

Research questions for the update of the Patient Blood Management Guidelines

Theme #	Theme	Active question	Population <i>Subgroups</i>	Intervention(s)	Critical outcome(s)
1	Effect of a PBM program	U1-GQ01 In (all) patients, what is the effect of a patient blood management program on patient outcomes and red blood cell (RBC) or blood component transfusion?	All patients <ul style="list-style-type: none"> • <i>Perioperative</i> • <i>Medical</i> • <i>Critical care</i> • <i>Obstetrics and maternity</i> • <i>Neonatal and paediatrics</i> 	PBM program	<ul style="list-style-type: none"> • Mortality • Transfusion
2	Effect of RBC transfusion	U1-GQ02 In (all adult) patients, what is the effect of red blood cell (RBC) transfusion on patient outcomes?	All adult patients <ul style="list-style-type: none"> • <i>Perioperative</i> • <i>Medical</i> • <i>Critical care</i> 	RBC transfusion	<ul style="list-style-type: none"> • Mortality
		U1-Q25 In neonates/paediatric patients, what is the effect of red blood cell (RBC) transfusion on patient outcomes?	Neonatal and paediatric patients	RBC (allogeneic) transfusion	<ul style="list-style-type: none"> • Mortality • Composite of mortality and severe morbidity • Neurodevelopmental disability • Necrotising enterocolitis
3	Restrictive vs. liberal transfusion strategies	U1-GQ03 In (all) patients at risk of red blood cell (RBC) transfusion, what is the effect of a restrictive transfusion threshold compared to a liberal transfusion threshold on patient outcomes and transfusion?	All patients <ul style="list-style-type: none"> • <i>Perioperative</i> • <i>Medical</i> • <i>Critical care</i> • <i>Obstetrics and maternity</i> • <i>Neonatal and paediatrics</i> 	Restrictive vs. liberal RBC transfusion	<ul style="list-style-type: none"> • Mortality • Transfusion • Neurodevelopmental disability (<i>neonatal only</i>) • Necrotising enterocolitis (<i>neonatal only</i>)
4	Optimal Hb threshold for transfusion	U1-Q20 In chronically transfused patients, at what haemoglobin (Hb) threshold should patients be transfused to avoid adverse outcomes?	Chronically transfused patients <ul style="list-style-type: none"> • <i>Paediatrics</i> • <i>Myelodysplasia</i> 	RBC transfusion (at different Hb thresholds)	<ul style="list-style-type: none"> • Mortality/survival • Functional/performance status
5	Effect of blood component therapy	U1-GQ06 In patients receiving anti-platelet medication, what is the effect of platelet transfusion?	Patients receiving anti-platelet medication <ul style="list-style-type: none"> • <i>Perioperative</i> • <i>Medical</i> • <i>Critical care</i> 	Platelet transfusion	<ul style="list-style-type: none"> • Mortality • Blood component utilisation • Bleeding into critical sites/organs • Major bleeding
		U1-Q22 In patients with critical bleeding, what is the effect of cryoprecipitate compared with fibrinogen concentrate on patient outcomes and blood component utilisation?	Patients with critical bleeding <ul style="list-style-type: none"> • <i>Perioperative</i> • <i>Obstetrics</i> • <i>Paediatric patients</i> 	Cryoprecipitate vs. Fibrinogen concentrate	<ul style="list-style-type: none"> • Mortality • Blood component utilisation
		U1-Q26 In neonates/paediatric patients, what is the effect of fibrinogen concentrate, and/or platelet transfusion on patient outcomes and blood component utilisation?	Neonatal and paediatric patients <ul style="list-style-type: none"> • <i>Surgical</i> • <i>Trauma</i> • <i>Critical illness</i> 	<ol style="list-style-type: none"> 1. Platelet transfusion (<i>preterms and newborns</i>) 2. Fibrinogen concentrate (<i>paediatric surgical and trauma patients</i>) 	<ul style="list-style-type: none"> • Mortality • Major bleeding • Intraventricular haemorrhage (<i>neonatal only</i>) • Blood component utilisation

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6	Trigger for blood component therapy	U1-GQ04 In (all) patients, at what platelet count should patients be transfused platelet concentrates to avoid adverse outcomes?	All patients <ul style="list-style-type: none"> • <i>Perioperative</i> • <i>Medical</i> • <i>Critical care</i> • <i>Obstetrics and maternity</i> • <i>Neonatal and paediatrics</i> 	Platelet transfusion	<ul style="list-style-type: none"> • Mortality • Bleeding in previously non-bleeding patients (including intracranial haemorrhage for neonates) • Bleeding into critical sites/organs • ischaemic/thromboembolic events • Blood component utilisation
		U1-GQ05 In (all) patients with acquired abnormalities of haemostasis, what is the effect of blood component therapy on patient outcomes and blood component utilisation?	Patients with acquired abnormalities of haemostasis <ul style="list-style-type: none"> • <i>Perioperative</i> • <i>Medical</i> • <i>Critical care</i> • <i>Obstetrics and maternity</i> • <i>Neonatal and paediatrics</i> 	<ol style="list-style-type: none"> 1. Plasma transfusion or prothrombinex (at an INR threshold) 2. Cryoprecipitate or fibrinogen concentrate (at a specific fibrinogen level) 3. Platelet transfusion (at a specific platelet count) (included in GQ04) 4. Blood component therapy based on viscoelastic testing 	<ul style="list-style-type: none"> • Mortality • Major bleeding • Intracranial haemorrhage (<i>neonatal only</i>) • Ischaemic or thromboembolic events • Blood component utilisation
7	Effect of cessation of medications that affect haemostasis	U1-Q17 In patients undergoing invasive procedures, what effect does the cessation and timing of cessation of medications that affect haemostasis, have on patient outcomes and red blood cell (RBC) or blood component transfusion?	<ol style="list-style-type: none"> 1. Surgical patients 2. Patients undergoing invasive procedures 	Anti-coagulants and anti-platelet therapy, including aspirin, clopidogrel, direct-acting anti-coagulants, warfarin	<ul style="list-style-type: none"> • Mortality • Transfusion • Procedure-related bleeding • Reoperation for bleeding • Ischaemic or thromboembolic events
8	Effect of non-transfusion interventions	U1-Q16 In surgical patients, what is the effect of perioperative iron therapy on patient outcomes and red blood cell (RBC) transfusion?	Surgical patients <ul style="list-style-type: none"> • <i>Preoperative</i> • <i>Intraoperative</i> • <i>Postoperative</i> 	Iron therapy (oral and/or parenteral)	<ul style="list-style-type: none"> • Mortality • RBC transfusion
		U1-Q19 In medical patients, what is the effect of non-transfusion interventions on patient outcomes and red blood cell (RBC) transfusion?	Medical patients <ul style="list-style-type: none"> • <i>Haematology oncology</i> • <i>Renal</i> • <i>Congestive heart failure</i> 	<ol style="list-style-type: none"> 1. ESAs 2. Iron therapy (oral or parenteral IV or IM) 3. Combination of these 	<ul style="list-style-type: none"> • Mortality • RBC transfusion • Ischaemic or thromboembolic events
		U1-Q21 In critically ill patients, what is the effect of non-transfusion interventions on patient outcomes and red blood cell (RBC) transfusion?	Critically ill patients	<ol style="list-style-type: none"> 1. Iron therapy (parenteral IV) 2. ESAs 3. Combination of these 	<ul style="list-style-type: none"> • Mortality • RBC transfusion • Ischaemic or thromboembolic events
		U1-Q23 In maternity patients, what is the effect of iron therapy on patient outcomes and red blood cell (RBC) transfusion?	Obstetrics and maternity patients	Iron therapy (oral and/or parenteral IV)	<ul style="list-style-type: none"> • Mortality (maternal) • Transfusion • Measures of fetal outcome

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9	Effect of blood conservation strategies	U1-Q18 In surgical patients, what is the effect of perioperative strategies that minimise blood loss on patient outcomes and red blood cell (RBC) or blood component transfusion?	Surgical patients Patients undergoing invasive procedures (TXA only) • <i>Obstetrics</i>	1. Cell salvage (perioperative) 2. Deliberate induced hypotension 3. POC testing for coagulation status and Hb 4. Restrictive sampling 5. Administration of antifibrinolytics (TXA, aprotinin) and DDAVP	• Mortality • Transfusion
		U1-Q24 In maternity patients, what is the effect of non-obstetric strategies that aim to minimise maternal blood loss in the peripartum period on patient outcomes and red blood cell (RBC) or blood component transfusion?	Obstetrics and maternity patients • <i>Bleeding patients (postpartum/ante partum haemorrhage, placenta problems, ectopic pregnancy, miscarriage)</i>	1. Viscoelastic testing 2. Administration of antifibrinolytics (TXA only) 3. Cell salvage (intraoperative) 4. Interventional radiology (iliac balloon catheters or embolisation only)	• Mortality (maternal) • Transfusion
		U1-Q27 In neonates/paediatric patients, what is the effect of strategies that minimise blood loss and/or reduce the need for red blood cell (RBC) transfusion on patient outcomes?	Neonatal patients Paediatric patients • <i>Surgical (cardiac, burns, transplantation, orthopaedic)</i> • <i>Critical illness (ECMO/ECLS, trauma)</i>	<u>Preterm and newborn</u> 1. Placental transfusion <u>Infant/child/adolescent – surgical</u> 1. Deliberate controlled/induced hypotension 2. Cell salvage (intraoperative) 3. Viscoelastic testing 4. Administration of antifibrinolytics (TXA, aprotinin) <u>Infant/child/adolescent – critical illness</u> 1. Viscoelastic testing	<u>Preterm and newborn</u> • Composite death and/or major morbidity • Transfusion • Mortality • Neurodevelopmental outcomes <u>Infant/child/adolescent – surgical/critical illness</u> • Mortality • Transfusion • Neurodevelopmental outcomes • Major bleeding • Intraventricular haemorrhage (neonatal only)

Abbreviations: DDAVP, desmopressin; ECLS, extracorporeal life support; ECMO, extracorporeal membrane oxygenation; ESA, erythrocyte-stimulating agents; Hb, haemoglobin; IM, intramuscular; IV, intravenous; IVIg, intravenous immunoglobulin; LBW, low birth weight; NSAID, non-steroidal anti-coagulant; POC, point-of-care; RBC, red blood cell; TXA, tranexamic acid.