 | 1 | 0 | 1(0) | 2 |
| None | Yes | 20% | 24% | 1,2,3,4 | 2 | 0 | 1(0) | 3 |
| None | Yes | 30% | 30% | 2,3,4 | 1 | 0 | 1(0) | 2 |
| None | Yes | 27(24) | 30% | 1,2,3,4 | 1 | 0 | 1(0) | 2 |

**Table 1 (Continued)**

|  |  |  |
| --- | --- | --- |
| **Studies** | **Participants** | **Interventions** |
| **First author** | **year** | **Location of study** | **Type of Surgery** | **Sample (PANH/Control)** | **Age (Mean)** | **Male (%)** | **Baseline Hct or Hb** | **Target Hct (%) or (Hb)** | **Average volume of blood withdrawn** | **Fluid to replace the withdraw blood** |
|
| Virmani et al. | 2010 | India | Valve surgery | 88/100 | 31.0  | 49.5  | 12.25 g/dL | - | 270.8 | HES |
| Welch et al. | 1993 | UK | Infrarenal aortic surgery | 20/19 | 60.1  | 59.0  | 40.20% | 28% | 1500 ml | Dextran 70 or/and plasma |
| Wolowczyk et al. | 2003 | UK | Abdominal aortic aneurysm repair surgery | 16/18 | 74.1  | 67.6  | 14.0 g/dL | 9.4 g/dL | 890 ml | 6% HES |
| Yao et al. | 2006 | China | Liver tumorectomy surgery | 10/10 | 28-65 | 53.0  | 41% or 13.62 g/dL | 34.7% or 11.42 g/dL | 705 ml | 6% HES |
| Zisman et al. | 2009 | Israel | Cardiac surgery | 27/35 | 59.7  | 87.1  | 14.3 g/dL | - | 600 ml | 6% HES |
| **Interventions** | **Outcomes** | **Jadad Scale** |
| **Other active intervention** **in both groups** | **Transfusion protocal** | **Trigger Hb or Hct** | **Extractable Outcomes****(1.No. exposed to allogeneic blood 2.Units of Allogeneic Blood 3.Volume of Blood Loss 4.Adverse Events)** | **Randomization** | **Blind** | **Withdrawals and** **Dropouts Described (n)** | **Jadad Score** |
| **Intraoperative** | **Postoperative** |
| None | Yes | 8(6) g/dL | - | 1,2,3,4 | 2 | 0 | 1(0) | 3 |
| None | No | - | - | 2,3,4 | 1 | 0 | 1(0) | 2 |
| Cell salvage | Yes | 8 g/dL | 9.5 g/dL | 1 | 2 | 0 | 1(2) | 3 |
| None | Yes | - | - | 1,2,3,4 | 1 | 0 | 1(0) | 2 |
| None | Yes | - | 9 g/dL | 1,3,4 | 1 | 0 | 1(6) | 2 |

**\***Criteria for intraoperative allogeneic transfusions: number in brackets means during cardiopulmonary bypass; number out of brackets means after cardiopulmonary bypass.

PANH, Preoperative acute normovolemic hemodilution; Hct, Red blood cell specific volume; Hb, Hemoglobin; HES, Hydroxyethyl starch; rHu-EPO, Recombinant human erythropoietin; PPF, Plasma protein fraction; PAD, Preoperative autologous donation.