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Article type : International Forum

United States of America

Meghan Delaney

Subject 1. Hospital and transfusion service demographics:

Question 1

United States of America.

Question 2

Yes.

Question 3

Both.

Question 4

Neonate is defined by transfusion service as < 4 months according to US regulations (FDA, AABB) that is built around being able to waive additional cross matching to avoid iatrogenic phlebotomy by using Group O red blood cells during this time period (birth to chronological 4 months of age). All of the patients at our facility would be considered "pediatric" since we are a stand-alone tertiary /quaternary pediatric referral center. We do not have "adult" protocols, even though we may treat patients >18 years, they would fall under regular transfusion approach. The only exception to this may be if there is a patient >18 years who is refusing transfusion due to their wishes, if the patient is a legal minor (<18 years) or not (>18 years), the hospital would proceed differently.

Question 5

Yes, it is pediatric specialty hospital that has a NICU as well. We have 313 beds.

Question 6

No, only neonates and pediatrics. We do treat young adults as well when there is a reason for the patient to see a physician with specialty in pediatric geared specialties (pediatric cancers, genetics, congenital heart disease, etc).

Question 7a

Yes.

Question 7b

Yes.

Question 7c

Yes.

Question 7d

Yes.

Question 7e

Yes.

Question 7f

Yes.

Question 7g

Yes.

Question 7h

Yes.

Question 7i

Yes.

Question 7j

Yes.

Question 7k

Yes.

Question 7l

Yes.

Question 7m

Yes.

Question 7n

Yes.

Question 7o

Yes.

Question 7p

Yes.

Question 8a

RBCs: 8,057 units (in 2017).

Question 8b

I am not able to get this information without a long wait and IT request.

Question 9a

Plasma: 1,760 (in 2017).

Question 9b

I am not able to get this information without a long wait and IT request.

Question 10

Platelets: 3525 / year (Full size units. We aliquot them into smaller doses for smaller patients.) (in 2017).

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1

No, national guideline for transfusion in pediatric and neonatal patients in the USA do not exist. The USA has never really had national level guidelines on transfusion. There are initiatives through various networks and professional societies to create guidelines, but these are typically in specific populations or according to certain practices.

For instance, the PALISI network created a set of 10 manuscripts focused on evidence based review and areas needed for research on transfusion indications and thresholds in pediatric critical care patients only (called the TAXI project). There are other AABB and ASCO guidelines, some of which mention pediatric patients and some do not.

Question 2

Our hospital specialties do have transfusion thresholds for neonatal and/or pediatric transfusions based on diagnosis that are kept at the local level. My plan is to collate these empiric approaches into one transfusion policy at the hospital level. I was able to do this at Seattle Children's Hospital when I was Transfusion Medicine Director there.

Question 3

Our hospital specialties do have transfusion thresholds for ordering RBC/plasma/platelets based on diagnosis that are kept at the local level. My plan is to collate these empiric approaches into one transfusion policy at the hospital level. I was able to do this at Seattle Children's Hospital when I was Transfusion Medicine Director there.

Question 4

Yes. Providers that are ordering blood product transfusion must electronically complete the "Justification for transfusion" to order the blood.

Question 5

No, the provider does not enter the diagnosis. The provider must enter "Justification for transfusion", but not a separate diagnosis. The diagnosis is available in the medical record if it needs to be checked.

Question 6

Our hospital specialties do have transfusion thresholds for RBC transfusion based on diagnosis that are kept at the local level. My plan is to collate these empiric approaches into one transfusion policy at the hospital level. I was able to do this at Seattle Children's Hospital when I was Transfusion Medicine Director there.

Our transfusion data card states, “Increase oxygen- carrying capacity”

Question 7

Our hospital specialties do have transfusion thresholds for platelet transfusion based on diagnosis that are kept at the local level. My plan is to collate these empiric approaches into one transfusion policy at the hospital level. I was able to do this at Seattle Children’s Hospital when I was Transfusion Medicine Director there.

Our transfusion data card states, “Correct/prevent bleeding due to thrombocytopenia”

Question 8

Somewhat. Our hospital specialties do have transfusion thresholds for plasma transfusion based on diagnosis.

Our hospital specialties do have transfusion thresholds based on diagnosis that are kept at the local level. My plan is to collate these empiric approaches into one transfusion policy at the hospital level. I was able to do this at Seattle Children’s Hospital when I was Transfusion Medicine Director there.

Our transfusion data card states, “Coagulation factor replacement for which there is no specific factor concentrate”

Subject 3. Product manipulations for pediatric and neonatal patients:

Question 1

Yes, all platelets and RBCs are irradiated. This policy was put in place because of missed irradiation events in our population that is heavily enriched for patients that have a medical indication for irradiation. The only exception is if they are ordering emergency release blood when the provider signs to waive irradiation.

Question 2

Yes, all red blood cells are leukocyte reduced.

Question 3

Yes, this is by transfusion medical director approval and typically only for prevention of severe allergic reactions.

Question 4

No, not at this time, but we plan to in the future.

Question 5

No, not at this time.

Question 6

Yes. We have a large and active sickle cell disease treatment program and provide Rh/K for these patients. We also default to antigen matched cells when a patient has certain serological findings, such as panagglutinin, but this is on the case-by-case basis by the transfusion medical and technical laboratory specialists (SBB).

Question 7

No.

Question 8

Yes, we have multiple infants assigned to one red blood cell parent unit and we draw multiple aliquots off of them. We put up to 5 babies on Group O, RhD positive or RhD negative RBC unit. We select the unit that is ≤10 days of storage at the time of assignment.

Question 9

We do use small pediatric tubes whenever we can.

Question 10

Yes, this is based on age of RBC product and time from irradiation. In general, this is what we follow:

Patient Age	Maximum Storage After Irradiation	Additional Attributes
Neonates (<4 months)	• 24 hours	• Fresh units ≤10 days old at time of transfusion • O positive or negative
Infants and Young Children (4 months - 5 yrs)	• 72 hours after day of irradiation (day 0)	
Older Children and Adolescents/Adults (>5 yrs)	• 28 days post-irradiation or original expiration date, whichever is first	
Any age patient: ECMO, cardiac surgery pump prime units	• Age-dependent • Minimize post-irradiation storage time whenever possible	• Fresh units ≤10 days old at time of transfusion • Select <7 day old units for

		cardiac surgery pump prime whenever inventory allows • Cath lab units are NOT required to be fresh (>10 days allowed)

Subject 4. Blood product dosing:

Question 1

Patients < 50 kg and sickle cell pts: 10-15 mL/Kg

Patients ≥ 50 kg: 1-2 units (5-10 mL/kg)

Question 2

Patients < 5 kg: 1 EU.

Patients ≥ 5 kg: 1 EU/5 kg (oncology/BMT/ bleeding patient).

1 EU/10 kg.

Apheresis derived: 1 EU = equivalent to 1 random donor platelet or 5.5×10^{10} platelets in 25-50 mL plasma).

Question 3

Patients < 50 kg: 10-15 mL/kg

Patients ≥ 50 kg: 2 units (5-10 mL/kg)

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Czech Republic

Hana Lejdarová

Subject 1. Hospital and transfusion service demographics:

Question 1

The Czech Republic.

Question 2

Yes.

Question 3

In our facility.

Question 4

For neonate: 30 days old.

For pediatric: under 19 years old.

Question 5

No, we are not a pediatric specialty hospital.

Question 6

Yes, we treat both adult and pediatric patients and have 400 inpatient beds.

Question 7a

Yes.

Question 7b

Yes.

Question 7c

Yes.

Question 7d

Yes.

Question 7e

Yes.

Question 7f

Yes.

Question 7g

Yes.

Question 7h

Yes.

Question 7i

Yes.

Question 7j

Yes.

Question 7k

Yes.

Question 7l

Yes.

Question 7m

Yes.

Question 7n

Yes.

Question 7o

Yes.

Question 7p

Yes.

Question 8a

1671 T.U.

Question 8b

i. 216 T.U.

ii. 231 T.U.

iii. 1224 T.U.

Question 9a

182 T.U. + 61 Octaplas.

Question 9b

i. 24 T.U.

ii. 29 T.U.

iii. 129 T.U.

Question 10a

921 T.D.

Question 10b

i. 40 T.D.

ii. 24 T.D.

iii. 857 T.D.

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1

No. (There is only a chapter in the national guidelines. There is information about intrauterine or intraumbilical transfusions and doses for children).

Question 2

No. (There is only a chapter in the guidelines about indications of blood components in children in hospital guidelines).

Question 3

No.

Question 4

No.

Question 5

No.

Question 6

Yes. The Treshold for adults is 70 – 80 g/l. We have no exact recommendations for children for the fast changes of clinical status.

Question 7

Yes. Recomendation for adults: prophylactic aplication: usually under 20 x 10^9/l, therapeutic aplication: under 80-100 x 10^9/l – massive bleeding, cerebral injurance, under 50 x 10^9/l - serious bleeding gastrointestinal or urological, under 30 x 10^9/l - bleeding in muscles or skin. There is no special recommendation for children.

Question 8

No. We have a clinical definition.

Subject 3. Product manipulations for pediatric and neonatal patients:

Question 1

Yes. Children under 1 year old, onkology patients, imunodeficites.

Question 2

Yes. All RBCs for pediatric and neonatal patients are leukodepleted.

Question 3

Yes. IgA selective imunodeficit, serious allergic adverse events after aplication of blood components.

Question 4

No.

Question 5

No.

Question 6

Yes. Onkology patients.

Question 7

No.

Question 8

No.

Question 9

Yes.

Question 10

Yes. Polytraumatic patients maximaly 14 days old, neonates 5 days old, pediatric 14 days old.

Subject 4. Blood product dosing:

Question 1

5-10 ml/kg.

Question 2

Standard pediatric dose (about 80-100 ml). Children under 15 kg – 10-20 ml/kg.

Question 3

10-15 ml/kg. We aplicate almost Octaplas to pediatrics and neonates patients.

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Italy

Paola Maria Manzini, Giuseppina Facco & Costantino Avdis

Subject 1. Hospital and transfusion service demographics:

Question 1

Our hospital is located in North West Italy in the city of Torino.

Question 2

It is a teaching academic Hospital.

Question 3

The Blood Establishment, from which we receive blood components, is part of our facility.

Question 4

At our hospital, an age thresholds of less than 30 days old is used to define neonate while a thresholds of less than 18 yrs old defines pediatric patients.

Question 5

No.

Question 6

Our hospital treats both adult and pediatric patients and has nearly 300 inpatient beds for pediatric and neonatal patients.

Question 7a

Yes.

Question 7b

Yes.

Question 7c

Yes.

Question 7d

Yes.

Question 7e

Yes.

Question 7f

Yes.

Question 7g

Yes.

Question 7h

Yes.

Question 7i

Yes.

Question 7j

Yes.

Question 7k

Yes.

Question7 l

Yes.

Question 7m

Yes.

Question 7n

Yes.

Question 7o

Yes.

Question 7p

Yes.

Additionally our Hospital provides solid organ transplants for pediatric and neonatal patients.

Question 8a

Around 3000 RBCs are transfused to pediatric and neonatal patients every year.

Question 8b

i. Nearly 300 RBCs to neonates younger than 1 month old.

ii. 180 RBCs to pediatric patients between 1 and 4 months old.

iii. 2500 RBCs to pediatric patients between 4 months and 18 years old.

Question 9a

Around 1300 plasma units are transfused to pediatric and neonatal patients each year.

Question 9b

i. 240 plasma units to neonates younger than 1 month old.

ii. 90 plasma units to pediatric patients between 1 and 4 months old.

iii. 1000 plasma units to pediatric patients between 4 months old and 18 years old.

Question 10 a

Around 2000 platelet concentrates are transfused to pediatric and neonatal patients each year.

Question 10b

i. 50 platelet concentrates to neonates younger than 1 month old.

ii. 15 platelet concentrates to pediatric patients between 1 and 4 months old.

iii. 1900 platelet concentrates to pediatric patients between 4 months old and 18 years old.

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1

In Italy there is a national recommendation for Neonatal transfusion[1] (last revision in 2014), made by Italian Society of Transfusion Medicine (SIMTI), through a working group of medical experts, including transfusion medicine, foetal medicine, neonatology, paediatric intensive care, haematologist. The recommendation is shared by the Italian society of neonatology (SI). The main differences from adult guidelines concern:

- Blood component selection: from regular donors only, irradiated, then 'fresh' (before the end of Day 5 following donation) and with a 24-h shelf-life post-irradiation for Intrauterine transfusions (IUT), Exchange blood transfusion (EBT). In order to reduce donor exposure, small-volume splits of single-donor (pedi-packs) are used for neonatal transfusions; blood components have to be prepared following the standards of The Guide to the preparation, use and quality assurance of blood components, 19th Edition, European Directorate for the Quality of Medicines & HealthCare of the Council of Europe[2]
- Small volume transfusions (15 ml/kg in non-bleeding neonates);
- Suggestions of restrictive RBCs transfusion thresholds in stable and non-bleeding patient. However, the final decision for transfusion is made by clinicians based on their clinical judgement.

Question 2

Our hospital has local policy that is available for clinicians on local network. In addition to the indications suggested at national level, our policy recommends:

- Blood component selection: from regular donors who have given at least 2 donations per year within the previous 2 years;
- Small-volume splits of single-donor (pedi-packs, mean volume 70-80 mL) are stored for the same patient at least until T&S expiry date (72 hours);
- Suggestions of restrictive RBCs transfusion thresholds in stable and non-bleeding patient, avoiding for Very Low Birth Weight (VLBW) and Extremely Low Birth Weight (EVLBW) haemoglobin levels below the lower limits tested in the Cochrane review (Table 3)[4].

Question 3

Our Hospital has a list of indications for ordering RBC plasma and platelets; for paediatric transfusion indication refers to BSH Guideline[3]. These indications include IUT, EBT, Hemolytic Disease of Newborn (HDN), preterm anemia and neonatal cardiac surgery.

Question 4

In Our Hospital it is mandatory, for the person ordering the transfusion, to provide the indication for the transfusion at the time that the blood products are ordered, at the moment the indication is chosen from a list present in the emocomponent order paper. By the end of 2018 an electronic order will be available.

Question 5

It is also mandatory for the person ordering the transfusion to provide the patient's diagnosis when blood products are ordered.

Question 6b

Our hospital has guidelines with threshold for RBC, plasma and platelets transfusion for adult patients as well as for pediatric and neonatal pts.

i. See table 1 for RBCs thresholds in stable non-bleeding neonatal patients. Indications do not exclude clinical evaluation by clinicians who eventually decide for transfusion.

Table 1: Hemoglobin treshold levels (g/L) (Haematocrit %) triggering RBC transfusion (modified by Whyte et al, 2011[4])

Age in days	Blood sampling	Respiratory support	No respiratory support
1-7	Capillary	≤ 115 (35%)	≤ 100 (30%)
8 – 14	Capillary	≤ 100 (30%)	≤ 85 (25%)
≥15	Capillary	≤ 85 (25%)	≤ 75 (23%)

Question 7b

Thresholds for platelet transfusion in neonates are also suggested and are shown in Table 2. Indications do not exclude clinical evaluation by clinicians who eventually decide for transfusion.

Table 2: Platelets threshold levels (10^9/L) triggering Platelet transfusion[1, 3]

Platelets count	**Indication for transfusion**
< 30	Always indication for transfusion
30 – 49	Neonates with bleeding, current coagulopathy, before surgery, previous intracranial haemorrhage
50 – 99	Major bleeding or requiring major surgery
>100	Usually no indication for transfusion

Question 8

Our hospital doesn't have thresholds for plasma transfusion in pediatric and neonatal patients but suggests plasma use in neonates with clinically significant bleeding (including massive blood loss), prior to invasive procedures with a risk of significant bleeding, who have an abnormal coagulation profile, defined as a PT or APTT significantly above the normal gestational and postnatal age-related reference range and neonates who have congenital bleeding disorders, with no specific factor concentrate available. Our policy discourages the routine use of plasma to correct abnormalities of the coagulation screen alone in non-bleeding neonates and for prevention of intraventricular haemorrhage.

Subject 3. Product manipulations for pediatric and neonatal patients:

Question 1

Our transfusion Department offers irradiated products. Indications for irradiation are: prevention of Graft Versus Host Disease and particularly in IUT, EBT and for all neonatal VLBW and ELBW patients; in pediatric patients with haematological malignancies and in Liver transplantation patients younger than 4 yrs old.

Question 2

Since 2017 Italy has introduced universal Leukodepletion so RBCs and platelets are all leukodepleted. Even before our department has always issued leukodepleted RBCs and Platelets for IUT, EBT, neonatal transfusions and paediatric oncologic and hematologic patients.

Question 3

We also have the chance to offer washed RBCs. Indications are: EBT and all patients with repeated serious allergic or anaphylactic or anaphylactoid reaction or patients considered to be at higher risk of an anaphylactic or anaphylactoid reaction due to selective severe IgA deficiency with or without anti-IgA antibodies. Washed RBCs are also delivered in operating room during liver transplant for patients younger than 8 months old.

Question 4

We do not maintain a stock of thawed plasma units for immediate issue.

Question 5

In our transfusion center we can offer pathogen inactivated plasma, cryoprecipitate and cryoprecipitate depleted plasma. Methods for inactivation are: solvent/detergent for plasma and riboflavin/UV for cryo and cryo-depleted plasma.

Question 6

Our transfusion department prophylactically match, for all neonates and pediatric patients, RBCs C,c,E,e, and Kell antigens other than ABO and RhD.

Question 7

Usually we don't provide other specific tests for neonatal/pediatric patients, unless some peculiar condition as CMV negative stem cell transplantation candidate where CMV negative blood units are issued.

Question 8

In order to minimize number of donors the patients are exposed to, for neonatal transfusion we use small-volume splits of single-donor (pedi-packs, mean volume 70-80 mL) and store them for the same patient at least until T&S expiry date (72 hours -3 days). During liver transplant RBC units divided in two pediatric units are delivered coupled to be transfused one after the other in case of needing before transfusion of any other RBC.

Question 9

To minimize the volume of the samples drawn for laboratory testing only small volume test tubes for collecting samples are used. A policy to reduce when possible frequency of sampling is applied in all departments.

Question 10

Irradiated RBCs with no more 5 days shelf-life post-irradiation are used for all neonatal patients and pediatric patients younger than 6 months old. 5 days storage age RBCs are issued during liver transplant, for IUT, EBT and neonatal cardiac surgery. RBCs with a 24-h shelf-life post-irradiation are used for IUT, EBT, neonatal cardiac surgery and liver transplant younger than 4 yrs old.

Subject 4. Blood product dosing:

Question 1

For stable pediatric and/or neonatal patients 5-10 ml/kg of RBCs are usually prescribed.

Question 2

For stable pediatric and/or neonatal patients 10 ml/kg of platelet concentrate are usually prescribed.

Question 3

For stable pediatric and/or neonatal patients 15-20 ml/kg of plasma[1, 3] are usually prescribed.

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India

Lakhvinder Singh, Rekha Hans, Ratti Ram Sharma & Praveen Kumar

Subject 1. Hospital and transfusion service demographics:

Question 1

Our hospital is located in India.

Question 2

Ours is a Major academic teaching hospital offering the widest possible selection of services. It is a large public tertiary healthcare institute and a referral center for five provinces of north India. It conducts postgraduate and doctoral courses in all the major medical and surgical specialties and superspecialities.It also conducts graduate and post graduate courses in nursing and medical laboratory technology. About 1.2to 1.3 million patients visit the out-patient services (OPD) of our institute every year. It has inpatient bed strength of 2200 with an annual inpatient admission numbers ranging from 80,000 to 90,000.

Question 3

The institute has a Department of Transfusion Medicine, a hospital based academic blood centre with postgraduate and doctoral programmes in the speciality. The Department collects around 60,000 units of blood, majority (>90%) from Voluntary source, prepares blood components, perform mandatory screening for infectious markers (HIV-1&2, HBV, HCV, Syphilis and malaria) and compatibility testing. The requisite blood components are issued to both adult and pediatric patients in emergency as well as for routine transfusions. The Dept. also has an active Apheresis unit performing Plateletpheresis, Therapeutic Plasma exchange and stem cell harvesting and cryopreservation.

Question 4a

A less than 30 days old child is defined as a neonate in our Institute.

Question 4b

A less than 13 years old is defined as a pediatric patient in our Institute.

Question 5

Our Institute provides treatment for both pediatric as well as adult patients.

Question 6

Our Institute provides treatment for both pediatric as well as adult patients. In our institute, we have an Advanced Pediatric care Centre with bed strength of 283 exclusively for pediatric patients in the same campus.

Question 7a

Yes.

Question 7b

Yes.

Question 7c

Yes.

Question 7d

Yes.

Question 7e

Yes.

Question 7f

Yes.

Question 7g

Yes.

Question 7h

Yes.

Question 7i

Yes.

Question 7j

Yes.

Question 7k

Yes.

Question 7l

Yes.

Question 7m

Yes.

Question 7n

Yes.

Question 7o

Yes.

Question 7p

Yes

Question 8a

On an average 10000 to 12000 Packed Red Blood Cells (PRBC) units are transfused annually to pediatric and neonatal patients in our institute and in the year 2017-18 (1st July, 2017 to 30 June, 2018), 12144 units of PRBC were transfused.

Question 8b

i. A total of 2754 PRBC units were transfused to the patients younger than 1 month, in the year 2017-2018 (1st July, 2017 to 30 June, 2018).

ii. A total of 1140 PRBC units were transfused to patients of 1 month to 4 months, in the year 2017-2018 (1 st July, 2017 to 30 June, 2018).

iii. A total of 8250 PRBC units were transfused to patients older than 4 months, in the year 2017-2018 (1st July, 2017 to 30 June, 2018).

Question 9a

On an average 3000 to 3500 Fresh Frozen Plasma (FFP) units and 100 to 150 Cryoprecipitate units are transfused annually to pediatric and neonatal patients in our institute and in the year 2017-18 (1st July, 2017 to 30 June, 2018), 3322 units of FFP and 91 units of Cryoprecipitate were transfused.

Question 9b

i. A total of 715 FFP units and 2 cryoprecipitate units were transfused to patients of younger than 1 month, in the year 2017-2018 (1st July, 2017 to 30 June, 2018).

ii. A total of 212 FFP units and 2 cryoprecipitate units were transfused to patients of 1 month to 4 months, in the year 2017-2018 (1st July, 2017 to 30 June, 2018).

iii. A total of 2395 FFP units and 87 cryoprecipitate units were transfused to patients older than 4 months, in the year 2017-2018 (1st July, 2017 to 30 June, 2018).

Question 10a

On an average 8000 to 8500 Whole blood derived Random Donor Platelets (RDP) and 200 to 250 Single Donor Apheresis Platelet (SDAP) units (split in to aliquots) are transfused annually to pediatric and neonatal patients in our institute and in the year 2017-18 (1st July, 2017 to 30 June, 2018), 8055 RDPs and 227 SDAP were transfused.

Question 10b

i. A total of 2386 RDPs and 16 SDAPs (split in to aliquots) were transfused to patients of younger than 1 month, in the year 2017-2018 (1st July, 2017 to 30 June, 2018).

ii. A total of 320 RDPs and 8 SDAPs (split in to aliquots units) were transfused to patients of 1 month to 4 months, in the year 2017-2018 (1st July, 2017 to 30 June, 2018).

iii. A total of 5349 RDPs and 203 SDAPs (split in to aliquots) units were transfused to patients older than 4 months, in the year 2017-2018 (1st July, 2017 to 30 June, 2018).

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1

There are evidence based clinical practice guidelines developed by the National Neonatology Forum of India, October 2010, are available to guide neonatal transfusion practice[1]. For pediatric transfusions, standard textbook and current international published guidelines are followed.

However, there are no national published guidelines for adult transfusion for comparison.

Question 2

Our institute has local protocols for pediatric and neonatal transfusions based on the current national and international guidelines. However, there are no published local guidelines for adult transfusion for comparison.

Question 3b

The neonatologists follow the National Neonatology Forum of India, October 2010, guidelines for ordering blood components for transfusion. For the pediatric age group; standard national and international guidelines are followed. On review of the blood requisitions for the last one year (1st July, 2017 to 30th June, 2018) the indications for blood component ordering are listed below;

i. Indications for RBC Transfusion-(Percentage of total RBC Transfusions)

Neonates **Medical (60%):**	- Exchange transfusion for neonatal sepsis (50%) and Hemolytic disease of newborn (20%) -Anemia developing due to various other neonatal problems like anemia of prematurity and hemorrhagic

	disease of newborn. (30%)
Neonates **Surgical (40%)**	Congenital malformations like Anorectal malformations, posterior urethral valves and cardiac anomalies like Tetralogy of Fallot.
Pediatrics **Medical (69%):**	-Hematological malignancies (36%). -Genetic disorders (26%)-Thalassemia. -Anemia due to **a)** Acute Infections (20%): Pneumonia, meningitis, Pyrexia of unknown origin with anemia, Acute Respiratory Distress Syndrome **b)** Chronic Infections (8%): Tubercular meningitis. **c)** Other indications (10%) Hemolytic uremic syndrome, Chronic Kidney disease and Autoimmune Hemolytic Anemias.
Pediatrics **Surgical (31%)**	-Abdominal mass, sub acute intestinal obstruction, Acute appendicitis. -Congenital malformations- Patent Ductus Arteriosus, Ventricular septal defects, Hydrocephalus, pelvi-ureteric junction obstruction. -Childhood malignancies and tumors like Ewing's sarcoma, Teratoma, Germ cell tumors. -Orthopaedic indications like limb and spine fractures

Indications for Plasma: (Percentage of total PlasmaTransfusions)

Neonate- **Surgical (74%)**	**Congenital malformations-**Tracheo-esophageal fistula (83.7%) Intestinal atresias (16.3%)
Neonate- **Medical (26%)**	Double volume Exchange Transfusions (7.6%) Sepsis (92.4%)
Pediatric- Surgical (37%)	**Congenital malformations (83.7%)-**Intestinal Atresias, Malrotation, Pelvic uretric junction obstruction, Subacute Intestinal Obstruction **Trauma (16.3%)-** Blunt Trauma abdomen, Fractures, Limb Injury
Pediatric – Medical (63%)	**Bleeding disorders (6.3%)-** Hemophilia, Protein C and S deficiency, Factor deficiency. **Acute infections (41.2%)-** Liver abscess, Brain abscess, Septic shock, Post operative Sepsis, Disseminated Intravascular Coagulopathy **Chronic infections (6.3%)-**Tubercular meningitis, meningoencephalitis **Hematological disorders (4.7%)-**Hemolytic uremic syndrome **Hematological malignancies (41.5%)-** Acute Lymphoblastic Leukemia, Acute Myeloid Leukemia, Lymphoma

Indications for Platelets: (Percentage of total Platelet Transfusions)

Neonate **Surgical (81%)-**	**Congenital malformations** Like Tracheo-esophageal fistula
Medical (19%)-	**Acute Infections** -Early Onset of Neonatal Sepsis, Necrotizing enterocolitis.
Pediatric- **Medical (73%)-**	**Hematological malignancies (75.8%)** like Acute Lymphoblastic Leukemia, Acute Myeloid Leukemia, and Aplastic Anemia. **Acute infections (24.2%)**-Pneumonia, Meningitis, Parvo Virus infection.
Surgical (27%)	**Congenital malformations (98%)** like Tracheo-esophageal fistula, Tetralogy of Fallot, Intestinal Atresia**.** **-Trauma (2%)-** Limb injury, blunt trauma abdomen

Question 4

It is not mandatory for the person ordering transfusion to provide the indication for the transfusion at the time the blood products are ordered. However, there is a provision for conveying the specific indication for blood component transfusion in the blood requisition form, which is subsequently entered electronically in the Hospital Information System.

Question 5

It is not mandatory for the person ordering transfusion to provide the diagnosis at the time the blood products are ordered. However, there is a provision for conveying the specific indication/diagnosis for blood component transfusion in the blood requisition form, which is subsequently entered electronically in the Hospital Information System. In addition, the importance of mentioning an indication/diagnosis on the blood order are also discussed in the hospital transfusion committee to provide necessary instructions to the user departments for compliance at regular intervals.

Question 6b

i. The Thresholds for RBC Transfusion in Neonates in our institute are given as below:

- PCV <36% and requiring
  - >35% supplemental oxygen
  - MAP ≥6-8 cm H2O by CPAP or IMV
- PCV <31% and Requiring
  - <35% supplemental oxygen or MAP <6 cm H2O by CPAP or IMV
  - >9 episodes of apnea and bradycardia in 12 h or 2 episodes in 24 h requiring bag & mask ventilation while on adequate methylxanthine therapy
- PCV < 40% and
  - HR >180/min or RR >80/min persisting for 24 h
  - Wt gain <10 g/d for 4 d while on 100 Cal/k/d
  - Undergoing surgery
- PCV <21% and
  - Asymptomatic with reticulocytes <100,000/µL (2%)

The Thresholds for RBC Transfusion for Pediatric Patients in our institute are given as below:

- Hb<10g/dl in hemodynamically unstable patients.
- Hb<7g/dl in hemodynamically stable patients.

Question 7b

Yes

i. The Thresholds for Platelet Transfusion in Neonates in our institute are given as below:

- Platelet Count<50,000/ µL in - Any preterm infant (<33 wks) in 1st wk of life - Clinically unstable term infants in 1st wk of life - Any neonate undergoing invasive procedure (e.g. ventricular tap) - Preterm neonate who has to be started ibuprofen or indomethacin or who has recent-onset grade III/IV IVH
- Platelet Count <20,000 /µL in all stable infants beyond 1st wk of life without active bleeding.
- Platelet Count <100,000 /µL in presence of allo-immune thrombocytopenia
- Platelet Count <100,000 /µL in presence of active major bleeding

The Thresholds for Platelet Transfusion for Pediatric patients in our institute are given as below:

- Platelet count< 50,000/µL in case of active bleeding other than ecchymoses or petechiae.
- Platelet count< 100,000/µL in intracranial bleeding or there is a condition that impairs platelet adhesion.
- Platelet count< 10,000/µL when there is no evidence of active bleeding other than ecchymotic, petechial hemorrhages and there is thrombocytopenia from bone marrow suppression or severe sepsis.

Question 8b

i. The Thresholds for Plasma Transfusion for Neonates in our institute are given as below:
Abnormal Prothrombin time and Activated Partial thromboplastin time (PT ≥17 seconds is abnormal in both term and preterm. APTT of >45 s in term and >55 s in preterm).

The Thresholds for Plasma Transfusion for Pediatric Patients in our institute are given as below:
FFP transfusion is indicated in critically ill patients with coagulopathy associated with active bleed. International Normalized Ratio (INR)>1.5.

Subject 3. Product manipulations for pediatric and neonatal patients:

Question 1b

Yes, the department of transfusion medicine has the facility for irradiation of blood components.

i. Following are the main indications for irradiation:
    1. Acute leukemias (Acute Myeloid Leukemia, Acute Lymphocytic leukemia)
    2. Intra Uterine Transfusions
    3. Patients undergoing stem cell transplantation.

Question 2b

Yes the department of transfusion medicine Provides Buffy coat depleted (1 log leukoreduced) RBCs to Thalassemia and Hemato-oncology patients and these units are further leukoreduced at bedside of the patient by using third generation Leukofilters.

Question 3b

Yes, the department of transfusion medicine offers washed RBCs for Thalassemia /multiply transfused patients who report recurrent severe allergic reactions to RBC transfusion.

Question 4a

No, the department of transfusion medicine does not stock thawed plasma units, but offer thawed plasma only on patient specific demand.

Question 5a

No, the department of transfusion medicine does not has facility for pathogen inactivation.

Question 6b

Yes, the department of transfusion medicine prophylactically match extended Rh blood group antigens (E,e,C,c) and Kell antigen other than ABO and RhD for Thalassemia patients.

Question 7

Department of transfusion medicine does not screen the donor units, other than the infectious markers mentioned above in reply to question 3 (subject:1), or CMV, due to its high prevalence in general population and it is difficult get a CMV negative units.

Question 8

Department of transfusion medicine prepares Pedi bags from adult red cell units and split the Single Donor Apheresis Platelet products for pediatric patients to minimize the donor exposure and optimize the product usage.

Question 9

Smaller blood volume samples are taken from neonates and younger pediatric patients for laboratory testing and they are run the dedicated equipments for their analysis.

Question 10

Department of transfusion medicine has a policy to reserve RBCs for maximum of 72 hours for a particular patient after which it can be released for other patients for optimum usage of the product.

Subject 4. Blood product dosing:

Question 1

- The usually prescribed red cell dose for Neonates is 10 mL/kg over 4hour.
- The usually prescribed red cell dose for Pediatrics-10-15 mL/kg.

Question 2

- The usually prescribed platelet dose for Neonates is 10 mL/kg of PC over 1 hour.
- The usually prescribed platelet dose for Pediatrics is 10mL /kg.

Question 3

- The usually prescribed plasma dose for Neonates is 10 mL/kg over 2-3 hour
- The usually prescribed platelet dose for Pediatrics is 10-20mL /kg

Reference:

https://www.scribd.com/document/357493116/Nnf-Guidelines-2011 (Accessed on 10-7-18)

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Sweden

Agneta Wikman & Emöke Deschmann

Subject 1. Hospital and transfusion service demographics:

Question 1

Sweden.

Question 2

Karolinska University Hospital is a teaching/academic hospital in Stockholm.

Question 3

Blood is collected in our own collection centers and components are prepared in our own facility, a hospital blood bank.

Question 4a

Neonate is defined as less than one month old, corrected for gestational age.

Question 4b

Pediatric patients are less than 18 years old.

Question 5

No.

Question 6

At the hospital both adult and pediatric patients are treated.

a. The hospital has in total 212 pediatric inpatient beds. The pediatric departments are organized in themes, with 72 beds in neonatology, 28 beds in high specialty medicine (infections, allergy and respiratory disorders, obesitas, investigations NUD) 84 beds in surgery, pediatric intensive care unit, haematology, oncology, 28 beds in orthopedics, neurology, habilitation.

Question 7

The hospital has all specialties listed, with reservation for heart transplantations that are not done at Karolinska. In addition, the hospital has an ECMO unit, where both neonatal and pediatric patients are treated.

Question 8a

3683 RBC transfusions were given to pediatric patients during 2017.

Question 8b

867 RBC transfusions were given in the Neonatology Department.

Information on the age of the recipients is not available.

Question 9a

1339 plasma transfusions were given to pediatric patients during 2017.

Question 9b

375 plasma transfusions were given in the Neonatology Department.

Information on the age of the recipients is not available.

Question 10a

1876 platelet transfusions were given to pediatric patients during 2017.

Question 10b

217 platelet transfusions were given in the Neonatology Department.

Information on the age of the recipients is not available.

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1

There are no Swedish national guidelines for neonatal and/or pediatric transfusions. On-going work for neonatal transfusions is not implemented yet.

Question 2

There are local guidelines at the hospital, specific for neonatal transfusions and more general for pediatric transfusions. The guidelines differ from adult guidelines, regarding the thresholds, indications and considerations.

Question 3

The hospital has no list of indications for ordering RBC/plasma/platelet transfusions to pediatric patients.

Question 4

It is not routine to provide the indication for the transfusion when ordering blood.

Question 5

No.

Question 6

The local guidelines have hemoglobin thresholds for neonatal RBC transfusions [1], but the general pediatric guidelines have not.

Neonates:

Different thresholds, from Hb ≤120 g/L - ≤85g/L, EVF ≤ 0.35 - ≤0.25 depending of the age (day 1-15) and respiratory support or not.

Pediatrics:

There are no strict general transfusion thresholds. Indication is based on status, circulation, cause of anemia.

Question 7

The local guidelines have platelet count thresholds for neonatal platelet transfusions [1], but the general pediatric guidelines have not.

Neonates:

Stable, platelet count <30x10(9)/L

BW <1500 g and < 7 days old, coagulation disorder <30-49x10(9)/L

Bleeding, FNAIT with ICH, neurosurgery < 50-100x(9)/L

Pediatrics:

No strict general platelet count thresholds. Indication based on bleeding tendency. Platelet transfusion is not indicated in stable patients with platelet count >20x10(9)/L.

Question 8

The local guidelines give no strict thresholds for plasma transfusion. Indications are coagulation disorder, DIC in septicemia.

Subject 3. Product manipulations for pediatric and neonatal patients:

Question 1

The transfusion department offers irradiated products, when requested. All neonates receive routinely irradiated products. In addition, stem cell transplanted patients and the majority of pediatric patients with malignant disorders receive irradiated products. Patients with non-malignant haematological disorders such as sickle-cell disease and thalassemia do not receive irradiated products.

Question 2

The transfusion department provides universal leukodepleted blood products, since almost 20 years.

Question 3

Washed RBCs are offered to those with a previous severe allergic reaction.

Question 4

The transfusion department maintains a stock of thawed plasma units for immediate issue.
4 units of blood group AB plasma are always available at the blood bank and also thawed plasma of other blood groups are normally available. In addition, the trauma unit has 4 units of thawed AB plasma in an external fridge.

Question 5

All platelet units are pathogen inactivated with Intercept® (Cerus) technology. Solvent detergent plasma (Octaplas®, Octapharma AG, Austria) is available on special indications (e.g. regular plasma transfusions due to a coagulation factor deficiency, severe allergic reactions, plasmapheresis).

Question 6

RBCs are prophylactically matched for Rh, K, Kidd, Duffy for patients with chronic transfusion requirements (thalassemia, sickle-cell etc) [2,3]. In malignant disorders RBCs are not routinely antigen matched.

Question 7

Other than mandatory testing is done only on specific indications. E.g. CMV is tested if granulocyte transfusions are given. In other blood components leukodepletion is considered sufficient not to transmit CMV, also in intrauterine blood transfusions.

Question 8

Procedures to minimize the number of donors the patients are exposed to are not routinely used, fresh blood components are normally prioritized.

Question 9

The neonatal ward has a policy to minimize the volume and frequency of the samples drawn for laboratory testing; small volume test tubes and priority of analyses have been implemented.

Question 10

The transfusion department has policies for the maximum storage age of RBCs that can be issued to specific patients. RBC pediatric units, 70 mL, is stored maximum 14 days after the day of collection and 24 hours after irradiation, RBC units for pediatric patients and to all who requires chronic transfusions is less than 14 days. RBC units used for the preparation of blood exchange and prime blood, is less than 5 days and maximum 24 hours after irradiation [4].

Subject 4. Blood product dosing:

Question 1

The dose of RBCs prescribed for stable patients is to neonates 15-20 mL/kgBW and to pediatric patients 10 mL/kgBW.

Question 2

The dose of platelets prescribed for stable patients is to neonates 10-15 mL/kgBW and to pediatric patients 10 mL/kgBW.

Question 3

The dose of plasma prescribed for stable neonates is 10 mL/kgBW. In the local pediatric guidelines the plasma dosage is not mentioned.

References:

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2. Matteocci A, Perelli L. Red blood cell alloimmunization in sickle-cell disease and in thalassemia: current status, future perspectives and potential role of molecular typing. Vox Sang 2014; 106: 197-208.

3. La Salle-Williams M, Nuss R, Le T et al. Extended red blood cell matching for transfusion in sickle-cell disease: a review of 14 years experience from a single center. Transfusion 2011; 51:1732-1739.
4. Guide to the preparation, use and quality assurance of Blood Components 19th ed, 2017.

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Singapore

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Subject 1. Hospital and transfusion service demographics:

Question 1

Singapore.

Question 2

We are not a hospital but we serve as Singapore's national blood service (Blood Services Group (BSG), Health Sciences Authority (HSA)).

There are 3 main public hospitals in Singapore with neonate and paediatric services and these are all teaching/academic hospitals. These hospitals are:

1. KK Women's and Children's Hospital (KKH)
2. National University Hospital (NUH)
3. Singapore General Hospital (SGH - primarily neonates)

Blood Services Group (BSG), Health Sciences Authority (HSA) which serves as the national blood service of Singapore, supplies blood to the above hospitals. In addition, BSG also supplies blood and provide pre-transfusion test services to a few private hospitals which may contribute to a small pool of the neonate/paediatric population who receives transfusion.

Question 3

See reply to Question 2.

Question 4a

< 1 month.

Question 4b

< 16 years old in KKH, < 18 years old in NUH.

Question 5a

KKH is a paediatric and women specialty hospital with 365 beds for the paediatric specialty. The other hospitals are not paediatric specialty hospitals.

Question 6

All the hospitals stated in question 2) treat both adult and paediatric patients.

Question 6a

For SGH : Neonatal Intensive Care Unit 10, High Dependency 18, Nursery 20 (neonates only).

For NUH: 100 Paediatric beds.

Question 7a

Yes at KKH and NUH.

Question 7b

Yes at KKH and NUH.

Question 7c

Yes at KKH and NUH.

Question 7d

Yes at KKH and NUH.

Question 7e

Yes at KKH and NUH.

Question 7f

Yes at KKH and NUH.

Question 7g

Yes at KKH and NUH.

Question 7h

Yes at KKH and NUH.

Question 7i

Yes at KKH and NUH.

Question 7j

Yes at KKH and NUH.

Question 7k

Yes at KKH and NUH.

Question 7l

Yes at KKH and NUH.

Question 7m

Yes at KKH and NUH.

Question 7n

Yes at KKH and NUH.

Question 7o

Yes at KKH and NUH.

Question 7p

Yes at KKH and NUH.

Question 8

The figures stated in Questions 8-10 refer to the number of blood product units supplied to neonates and paediatric patients from BSG, HSA across the various hospitals in Singapore over the last 1 year.

Question 8a

4394.

Question 8b

i. 794.

ii. 530.

iii. 3070.

Question 9a

1063.

Question 9b

i. 320.

ii. 106.

iii. 637.

Question 10a

2241.

Question 10b

i. 310.

ii. 274.

iii. 1656.

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1

No.

Question 2

There are hospital specific guidelines.

Question 2b

i. 1. Transfusion triggers.

2. Provision of manipulated blood products for special groups: intrauterine transfusion, neonatatal exchange transfusion, paediatric Extracorporeal Membrane Oxygenation (ECMO), cardiac surgery.

Question 3b

Yes.

i. Please see replies to questions 6) to 8) below for the indications.

Question 4b

Yes.

i. KKH : yes.

NUH: yes.

SGH: yes.

Question 5

KKH: no.

NUH: no.

SGH: no.

Question 6b

Below are the RBC transfusion thresholds for the 3 major paediatric hospitals.

Question 6b

i. KKH thresholds:

RBC transfusion thresholds for neonates

Postnatal Age	Suggested Transfusion Threshold		
	Ventilated	On oxygen or	Off oxygen

		non-invasive positive pressure ventilation	
First 24 hours	<12	<12	<10
< week 1 (day 1-7)	<12	<10	<10
Week 2 (day 8-14) > Week 3 (day 15 onwards)	<10	<9.5 <8.5	<7.5*
Cumulative blood loss in 1st week of life in extremely low birth weight (Body weight <1kg) infants requiring intensive care	10% blood volume		
Acute blood loss	10% blood volume or estimated (5ml/kg RBC increases Hb by 1g/dL)		

*It is accepted that clinicians may use up to 8.5g/dL depending on clinical situation

RBC transfusion threshold for paediatrics

Clinical situation	Hb transfusion trigger
Patients undergoing chemotherapy Stable Unstable/febrile	 8g/dL 9g/dL
Patients with chronic anaemia on regular transfusion therapy	9g/dL

Symptomatic patients or patients with ongoing blood loss	7g/dL

NUH paediatric RBC transfusion thresholds:

1. Actively bleeding patient with haemodynamic compromise.
2. Symptomatic anaemia.
3. Regular transfusion for thalassaemia patients.
4. Hb < 7g/dL even if asymptomatic.
5. Hb < 10g/dL in hypoxic patients or patients with sepsis.

SGH neonate RBC transfusion thresholds:

1. Transfuse infants at haematocrit < 25% (or Hb < 8g/dl) if the neonate is asymptomatic with reticulocytes <100,000/ul, at the discretion of the attending physician.
2. Transfuse infants at haematocrit less than 30% if:
    - There is significant apnoea and bradycardia (defined as > 9 episodes in 12 h, or 2 episodes in 24 h requiring bag-mask ventilation while receiving therapeutic doses of methylxanthines).
    - The patient requires nasal CPAP of 6 cm water or less (FiO2< 35% by hood or nasal cannula).
    - The patient has persistent tachycardia (heart rate > 180/min) or tachypnoea (respiratory rate of > 80 breaths/min), persisting without other explanation for 24 hours.
    - Weight gain of patient is deemed unacceptable (defined as weight gain of < 10 g/day observed over 4 days) in light of adequate caloric intake (at least 100kcal/kg/day) without other explanation, such as known increases in metabolic demands or known losses in metabolic demands (malabsorption).
    - If the patient is scheduled for surgery, transfuse in consultation with the surgical team.
3. Transfuse for haematocrit levels of less than 35%in the following situations:
    - Infant with severe pulmonary disease (defined as requiring (FiO2> 35% supplemental hood oxygen or continuous positive airway pressure [CPAP]

or NIPPV or mechanical ventilation with a mean airway pressure of > 6 cm water).

- Infant with hypotension requiring pressor support or is critically ill.
- Infant in whom anaemia may be contributing to heart failure.

4. Transfuse if there is a history of massive blood loss (blood volume of 80ml/kg), at the discretion of the attending physician.

5. Transfuse if haematocrit levels less than 45% for babies on ECMO/Cyanotic Congenital Heart Disease.

Question 7b

Below are the platelet transfusion thresholds for the 3 major public hospitals with paediatric and/or neonatal service.

KKH:

Platelet transfusion thresholds for neonates

Indications for platelets transfusion	Platelet count (x 109/L)
Neonates with no bleeding - including neonates with NAIT if no bleeding and no family history of ICH	< 25
Neonates with bleeding - with current coagulopathy, before surgery, or infants with NAIT if previously affected sibling with ICH	< 50
Neonates with major bleeding or requiring major surgery	<100

NAIT: neonatal alloimmune thrombocytopenia, ICH: Intracranial haemorrhage

Indications for platelet transfusion	Platelet counts ($x10^9$/L)
Bone marrow failure (eg aplastic anaemia)	10-20
Patients undergoing chemotherapy Stable Unstable/febrile	 20 30

Prior to lumbar puncture	50
Prior to surgical procedures	50-80
Prior to neurosurgical procedures	100

Platelet transfusion thresholds for paediatrics

NUH Paediatric platelet transfusion thresholds:

1. Bleeding patient with thrombocytopenia to maintain platelet count more than 50 x 10^9/L or 100 x 10^9/L(critical site bleeding).
2. Severe thrombocytopenia – platelet < 10 x 10^9/L (even if patient is not bleeding; exceptions: immune/idiopathic thrombocytopenic purpura in which platelet transfusion alone will not bring up the platelet count) or platelet < 20 x 10^9/L (depending on assessment of bleeding risk e.g sepsis).
3. Before invasive procedure which may cause bleeding if platelet count < 50 x 10^9/L.
4. Before surgery if platelet count less < 100 x 10^9/L to reduce risk of bleeding.

SGH neonate platelet transfusion thresholds:

Indications for platelet transfusion	Platelet counts (x10^9/L)
Well and stable babies	50
Active bleeding, definite threat of bleeding from an invasive procedure or surgery, Major haemorrhage (Grade 3-4 IVH, evolving IVH, Pulmonary Hemorrhage), Fulminant NEC, Critically ill baby, NSAID therapy, sepsis & Preterm babies < 1500g (in the first 2 weeks).	100

IVH: intraventricular haemorrhage, NEC: necrotizing enterocolitis.

Question 8b

Below are the plasma transfusion thresholds for the 3 major paediatric hospitals.

KKH neonate and paediatric plasma transfusion thresholds:

1. Haemorrhagic disease of the newborn.
2. Significant coagulopathy e.g. PTT >63 sec or PT>25 sec (1.5x longer than upper limit of normal range) with risk of significant bleeding or prior to invasive procedure.
3. Reversal of warfarin overdose, in combination with prothrombin complex concentrate (PCC) and Vitamin K.
4. Clotting factor deficiencies for which no alternative clotting factor concentrates are available, e.g. Factor XI deficiency.
5. Massive transfusion.

NUH paediatric plasma transfusion thresholds:

1. Bleeding patient with coagulopathy (defined as PT/aPTT > 1.5 times upper limit of normal).
2. Prophylactic in patients with coagulopathy going for invasive procedure or surgery.
3. Plasma exchange.

SGH neonate plasma transfusion thresholds:

Coagulopathy (PT > 16sec PTT > 60sec) with bleeding or risk of significant bleeding.

Subject 3. Product manipulations for pediatric and neonatal patients:

Question 1b

Yes.

i. Following are the indications which BSG follows in the supply of irradiated and leucoreduced blood products for patients of all ages:

(a) Haematopoietic stem cell transplant recipients (autologous or allogenic), from the time of conditioning chemotherapy onwards;

(b) Intrauterine transfusions;

(c) Neonatal exchange transfusion subsequent to intrauterine transfusions;

(d) Patients currently or previously treated with the following medications:

*Purine analogue drugs such as Fludarabine, Cladribine, Deoxycoformicin, Clofarabine.

*Bendamustine

*Campath (Alemtuzimab)

*Anti-thymocyte Globulin (ATG);

(e) Patients with suspected or confirmed congenital T-cell immune deficiency disorders;

(f) Recipients of donor units known to be from a 1st or 2nd degree blood relative;

(g) Human Leucocyte antigen (HLA) compatible blood components and

(h) All granulocyte products.

Question 2b

Yes.

i. Following are the indications which BSG follows in the supply of leucoreduced blood products for patients of all ages:

(a) Patients who have developed febrile non-haemolytic transfusion reactions on two or more occasions.

(b) CMV-seronegative recipients at risk of CMV transmission via transfusion, including:
- Patients undergoing bone marrow transplants (Leukoreduced and Irradiated)
- Neonates (1st 28 days of life)
- Premature infants and/or infants weighing less than 1200 gm at birth
- Intrauterine transfusions or in neonates who previously received IUT (Leukoreduced and Irradiated).

(c) Non-hepatic solid organ transplant organ candidates to reduce the rate of human leucocyte (HLA) alloimmunisation.

(d) Haematology patients likely to require regular transfusions of blood and blood components to reduce the rate of human leucocyte (HLA) alloimmunisation.

(e) All neonates undergoing cardiac surgery.

(f) All paediatric ECMO patients.

Following are the indications which BSG follows in the supply of leucoreduced blood products for patients of all ages:

(a) Patients who have developed febrile non-haemolytic transfusion reactions on two or more occasions.

(b) CMV-seronegative recipients at risk of CMV transmission via transfusion, including:
- Patients undergoing bone marrow transplants (Leukoreduced and Irradiated)

- Neonates (1st 28 days of life)
- Premature infants and/or infants weighing less than 1200 gm at birth
- Intrauterine transfusions or in neonates who previously received IUT (Leukoreduced and Irradiated).

(c) Non-hepatic solid organ transplant organ candidates to reduce the rate of human leucocyte (HLA) alloimmunisation.

(d) Haematology patients likely to require regular transfusions of blood and blood components to reduce the rate of human leucocyte (HLA) alloimmunisation.

(e) All neonates undergoing cardiac surgery.

(f) All paediatric ECMO patients.

Question 3b

Yes.

i. Following are the indications which BSG follows in the supply of washed RBCs for patients of all ages:

(a) IgA deficiency.

(b) Severe allergic/anaphylactic transfusion reactions.

Question 4a

No.

Question 5a

No.

Question 6a

No.

Question 7

No. Leucoreduced blood products are provided as a measure for minimising transfusion-transmitted CMV infection.

Question 8

No.

Question 9

Yes, please refer below:

KKH:

Neonates aged below 4 months do not require routine crossmatching if the following criteria are met: BW <1.5kg, pre-transfusion ABO / Rh available, DCT negative, maternal ABO/ Rh available, negative maternal antibody screen.

NUH

Paediatric blood tubes are used for Group and Crossmatch and other blood investigations.

SGH (neonates):

- using microtubes and taking the bare minimum needed to run the sample.
- trending electrolytes using the microelectrolyte assay from the Arterial Blood Gas analyser in the Neonatal Intensive Care Unit.
- using transcutaneous CO2 & O2 monitors to minimize Arterial Blood Gas sampling.
- Plan to also start transcutaneous serum bilirubin measurements to minimize blood taking.

Question 10a

No for NUH paediatrics.

Question 10b

Yes for KKH and SGH. Refer below.

Question 10c

SGH (neonates):

Yes – Preference for as fresh as possible RBCs (within 3days of collection), but have used up to 5 days old RBCs when there are supply issues.

BSG recommends the following:

(a) For intrauterine transfusion and exchange transfusion : red cells less than 5 days from date of collection.

(b) Paediatric ECMO: red cells less than 7 days from date of collection.

(c) Neonates of infants < 5kg undergoing cardiac surgery: red cells less than 7 days from date of collection.

Subject 4. Blood product dosing:

Question 1

10-20ml/kg.

Question 2

10ml/kg (10-20ml/kg).

Question 3

10-15ml/kg (10-20ml/kg).

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United Kingdom

Helen V. New & Rachel Moss

Subject 1. Hospital and transfusion service demographics:

Question 1

United Kingdom.

Question 2

Yes.

Question 3

Blood Centre.

Question 4a

First 28 days following birth.

Question 4b

Less than 18 years old..

Question 5

Yes, we are a pediatric specialty hospital with 350 inpatient beds.

Question 6

N/A.

Question 7a

Yes.

Question 7b

Yes.

Question 7c

No.

Question 7d

Yes.

Question 7e

Yes.

Question 7f

Yes.

Question 7g

No.

Question 7h

Yes.

Question 7i

Yes.

Question 7j

Yes.

Question 7k

Yes.

Question 7l

Yes.

Question 7m

Yes.

Question 7n

No.

Question 7o

Yes.

Question 7p

Yes.

Question 8a

5250 RBCs are transfused to pediatric and neonatal patients per year.

Question 8b

Information not available.

Question 9a

1700 plasma units are transfused to pediatric and neonatal patients per year.

Question 9b

Information not available.

Question 10a

4457 platelet units are transfused to pediatric and neonatal patients per year.

Question 10b

Information not available.

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1

Yes (New HV et al, on behalf of the British Committee for Standards in Haematology. Guidelines on transfusion for fetuses, neonates and older children. Br J Haematol. 2016;175:784-828).

The aim of the guidelines is to provide healthcare professionals with clear guidance on the management of all aspects of paediatric transfusion, available all in one place. Unlike the UK adult transfusion guidelines, which mostly focus on specific areas of transfusion, the guidelines have a wide scope, including areas such as cardiac surgery and major haemorrhage. They review the paediatric-specific literature and make recommendations vs consensus-based 'key practice points' depending on the quality of evidence available. They include both clinical and laboratory sections, covering neonatal/paediatric transfusion indications, administration, pre-transfusion testing and component selection, and details of specialised blood components for fetuses/neonates/infants.

Question 2

Yes, we have local guidelines specific for neonatal and pediatric transfusions. We have no adult guidelines.

Question 3

Yes, we have a list of indications for ordering RBC/plasma/platelets, but within the current 40 page blood transfusion policy and not succinct.

Question 4

It is currently not mandatory, but we will be introducing a new Electronic Patient Record system in 2019 that will make it mandatory.

Question 5

No, it is not mandatory but is considered best practice to do so.

Question 6

For RBC transfusions, our thresholds are based on BSH guidelines (New et al, 2016).

Question 7

Our platelet transfusions are based on BSH guidelines (New et al, 2016).

Question 8

Our plasma transfusions are based on BSH guidelines (New et al, 2016).

Subject 3. Product manipulations for pediatric and neonatal patients:

Question 1

Yes we offer irradiated products. Please see attached document "Blood Transfusion Special Requirements".

Question 2

Yes, we offer Leukodepleted RBCs. They are standard issue in the UK (universal pre-storage leucodepletion).

Question 3

Yes, we offer washed RBCs, based on consultant decision post recurrent transfusion reactions.

Question 4

Yes, we maintain a stock of thawed plasma. We keep 1 unit of AB Solvent-Detergent FFP (SDFFP).

Question 5

Yes, we offer SDFFP and Methylene-Blue treated cryoprecipitate.

Question 6

Yes, we match for the following:

transfusion dependant patient with Rh phenotyped units.

patient with clinically significant antibodies with units Rh phenotyped and negative for their clinically significant antibody based on current clinical guidelines.

Question 7

Yes, CMV testing is done at NHSBT.

Question 8

Yes, we minimize exposure by the use of paedipacks (split packs for neonatal red cells and neonatal platelets as provided by NHSBT).

Question 9

Yes.

Question 10

Yes, our policy follows:

Patients under 1 year requiring large volume neonatal pack transfusions (LVT)<5 days.

Cardiac surgical patients over 1 year units <14 days.

Sickle Cell Disease patients units <14 days.

Irradiated units <14 days (all patients except neonatal/infant large volume transfusion and all cardiac surgery where irradiated blood is used within 24 hours post irradiation).

Subject 4. Blood product dosing:

Question 1

This is the recommendation for a target Hb:

Volume to be transfused =

$$\frac{\text{Desired Hb (g/l) – actual Hb (g/l) x weight (kg) x 4*}}{10}$$

*It is reasonable to use a Factor of 4 (practice varies between 3-5), but this should be assessed on an individual patient basis.

With a local volume recommendation of:

Neonates – 15ml/kg

Paediatrics – 3-4 mls /kg to raise Hb by 10g/l

Question 2

We prescribe 10 – 15 mls/kg.

Question 3

We prescribe 10 – 15 mls/kg.

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BLOOD TRANSFUSION SPECIAL REQUIREMENT REQUESTS

FILE FORM AT FRONT OF PATIENT NOTES

*A COPY OF THIS FORM **MUST** BE FAXED TO BLOOD TRANSFUSION*

ITEMS WITH * ARE MANDATORY

First form/updated form* (delete where applicable)

***Patient surname**		***Patient forename**	
***Hospital number**		***Date of Birth**	
***Diagnosis** Please include any atypical antibodies			

The chart overleaf gives indications for the diagnosis which have the following special requirements. Tick all that apply. Please complete the reason for the request as well as the review date.

*Requirement	Tick all that apply (leave blank if no longer required)	*Reason for requirement/removal See overleaf	*Review period
CMV negative	☐		
Irradiated components	☐		
HLA matched components	☐		

ABO Mismatched Transplant **Heart / Bone Marrow / Renal** ***(Indicate type)***

Donor Group	Recipient group	Red cells	Platelets	Plasma
……. RhD ……	……. RhD ……	……. RhD ……	……. RhD ……	……. RhD ……

Haemoglobinopathies

Condition	Referring hospital	Last Transfusion Date	Any known antibodies

Authorised by			
***Name**		***Bleep number**	
***Position**		***Date**	
***Form FAXED to 8288**	☐	**Signed:**	

Laboratory Use Only:

Received in laboratory (Print name): **Signature:** **Date / Time:**

Entered on OmniLab (Print name) **Signature:** **Date / Time:**

#SBMS Check:(Print name): **Signature:** **Date / Time:**

#Senior/Chief BMS to check for accuracy and appropriateness. Refer to Haem SpR if required.

Guidance on Special Requirements

CMV (Cytomegalovirus) negative requirements		
CMV Negative Components	• Neonates <6 months • Intrauterine transfusion • Exchange transfusion • **CMV negative recipients of allogeneic SCT** • SCID • Pregnancy for patients requiring transfusion (except in emergency).	**Granulocytes –** CMV negative if recipient negative Granulocytes must always be irradiated
Irradiation requirements		
Stem Cell Transplantation (BMT or PBSC)	**Allogeneic recipients** – require irradiated components from start of conditioning until Consultant states otherwise. **All donors** require irradiated components from 7 days prior to and during the harvest. **Autologous recipients** – require irradiated components 7 days prior to and during harvest. Then from start of conditioning until 3 months post transplant.	
Neonates	**Intrauterine Transfusion (IUT)** – all components are required to be CMV Neg and irradiated (use within 24 hours post irradiation). Neonates post IUT: all components including ET are required to be CMV Neg and irradiated up to 6 months post EDD. **Exchange Transfusion (ET)** – Blood must be CMV Neg and irradiated (use within 24 hours post irradiation).	
Miscellaneous/ Specific Drugs	**Purine Analogues** – such as fludarabine, cladribine (2-cda), deoxycoformycin, clofarabine, nelarabine and bendamustine **Alemtuzumab (Anti-CD52) (Campath, MabCampath)** **Human Leucocyte Antigen** (HLA) Matched Components and components from first or second degree relatives. **Known or suspected Congenital Immunodeficiency** – such as **CID**, **SCID, Wiskott Aldrich** or **Di George Syndrome** (CMV negative blood components **are not** required **except** for SCID) **Asplenia**, together with any other immunodeficiency. (Asplenia alone does not qualify) **Aplastic Anaemia** (on **Anti-Thymocyte Globulin (ATG)** treatment) **Hodgkin's Lymphoma** **Granulocytes** –**need to consider if the patient requires CMV negative**	
Other Requirements		
Haemoglobinopathies	**These patients are regularly transfused either at GOSH or other Trust under shared care** **Phenotyped Blood –** to help prevent the formation of allo-antibodies, all patients are given Rh and K negative red cells. If antibodies develop, they are also given antigen negative red cells. These may not be standard stock therefore order in advance (24 hours preferably) **Transfusion History –** please inform the laboratory when and where the last transfusion occurred.	

NB. Remember to complete special requirement boxes on the pink blood prescription chart, if the requirement is new or has been amended please start a new chart.

Australia

Anne Kinmonth, Mary Comande, Helen Savoia & Gemma Crighton

Subject 1. Hospital and transfusion service demographics:

Question 1

Australia.

Question 2

Yes it is major specialist paediatric hospital, providing tertiary care for Victoria, Tasmania, southern New South Wales (as well as specialist treatment for patients from other states and overseas) and is a major teaching hospital.

Question 3

Our hospital receives blood components from the Australian Red Cross Blood Service; requests for specialised blood products such as phenotype matched or CMV seronegative components are directed to the Blood Service. However we have an onsite irradiator and irradiate our own components.

Question 4a

In our hospital, the definition of a neonate, specified by the neonatal department is an infant that is less than 28 days of age.

Question 4b

In our hospital, a paediatric patient is considered someone less than 18 years of age.

Question 5

357 inpatient beds.

Question 6

No, it only treats paediatric patients. On occasion, we will treat a young adult whilst they are awaiting transition to adult services.

Question 7a

Yes.

Question 7b

Yes.

Question 7c

Yes.

Question 7d

Yes.

Question 7e

Yes.

Question 7f

Yes.

Question 7g

Yes.

Question 7h

Yes.

Question 7i

Yes.

Question 7j

Yes.

Question 7k

Yes.

Question 7l

Yes.

Question 7m

Yes.

Question 7n

Yes.

Question 7o

Yes.

Question 7p

Yes.

Question 8

Approximately 4,700 RBC per year.

Question 9

Approximately 2,350 per year.

Question 10

Approximately 3,100 per year.

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1

Yes, the National Blood Authority, Australia has developed a series of six patient blood management (PBM) modules and Module 6 specifically focuses on evidence-based neonatal and paediatric PBM. The Modules include recommendations based on systematic review, practice points which are based on consensus where systematic review found insufficient high quality data to produce evidence-based recommendations. Finally it includes expert opinion points based on consensus where relevant guidance is required. Module 6 includes general information about blood product modifications, fetal transfusion, blood conservation strategies and iron deficiency anaemia. The Appendices include information on transfusion volume calculations, a pre-operative haemoglobin (Hb) assessment and optimisation template, a critical bleeding template and dosing information for intravenous iron and tranexamic acid.

The Australian and New Zealand Society of Blood Transfusion have developed local guidelines, which provide guidance for paediatric, neonatal and fetal transfusions, they include specific information on blood product administration, transfusion volume calculations and rates of infusion, in addition to blood product modifications.

The Transfusion Orientation Pack produced by the Australian Red Cross Blood Service, provides specific paediatric guidance for red cell and platelet transfusion triggers and dosing.

Our hospital's blood product prescription guideline has been adapted for use in our state in Australia.

Question 2

Yes, our hospital has developed its own neonatal and paediatric blood transfusion and blood management resources and guidelines for our clinicians. We do not have any specific adult transfusion guidelines on our website. Clinicians access our guidelines both internally from within our hospital, locally across the state and nationally across Australia.

Our guidelines differ from adult guidelines because they provide specific guidance for the different clinical scenarios that affect neonates and children and take into account some of the specific differences between these patient groups.

Our guidelines provide guidance for specific, transfusion indications, consent for transfusion, refusal of transfusion consent, blood group and antibody testing, calculating transfusion volumes, blood product modifications such as indications for CMV seronegative blood products, fresh products and irradiated blood products.

Transfusion consent for example in an adult involves a discussion between the consenting adult and the clinician, whereas in children it involves a discussion with the parents or guardians and may involve discussion with the child. Refusal of transfusion consent by a parent/guardian is a unique situation, and in this instance a parents wishes may be over-ridden if a transfusion is considered life saving.
Most neonates are eligible for extended expiry for their blood group and antibody screening, because the development of antibodies to red cell antigens is very uncommon in the first four months of life and this reduces the requirement for repeated sampling.

There are a number of different considerations in neonates and children that determine whether a transfusion is indicated and these differ compared with adults. Neonates in particular have higher normal Hb values ranges compared with adults and children. Red cell transfusion thresholds in neonates depend on the gestational age, the post-natal age, the Hb concentration and the degree of respiratory support the neonate is receiving. There are a number of unique transfusion indications affecting only fetuses and neonates, such as feto-maternal alloimmune thrombocytopenia, intrauterine transfusion for haemolytic disease of the newborn and exchange transfusions and these have their own specific considerations such as human platelet antigen (HPA) or red cell alloantibody matching.

Transfusion volumes for neonates, infants and small children, must be carefully calculated based on mls/kg and prescribed in mls (not units) with a specific appropriate transfusion rate.

There are some specific blood product modifications such as: phenotype matched, irradiated. CMV seronegative and washed blood products where indications differ between children and adults, or the requests occur more frequently in children.

Question 3
Yes.

Paediatrics	
Haemoglobin threshold	**Indication/clinical information**
Hb <70g/L	Often indicated, however lower thresholds may be acceptable in patients without symptoms (symptoms may include – tachycardia, flow murmur, lethargy, dizziness, shortness of breath and cardiac

	failure) and where specific therapy (e.g. iron) is available.
Hb 70 – 90g/L	RBC may be indicated, depending on the clinical setting e.g. the presence of bleeding or haemolysis and clinical signs and symptoms of anaemia Patients with disease or therapy-related bone marrow failure
Hb >90g/L	RBC transfusion is often unnecessary and may be inappropriate
Threshold not specified	Sickle cell disease
	Blood prime for circuit
	Red cell exchange transfusion
	Haemolysis
	Clinically significant acute blood loss
Transfusion may be indicated at higher thresholds for specific situations	
Preterm neonates	
Children with cyanotic heart disease or on ECLS	
Children with haemoglobinopathies (thalassaemia or SCD) or congenital anaemia on a chronic transfusion programme.	
Neonates	
Haemoglobin threshold	**Indication/clinical information**
Hb <100 – 120g/L	Preterm or term neonate with no respiratory support, week 1 of life
Hb <85g/L – 100g/L	Preterm or term neonate with no respiratory support, week 2 of life
Hb <70 – 100g/L	Preterm or term neonate with no respiratory support, week 3 of life
Hb <110 – 130g/L	Preterm neonate with respiratory support, week 1 of life
Hb <100 – 125g/L	Preterm neonate with respiratory support, week 2 of life
Hb <85 – 110g/L	Preterm neonate with respiratory support, week 3 of life
	Clinically significant acute blood loss
ECLS - extra-corporeal life support, RBC – red blood cell, SCD – sickle cell disease	

Question 4

Yes, it is mandatory.

Yes, the indication is entered electronically.

Question 5

No, there is a space where the patient's clinical information or diagnosis can be entered, but it is not mandatory. As we have an electronic medical record, it is possible, to review in real-time the patient's clinical diagnosis, medical notes and laboratory investigations to determine transfusion indication.

Question 6

Yes, thresholds are included with some of the indications, please see table above.

Question 7

Yes.

Paediatrics	
Platelet count	**Indication/clinical information**
<10 x 10^9/L	Clinically stable paediatric patients receiving chemotherapy for leukaemia or post HSCT
	Clinically stable patients with solid tumours (prophylactic)* * Transfusions at higher levels may be required for bladder, brain or necrotic tumours
	Critically ill patients with no bleeding
<20 x 10^9/L	Chemotherapy, HSCT & risk factors (e.g. fever, sepsis, minor bleeding, mucositis, DIC without bleeding)
	Critically ill patients with no bleeding and risk factors (e.g. sepsis, renal failure, medications)
	Nasogastric tube insertion
	Intramuscular injections e.g. Erwinia aspariginase
	Insertion of a non-tunnelled central venous line
<30 x 10^9/L	LP and on-going chemotherapy induced thrombocytopenia

	CNS tumour and: - A VP shunt or Ommaya reservoir - Has a gross total resection and is receiving chemotherapy and/or radiation - Has residual tumour and is receiving chemotherapy and/or radiation
<50 x 10^9/L	LP and new disease induced thrombocytopenia
	Patient undergoing invasive procedure (including tunnelled central venous line insertion)
	Moderate active bleeding (including bleeding associated with DIC)
	CNS tumour and: - A past history of intracranial haemorrhage - Is receiving an anti- angiogenesis agent
<75 x 10^9/L	Major haemorrhage due to trauma or significant post-operative bleeding (e.g. post cardiac surgery)
<100 x 10^9/L	Patient undergoing high risk invasive procedure (e.g. neurosurgery/ophthalmology)
	ECLS (lower platelets may be acceptable in stable patients)
Platelet transfusion not indicated	
Stable patients with chronic, stable, severe thrombocytopenia due to: - Alloimmunisation, ITP, TTP, aplastic anaemia or MDS These patients should receive platelet transfusions with clinically significant bleeding only.	
BMA and trephine biopsy	
Intravenous cannula insertion	
Neonates	
Platelet threshold	**Indication/clinical information**
<30 x 10^9/L	Stable term or preterm neonate with asymptomatic thrombocytopenia and no bleeding
30 – 50 x 10^9/L	Preterm neonate with thrombocytopenia being treated for sepsis or requiring respiratory support
<50 x 10^9/L	Term or preterm neonate with bleeding symptoms (mucocutaneous, gastrointestinal, petechiae/purpura), coagulopathy or prior to surgery
<100 x 10^9/L	Term or preterm neonate with major bleeding (drop in Hb requiring RBC transfusion) or those that require major surgery (e.g. neurosurgery)

BMA – bone marrow aspirate, CNS – central nervous system, DIC - disseminated intravascular coagulopathy, ECLS - Extra-corporeal life support, Hb – haemoglobin, HSCT - haematopoietic stem cell transplantation, ITP – Immune thrombocytopenia, LP – lumbar puncture, MDS – myelodysplastic syndrome, RBC – red blood cell, TTP – thrombotic thrombocytopenic purpure, VP- ventriculo-peritoneal

Question 8

Yes

Paediatrics and Neonates– Fresh frozen plasma	
Laboratory parameter	**Indication/clinical information**
Significant coagulopathy	Acute bleeding
	Liver disease, with clinically significant bleeding or in the context of coagulopathy post liver transplantation.
	Acute DIC with bleeding
Prolonged INR	Warfarin reversal, in the presence of significant or life-threatening bleeding or prior to emergency surgical procedures • Given in addition to vitamin K • NOTE: Vitamin-K dependent clotting factor concentrates (e.g. Prothrombinex) may be given instead of FFP for bleeding secondary to warfarin or emergency warfarin reversal.
Not specified	During massive transfusion or cardiac bypass for the treatment of bleeding
Not specified	Plasma exchange for the treatment of TTP
Not specified	Specific factor deficiencies where a factor concentrate is not available
FFP is not indicated for	
The correction of minor coagulation abnormalities (minor prolongation of the INR/APTT) in the non-bleeding child	
Liver disease when there are minor coagulation abnormalities and no-bleeding	
For reversal of a INR <2.0 in patients undergoing minor procedures	

APTT – activated partial thromboplastin time, DIC - disseminated intravasculaor coagulopathy, FFP – fresh frozen plasma, INR – international normalised ratio, TTP – thrombotic thrombocytopenic purpura.

Paediatrics– Cryoprecipitate	
Laboratory parameter	**Indication/clinical information**
Fibrinogen <1.5g/L	Active bleeding During massive transfusion or cardio-pulmonary bypass
Fibrinogen <1.0g/L	Acquired fibrinogen deficiency of acute DIC for the treatment of bleeding.
Fibrinogen <1.0g/L	Prior to an invasive procedure and there is a risk of significant bleeding associated with the surgery or it is at a critical site (e.g. neurosurgery or eye surgery)
Hyperfibrinolysis	During massive transfusion or cardio-pulmonary bypass
Cryoprecipitate is not indicated for	
Non-bleeding children with mildly reduced fibrinogen levels.	
Liver disease when there are minor coagulation abnormalities and no bleeding.	
Additional neonate indication– Cryoprecipitate	
Laboratory parameters	**Indication/clinical information**
Fibrinogen <0.5g/L	Active bleeding in the neonate

DIC - disseminated intravasculaor coagulopathy,

Subject 3. Product manipulations for pediatric and neonatal patients:

Question 1

Yes, our hospital has an onsite irradiator and is able to provide irradiated red cells. Our hospital has a universal blood product irradiation for patients in the following units: Paediatric Intensive Care Unit (PICU), Neonatal Unit (NNU) and oncology patients, in addition infants under 3 months of age and patients treated with extracorporeal life support (ECLS) or left-ventricular assist devices receive irradiated components. Although not all patients in these units are at risk of transfusion-associated graft versus host disease, this policy ensures patients who require irradiated products are not missed. In addition blood is irradiated for intrauterine and exchange transfusions, directed donations and immune-compromised patients, this includes immunology patients with conditions such as Severe Combined Immune Deficiency (SCID) and Common Variable Immune Deficiency (CVID), as well as patients with malignancy, transplantation recipients (bone marrow, cord blood and solid organ).

Question 2

All red cells and platelets components (both apheresis and pooled) manufactured by the Blood Service are pre-storage leucodepleted. The leucodepletion system used by the Blood Service enables leucodepletion of some but not all clinical plasma. As a result there is a mixed inventory of leucodepleted and non-leucodepleted clinical plasma components.

Question 3

Washed blood components are produced by the Blood Service on special requests. Requests for these components are usually discussed with the laboratory haematology team. Indications include patients with IgA deficiency and patients with severe allergic reactions to previous red cell or platelet transfusions.

Question 4

Yes, two units of AB plasma are available for emergency use and for life-threatening bleeding.

Question 5

No, at present the Blood Service does not offer pathogen inactivated blood components.

Question 6

At present all patients at our institution receive Kell negative blood, due to the risk of Kell alloimmunisation, by not matching for Kell in young girls with child-bearing potential. Patients with haemoglobinopathies such as Sickle cell disease and patients with congenital anaemia will have red cell genotyping assessment at diagnosis. Their transfusions will be matched for Rh (C, D and E) and Kell. Patients receiving exchange transfusions for SCD or RBC transfusion for warm autoimmune haemolytic anaemia will have RBC most suitably matched to negative antigens of Rh/Kell, Jka, Fy and Ss systems.

If a patient forms a red cell alloantibody they will have extended red cell matching and antigen negative blood will be provided for any alloantibodies they may have or at risk of making and consideration given for matching for Fya, Jk, M, N and Ss.

Fetuses receiving an intrauterine transfusion and neonates receiving a exchange transfusion for haemolytic disease of the fetus and newborn will be provided with red cells that are RhD negative (or RhD identical with neonate if mother not Rh immunised), Kell negative and antigen negative for any maternal alloantibodies. If there is time, an extended maternal phenotype will be performed and consideration given for provided red cells matched for Fya, Jk, M, N and Ss.

Question 7

CMV testing is performed on an ad hoc basis by the treating clinician and is not performed by the transfusion laboratory. We have a policy, which outlines in which patients CMV seronegative blood products are indicated. CMV seronegative blood products are indicated for intrauterine transfusion, neonatal exchange transfusions, pre-term and term infants up to 28 days post estimated due date, patients with SCID, who are CMV negative (including those undergoing haematopoietic stem cell transplantation), pregnant women and granulocyte infusions. All other indications – haematology/oncology patients, allogeneic and autologous stem cell transplantation, solid organ transplant patients and other immunodeficiency patients, leucocyte deplete blood products are considered equivalent to CMV seronegative products.

Question 8

We attempt to reduce donor exposure in the multiply-transfused haemato-oncology patient and allocate apheresis platelets when possible. If we are aware a neonate is going to need multiple transfusion we will attempt to minimise donor exposure by allocating pedipaks. Since implementation of an electronic medical record, blood components are now generally only issued at the time a request is made for a transfusion. This means they are not allocated prior to transfusion and therefore a neonate does not have blood components allocated prior to transfusion unless we are aware they are going to require multiple transfusions.

Question 9

We have no formal policy in place to minimise the volume and frequency of blood samples drawn, however we do have a number of strategies in place, which aim at blood conservation in these patients. We have paediatric collection tubes, which are standard of care for our neonates and small paediatric patients. Patients in the NNU and PICU have discard volumes returned after sampling. We use of point of care testing for INRs for patients on warfarin, arterial and venous blood gas sampling and glucose analysis for diabetics. We have a policy for neonates for extended blood group and antibody testing in the first 4 months of life if the DAT is negative and there are no maternal alloantibodies.

Question 10

Yes, in Australia red cell units can be stored up until 42 days. The following table gives information regarding the age of red cells on the day of issue for particular patient groups.

Patient group	**Age of red cells on day of issue**	**Consideration**

Neonatal exchange transfusion	<5 days	Kell, negative, CMV negative, Rh and phenotype matched
Intrauterine transfusion	<5 days	Kell, negative, CMV negative, Rh and phenotype matched
Paediatric large volume transfusion * -Cardiac surgery requiring cardiopulmonary bypass - ECLS -Craniofacial surgery	<7 days	In an emergency, the blood bank scientist will issue the most appropriate unit available at the time
Massive transfusion	Aim < 10 days	In an emergency, the blood bank scientist will issue the most appropriate unit available at the time
Paediatric-routine transfusion - Post operative surgical patient - Oncology patient - Solid-organ transplantation	Standard issue	
Chronically transfused patients - Congenital anaemia who are transfusion dependent - Haemoglobinopathies (SCD, thalassaemia) - Aplastic anaemia	Aim < 14 days	Patients with haemoglobinopathies are matched with Rh and Kell Extended phenotype matching for patients with alloantibodies. Extended phenotype matching may take precedence over age of red cells
Small volume (top up) neonatal transfusions	Standard issue	
Children and adolescents not included in any groups listed	Standard issue	

above		

*equivalent to a single circulating blood volume (~80ml/kg)

CMV – cytomegalovirus, ECLS – extracorporeal life support, SCD – sickle cell disease

Subject 4. Blood product dosing:

Question 1

The transfusion volume for a red cell transfusion is calculated for children <20kg from the equation

ml = weight (kg) x Hb (g/L) rise (desired Hb – actual Hb) x 0.5

For children >20kg – 1 unit of red cells is prescribed.

Question 2

	< 10kg	**10 – 19kg**	**20 – 29kg**	**30 - 39kg**	**> 40kg**
Pooled platelets (adult unit)	10ml/kg	10ml/kg	10ml/kg up to 1 unit	1 unit	1 unit
Apheresis platelets (adult unit)	5-10ml/kg	5-10ml/kg	5-10ml/kg up to 1 unit	1 unit	1 unit
Paediatric apheresis platelets (pedipak)	5-10ml/kg or 1 pedipak	5-10ml/kg or 2 pedipak	3-4 pedipaks	4 pedipaks	4 pedipaks

Question 3

A dose of 10- 20ml/kg of fresh frozen plasma is prescribed for stable paediatric or neonatal patients with consideration given to the average fresh frozen plasma unit size of about 284ml. A dose of 5 – 10ml/kg of cryoprecipitate is prescribed for stable paediatric or neonatal patients, with consideration given to the typical unit size of approximately 37ml.

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Israel

Joanne Yacobovich & Vered Yahalom

Subject 1. Hospital and transfusion service demographics:

Question 1

Israel.

Question 2

Yes.

Question 3

Prepared in a neighboring facility.

Question 4a

Less than 30 days old.

Question 4b

Less than 18 years old.

Question 5a

300 inpatient beds, 100 are intensive care/emergency.

Question 6

No.

Question 7a

Yes.

Question 7b

Yes.

Question 7c

Yes.

Question 7d

Yes.

Question 7e

Yes.

Question 7f

Yes.

Question 7g

Yes.

Question 7h

Yes.

Question 7i

Yes.

Question 7j

Yes both.

Question 7k

Yes, including dialysis.

Question 7l

Yes.

Question 7m

Yes.

Question 7n

Yes.

Question 7o

Yes.

Question 7p

Yes.

Question 8a

> 5000 in 2017.

Question 9

> 700 in 2017 (Variable volume).

Question 10

> 2150 in 2017 (Variable volume).

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1b

Yes – Only for Platelets, approved by Israeli pediatric hematology-oncology society.

i. Higher platelet thresholds for pre term babies, sick newborns and babies on ECMO.

Platelet dosing per Kg weight up to 1 SDP.

Question 2b

Yes - Lower threshold for RBC Tx (see 3b).

Question 3b

Yes.

RBC – HB<8.0g/dl for anesthesia, patients on oxygen, fever,

HB<6.0g/dl in general,

HB 6-8 g/dl – can consider RBC

PLT – If<10,000/mcl

or <20,000 for febrile patients,

<80,000 post neurosurgery

Question 4b

Yes- requested not mandatory.

i. No.

Question 5

Yes.

Question 6b

Yes – see Q.3.

Question 7b

Yes- see Q.3.

Question 8a

No.

Subject 3. Product manipulations for pediatric and neonatal patients:

Question 1b

Yes - Hematooncology & oncology patients.

Question 2b

Yes - Hematooncology & oncology patients.

Question 3b

Yes - Severe transfusion reactions.

Question 4b

Yes – 2 units of every ABO blood group.

Question 5a

No.

Question 6b

Yes – Hemoglobinopathies, AIHA patients.

Question 7

CMV negative components for selected patients –SCID CMV negative.

Question 8

Only if required by the treating physician.

Question 9

Yes, microtainers for CBC, smaller tubes for coagulation tests, finger prick monitoring for INR monitoring in in-patients.

Question 10b

Yes – 7 days exchange Tx, pre term. 10 days Thalassemia / SCD patients (up to 14 if multiple antibodies).

Subject 4. Blood product dosing:

Question 1

10-15 ml/kg.

Question 2

15 ml/kg up to 1 SDP unit.

Question 3

10-15 ml/kg.

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Canada

Wendy Lau

Subject 1. Hospital and transfusion service demographics:

Question 1

Canada.

Question 2

Yes.

Question 3

Blood center.

Question 4a

Neonate less than 4 months.

Question 4b

Pediatric less than 18 years.

Question 5

Yes, 350 beds.

Question 7a

Yes.

Question 7b

Yes.

Question 7c

Yes.

Question 7d

Yes.

Question 7e

Yes.

Question 7f

Yes.

Question 7g

Yes.

Question 7h

Yes.

Question 7i

Yes.

Question 7j

Yes.

Question 7k

Yes.

Question 7l

Yes.

Question 7m

Yes.

Question 7n

Yes.

Question 7o

Yes.

Question 7p

Yes.

Question 8a

Just over 8000 units per year (range 8000 to 8700 units in recent years).

Question 8b

It is not possible at this time to subgroup by age, maybe in the future (with help with EPIC/HCLL).

Question 9a

About 1500 units per year (range 1400 to 1600 in recent years).

Question 9b

It is not possible at this time to subgroup by age, maybe in the future (with help with EPIC/HCLL).

Question 10a

Just over 3500 units (total of pools and apheresis platelets) per year (range 3500 to 3800 in recent years).

Question 10b

It is not possible at this time to subgroup by age, maybe in the future (with help with EPIC/HCLL).

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1b

Yes, some recommendations (neonatal, platelet).

i. Recommendations for neonatal red cell transfusions differ from adults.
C17 recommendations for platelets – threshold higher for bleeding, fever.

Question 2b

Yes.

i. Red cells similar to adults.
Platelets more similar to C17 guidelines.

Question 3b

Yes.

i. This is what we have in EPIC right now.

Red cells
Acute or Surgical Blood loss
To maintain Hb. Level > 70g/L
To maintain Hb. Level > 100 g/L
To maintain Hb. Level > _____specify
Chronic transfusion program
Exchange Transfusion
ECMO
Dialysis Prime
Apheresis Prime
Plasma

Bleeding with INR >1.5 or APTT >1.5x top of age-related reference range
Pre invasive procedure with INR >1.5 or APTT >1.5x top of age-related reference range
Replacement therapy when specific factor concentrate not available
Therapeutic plasma exchange
Massive haemorrhage / transfusion
Urgent reversal of warfarin if prothrombin complex not available
Platelets
PLT.ct < 10,000/ul
PLT.ct < 20,000/ul stable infant
PLT.ct < 20,000/ul (sepsis, bleeding, other considerations)
PLT .ct < 50,000/ul unstable infant
PLT .ct < 50,000/ul actively bleeding
PLT .ct < 50,000/ul pre invasive procedure
PLT .ct < 50,000/ul pre major surgery
PLT. Ct <100,000/ul CNS bleeding
PLT. Ct <100,000/ul CNS surgery

Question 4b

Yes, have to select in EPIC.

Question 5

No.

Question 6b

Yes.

i. Over 4 months, similar to adults (as per AABB pediatric transfusion handbook).
Neonates as per AABB pediatric transfusion handbook, except we use Hb 140 instead of 150 for congenital cyanotic heart disease.

Question 7b

Yes.

Guidelines for Platelet Transfusion in Neonates:

1. Stable infant, platelet count <20 x 10^9 /L.

2. Unstable infant, platelet count 30 to 50 x 10^9 /L.

3. Infant with active bleeding, or invasive procedure, platelet count < 50 x 10^9 /L.

Prophylactic platelet transfusion (for hem/onc patients over 4 months of age):

Platelet count 10 x 10^9 /L:

- All patients.

Platelet count 20 x 10^9 /L:

- Patients with fever, sepsis, DIC, bleeding, coagulopathy, splenomegaly, AML M3, brain tumour.
- Bone marrow aspirate and biopsy.
- Insertion of PICC line (peripherally inserted central line).

Platelet count 50 x 10^9 /L:

- Lumbar puncture.
- Major surgery.
- Hurler's Syndrome post BMT.
- For placement of central venous catheters other than PICC lines, consult IGT (Image-Guided Therapy) in advance.

Platelet count 100 x 10^9 /L:

- CNS bleeding, CNS surgery, invasive procedure in patients with D.I.C.

Question 8b

Yes.

See the indications in Epic in 3.

Subject 3. Product manipulations for pediatric and neonatal patients:

Question 1b

Yes.

Irradiated cellular blood products (red cells and platelets):

The following patient populations receive irradiated cellular blood components at Sick Kids:

- Infants up to 6 months of age
- Primary immune deficiencies (SCID, Wiscott Aldrich Syndrome, Di George's Syndrome, 22q deletion etc).
- Cardiac patients with a diagnosis of truncus arteriosus or interrupted aortic arch, until test result for 22q deletion is known.
- Patients receiving or have received: Purine analog (e.g. fludarabine, cladribine, pentostatin/deoxycoformicin), Alemtuzumab (anti-CD 52), Anti-thymocyte globulin (ATG).
- Leukemia, lymphoma. severe aplastic anemia.
- Solid tumours if receiving intense chemotherapy such as those listed above.
- Bone marrow transplant recipients (and donors during bone marrow harvest).
- Heart transplant and lung transplant recipients (ATG for conditioning).
- Components from blood relatives (directed donations).
- HLA Matched Single Donor Apheresis Platelets.

Question 2b

Yes.

i. All RBCs are pre-storage leukoreduced by blood centre.

Question 3b

Yes, but rarely do.

i. Patients with anti-IgA and those still reacting to plasma-reduced red cells.

Question 4a

No.

Question 5a

No.

Question 6b

Yes.

i. K neg for all female patients.

Rh and K for sickle cell and WAIHA.

Fya, Jka, Jkb, S for SCD who have already made clinically significant antibodies.

Question 7

No.

Question 8a

Yes.

Dedicated units for neonates under 1000g birth weight.

Split units for patients >4 months who only gets part of unit at a time (eg. to prevent alloimmunization pre kidney transplant) (give half a unit now, half a unit at a subsequent date).

Our routine platelet product is pooled buffy coat (4 donors) for children. We try to give part of an apheresis platelet to neonates and to small infants who only need 100 ml or less of platelets.

Question 9

Yes, microtubes.

Question 10b

Yes.

i. Fresher units for cardiac surgery

< 7 days for infants < 3 months

< 7 days if possible for infants 3-6 months old, otherwise <14 days

< 14 days for 6 months to 4 years

< 28 days for patients over 4 years

Neonatal top up transfusions – any age

Neonatal exchange transfusion - <7 days

Hemoglobinopathy patients on chronic transfusion program – phenotyped units <21 days ordered for scheduled patients, but will use up to 35 days

Sickle cell red cell exchange - <21 days

Subject 4. Blood product dosing:

Question 1

Peds: 10 to 15 ml/kg.

Neonates: 15 to 20 ml/kg.

Question 2

Peds: 5 to 10 ml/kg.

Neonates: 10 to 15 ml/kg.

Question 3

10 to 15 ml/kg.

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Russia - Children's City Clinical Hospital of St. Vladimir

Dana Evgenievna Pavlova

Subject 1. Hospital and transfusion service demographics:

Question 1

Russia, Moscow

Question 2

No.

Question 3

We prepare blood in our own facility.

Question 4a

Yes.

Question 5

Our hospital is a pediatric specialty hospital.

a. 574 (24 reanimatology).

Question 6

No.

Question 7a

Yes.

Question 7b

Yes.

Question 7c

Yes.

Question 7d

No.

Question 7e

Yes.

Question f

No.

Question 7g

Yes.

Question 7h

No.

Question 7i

Yes.

Question 7j.

Yes.

Question 7k

Yes.

Question 7l

Yes.

Question 7m

Yes.

Question 7n

Yes.

Question 7o

Yes.

Question 7p

Yes.

Question 8

RBC

a. 96,9 liters, 651 packages.

Question 9

Plasma.

a. 172,l liters, 1896 packages.

Question 10

Platelet.

a. 5,5 liters, 64 packages.

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1b

Yes (There are restrictions on the time storages from the moment of donation: for children under 1 month not more than 10 days, for a replacement transfusion no more than 5 days, 100% individual selection taking into account 10 red cell antigens, recommended leukofiltration, irradiation, virusinactivation and selection of CMV negative donors. Analyzing hemoglobin level in children different age.)

Question 2b

Yes.

i. in accordance with national principles.

Question 3b

Yes.

i. see application in attached table.

Question 4b

Yes.

i. No.

Question 5

Yes.

Question 6b

Yes.

i. see application in attached table.

Question 7b

Yes.

i. see application in attached table.

Question 8b

Yes.

i. see application in attached table.

Subject 3. Product manipulations for pediatric and neonatal patients:

Question 1a

No.

Question 2b

Yes.

i. Leukofiltration in the preparation of whole blood.

Question 3b

Yes.

i. With transfusions of another blood group, an allergic anamnesis.

Question 4a

No.

Question 5a

No.

Question 6a

No.

Question 6b

Yes.

i. Since 1999, we have been selecting erythrocytes with antigens - A, B, C, Cw, c, E, e, K, k.

Question 7

Yes. We make individual selection of red blood cells, thromboelastography, thrombodynamics.

Question 8

Yes. We do a division of a large dose into several pediatric packages.

Question 9

Yes.

Question 10b

Yes.

i. Erythrocytes can be used for children under 1 month for not more than 10 days of storage, for a transfusion transfusion no more than 5 days of storage.

Subject 4. Blood product dosing:

Question 1

10-15 ml/kg.

Question 2

5-10 ml/kg.

Question 3

10-15 ml/kg.

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Formation of indications for blood transfusions

I. Erythrocyte-containing media

Nosology	Newborns and children up to 4 months	Older age
Routine transfusions		
Anemia without signs of bleeding	**Up to 14 days:** Hb < 100 g/l, Ht < 30%, RBC < $3,0*10^6$	Hb < 70 Calculation of the volume of erythrocyte-containing media: V = (Hb desired - Hb true) x 0.6 x m / 2
	14-30 days: Hb < 96 g/l, Ht < 25%, RBC < $2,5*10^6$	
	1-4 months: Hb < 85 g/l, Ht < 25%,	
Anemia with signs of respiratory failure	**Up to 1 month:** Hb < 120 g/l, Ht < 40%, RBC < $3,9*10^6$	Hb < 80 g/l
Anemia and preparation for surgery	**Up to 1 month:** Ht < 40%	Hb < 100 g/l, PLT < $100*10^9$
	1-4 months: Ht < 30%	
Emergency transfusion		
Anemia in critical conditions	**of ventilation**, FiO_2 > 0.4 Hb < 110 g/l, Ht < 35%	**Taking into account transport O2:**
	auxiliary ventilation, FiO_2 < 0.4 Hb < 100 g/l, Ht < 30%	
	self-breathing, ЧД 85/min 24 hours Hb < 80 g/l, Ht < 25%	
Intraoperative	in children under 4	**Loss > 15% volume of circulating blood (VCB):**

blood loss	months, the loss of more than 10% volume of circulating blood is replenished first of all by erythrocytes	erythrocyte 1 dose + plasma 10% volume of circulating plasma
		Утрата > 25% volume of circulating blood: erythrocyte 2 doses + plasma 50% volume of circulating plasma + platelet 5-6 doses
		Потеря > 40% volume of circulating blood: erythrocyte - 30% VCB + plasma - 100% volume of circulating plasma + platelet 5-6 doses + albumin 20% 1 g/kg m

II. Thrombose concentrate

Platelet level	**Indications**
Any baseline level of platelets	Acute massive blood loss (absolute indications, included in the list of mandatory components for replenishment of blood loss). Ratio of erythrocytes / plasma / platelets = 1/1/1
> 100* 10^9	• Transfusion not shown • It is possible to make a decision in favor of transfusion with functional insufficiency of platelets (thrombocytopathy)
50 – 100* 10^9	• Intraventricular hemorrhage III-IV st, • continued bleeding, • surgical interventions of a large volume, including neurosurgical
20 – 49* 10^9	• minimally invasive interventions and operations (biopsy, puncture, epidural anesthesia, replacement blood transfusion, etc.) • the first 7 days after birth, • premature babies with extremely low body weight (less than 1000 g), • concomitant coagulopathy without marked bleeding, • ongoing bleeding, skin-hemorrhagic syndrome • septicemia
< 20* 10^9	Absolute indications, even without clinical manifestations

Contraindications to the use of thrombocyte concentrate:

• Immune thrombocytopenia,

• Heparin-induced thrombocytopenia,

• Thrombotic thrombocytopenic purpura,

• Hemolytic-uremic syndrome

III. Freshly frozen plasma (FFP)

• Multifactorial coagulation deficiency, confirmed laboratory and associated with:

- cutaneous hemorrhagic and hemorrhagic manifestations and ICE (Caution: DIC without bleeding is not an absolute indication for transfusion, nor is transfusion indicated for prophylactic purposes),
- liver disease (liver failure),
- hemolytic disease of newborns - up to 20 ml / kg, with simultaneous administration of vitamin K,
- intraoperative hemodilution (dilution coagulopathy)

• Hereditary deficiency of coagulation factors, in the absence of a virus-safe preparation (including atypical hemolytic-uremic syndrome),

• Thrombotic thrombocytopenic purpura (Plasma exchange),

• Elimination of the effect of warfarin, in case of bleeding,

• Operational hemorrhage of more than 15% volume of circulating blood

Russia - Russian National Centre for Pediatric Hematology, Oncology and Immunology

Pavel Trakhtman & Nikolay Starostin

Subject 1. Hospital and transfusion service demographics:

Question 1

Hospital located in Moscow, Russian Federation.

Question 2

Yes, an academic hospital.

Question 3

No, all blood components provided by hospital based blood bank.

Question 4a

Neonate – less than 28 days old.

Question 4b

Pediatric – less than 18 years old.

Question 5

Yes.

a. Hospital has 220 inpatient beds.

Question 6

No, only pediatric patients.

Question 7a

Yes.

Question 7b

No.

Question 7c

No.

Question 7d

No.

Question 7e

No.

Question 7f

Yes.

Question 7g

No.

Question 7h

Yes.

Question 7i

No.

Question 7j

Yes.

Question 7k

No.

Question 7l

No.

Question 7m

Yes.

Question 7n

No.

Question 7o

No.

Question 7p

No.

Question 8a

6000 RBC transfusions per year.

Question 8b

i. 30 transf.

ii. 278 transf.

iii. 5692 transf.

Question 9a

1700 units of FFP per year.

Question 9b

i. 10 un.

ii. 104 un.

iii. 1586 un.

Question 10a

6300 units per year (1 unit = $2x10^{11}$ plt).

Question 10b

i. 29 un.

ii. 69 un.

iii. 6202 un.

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1b

Yes. Main differences are restrictions of the storages period for RBC: for children under 1 month not more than 10 days, for a replacement transfusion no more than 5 days, match for 10 red cell antigens, recommended leukofiltration.

Question 2b

Yes. In accordance with national guideline (see above).

Question 3a

No.

Question 4b

Yes.

i. The indication is entered electronically.

Question 5

Yes.

Question 6b

Yes.

i. For neonatal Hb<10g/dl, Ht<29%; for pediatric Hb<7g/dl, Ht<20%.

Question 7b

Yes.

i. For neonatal PLT<40, for pediatric PLT<10 or <40 before invasive procedure or <100 before neurosurgery.

Question 8b

Yes

i. Multifactorial coagulation deficiency, confirmed laboratory.

Subject 3. Product manipulations for pediatric and neonatal patients:

Question 1b

Yes.

i. all patients receive only irradiated RBC and platelets.

Question 2b

Yes.

i. Uniform leucodepletion of all transfused products.

Question 3b

Yes.

i. Patients with severe repeated PTR, patients with positive DAT, patients with unidentified hemolysis.

Question 4a

No.

Question 5b

Yes.

i. Plasma, platelets, whole blood are inactivated with MIRASOL PRT (Terumo).

Question 6b

Yes.

i. For all patients: k and Cw.

Question 7

We are providing CMV-neg blood components upon request.

Question 8

No.

Question 9

Yes.

Question 10b

Yes.

i. For neonatal patients' maximum storage period of RBC do not exceed 5 days.

Subject 4. Blood product dosing:

Question 1

Milliliters/kg.

Question 2

Milliliters/kg.

Question 3

Milliliters/kg.

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Russia - Pirogov National Medical Surgical Center

Eugene Zhiburt

Subject 1. Hospital and transfusion service demographics:

Question 1

Russia.

Question 2

Yes, my hospital is a teaching/academic hospital.

Question 3

We receive the blood components from 3 blood centers.

Question 4a

Neonate – less than 30 days old.

Question 4b

Pediatric - less than 18 years old.

Question 5

No, a pediatric specialty works only for out-patients.

Question 6

NA.

Question 7

NA.

Question 8

NA.

Question 9

NA.

Question 10

NA.

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1

Yes.

i. Reverse ABO typing starts since 4 months age. Typing of C, c, E, e, Cw, K and k is mandatory. Newborn blood tube is labeled with mother surname and initials. Threshold for RBC transfusions: 85 g/l – before 1 year, 70 g/l – > 1 year. For newborns: a) RBCs should be stored < 10 days; b) volume of transfused RBCs is 10-15 ml/kg; c) rate of RBCs transfusion is 5 ml/kg/hour; d) transfused product should be warmed to 36-37 ^{o}C. For intrauterine transfusion RBC should be O RhD-negative with a period of storage no more than 5 days.

Question 2

NA.

Question 3b

Yes.

i. NA.

Question 4b

Yes.

i. No.

Question 5

Yes.

Question 6b

Yes.

i. NA.

Question 7b

Yes.

i. NA.

Question 8b

Yes.

i. NA.

Subject 3. Product manipulations for pediatric and neonatal patients:

Question 1b

Yes.

i. Allogeneic stem cell transplantation.

Question 2b

Yes.

i. 100%.

Question 3a

No. Not necessary.

Question 4a

No.

Question 5b

Yes.

i. MB-plasma and amotosalen-platelets.

Question 6

NA.

Question 7

NA.

Question 8

Jumbo plasma apheresis bags

Question 9

No.

Question 10.

No.

Subject 4. Blood product dosing:

Question 1

For neonatal patients – 10-15 milliliters/kg.

Question 2

50-70×10^9 platelets per 10 kg.

Question 3

15 milliliters/kg

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The Netherlands

Marian G.J. van Kraaij & Elise Huisman

Subject 1. Hospital and transfusion service demographics:

Question 1

The Netherlands.

Question 2

Academic.

Question 3

We receive them from the national blood center (Sanquin).

Question 4

Neonate is less than 28 days, but for transfusion we “stretch” this till the age of 3 months.

Pediatric is indeed < 18 years.

Question 5

It is a university pediatric hospital, a university adult hospital and a specialized adult oncology hospital. Total amount of pediatric beds = ?

Question 6

See question 5.

Question 7a

Yes.

Question 7b

Yes.

Question 7c

Yes.

Question 7d

Yes.

Question 7e

Yes.

Question 7f

Yes.

Question 7g

Yes.

Question 7h

Until 1st of June yes, from 1-6-2018 only shared care pediatric oncology. Pediatric (benign) hematology still is available. But pediatric stem cell transplantations occur in another academic hospital, only pre- and post-transplantation care occurs again in our hospital.

Question 7i

Yes.

Question 7j

Yes, both. ECMO, LVAD also.

Question 7k

Yes.

Question 7l

Yes.

Question 7m

Yes.

Question 7n

Yes.

Question 7o

Yes

Question 7p

Yes and chronic ventilation care.

Question 8a

The total for both is 1468.

Question 8b

i. 31, younger than 1 month.

ii. 50, 1-4 months.

iii. 1387, older than 4 months.

Question 9a

The total for both is 551.

Question 9b

i. 21, younger than 1 month.

ii. 21, 1-4 months.

iii. 509, older than 4 months.

Question 10a

The total of both is 816.

Question 10b

i. 26, younger than 1 month.

ii. 19, 1-4 months.

iii. 771, older than 4 months.

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1

Yes, there is (2011, update expected 2019/20), it is embedded in the general (adult) guideline with special chapters if needed. Extra attention is given to:

- Intra uterine blood transfusions
- HPA (e.g. 1a) negative platelets if indicated in FNAIT
- Exchange transfusion (e.g. with hyperbilirubinemia)
- Specific blood transfusions (e.g. apheresis for neonates) or regulations (e.g. irradiated if <32 weeks GA, HLA matched, PvB19 etc)
- Laboratory tests (for neonates test mother ‘and child)
- Tresholds differ for transfusions per age -group

Question 2

No, we follow the national guideline. Rarely exceptions are made, e.g. FF-plasma extended till age of 1 year in case of large cardiothoracical surgery with ECMO.

Question 3

Yes, there is. Indications

- Acute or chronic anemia (threshold depends on clinical situation / ventilation etc), or during sickle cell crisis with complications, sporadic prophylactic in sickle cell disease.
- Platelets if (prophylactic in neonates <20, <10 in pediatric hemato-oncology, pre-operative if regenerative thrombopcytopenia or functional platelet disorder), otherwise indications depend on stability of clinical state / correction of bleeding in thrombocytopenic/-pathic patients
- Plasma, when bleeding tendency on ECMO, when F VI deficiency, when F XI deficiency, when plasmapheresis

Question 4a

No, in general, but yes when a specific product is needed (PvB19 / irradiated / HLA identical platelets etc, this is only once at the beginning of the specification via paper-+ electronic order. After that it is automatically continued, also in electronic patient file, unless physician confirms that indication is no longer needed).

Question 4b

Yes, see 4.a

Question 5

Only when it means that there are specific laboratory or product requirements. E.g. sickle cell (extended blood group typing, use of ATG, SCTx or MDS → irradiation, etc).

Question 6

Yes.

Neonates

- <7 days and born <32 weeks and/or < 1500 gram and with respiratory or circulatory support: Hb 8 mmol/l = 12,8 g/dL
- <7 days and born <32 weeks and/or < 1500 gram and no respiratory or circulatory support: Hb 7 mmol/l = 11,2 g/dL
- <7days, born >32 weeks and/or >1500gram and with respiratory or circulatory support: Hb 7 mmol/l = 11,2 g/dL
- <7days, born >32 weeks and/or >1500gram and no respiratory or circulatory support: Hb 6 mmol/l = 9,6 g/dL
- >7days, regardless of gestational age or birth weight and with respiratory or circulatory support: Hb 5 mmol/l = 8 g/dL

- >7days, regardless of gestational age or birth weight and no respiratory or circulatory support: Hb 4 mmol/l = 6,4 g/dL

Children

- In need of ventilator or circulatory support: Hb 6 mmol/L = 9,6 g/dL
- In need of oxygen or otherwise critically ill but no (not yet) ventilator or circulatory support: Hb 5 mmol/L = 8 g/dL
- Stable clinical condition and anemia secondary to regeneration (chemo/bone marrow failure: Hb 4,3 mmol/L = 7 g/dL
- Stable clinical condition, able to compensate for anemia and acute or chronic anemia (for other reasons than regeneration, e.g. iron deficiency): Hb 3,5-4 mmol/L = 5,6-6,4 g/dL
- Stable condition, but auto-immune hemolytic anemia, able to compensate: Hb 3,5 mmol/L = 5,6 g/dL
- Pre-surgery and stable condition Hb 4 mmol/l = 6,4 g/dL

Question 7

Yes

Neonates

- < or > 7 days independent for gestational age or birth weight and with major bleeding (e.g. IVH/pulmonary hemorrhage) : platelets > 50, first 48h try >100
- <7 days and born <32 weeks and/or < 1500 gram and with respiratory or circulatory support or with major bleeding (e.g. IVH/pulmonary hemorrhage) : platelets > 50
- < or >7 days independent for gestational age or birth weight but with no respiratory or circulatory support: Platelets > 20
- Pre-surgery (large surgery) independent for gestational age or birth weight: platelets > 50
- In case of maternal IgG auto-antibodies (maternal ITP): platelets >20, preferably with IVIG, otherwise in first 5 days of life with platelet transfusion

Children

- In need of major bleedings (e.g. intracranial, trauma): platelet >100
- In need of ventilator or circulatory support: platelets > 50
- In need of ECMO or LVAD and bleeding: platelets >80
- In need of ECMO or LVAD and not bleeding: platelets > 50
- In need of regenerative thrombocytopenia and with bleeding and/or major surgery and/or: platelets >50

- In need of regenerative thrombocytopenia and no bleeding nor major surgery nor anticoagulative therapy: platelets >10 if also on chemotherapy, >5 if secondary to bone marrow failure
- In case of surgery (preventive) or in case of bleeding in patients with thrombocytopathy: 20ml/kg, with maximum of 1 unit
- Stable condition, but auto-immune thrombocyopenia (ITP) : none unless acute, major bleeding

Question 8

No, indications to diffuse.

Subject 3. Product manipulations for pediatric and neonatal patients:

Question 1

Yes.

- Neonates <32 weeks or < 1500 gram BW for 6 months
- Intrauterine transfusions, for 6 months postnatally
- Autologous stem cell transplantation
- Allogenic stem cell transplantation
- Use of ATG / Fludarabin / Campath
- Severe combined immune deficiency or selective severe T-cell defects elevating the risk on TA-GvH

Question 2

Yes, all blood component transfusions are LD, this is the standard of the Dutch Blood Supply Company Sanquin

Question 3

Yes, rarely used, but possible indications are severe allergic reactions, pneumococcal mediated HUS (T-antibody –involvement) and only in PNH when routine blood products clearly lead to aggravation of hemolysis, not routinely.

Question 4

No, we do not, it will take a minimum of 30-45 minutes before it is thawed.

Question 5

No.

Question 6

Yes.

All girls and patients with MDS and auto-antibodies against red blood cells: also cEK

All hemoglobinopathies: cEK, Fy a/b, Jk a/b, MNSs.

Question 7

Yes, but this is not specific for our hospital laboratory, it is arranged but the Dutch blood Supply Company Sanquin: routinely in case of intrauterine blood transfusion and on indication for individual needs (e.g. critically sick child with SCID pre-transplantations, still CMV negative).

Subject 4. Blood product dosing:

Question 1

10-15 ml/kg, maximum 2units.

Question 2

15-20ml/kg, maximum 1 unit.

Question 3

10-15ml/kg, amountof units depend, usually maximum one, but for the children on ECMO we sometimes provide continuously for 24 hours (4 x 6 hours).

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Brazil

Jose M. Kutner, Araci M. Sakashita & Ana P. H. Yokoyama

Subject 1. Hospital and transfusion service demographics:

Question 1

We are a tertiary care facility located in São Paulo city, SP, Brazil.

Question 2

We area a teaching/academic hospital with a Nursing college, a Medical college, a Research Institute, Medical Internship programs, and a Graduate Program in Health Sciences.

Question 3

All the blood components are collected, tested, and prepared at our own facility.

Question 4

The following age thresholds are used to define our pediatric population:

a. Neonate patient: less than 28 days old.

b. Pediatric patient: 29 days old - less than 18 years old.

Question 6

We are a 650-bed hospital for both adult and pediatric patients.

A total of 106 inpatient beds are available for pediatric patients with the following distribution:

i. Pediatric Ward: 20 beds;
ii. Pediatric Intensive Care Unit: 18 beds;
iii. Neonatal Ward: 46 beds
iv. Neonatal Intensive Care Unit: 22 beds

Question 7a

Yes.

Question 7b

Yes.

Question 7c

Yes.

Question 7d

Yes.

Question 7e

Yes.

Question 7f

Yes.

Question 7g

Yes.

Question 7h

Yes.

Question 7i

Yes.

Question 7j

Yes.

Question 7k

Yes.

Question 7l

Yes.

Question 7m

Yes.

Question 7n

Yes.

Question 7o

Yes.

Question 7p

Yes.

Additionally we provide specialties for pediatric and neonatal patients for Orthopedics and Fetal Medicine.

Question 8a.

We define pediatric transfusion dose according to a patient´s body weight.

Seven hundred and eight (708) RBCs transfusions are done per year in both pediatric and neonatal patients at our facility.

Question 8b

The transfused RBCs distribution according to patient´s age is described bellow:

i. Younger than 1 month: 114 transfusions
ii. 1-4 months: 98 transfusions
iii. Older than 4 months: 496 transfusions (4 mo-1yo: 64 transfusions; >1yo: 432 transfusions)

Question 9a

Eighty six (86) FFP transfusions are done per year in both pediatric and neonatal patients.

Question 9b

The transfused FFP distribution according to patient´s age is described bellow:

i. Younger than 1 month: 28 transfusions
ii. 1-4 months: 17 transfusions
iii. Older than 4 months: 41 transfusions (4 mo-1yo: 10 transfusions; >1yo: 31 transfusions)

Question 10a

Five hundred and four (504) platelet transfusions are done per year in both pediatric and neonatal patients.

Question 10b

The transfused platelet distribution according to patient´s age is described bellow:

i. Younger than 1 month: 58 transfusions
ii. 1-4 months: 39 transfusions
iii. Older than 4 months: 407 transfusions (4 mo-1yo: 32 transfusions; >1yo: 375 transfusions)

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1

Brazil does not have guidelines specific for neonatal and pediatric populations.

Questions 2 and 3

Our hospital has a list of indications for RBC, plasma and platelet transfusion, as follows:

i. **RBC**:

1. **Infants younger than four months**:

- **Hematocrit <20%** with low reticulocyte count and symptomatic anemia (tachycardia, tachypnea, poor feeding)
- **Hematocrit <30% and either of the following:**
  - ✓ Tachypnea (respiratory rate >80 beats/minute), tachycardia (heart rate >180 beats /minute) for at leats 24 hours
  - ✓ Significant bradycardia or apnea
  - ✓ Oxygen support by nasal canula
  - ✓ Continuous positive airway pressure support or mandatory ventilation on mechanical ventilation with mean airway pressure under 6 cm of water
  - ✓ Low weight gain (<10g/day observed over 4 days, provided that there is adequate calories intake)
  - ✓ On <35% oxygen hood
- **Hematocrit < 35% and either of the following**
  - ✓ Continuous positive airway pressure support or mandatory ventilation on mechanical ventilation with mean airway pressure >6 cm of water
  - ✓ On >35% oxygen hood
- **Hematocrit <45% and either of the following:**
  - ✓ Congenital cyanotic heart disease
  - ✓ Extracorporeal membrane oxygenation support

2. **Pediatric patients**

- **Hemoglobin<7g/dL (Hematocrit <21%)** in:
  - ✓ Stable, non cyanotic patients. Unstable children will be transfused at their physician's discretion
  - ✓ Active bleeding with evidence of inadequate oxygen tissue delivery

- **Hematocrit < 24% and either of the following:**
  - ✓ Symptomatic anemia
  - ✓ Under chemotherapy or radiotherapy
  - ✓ Acute blood loss non responsive to volume replacement
- **Hematocrit <40% and either of the following:**
  - ✓ Severe pulmonary disease
  - ✓ Extracorporeal membrane oxygenation support

ii. **FFP**:

1. **Neonates and children:**
   - ✓ Clinically significant bleeding or prior to invasive procedures with a significant bleeding risk with abnormal coagulation profile defined by APTT or PT above the normal gestational and post-natal age-related reference range.

iii. **Cryoprecipitate**

1. **Neonates and children:**
   - ✓ Fibrinogen <1g/L for surgery with significant bleeding risk or at critical sites;
   - ✓ Disfibrinogenemia with active bleeding or undergoing invasive procedures.
   - ✓ Factor XIII deficiency with active bleeding or while undergoing invasive procedures in absence of factor XIII concentrate
   - ✓ Patients on ECMO with fibrinogen levels <0,25 g/L

iv. **Platelets**

1. **Prophylactic transfusion:**
   - ✓ Platelet count <10-20x10^9/L in stable pediatric patients
   - ✓ Platelet count <30x10^9/L in stable neonates
   - ✓ Platelet count <50x10^9/L before invasive procedure
   - ✓ Platelet count <100x10^9/L before neurosurgery

2. **Therapeutic transfusion**:
   - ✓ Platelet count <50x10^9/L and active bleeding in stable neonates
   - ✓ Platelet count <100x10^9/L in neonate with disseminated intravascular coagulation or unstable premature neonates

- ✓ Platelet dysfunction
- ✓ Patients on ECMO support with active bleeding or platelet count <$50x10^9$/L or <$100x10^9$/L if intracranial bleeding

Question 4

It is not mandatory that the physician ordering the transfusion provides the indication by the time the blood products are ordered. However, transfusion staff does perform a critical analysis before preparing blood components to check compliance with our guidelines. If the transfusion is considered not appropriate, a Blood Bank physician will contact the physician who prescribed the blood component so that the latter can provide the reasons why the transfusion was ordered.

Question 5

It is mandatory that the person ordering transfusion provides patient´s diagnosis when blood products are prescribed.

Question 6

Our hospital has thresholds for RBC transfusion, as described on question 3 above.

Question 7

Our hospital has thresholds for platelet transfusion, as described on question 3 above.

Question 8

Our hospital has thresholds for plasma transfusion, as described on question 3 above.

Subject 3 Product manipulations for pediatric and neonatal patients

Question 1

Our transfusion service provides irradiated blood components which are recommended in the following conditions:

i. Low birth weight newborn (<1200g)
ii. Premature newborn (<28 weeks of gestation)
iii. Neonate and pediatric patients with severe congenital immunodeficiencies
iv. Transfusion of blood components from relatives and HLA compatible donors
v. Intrauterine transfusion
vi. Massive transfusion. RBCs must be transfused up to 24 hours post irradiation

Question 2

Our transfusion service provides leukodepleted blood components which are recommended in the following conditions:

i. HLA alloimmunization prevention
ii. Febrile non hemolytic transfusion reaction prevention
iii. Chronic transfusion regimen (i.e. hemoglobinopathies and myelodisplastic syndrome)
iv. Pre-storage leukodepleted blood components are accepted as surrogate for CMV negative products in our country. Therefore, transfusion of CMV negative or pre-storage leukodepleted blood components is recommended in the following conditions:
    1. Low birth weight newborn (<1200g)
    2. Neonate whose mother is CMV negative or unknown CMV status
    3. Intrauterine transfusion
    4. Bone marrow transplant recipient with CMV negative donor
    5. Solid organ transplant recipient with CMV negative donor

Question 3

Our transfusion service provides washed RBCs which are recommended for patients who have had severe allergic or anaphylactic reactions in previous transfusion.

Question 4

Our transfusion service does not maintain a stock of thawed plasma for immediate use.

Question 5

Our transfusion service does not provide pathogen inactivated blood products.

Question 6

Our transfusion service provides prophylactically matched RBC units for Rh, Kell, Duffy, Kidd, and MNS antigen systems for chronically transfused patients with hereditary hemoglobinopathies and myelodisplastic syndrome.

Question 7

We do not provide other specific tests for pediatric patients.

Question 8

Our transfusion service does have a procedure to minimize the number of donors the patients are exposed to. Once a RBC unit is selected to a neonate or pediatric patient, we try to transfuse aliquots of the same unit whenever feasible.

Question 9

Our transfusion service uses small volume test tubes (i.e 1.2 mL) to draw blood samples from neonates and pediatric patients.

Question 10

RBC units for massive transfusion, RBC exchange in neonates, or intrauterine transfusion must be transfused up to 5 days after collection.

Subject 4 . Blood product dosing

Question 1

We usually prepare 10-15 ml/kg body weight (b.w) of RBC for pediatric/neonatal patients.

Question 2

We usually prepare 10-15 ml/kg b.w. of platelets for pediatric/neonatal patients.

Question 3

We usually prepare 10-15 ml/kg b.w. of plasma for pediatric/neonatal patients.

References:

1. New et al. Guidelines on transfusion for fetuses, neonates and older children. British Journal of Hematology, 2016; 175:784-828
2. AABB Technical Manual, 19th edition, AABB Press, 2017
3. Parker et al. Transfusion in critically ill children: Indications, Risks and challenges. Critical Care medicine, 2014; 42:675-690
4. Yuan et al. How we provide transfusion support for neonatal and pediatric patients on extracorporeal membrane oxygenation. Transfusion 2013; 53:1157-1165

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Spain

Josune Zubicaray & Julián Sevilla

Subject 1. Hospital and transfusión service demographics:

Question 1

Spain

Question 2

Yes, it is a university hospital.

Question 3

We receive the blood components from the Regional Blood Center (Centro de Transfusion Comunidad de Madrid, CTCM). They provide the blood components and we prepare them for transfusion.

Question 4a

Neonate: less than 30 days old.

Question 4b

Pediatric: less than 18 years old.

Question 5

Yes, it is a monographic pediatric hospital constituted by 180 inpatient beds.

Question 6

No, it is only for pediatric patients.

Question 7a

There are Allergy and Rheumatology services, but not Immunology.

Question 7b

Yes

Question 7c

Yes

Question 7d

Yes

Question 7e

Yes

Question 7f

No

Question 7g

Yes

Question 7h

Yes

Question 7i

No

Question 7j

Yes

Question 7k

Yes

Question 7l

Yes

Question 7m

General surgery, neurosurgery, traumatology, plastic surgery, urology.

Question 7n

Yes

Question 7o

Yes

Question 7p

Yes

Question 8a

1800-2000 RBCs.

Question 8b

All of them have been older than 4 months. There isn´t a neonatal department, so neonatal patients are not admitted.

Question 9a

150-250 plasma units.

Question 9b

All of them have been older than 4 months (no neonatal department).

Question 10a

1300-1500 platelet units.

Question 10b

All of them have been older than 4 months (no neonatal department).

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1b

Yes. Guide for the transfusion of blood components and plasma derivatives, 5º edition, SETS (Spanish Society of Blood Transfusion and Cellular Therapy).

i. Criteria vary according to age: preterm infants, under 4 months, older than 4 months.

Question 2b

Yes; elaborated by transfusion Committee based on the guide for the transfusion of blood components and plasma derivatives of the Spanish Society of Blood Transfusion and Cellular Therapy: Blood Derivatives Transfusion Guide (Code: CTR-DC-002). References below.

i. They differ according to the weight and age.

Question 3b

Yes. Elaborated by transfusión Committee based on the guide for the transfusion of blood components and plasma derivatives of the Spanish Society of Blood Transfusion and Celular Therapy: Blood Derivatives Transfusion Guide (Code: CTR-DC-002). See the indications on question 6, 7 and 8. References below

Question 4b

Yes, they must provide the indication for the transfusion.

i. The indication is entered electronically.

Question 5

Yes, they must provide the patient´s diagnosis at the time of ordering blood products.

Question 6b

Yes. Elaborated by transfusion Committee based on the guide for the transfusion of blood components and plasma derivatives of the Spanish Society of Blood Transfusion and Celular Therapy: Blood Derivatives Transfusion Guide (Code: CTR-DC-002). References below

i. Thresholds for pediatrics:

*Pediatrics <4 months:

- Hb < 7 g/dL with low reticulocytes and anemia symptoms.

- Hb <9 g/dL if:
    - Oxygen requirements with CPAP or mechanic ventilation with FiO2 30-35% or high flow rate with more than 1 liter/kg and FiO2 30-35% or oxygen glasses with > 2 liters/min and saturation ≤ 92%.
    - Signs of apnea, bradycardia, tachycardia or tachypnea and low weight gain (≤ 10 g/day for 4 days receiving ≥ 100 Kcal/kg/day).
- Hb <9 g/dL if:
    - Oxygen requirements with CPAP or mechanic ventilation with FiO2 ≥ 35% or high flow rate with more than 1 liter/kg and FiO2 ≥ 35% and saturation ≤ 92%.
    - Preoperative anemia
- Hb < 15 g/dL with: congenital cyanotic cardiopathy or oxygenation with extracorporeal membrane.

*Pediatrics >4 months:

- Hb < 7 g/dL with chronic anemia and/or not responding to specific and symptomatic treatment.
- Hb 7-10 g/dL according to the clinical situation:
    - Acute loss of ≥ 25% of blood volume.
    - Preoperative Hb < 8 g/dL or losses above 15% of the blood volumen.
    - Hb < 8 g/dL and treatment with chemotherapy and/or radiotherapy.
- Hb < 13 g/dL and severe pulmonary disease, cyanotic cardiopathy or oxygenation with extracorporeal membrane with descent of
  O2 saturation.

Question 7

Yes. Elaborated by transfusión Committee based on the guide for the transfusion of blood components and plasma derivatives of the Spanish Society of Blood Transfusion and Celular Therapy: Blood Derivatives Transfusion Guide (Code: CTR-DC-002). References below

i. Thresholds for pediatrics and neonates:

They should be transfused below the following figures:

- Platelets < 20x109/L and asymptomatic
- Platelets between 30 and 50x109/L in unstable patient:
    - Premature in their first week of life and/or < 1kg.
    - Premature with bleeding Grade III or IV
    - Newborns with signs of bleeding
    - Need for invasive procedures or administration of drugs that alter platelets
    - Platelets < 50x109/L and
- Need to perform an invasive procedure or Exchange-transfusion
- Platelets < 100x109/L before a major surgery

Question 8

Yes. Elaborated by transfusión Committee based on the guide for the transfusion of blood components and plasma derivatives of the Spanish Society of Blood Transfusion and Celular Therapy: Blood Derivatives Transfusion Guide (Code: CTR-DC-002). References below

i. Thresholds for pediatrics and neonates:

- Prior to invasive procedures or surgery if INR (International Normalized Ratio) > 1.5 or 2 times above normal value.
- Replacement treatment for disseminated intravascular coagulation or massive transfusion.
- Deficit of coagulation factors, with hemorrhage prior to invasive procedures or surgery, if the specific coagulation factor is not available for administration.
- Thrombotic thrombocytopenic purpura.
- In the case of fulminant purpura of the newborn due to protein C and S deficiency, if specific concentrates of these factors are not available for administration.

- For reconstitution of the erythrocytes concentrate, when total blood is not available for the realization of Exchange-transfusion.
- If is necessary to revert the effect of the vitamin K dependent anticoagulants, we recommend to use vitamin K in the first place. In situations with vital risk for bleeding or urgent invasive procedure, Complex Prothrombinic concentrate will be administered, if is not available, fresh frozen plasma will be used.

Subject 3. Product manipulation for pediatric and neonatal patients:

Question 1b

Yes. Elaborated by transfusión Committee based on the guide for the transfusion of blood components and plasma derivatives of the Spanish Society of Blood Transfusion and Celular Therapy: Blood Derivatives Transfusion Guide (Code: CTR-DC-002). References below

Indications for irradiation:

- Severe immunodeficiency syndromes.
- Receptors of allogeneic Hematopoietic Stem Cell Transplantation (HSCT) from the beginning of the conditioning until the patient is receiving prophylaxis for graft versus host disease.
- Patients with Hodgkin lymphoma.
- Patients treated with purine analogs (fludarabine, cladribine and deoxicoformycin).
- Exchange-transfusion in intrauterine transfusion receptors.
- Receivers of intrauterine transfusions (UTI) up to 6 months after the probable date of birth (40 weeks of gestation) or if the donation comes from a first or second family degree.
- Patients undergoing bone marrow or peripheral blood progenitor extraction for autologous reinfusion from 7 days before and during the collection.
- Patients undergoing transplantation of autologous hematopoietic progenitors (HSCT) since the beginning of the conditioning up to 3 months after transplantation (6 months if total body irradiation was used in conditioning).
- Patients treated with Alemtuzumab (anti-CD52).

- Patients with aplastic anemia treated with anti-thymocytic gammaglobulin.

Question 2b

Yes. All of them are leukodepleted according to national requirements

Question 3b

Yes, provided by the regional blood center.

i. Ig A deficit.

Question 3a

No, we don´t maintain a stock of thawed plasma units.

Question 4b

Yes; all plasma units are inactivated according to the CTCM standard procedure. The inactivation protocol varies annually according to a public assignment procedure, being more frequent inactivation with blue methylene in the last years. Also a small proportion of platelet units are inactivated with Amotosalen.

Question 5b

In girls we match the following antigens Rh and Kell, as referred in SOP SET-PT-035.

Question 6

Yes, we matched blood com,ponents fro CMV in hematopoietic stem cell transplantation receptors.

We carry out studies such as direct Coombs test, detection of irregular antibodies by indirect Coombs test, identification of them by panels or extended phenotype studies; the rest of the extended or complementary studies are provided by Regional Blood Center.

Question 7

Yes, we aliquot the units and prioritize the use of apheresis platelets instead of pools.

Question 8

No.

Question 9a

No.

Subject 4. Blood product dosing:

Question 1

Units or half unit according to the weight.

Question 2

Five unit pools or apheresis products for patients over 30 kg, and half apheresis for those less than 30 kgs.

Question 3

10-20 ml/kg adjusted to plasma units volume (250cc).

References:

[1] Bolton-Maggs P.H. Bullet points from SHOT: key messages and recommendations from the Annual SHOT Report 2013. Transfus Med 2014; 24(4): 197-203.

[2] Directive 2005/62/EC of 30 September 2005 implementing Directive 2002/98/EC of the European Parliament and of the Council as regards Community standars and specifications relating to a quality system for blood establishments.

[3] Guideline on the Administration of Blood Components. British Committee for Standars in Haematology.

[4] Chaffe B, Glencross H, Jones J, et al. UK Transfusion Laboratory Collaborative: mínimum standars for staff qualifications, training, competency and the use of information technology in hospital transfusión laboratorios. Transfus Med 2014; 24(6): 335-40.

[5] Guía sobre la transfusión de componentes sanguíneos y derivados plasmáticos. 5º edición. Sociedad Española de Transfusión Sanguínea y Terapia Celular. 2015.

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Japan

Hitoshi Okazaki, Mitsuteru Hiwatari & Yutaka Nagura

Subject 1. Hospital and transfusion service demographics:

Question 1

Japan.

Question 2

Yes.

Question 3

All the allogenic blood products are from the Japanese Red Cross blood center, and autologous blood products are prepared in our hospital.

Question 4a

Less than 30 days old.

Question 4b

Between 30 days old and 15 years.

Question 5

No.

Question 6

Yes. About 20 beds.

Question 7a

No.

Question 7b

Five physicians.

Question 7c

One physician.

Question 7d

Two physicians.

Question 7e

No.

Question 7f

No.

Question 7g

Yes.

Question 7h

Seven physicians.

Question 7i

No.

Question 7j

Four physicians.

Question 7k

Three physicians.

Question 7l

One physician.

Question 7m

Five physicians.

Question 7n

Four physicians.

Question 7o

Yes (At the Dept. of Otolaryngology).

Question 7 p

Yes (At the Dept. of Palliative Care).

Question 8a

1260.24 units (In Japan, 1 unit is defined as that obtained from 200ml of whole blood).

Question 8b

i. 240.74 units.

ii) 79.5 units.

iii) 940 units.

Question 9a

406 units (in Japan, 1 unit is defined as 120ml of plasma).

Question 9b

i. 134 units.

ii. 40 units.

iii. 232 units.

Question 10a

8067 units (in Japan, 1 unit is defined as $2x10^{10}$ counts/ bag)

Question 10b

i. 647 units.

ii. 90 units.

iii. 7330 units.

Subject 2. Transfusion Indications for pediatric and neonatal patients:

Question 1

Yes.

i. We have just revised the guideline for neonatal and pediatric (up to 4 months) transfusions. The threshold for the administration of each labile blood for neonates is somehow different from that for adults. The indications for neonatal and pediatric transfusion are as follows:

1) RBC transfusion will be considered; i) if the patients' Hb is equal to or lower than 7 g/dL when the patients are in a stable condition. ii) if the patients' Hb is equal to or lower than 11 g/dL when the patients are chronically dependent on oxygen administration. iii) if the patients' Hb is equal to or lower than 12 g/dL when the patients are the neonates within 24 hours after birth or neonates under intensive care treatment. RBC storage less than 2 weeks from donation are preferable, and 10-20mL/Kg of RBC will be given at a speed of 1-2mL/Kg/hr if there are no signs of congestive heart failure in the patients. If there are signs of congestive heart failure, RBC transfusion will be discussed separately. Because transfusion of RBC using the needle thinner than 24 gauge with pressure pump may cause hemolysis, careful attentions need to be paid to this kind of hemolysis. RBC transfusion should be finished within 6 hours after opening the bag. If the duration of transfusion exceeds 6 hours, RBC should be aseptically divided into small bags and stored at 2-6 ˚C until use.

2) i) Platelet concentrate transfusion should be considered if the platelet count is lower than $2\text{-}3x10^{3}/\square L$ when the patients are stable and have no signs of bleeding. Higher platelet counts are recommended for the premature infants within a few days after birth. ii) Platelet concentrate administration will be considered when

the platelet count is lower than $3x10^3/\mu L$ if the patients are diagnosed as NAIT (neonatal alloimmune thrombocytopenia). iii) Platelet count should be maintained at more than $5\ x10^3/\mu L$ when the patients are infants with very low birth weight, with any signs of bleeding, or undergoing invasive treatments. iv) Platelet count should be maintained at 5-10 $x10^3/\mu L$ when the patients are developing DIC or undergoing major surgeries.

3) FFP should be administered; i) when there is elongation of PT or APTT despite an administration of vitamin K, and there is bleeding or is undergoing invasive treatments. ii) when RBC transfusion exceeds ~~a~~ half of the amount of circulating blood. iii) when the patients are diagnosed with Upshaw-Schulman syndrome (congenital thrombotic thrombocytopenic purpura). FFP should be administered at 10-20mL/Kg every 12-24 hours (i) and ii)). In the case of iii), FFP should be administered at 10 mL/Kg every 2-3 weeks.
FFP can be substituted by saline solution in the case of the partial exchange transfusion for neonatal polycythemia.

Question 2

No.

Question 3

No.

Question 4

Yes.

i. Yes.

Question 5

No. However, columns are available to enter the diagnoses of the patients, and physicians can input them on a voluntary bases.

Question 6

Yes.

i. For adult patients only.

Question 7

Yes.

i. For adult patients only.

Question 8

Yes.

i. For adult patients only.

Subject 3. Product manipulations for pediatric and neonatal patients:

Question 1

Yes.

i. All RBC and platelets are irradiated.

Question 2

Yes.

i. All the labile blood products are leukodepleted and supplied by the Japanese Red Cross.

Question 3

Yes.

i. Washed RBCs can be purchased from Japanese Red Cross, and we usually do not prepare washed RBC in our hospital. We have experience of preparing washed RBC only once for a patient with paroxysmal nocturnal hematuria.

Question 4

No.

Question 5

No.

Question 6

No.

Question 7

No.

Question 8

Yes.

a. One unit RBC is provided split into up to 3 bags.

Question 9

No.

Question 10

No.

Subject 4. Blood product dosing:

Question 1

0.5-2 units (In Japan, 1 unit is defined as that obtained from 200ml of whole blood)

Question 2

5-20 units (In Japan, 1 unit is defined as 120ml of plasma)

Question 3

1-3 units (In Japan, 1 unit is defined as $2x10^{10}$ counts/ bag)

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