Anemia

Other Normocytic Anemias

	Path	Smear	Coombs	Clinical/Dx	Treatment
CKD-related	ESRD→ EPO def.	Normochr. normocytic		SE's of EPO: HTN, HA, Flu-like sx	EPO/Fe
Aplastic	BM failure	Pancytopenia		Pallor/fatigue, infections, bruising	Underlying

Macrocytic Anemias

	Path	Smear	Coombs	Clinical/Dx	Treatment
Folate def	Alcoholism, AEDs, severe anorexia/dietary limitations	Megaloblastic macrocyt.		Pallor/fatigue, atrophic glossitis	PO folate
B12 Def	Pernicious, chronic gastritis, malabsorp, parasite (*D. latum*), severe anorexia/dietary limitations	Megaloblastic macrocyt. Inc. methylmalonic acid and homocystine		Pallor/fatigue, subacute combine degeneration, atrophic glossitis, dementia	IM/IN B12 HD PO B12 Anti-IF Abs

Pediatric-Specific Anemias

	Path	Smear	Coombs	Clinical/Dx	Treatment
Prematurity	Preterm (dec EPO, dec. RBC life, inc. phlebotomy			Asymp or tachycardia, apnea	Fe/dec phleb
Erythroblastosis	ABO set-up/Rh disease, minor blood group Ags			Jaundice/hyperbili in 1st 24 HOL	Transf/Photo
Fanconi	AR/XL mut→aplastic	Pancytopenia, aplastic		Short, microceph, bent thumb, freckles, cafe-au-lait, ear abn.	Transfusion, +/- SCT
Diamond-Blackfan	Pure red cell aplasia	Macrocytic, normal WBC		Short, web neck, shield chest, cleft lip, triphalangeal thumbs	Steroids Transfusion

Transfusion Medicine

Consenting a Patient for Blood Products

Risks	• Fever, chills, hives/itching, and shortness of breath (can be managed w/ medicines) • Hemolytic transfusion reaction or transfusion-related lung injury (rare) • Bacterial or viral infection (hepatitis C, hepatitis B, HIV, malaria). Blood is extensively screened to prevent this.
Benefits	Improve blood clotting or oxygen delivery
Alternatives (may not work as well/quickly)	• Colony stimulating factor • Vitamin K • No treatment (note: parents may not refuse blood products in life-threatening situations)

Acute Transfusion Reactions

	Time	Path	Clinical	Treatment
Anaphylactic	Sec-Mins	IgA def → anti-IgA/IgG Abs	Shock, urticaria, angioedema, HoTN	EPI, IVF, O2 Washed RBCs
Urticarial	Anytime	Type I HSR (IgE mediated)	Hives, erythema	Benadryl, Wash
Anaphylactic	W/in mins	IgE-mediated, bradykinin-med if ACEi	HoTN, wheeze, N/V/D	ABCs, Epi, Beny
Acute Hemolytic	First 15 mins	ABO/Kidd incomp.→ hemolysis/comp activ. Rh/Kell/Duffy incom → hemolysis +Coombs, Pink plasma	Fevere, chills, back or flank pain, bleeding/DIC	NS/lasix M/f HoTN, AKI/DIC

Transfusion Medicine

Acute Transfusion Reactions

	Time	Path	Clinical	Treatment
Febrile Non-Hemolytic	1-6 hrs	Donor WBCs → TNF-alpha, IL □ RBC: anti-HLA, Plt: donor WBC cytokines	Low grade fever, chills, HA, flushing	APAP, meperidine Leukoreduction
Delayed Hemolytic	>3 days	Anamnestic IgG against exposed Ag (Kidd/ Duffy/Kell) → extravasc. hemolysis	Fever, anemia, jaundice, flu-like illness	R/O AIHA (+DAT)
Trans-related Lung Injury (TRALI)	1-6 hrs	Pre-Tx stress activates lung endotheial cells and primes PNMs Post-Tx donor anti-HLA Ab→primed PMNs	Fever, SpO2 <90%, PaO2/FiO2 <300 B/l pulm edema.	ABCs, O2, mech vent. Dec. in male donor
Trans-Assoc. Circ Overload (TACO)	1-6 hrs	High risk in elderly, CHF, CKD, chronic anemias	Cardiogenic edemas → dyspnea, hypoxemia	Stop, sit up , O2, diuretics, slower rate (1 cc/kg/hr)
Bacterial Sepsis	15-60 mins	Bacteria >> Viruses in donor blood. RBC: Yersinia, PsA, Plt: Staph epi (GPCs)	Fever (>39), rigors, Abd sxs, HoTN, shock	Antibiotics Screen
Specialized RBC's	**Irradiated**	BMT recipients, acquired.congenital cellular immunodef., blood from 1st/2nd deg. relatives		
	Leuko-reduced	Chronic transfusion, CMV seronegative at-risk pt's (AIDs, transplant), potential transplant candidates, previous febrile nonhemolytic transfusion reaction		
	Saline Washed	IgA def, Complement-dependent AIHA, allergic reactions w/ RBC transfusion		

Transfusion Products

Component	Contents	Vol	Indications	Contraindications	Considerations
Red Blood Cells (RBC)	Concentrated RBCs	200-300 mL	Symptomatic anemia (Hgb <7 g/dL); Acute hypovolemia due to hemorrhage	Pharmacologically treatable anemia (eg. iron, folate, B12 deficiencies)	Must be ABO compatible, cross-match compatible; Infuse w/i 4 hr or as patient tolerates*
Platelets (PLT)	>5.5×10^{10} PLT per 50 ml	60 mL	Bleeding related to thrombocytopenia or PLT dysfunction; Low PLT count	Patients w/ TTP, HUS or HIT; Not as effective in ITP, DIC, sepsis, uremia, hypersplenism	ABO and Rh compatible w/ patient's RBC if possible; Infuse 5-10 mL/min or as tolerated, usually w/i 1 hour.
Leukocyte Reduced RBC or PLT	RBC or PLT w/ WBC: $<5\times10^{6}$	Similar to original	RBC/PLT indications plus history of febrile transfusion reactions; At risk of CMV and alloimmunization.	See RBC or PLT.	See RBC or PLT.
Cryo-precipitate (Cryo)	80-120 units Factor VIII; 150-250 mg Fibrinogen;	25 mL 40-70% orig.l plasma VWF	Fibrinogen Deficiency or dysfunction;	Safer and more concentrated therapy available (ie, for specific clotting factors).	Consider alternative Therapies; Should be ABO compatible if possible;
Fresh Frozen Plasma (FFP)	400 mg fibrinogen and 200 units of other clotting factors	200-250 mL	Clotting factor def. (if specific factor conc. not avail.), lg. Volume required Severe liver disease; Rapid warfarin reversal; Vit K def. w. active bleed TTP; DIC; massive crystalloid + RBC transf. w/ ongoing bleeding; C1 esterase inhib def.	Safer and more concentrated therapy available (ie, for specific clotting factors).	Should be ABO compatible; Infuse 5-10 mL/min or as patient tolerates. Give 10-15 cc/kg.