Transfusion Medicine Bootcamp for Nurses

2025 Additional Questions

Session 4
2025 Using Blood Wisely Guidelines: Are You Transfusing Wisely?
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(for Discussion/Rationale, references per the presentation & as noted)

1. RBC transfusion is indicated in (select all that apply):
(Transfusion Knowledge Question 1)

a) Patients with uncorrected pre-existing cardiovascular disease and Hb less than 80 g/L.
b) Healthy postpartum patients without hemodynamic symptoms (e.g., dyspnea, chest pain, syncope) and Hb less than 70 g/L.
c) In some patients with acute myocardial infarction and Hb less than 90 g/L.
d) Patients with hemodynamic symptoms (e.g., dyspnea, chest pain, syncope), regardless of Hb.

Answer: a), c)

Discussion/Rationale:

a) As reviewed within the presentation (slide 22), this indication statement is per the draft ORBCoN OTQIP RBC transfusion recommendations.

c) As reviewed within the presentation (slide 24, 25), this indication statement is per the draft ORBCoN OTQIP RBC transfusion recommendations.

b) Per the draft ORBCoN OTQIP RBC transfusion recommendations (refer to presentation slide 22), healthy postpartum patients without hemodynamic symptoms typically do not require transfusion until Hb is less than 50-60 g/L. This restrictive RBC transfusion recommendation minimizes potential antibody formation in patients with childbearing potential (future risk of hemolytic disease of the fetus and newborn).

d) Per the draft ORBCoN OTQIP RBC transfusion recommendations (refer to presentation slide 22), RBC transfusion is likely inappropriate if Hb is greater than 90 g/L, discuss the specific reason(s) with the patient and document the indication in the patient's chart (answer option d) indicates regardless of Hb).

2. When administering RBC transfusion, at the patient's bedside, the crucial, mandatory element to ensure patient safety is:
(Transfusion Knowledge Question 2)

a) Patient is wearing a patient identification armband for identification checks.
b) Assess patient for TACO risk factors; implement TACO prevention strategies if indicated.
c) RBC unit is ABO & Rh(D) blood group identical or compatible.

d) *If no acute bleeding, initiate transfusion at 50 mL/hr. (adults) for 15 minutes, then reassess patient & vital signs.*

Answer: a)

Discussion/Rationale:
The cornerstone of safely administering transfusion is unequivocal identification of the patient for the checking processes. The patient must be wearing a patient identification armband and checking must occur at the bedside in the presence of the patient.
While responses b), c), and d) are key elements for transfusion patient safety (along with all elements included in the Transfusion Checklist) they become immaterial if the patient receiving the transfusion is misidentified.

3. Platelet transfusion is indicated in (select all that apply):
(Transfusion Knowledge Question 3)

a) *Neuraxial anesthesia (e.g., epidural) and platelet count less than 50-80 x 10^9/L.*
b) *Head trauma and platelet count less than 100 x 10^9/L.*
c) *As bleeding prophylaxis in oncology patients undergoing chemotherapy (hypoproliferative thrombocytopenia) and platelet count less than 30 x 10^9/L.*
d) *Platelet dysfunction e.g., post cardiopulmonary bypass, regardless of platelet count.*

Answer: a), b)

Discussion/Rationale:
a) As reviewed within the presentation (slide 35), this indication statement is per the draft ORBCoN OTQIP Platelet transfusion recommendations.

b) As reviewed within the presentation (slide 35), this indication statement is per the draft ORBCoN OTQIP Platelet transfusion recommendations.

c) Per the draft ORBCoN OTQIP Platelet transfusion recommendations (refer to presentation slide 35), in hypoproliferative thrombocytopenia patients, for bleeding prophylaxis the recommendation for platelet transfusion is platelet count less than 10 x 10^9/L.

d) Per the draft ORBCoN OTQIP Platelet transfusion recommendations (refer to presentation slide 35), in the patient scenario of platelet dysfunction, platelet transfusion is recommended if there is significant bleeding (the laboratory platelet count is not a factor).

4. Wilma, a frail 55-year-old (weight 50 kg) was admitted 1 week ago for treatment of chronic pneumonia (underlying medically managed Chronic Obstructive Pulmonary Disease, no other medications). A deep abscess of the lung parenchyma has been diagnosed. Plan: radiology will drain the abscess today. AM blood work: Hb 95 g/L, platelet count 75 X 10^9/L, INR 2.0
The Interventional Radiologist is likely to order:
(Plasma Transfusion Question 9)

a) *Transfuse 1 unit plasma over 2 hours.*
b) *Give vitamin K 10 mg IV, then transfuse 1 unit plasma over 2 hours.*
c) *Transfuse 3 units SD plasma, each unit over 2 hours.*

d) Thaw 3 units SD plasma, on hold for abscess drainage.

Answer: Suggest d) verses c)

Discussion/Rationale:
In this complex patient scenario, drainage of a deep abscess of the lung parenchyma is listed as high-risk invasive procedure per the 2019 Society of Interventional Radiology Guidelines. The patient, Wilma is not known to have liver disease. The patient's INR is elevated, 2.0. However, bleeding risk is not reliably correlated with INR. The patient is described as frail and has chronic illness (recent exacerbation with hospital admission); potential nutritional factors conducive to the elevated INR are unknown.

a) Appropriate plasma dose is 10-15 mL/kg. Considering the patient's weight of 50 kg, a plasma dose of 12.5 mL/kg would be 690 mL. The dose 1 unit would be inappropriate, underdosing.

b) There is no known information to indicate vitamin K deficiency, and the patient does not take warfarin. The dose 1 unit would be inappropriate, underdosing.

c) This plasma dose, 3 units SD plasma is appropriate (refer to presentation slide 45, Weight based plasma dosing table). The rate of infusion (each unit over 2 hours) is moderate; at minimum 6-7 hours of time would be required to transfuse the plasma pre-procedure. In terms of TACO risk, the patient history does not align with specific risk factors, however the patient is described as frail. This intervention does offer provide specific benefit and introduces potential risk.

d) This plasma dose, 3 units SD plasma is appropriate (refer to presentation slide 45, Weight based plasma dosing table). Thawed plasma, on hold for the procedure is a reasonable option in the event of procedural bleeding.

5. Select the incorrect statement pertaining to administration of plasma transfusion: (Plasma Transfusion Question 10)

a) Thawed plasma may be stored up to 5 days/120 hours at 1- 6°C in TML approved, monitored refrigerator.
b) Transfusion reactions are unlikely with plasma. Patient monitoring & vital signs checks are not required.
c) Rh(D) blood group compatibility is not relevant for plasma transfusion.
d) FP might have a light green or bright orange colour related to donor factors and is acceptable for transfusion.

Answer: b)

Discussion/Rationale:

b) Transfusion reactions can occur with any blood transfusion. Patient monitoring & vital signs checks are required for all transfusions.
a), c) Per the CBS Circular of information and the SD plasma monograph, Thawed plasma may be stored up to 5 days/120 hours at 1- 6°C in a TML approved, monitored refrigerator.

Rh(D) blood group compatibility is not relevant for plasma transfusion, however ABO blood group compatibility is required for plasma transfusion.

d) Per CBS Visual Inspection Toolkit, plasma discoloration can result from variety of donor factors, such as:
Medications (acceptable for transfusion) Oral contraceptive pill: light green plasma
Vitamins (acceptable for transfusion) Vitamin A (including consumption of large quantities of carrots): bright orange plasma.

6. **How often do you need to change the tubing/filter if transfusing different products via a Level 1 rapid infuser for MTP?**
   (Zoom Chat question)

Discussion/Rationale:
The device manufacturer's instructions for use should always be followed.
In the clinical scenario of massive hemorrhage and transfusion of multiple units of red blood cells and plasma, close observation for any slowing of the infusion suggesting the filter might be clogged is warranted. The device manufacturer's recommendation for platelet transfusion should be followed; in some instances, platelet transfusion is contraindicated. For optimal patient benefit from platelet transfusion, consider using a new blood administration set and infuse via a pump at the maximum rate (platelets can adhere to fibrin debris captured in a filter that was previously used).

7. **We recently had a red blood cell infusion where the administration set got caught and mechanically disconnected from the bag (at the spike). Are we able to respike if it was caught in time (before it became contaminated) in order to save that unit?**
   (Zoom Chat question)

Discussion/Rationale:
If the spike were disconnected from the red blood cell (RBC) bag abruptly (i.e., got caught), it would easily become contaminated (falling against the IV pole or the pump). An alternative would be to use a new blood administration set to respike the blood bag, prime the tubing and continue transfusing that unit (thereby avoiding wasting the unit and exposing the patient to an additional RBC unit).

8. **Are there any considerations for diuretic use in patient who receive large volumes of IVIG?**
   (Zoom Chat question)

Discussion/Rationale:
The assumption is this question is directed to prevention of Transfusion Associated Circulatory Overload (TACO). In this setting, diuretic (furosemide) use is empiric – it is done because it makes sense. However, there is no evidence that it actually prevents TACO or reduces its risk. TM experts concur if furosemide is given, it should be prior to the volume infusion (a preventative measure). Furosemide prior to a large volume infusion of IVIG may benefit a patient who has TACO risk factors.

For IVIG information refer to:
Ontario Regional Blood Coordinating Network. Infusion Guide and Adverse Events. version 3. Toronto: Ontario Regional Blood Coordinating Network; 2022 [cited 2025 Dec 5]. 25p. Available from: https://transfusionontario.org/en/category/ivig-scig/infusion-guide-and-adverse-events/

References regarding dose-response relationship include:
1. Khandelwal A, Lin Y, Cserti-Gazdewich C, Al Moosawi M, Armali C, Arnold D, et al (2021), TACO-BEL-3: a feasibility study and a retrospective audit of diuretics for patients receiving blood transfusion at ten hospitals. Vox sanguinis. 2021;116:434-439.

2. Pendergrast J, Armali C, Cserti-Gazdewich C, Hansen M, Kiss A, Lieberman L, et al. Can furosemide prevent transfusion-associated circulatory overload? Results of a pilot, double-blind, randomized controlled trial. Transfusion (Philadelphia, Pa). 2019;59(6):1997–2006.

3. Rotin L, Zhang L, Armali C, Malkin A, Massin S, Meirovich H, et al. How much furosemide should be administered to prevent transfusion-associated circulatory overload? Results of a dose-finding study. Vox sanguinis. 2025;120(7):683–93.

4. Saeed S, Zhang L, Armali C, Malkin A, Massin S, Meirovich H, et al. How much furosemide should be administered to prevent transfusion-associated circulatory overload? Results of a dose-finding study. Blood. 2023;142 (Supplement 1):1293. https://doi.org/10.1182/blood-2023-181190

9. Has barcode administration reduced the incidence of wrong unit / patient reactions? (Zoom Chat question)

Discussion/Rationale:
Based on Bloody Easy Handbook information the incidence of wrong blood transfused has decreased (refer to Table 1). However, it is likely that this decrease is related to multiple factors, one of which may be barcode technology.

Table 1: Risk of Incompatible ABO Blood Group RBCs Transfused

Publication Year	Risk	Event Description
2016*	1 in 40,000	Wrong ABO blood group, per unit of RBCs
2023**	1 in 354,000	ABO incompatible transfusion per RBC transfusion episode

*Callum JL, Pinkerton PH, Lima A, Lin Y, Karkouti K, Lieberman L, Pendergrast JM, Robitaille N, Tinmouth AT, Webert KE. Ontario Regional Blood Coordinating Network. Bloody easy 4 : blood transfusions, blood alternatives, and transfusion reactions : a guide to transfusion medicine. 3rd ed. Toronto: Ontario Regional Blood Coordinating Network; 2016.

**Callum JL, Pinkerton PH, Lin Y, Cope S, Karkouti K, Lieberman L, Pendergrast JM, Robitaille N, Tinmouth AT, Webert KE. Bloody easy 5.1 blood transfusions, blood alternatives and transfusion reactions : a guide to transfusion medicine. 5th ed. Toronto: Ontario Regional Blood Coordinating Network; 2022 [revised 2023].

Additional References (Generated using AI technology)

1. Chou SS, Chen YJ, Shen YT, Yen HF, Kuo SC. Implementation and Effectiveness of a Bar Code–Based Transfusion Management System for Transfusion Safety in a Tertiary Hospital: Retrospective Quality Improvement Study. JMIR medical informatics. 2019 Aug 26;7(3):e14192.

Demonstrates that the error rate decreased significantly after the implementation of the bar code-based transfusion management (BCTM) system, dropping from 0.03% (2008-2010) to 0.002% (2016) and 0.001% (2017).

- **Specific Error Counts:** Reports that in 2017, only one incorrect labeling incident occurred among 68,324 samples for blood typing, and no incorrect transfusions were noted among 67,423 transfusion orders.
- **Barcode System Mechanism:** Employs barcodes for patient identification, onsite labeling, and blood product verification, connected wirelessly to hospital information systems, as the mechanism for reducing transfusion errors.

2. Davies A, Staves J, Kay J, Casbard A, Murphy MF. End-to-end electronic control of the hospital transfusion process to increase the safety of blood transfusion: strengths and weaknesses. Transfusion. 2006 Mar;46(3):352-64.

Explains that a bar code patient identification system improved transfusion practice, which is designed to minimize errors outside the blood bank to increase patient safety.

- **Improved Procedure Compliance:** Reports that significant improvements were found in adherence to procedures after the introduction of the electronic system, including checking the blood group and unit number on the blood pack.
- **Compelled Adherence to Safety Checks:** Notes that the electronic process compels users to adhere to certain critical actions, such as checking patient identification wristbands, thereby reducing the risk of misidentification, the single most important factor in Incorrect Blood Component Transfused (IBCT) incidents.

3. Hensley NB, Koch CG, Pronovost PJ, Mershon BH, Boyd J, Franklin S, Moore D, Sheridan K, Steele A, Stierer TL. Wrong-patient blood transfusion error: leveraging technology to overcome human error in intraoperative blood component administration. The Joint Commission Journal on Quality and Patient Safety. 2019 Mar 1;45(3):190-8.

Explains that bedside bar code technology has reduced errors during blood administration and increased the number of near-miss events detected due to automated alerts.

- **Transfusion Error Rate Decrease:** Reports that one institution, by implementing bar code scanning of blood components, reduced transfusion errors from 1.5 per 100,000 transfusions to 0.3 per 100,000 transfusions.
- **Implementation of BBTV:** Introduces bedside bar code transfusion verification (BBTV) and a novel intraoperative documentation process within an Anesthesia Information Management System (AIMS) to initiate a safer blood transfusion process in operating rooms.

4. Nuttall GA, Abenstein JP, Stubbs JR, Santrach P, Ereth MH, Johnson PM, Douglas E, Oliver Jr WC. Computerized bar code–based blood identification systems and near-miss transfusion episodes and transfusion errors. In Mayo Clinic Proceedings 2013 Apr 1 (Vol. 88, No. 4, pp. 354-359). Elsevier.

Determines that a computerized bar code-based blood identification system was associated with a reduction in misidentification episodes of blood transfused to the wrong patient (from 1.5 per 100,000 transfusions before the system to 0.3 per 100,000 transfusions after the system).

- **Increased Near-Miss Detection:** Finds that the implementation of the bar code system was associated with a large increase in discovered near-miss events (from 0.3 per 100,000 transfusions before the system to 11.2 per 100,000 transfusions after the system).
- **Improved Error Reporting:** Suggests that the increase in reported near-miss errors was likely due to the system's automatic reporting feature, which improved the discovery of errors that were previously underreported.

5. Pagliaro P, Turdo R, Capuzzo E. Patients' positive identification systems. Blood transfusion. 2009 Oct;7(4):313.

Introduced a bar-code matching system, I-TRAC Plus, in 2003 between a patient's wristband and the blood bag to specifically avoid errors at the bedside.

- **Reduced Misidentification Cases:** Reports that the I-TRAC Plus system prevented 12 cases of patient misidentification over five years, thereby avoiding "wrong blood" transfusions.
- **Technology for Error Prevention:** Explains that technology-based solutions, like the bar-code system, are designed to improve recipient identification and serve as a technological approach to preventing errors during the pre-transfusion procedure.

6. Turner CL, Casbard AC, Murphy MF. Barcode technology: its role in increasing the safety of blood transfusion. Transfusion. 2003 Sep;43(9):1200-9.

Evaluates a barcode patient identification system, finding it simplifies the clinical transfusion process and improves practice, addressing the most frequent serious incident associated with transfusion, which is incorrect blood component transfusion.

- **Improved Patient Identification:** Demonstrates significant improvements in the procedure for blood administration, including an increase from 11.8 to 100 percent in the correct verbal identification of patients and improved matching of identification details.
- **Reduced Process Complexity:** Found that the barcode patient identification technology reduced the number of individual steps for the administration of blood from 27 in the standard procedure to 16, decreasing the complexity and potential for error.

7. Vanneman MW, Balakrishna A, Lang AL, Eliason KD, Payette AM, Xu X, Driscoll WD, Donovan KM, Deng H, Dzik WH, Levine WC. Improving transfusion safety in the operating room with a barcode scanning system designed specifically for the surgical environment and existing electronic medical record systems: an interrupted time series analysis. Anesthesia & Analgesia. 2020 Oct 1;131(4):1217-27.

Found that the electronic barcode system detected 45 potential transfusion errors in 27 unique patients and averted the transfusion of 36 mismatched blood products into 20 unique patients across 15,997 transfusions over two years.

- **Zero Reported Errors with Scanner:** Notes that when anesthesia providers used the barcode scanner, no transfusion errors or reactions were reported.
- **Improved Documentation Compliance:** Determined that the barcode-based system improved transfusion documentation compliance significantly, making it the preferred method for pretransfusion safety checks, which inherently reduces the risk of error.