



## Transfusion Camp, University of Toronto

Seminar for Day 4, March 25, 2022 (1045am-1215pm)

Please start session by asking trainees if they have any questions from the didactic sessions

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### Case 1 (15 minutes)

A 64 year old woman is being seen in preoperative clinic in preparation for an elective revision total hip arthroplasty (2021 ONTraC provincial transfusion rate 19%). She has been feeling fatigued over the past 6 months. She attributes this to her worsening hip pain. Her past medical history is significant for hypertension. Her current medications include ASA, Ramipril. Her weight is 80 kg. Her labs show the following: hemoglobin 95 g/L, MCV 75 fL, WBC  $6.5 \times 10^9/L$ , platelets  $425 \times 10^9/L$ . Her creatinine is 80  $\mu\text{mol/L}$ . Her ferritin is 20 mcg/L. The surgeon has a spot for the surgery next week.

1. Which one of the following tests is indicated to investigate the cause of her anemia?
  - A) **GI workup including colonoscopy**
  - B) Hemoglobin electrophoresis
  - C) Serum protein electrophoresis
  - D) Vitamin B12

The patient has a microcytic anemia with a low ferritin. The most likely cause of her anemia is iron deficiency anemia. The definition of iron deficiency varies in the literature but a generally accepted definition of iron deficiency would include: ferritin of  $< 30$  mcg/L or a ferritin of  $< 100$  mcg/L with a transferrin saturation of  $< 20\%$ . Other causes of a microcytic anemia include thalassemia and anemia of chronic disease. Iron deficiency anemia is very common in the preoperative setting and has been found in anywhere from 20-40% of preoperative patients in various surgical settings. Typically patients with thalassemia have a persistently low MCV usually in the 60's. A serum protein electrophoresis would be performed for suspicion of myeloma and so would not be helpful here. B12 deficiency typically presents with a high MCV ( $> 100$  fL).

The most important question to ask in any case of iron deficiency is to determine the cause of iron deficiency. The most common causes are related to bleeding and less commonly to poor GI absorption of iron. In fact, the prevalence of colon lesions has been reported to be up to 5-10% and upper GI lesions 1-5%. Therefore additional information that would be helpful would include obtaining a history of previous anemia, information on her previous CBCs (to see if there has been a recent drop in her hemoglobin), questioning the patient for a history of bleeding (particularly gastrointestinal bleeding (note her history of NSAIDs) and gynecologic bleeding) and whether she has undergone any recent GI investigations (stool for occult blood testing, OGD, colonoscopy). She should also be asked about her diet (whether she eats iron-containing foods) and any malabsorption issues (chronic GI symptoms, vomiting, diarrhea, celiac disease).

**Case: Can give the residents information that the patient had a recent OGD and colonoscopy through her family doctor's office 1 month ago. Her hemoglobin has been stable over the past 6 months. There is no overt bleeding. She had a gastric bypass 4 years ago and has had chronic iron deficiency.**



2. Which one of the following is the appropriate next step in her management?
- A) Delay surgery until investigations complete
  - B) **Delay surgery until patient iron replete**
  - C) Proceed with surgery next week, no interventions needed
  - D) Proceed with surgery next week, start iron supplementation this week

This patient's surgery should be delayed. The risk of delaying this elective procedure is minimal. The risks of proceeding with surgery far outweigh the risks of delaying the surgery. She has a treatable and reversible cause of anemia. As the transfusion rate for this procedure is high, proceeding with the surgery would most definitely result in transfusion, put the patient needlessly at risk for the complications of transfusion and also the potential adverse effects of the resulting anemia. The need for transfusion in the postoperative setting has also been associated with increased infection rate and increased length of stay. The typical response to any anemia treatment is about 5-10 g/L per week and thus even if she is starting on iron supplementation this week, it is unlikely that she will have a sufficient increase in her Hb to avoid transfusion.

3. Which one of the following is an appropriate treatment for her anemia?
- A) Feramax 150mg po OD
  - B) Ferrous fumarate 300 mg po OD
  - C) IV iron 300-500mg
  - D) **IV iron 1000-1200mg**

The etiology of her iron deficiency anemia should be determined. This may include a referral to GI or gynecology. This patient has already had GI investigations and has a clear reason for iron deficiency (gastric bypass leading to poor absorption of iron). This patient should be treated with iron supplementation. Oral iron supplementation is an option. However, because her hemoglobin is so low, full iron replacement may take months as oral iron absorption is poor and unlikely to be effective in her case due to poor absorption from her gastric bypass surgery. Thus iv iron would be most appropriate.

In terms of dosing for iv iron, the modified Ganzoni formula can be used = subject weight in kilograms x [target Hb – current Hb g/dL] x 2.4 + 500. For this patient, weight 80 kg with a target Hb 13 g/dL (=130 g/L) and a current Hb of 9.5 g/dL (=95 g/L), the total iron deficit would be 1172 mg. Simplified dosing may also be used. For example, Ning & Zeller (ASH review 2019) suggest 300-600 mg for iron deficient, non-anemic patient, 1200 to 1500mg for Hb 80-109 g/L and 2000 to 3000mg for pts with Hb less than 80 g/L.

**PROMPT: What would you tell the patient about side effects of oral iron and iv iron? What would you tell surgeon about how long it would take to optimize Hb?**

Patients can have significant side effects from oral iron including constipation, diarrhea, nausea, vomiting and abdominal pain. Data suggests that oral iron salts (e.g. ferrous sulfate, ferrous fumarate) are as effective and potentially superior to newer more expensive formulations (e.g. Feramax = iron polysaccharide) (References: Powers JM et al. ferrous sulfate vs. iron polysaccharide in young children, RCT. JAMA 2017;317(22):2297-2304 and CADTH. Oral iron for anemia. 2016). A better option to consider for this patient would be intravenous iron. Side effects include hypotension, muscle cramps, joint pain,

headache, injection site swelling, chest discomfort, nausea, vomiting and/or diarrhea. Serious allergic reactions (rashes, face swelling and wheezing) are rare. In terms of timing, the reticulocyte count should increase in about 3-5 days after starting iron and the expected increase is about 5-10g/L per week. Therefore it would be expected to take about 3-4 weeks to reach a hemoglobin of 130g/L. One could consider giving the go-ahead to book the surgery in 3-4 weeks rather than just reassessing in 3-4 weeks. It would also be important to discontinue her aspirin preoperatively.

### Case 2 (15 minutes)

A 75 year old woman (weight 65 kg) is being seen in the surgeon's office in preparation for aortic valve replacement surgery (2021 ONTraC provincial transfusion rate for pre-assessed (seen in preoperative clinic) aortic valve surgery 26%). She presented with shortness of breath on climbing 2 flights of stairs over the past three months. Her past medical history is significant for Type 2 diabetes, hypertension and hypercholesterolemia. She also had breast cancer 4 years ago for which she had surgery, chemotherapy and radiation. Her most recent angiogram did not show significant coronary artery disease. Her current medications include ASA, metformin, insulin, ramipril, furosemide, rosuvastatin and arimidex. On exam her vitals are stable with BP 110/70. Her physical exam is unremarkable. Her labs show the following: hemoglobin 98 g/L, MCV 103 fl, WBC  $9.3 \times 10^9/L$ , platelets  $250 \times 10^9/L$ . Her creatinine is  $150 \mu\text{mol/L}$ . The family doctor states that her hemoglobin has been stable at about 100g/L for the past 2 years. The surgeon has booked her for surgery in 3 weeks.

4. Which one of the following tests would you recommend for investigation of her anemia?
- A) **B12**
  - B) Ferritin
  - C) Hemoglobin electrophoresis
  - D) Transferrin saturation

### PROMPT: What factors might be contributing to anemia and increase her risk of transfusion?

This patient has a macrocytic anemia. The most likely cause of her anemia given her age and history of chemotherapy and radiation is a bone marrow disorder called myelodysplastic syndrome. Other causes of a macrocytic anemia include liver disease, hypothyroidism, alcohol, medications and nutritional disorders such as B12 and folate deficiency. In this patient, renal insufficiency may also be contributing to her anemia even though this typically causes a normocytic anemia. She is unlikely to be bleeding as her hemoglobin has been stable for the past 2 years. Other investigations that may be helpful include a reticulocyte count, liver profile, TSH and B12. Folate deficiency is extremely rare in the setting of a normal diet in developed countries. Consultation with hematology could be considered in this situation since a bone marrow disorder is suspected. However a bone marrow biopsy would unlikely change the immediate management in this scenario.

Her reticulocyte count is 35 (N 30-110  $\times 10^9/L$ ). Her B12 is normal. Her ferritin is 290 ug/L and her transferrin saturation is 20%. No hemoglobin electrophoresis was done.



5. Which one of the following is an appropriate plan for her surgery?
- A) Consult GI for endoscopy.
  - B) Delay surgery until results of bone marrow biopsy known
  - C) Delay surgery to optimize patient's anemia.
  - D) **Proceed with surgery as planned**

Given that she is not iron deficient and her hemoglobin has been stable over the past 2 years, it is unlikely that she has a source of blood loss; thus GI endoscopy is not urgent. Even though a bone marrow disorder is suspected, as there has been no change in her Hb over the past 2 years, a bone marrow biopsy at this time is unlikely to change the management prior to surgery. Since there are only 3 weeks left until surgery, a further delay is not required and might be detrimental from the cardiac perspective. At this point, the best answer would be D. to proceed with surgery as planned. However, one should plan to optimize this patient's anemia to avoid transfusion if possible. Studies have shown that the risk of mortality is increased with each additional unit transfused in cardiac surgery.

6. Which one of the following is an appropriate treatment for this patient's anemia?
- A) **Eprex 40,000 units s.c. weekly x 3 weeks**
  - B) Ferrous gluconate 300 mg po OD x 3 weeks
  - C) IV iron 1000-1200mg
  - D) Proceed with surgery as planned

This patient should be offered preoperative erythropoietin (e.g. 40,000 units s.c. q weekly) as long as no contraindications. When treating patients with erythropoietin, it is critical to ensure there is adequate iron supplementation. Oral iron may be used. Studies have shown that erythropoietin treatment may be more effective in treating anemia when intravenous iron is given rather than oral iron. Iron supplementation alone is not sufficient in this case because this patient's iron stores are replete.

**PROMPT: What would you tell the patient about side effects of eprex?**

Contraindications include uncontrolled hypertension, history of severe coronary, peripheral arterial, carotid or cerebral vascular disease, recent MI/CVA, and surgery patients who cannot receive adequate antithrombotic prophylaxis. Side effects include hypertension, fevers and chills and injection site swelling. There has been data to suggest that erythropoietin may increase mortality in patients with cancer. These studies were conducted in patients with active malignancy and typically the hemoglobin was pushed to high levels (hemoglobin 130-150g/L) for extended periods of time (e.g. > 8 weeks). Increased thromboembolic events have also been seen in clinical trials of patients being treated with erythropoiesis stimulating agents for treatment of anemia in the setting of chronic renal insufficiency. Studies of preoperative erythropoietin (for shorter periods of time typically 2-4 weekly doses) have not shown an increased risk of thrombosis or mortality. The risk of thrombosis can be mitigated by postoperative DVT prophylaxis.

**PROMPT: What would you tell surgeon about how long it would take to optimize Hb?**

The time to optimize this patient would be about 3 weeks expecting a 5-10g/L increment per week to a target hemoglobin of 130g/L. In this setting, surgery is unlikely to be postponed due to the cardiac symptoms.

### Case 3 (20 minutes)

A 55 year old woman originally from India presents to the preoperative clinic for bilateral knee surgery (2020 ONTraC provincial transfusion rate 4%; 2021 ONTraC provincial transfusion rate 0%) booked in one week. Her hemoglobin is 115 g/L, MCV 85 fL, WBC  $5.5 \times 10^9/L$ , platelets  $250 \times 10^9/L$ . Her creatinine is 70  $\mu\text{mol/L}$ . Her ferritin is 40 mcg/L. Her surgeon has started her on oral iron supplementation. When speaking to her, she states that in her work-up a couple of months ago for a minor surgery, she was found to have a very rare blood type. She hands you a card that she carries in her wallet that states that she has Bombay type blood. You call the blood bank to find out that Bombay type blood is an extremely rare blood type. In fact these patients can only receive Bombay type blood. The blood bank informs you that Canadian Blood Services only has 14 frozen red blood cell units of Bombay type in their inventory.

7. Which one of the following is an appropriate management strategy for this patient?
- A) Delay the surgery to enable patient to donate 2 units of autologous PRBCs
  - B) **Delay the surgery and treat the patient with iron and ESAs to get hemoglobin >130 g/L**
  - C) Obtain 4 units of frozen Bombay type RBCs from CBS, thaw and bring to hospital and proceed with surgery as booked
  - D) Proceed with surgery.

This surgery should be delayed so that you can adequately prepare her for surgery. The next major decision would be to change her surgery to a single knee surgery at a time where the 2021 provincial rate of transfusion is  $< 0.3\%$  (although important to know what the transfusion rate is at your centre). Although the provincial transfusion rate for bilateral knee surgery is 0% in 2021; fewer of these procedures are being done and the patients eligible for bilateral knee surgery are selected carefully. The second knee surgery would have the same low risk of transfusion and could be done once her hemoglobin had recovered from the first surgery.

Autologous blood donation may be considered in this rare instance especially if there are no blood donors available to donate for the patient. The side effects of autologous donation include bruising at the site of phlebotomy and vasovagal symptoms. Exclusions from autologous donation include active infection, unstable coronary states, uncontrolled hypertension and uncontrolled seizure disorders. The most important side effect of autologous donation is the resultant anemia. The limitation in this patient is that her hemoglobin and ferritin are on the low side of normal. Therefore if she donates a unit of autologous blood, her hemoglobin will drop by about 10 g/L and she will become iron deficient. In a small report, it was shown that when patients donated 2 units of autologous blood, it took 4 weeks to regenerate a single unit of blood.



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It is arguable whether or not she should donate autologous blood. If the local transfusion rate for the procedure is low, then the better choice may be to treat the patient with intravenous iron and erythropoietin alone. If the local transfusion rate is  $> 10\%$ , and there are no allogeneic donors to provide liquid red blood cell units, then autologous blood donation may be considered. However, she should then receive intravenous iron supplementation and be treated with erythropoietin to increase red blood cell production to replace the autologous unit by the time of the surgery. In addition, there is little harm in starting her on oral B12 and folate supplementation preoperatively. Essentially, all blood conservation measures should be used as would be considered in a Jehovah's witness patient.

Donating autologous blood would require approximately 3-4 weeks of planning so that she would have enough time to regenerate her own blood cells. Even if she did not donate autologous blood, you would still want to delay her surgery by 2 weeks to treat her with erythropoietin and intravenous iron.

This case requires discussion with your local blood bank to see what allogeneic blood may be available to the patient. Frozen rare Bombay type RBC units are available at Canadian Blood Services however the process of thawing blood is logistically difficult. There needs to be significant coordination since thawing of frozen RBC units can only be done at the Canadian Blood Services blood centre; the blood then needs to be transported to the hospital; and finally it must be used within 24 hours to 7 days (depending on when the units were frozen) and if it expires, the units must be discarded (cannot be re-frozen). Canadian Blood Services may also be able to contact a donor to provide liquid units with the usual expiry date of 42 days. Make sure to contact your blood bank with a lot of advanced notice to coordinate this.

8. Which one of the following intra-operative blood conservation strategies is indicated in this case?
- A) Acute normovolemic hemodilution
  - B) Intra-operative cell-saver use
  - C) **Perioperative tranexamic acid**
  - D) Transfuse plasma and rFVIIa if any bleeding encountered

Tranexamic acid intraoperatively should be used. Tranexamic acid is a lysine analog and inhibits fibrinolysis by preventing the binding of plasma to fibrin. It has been shown in systematic reviews of hip and knee replacement surgery to decrease transfusion rates by 50%, decreased blood loss by 300mL with no increase in venous thromboembolic events. The side effects of a short infusion or single dose are minimal. It can be given either intravenously or topically. Contraindications include disseminated intravascular coagulation and hematuria. Although in the CRASH-2, large study of 20,000 trauma patients treated with tranexamic acid with a mortality benefit, no specific exclusions were made for these criteria.

In surgeries with higher transfusion rates, the use of cell saver should be considered. Cell saver has been shown to be able to recover approximately half of the operative red cell mass lost and as a result has shown a decrease in allogeneic transfusion. The cell saver can be set up at the beginning of the case. It does typically require a minimum of 250-500mL of blood loss to process (depending on the type of machine). It is not routinely used in the setting of hip and knee replacement surgery because of low intraoperative blood loss and transfusion rates.



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9. Which one of the following is an appropriate post-operative plan for the patient?

- A) Continue oral iron supplementation
- B) Give ESAs if symptoms of anemia
- C) **Minimize unnecessary phlebotomy**
- D) Transfuse frozen Bombay type unit if Hgb < 80 g/L

Frequent bloodwork is a common cause of iatrogenic anemia. Therefore, bloodwork should be minimized and when done, pediatric or low volume tubes can be used. Some hospitals have transitioned to low vacuum tubes (same size but lower vacuum, thus less volume; same cost) so as to decrease iatrogenic blood loss.

Restrictive transfusion triggers should also be used. Randomized controlled trials to date have not shown a benefit of liberal transfusion triggers. The relevant RCT for this population is the FOCUS trial which randomized 2000 hip fracture patients (age > 50) with a history of cardiac disease or at least one cardiac risk factor to a restrictive transfusion threshold level (transfuse if hemoglobin < 80 g/L or symptomatic) or a liberal transfusion threshold (transfuse if hemoglobin < 100 g/L). There was no difference in the primary composite outcome of 60 day mortality or inability to walk independently; nor was there a difference in secondary outcomes including myocardial infarction, stroke, congestive heart failure, infection, thrombotic events or transfer to ICU. This patient is 55 years old and likely could tolerate a Hb threshold of 70 g/L or lower.

Finally, postoperatively, erythropoietin may be considered (with DVT prophylaxis) although there is no RCT evidence to support its use. The role of iron supplementation postoperatively is less clear as there is significant inflammation causing increased hepcidin, a molecule that regulates the export of iron out of the reticuloendothelial stores. This may lead to iron sequestration within the reticuloendothelial system thus making iron unavailable to the bone marrow for red blood cell production. This may explain why postoperative iron supplementation, to date has not been routinely used. One study (Khalafallah et al, Lancet Haematology 2016) of 200 postoperative patients found improved hemoglobin recovery at 4 weeks and fewer blood units transfused (1/103 vs. 5/98; p=0.035) in surgical pts treated postoperatively with iv iron compared with standard of care.



#### Case 4 (20 minutes)

A 13 year old boy is admitted after being hit by a car while riding his bike. He has significant abdominal and orthopedic injuries. His family was present at the scene and advised the health care providers that the patient and the family are Jehovah's Witnesses. The patient has undergone surgery with hemodynamic resuscitation with 3-4 L of crystalloids. His labs show the following: hemoglobin 45 g/L, WBC  $8.0 \times 10^9/L$ , platelets  $65 \times 10^9/L$ . His INR is 1.5, PTT is 40 seconds. It is suspected that his laboratory values are both secondary to the acute coagulopathy of trauma and dilutional.

10. Which one of the following is an appropriate post-operative order for this patient?

- A) CBC, INR, aPTT Q8H until normalized
- B) CBC, INR, aPTT, chemistry panel daily
- C) CBC, INR, aPTT, chemistry panel every 2 days
- D) **No follow up laboratory testing unless clinically indicated.**

As described in the previous cases, minimizing blood draws is extremely important. Studies in the ICU have shown an average of 40mL of blood drawn per day in the initial days of ICU admission. Bloodwork should only be ordered if it will change management. In an acute patient, this may still result in daily bloodwork; in such circumstances, drawing bloodwork using pediatric tubes to minimize the blood volume would also be acceptable. Speak to your local lab to find a supply of such tubes.

11. Which one of the following is an appropriate post-operative order for this patient?

- A) **Eporex 20,000 units daily x 5 days then reassess CBC**
- B) Eprex 20,000 units daily x 10 days, CBC daily
- C) Eprex 20,000 units daily until discharge home
- D) Eprex 20,000 units daily until Hgb  $>120 \text{ g/L}$

Consideration for the use of erythropoietin postoperatively should be used. From earlier studies of treatment of anemia in the ICU (Corwin 1999), a typical dosing regimen would be Eprex 20,000 units daily x 5 days then every 2 days. Eprex is generally accepted by Jehovah's Witness patients and most current formulations do not contain albumin which was previously used as a stabilizer. This could be further supplemented by intravenous iron, B12 and folate, recognizing that intravenous iron alone may not be effective in the postoperative setting but may help to support erythropoietin treatment. It would also be important to treat the underlying cause of bleeding. In the setting of any ongoing or suspected bleeding, tranexamic acid should also be considered.





The patient has now been extubated and is awake. The clinical team feel strongly that this patient should be transfused. The parents state that he is a Jehovah's Witness and would not want to be transfused even in a life-threatening situation.

12. Which one of the following is appropriate when discussing transfusion with the patient and family?
- A) Ask them to speak with their Jehovah's Witness medical liaison about whether there are some fractionated products that would be acceptable
  - B) Give them a list of all the non-cellular blood products available from CBS and ask them which of them they would accept for transfusion
  - C) Given the medicolegal risks in this case ask that the hospital ethicist and risk management team be present at all meetings with the parents
  - D) Inform them that your hospital's policy is that adolescents with decision-making capacity can make their own decisions should they wish to do so

The first issue is to recognize that there is substantial variation in what Jehovah's Witness patients will accept in terms of blood components and blood products in a situation where blood transfusion may be life-saving. Generally, Jehovah's Witness patients will NOT accept red blood cells, platelets and plasma. However, the acceptance of the fractions of blood is permitted and is at the discretion of the individual. In a single hospital audit of 25 Jehovah's Witness patients (Alam et al, Can J Anesthesia 2012), 50% would accept blood fractions including cryoprecipitate, clotting factor concentrates and albumin; 70-80% would accept erythropoietin and recombinant clotting factors and all patients accepted cell saver performed in a continuous extracorporeal circuit. The specific choices of the patient should be clearly documented in the chart. Some institutions have specific forms available for this purpose (e.g. see Sunnybrook transfusion alternative discussion form).

The guiding principles are:

- The best interests and wellbeing of the patient are paramount;
- Patients capable of deciding with respect to a proposed treatment shall make their own decisions should they wish to do so;
- Where there is a conflict between health care practitioners and patients and/or substitute decision maker(s), the health care practitioner shall take all reasonable steps to resolve such conflict as cooperatively as possible and to respect the integrity of the family unit;
- Care will be governed by a commitment to take reasonable steps to avoid the use of blood and blood products in the care of Jehovah Witness patients.

In adults, the patient's wishes should be documented and followed even if the patient becomes incapable of deciding about blood products later on in the hospital course.

The age of consent and the approach to minors vary by jurisdiction. Please refer to the following reference for specifics by Canadian province and territory: [Medical decision-making in paediatrics: Infancy to adolescence | Canadian Paediatric Society \(cps.ca\);  
\[https://www.cps.ca/en/documents/position/medical-decision-making-in-paediatrics-infancy-to-adolescence.\]\(https://www.cps.ca/en/documents/position/medical-decision-making-in-paediatrics-infancy-to-adolescence\)](https://www.cps.ca/en/documents/position/medical-decision-making-in-paediatrics-infancy-to-adolescence)



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For example, in Ontario, there is no stipulated age of consent for treatment; however persons 16 years of age are capable of giving or refusing consent in connection with their own care unless reasonable grounds to believe otherwise. In Quebec, the age of majority is 18 years. Minors between 14 and 18 years of age can consent to treatment but cannot refuse a treatment that may save their life. Court authorization is required when the person able to give consent to a minor's required care refuses to do so or to submit a minor 14 years or older to care that he/she refuses.

In situations where the health care team believes that a Jehovah's Witness patient who is a minor requires blood or blood products, assistance from the following resources should be considered: Bioethics, Hematology, Risk Management. Each hospital also has a Jehovah's Witness Liaison Committee Member that can be contacted through the hospital switchboard or the Hospital information services for Jehovah's Witnesses in Canada at 1-800-265-0327.

Steps as per the Sickkids policy. Note it is important to become familiar with the policy at your respective institutions

- 1) Ensure that blood products are absolutely necessary and all other treatment options have been exhausted.
- 2) If blood is likely to be needed, determine the decision making capacity of the patient.
- 3) If the patient does have decision making capacity, then he/she has the authority to give or refuse consent to blood transfusion. A valid decision should be informed and voluntary. The patient's decision should be assessed to ensure that it is independent and discussion should be done with the patient alone. The patient's decision to refuse blood should be documented and these wishes should be followed even if the patient later becomes incapable.
- 4) If the patient does not have decision making capacity, and blood is likely to be needed
  - a. the process at Sickkids (Toronto) is that the physician meets with the family to discuss a letter of understanding where the physician makes a commitment to do whatever is reasonably necessary to avoid blood transfusion in the unlikely event that it is needed and the parent acknowledges the physician's legal duty to treat the child, with blood if necessary in an emergency. It is not a consent to transfuse. The acknowledgement means that it is not necessary to contact the Children's Aid Society if blood must be administered in an emergency situation.
  - b. If the Substitute Decision Maker (SDM) refuses to consent to transfusion in a non-emergency situation, then further consultation is made with the Children's Aid Society (CAS).

## REMINDER:

**Please remind participants to complete their evaluation forms using the link that was sent to them.**

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