Supplemental Guide: Blood Banking/Transfusion Medicine

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Milestones Supplemental Guide

This document provides additional guidance and examples for the Blood Banking/Transfusion Medicine Milestones. This is not designed to indicate any specific requirements for each level, but to provide insight into the thinking of the Milestone Work Group.

Included in this document is the intent of each Milestone and examples of what a Clinical Competency Committee (CCC) might expect to be observed/assessed at each level. Also included are suggested assessment models and tools for each subcompetency, references, and other useful information.

Review this guide with the CCC and faculty members. As the program develops a shared mental model of the Milestones, consider creating an individualized guide (Supplemental Guide Template available) with institution/program-specific examples, assessment tools used by the program, and curricular components.

Additional tools and references, including the Milestones Guidebook, Clinical Competency Committee Guidebook, and Milestones Guidebook for Residents and Fellows, are available on the Resources page of the Milestones section of the ACGME website.

Patient Care 1: Consultation **Overall Intent:** To provide clear, comprehensive transfusion medicine consultations to clinicians across a variety of patient/practice settings and conditions	
Milestones	**Examples**
Level 1 *Describes the use of a consultation and lists useful resources*	• Uses clinical and institutional guidelines to assist clinicians in determining if an event needs to be investigated as a possible transfusion reaction • Recognizes the clinical diagnosis often associated with the use of red cell exchange, therapeutic plasma exchange, and other therapeutic apheresis procedures • Locates American Society for Apheresis (ASFA) guidelines, institutional transfusion practice guidelines, and laboratory standard operating procedures
Level 2 *For simple consultations, delineates the clinical question, obtains additional clinical information, can access available resources, recommends next steps, and documents, with assistance*	• Distinguishes between emergent and non-emergent situations for apheresis • Uses available information in order to diagnose a mild allergic transfusion reaction and makes transfusion recommendations to blood bank attending
Level 3 *For complex consultations, delineates the clinical question, obtains additional clinical information, applies relevant resources, and recommends next steps with assistance; manages simple consultations independently*	• Gathers and reviews relevant history and data of a patient with a febrile non-hemolytic transfusion reaction, recommends testing and evaluation, and recommends management and subsequent transfusion plan to the clinician • Narrows the differential diagnosis in a transfusion reaction with respiratory symptoms • Identifies testing and approaches to blood product selection for platelet refractory patients
Level 4 *Manages complex consultations independently with comprehensive, timely documentation of findings and recommendations*	• Understands massive transfusion protocol management • Differentiates between transfusion-related acute lung injury and transfusion-associated circulatory overload, orders additional supplementary testing, and provides transfusion management recommendations to the clinical team • Manages a sickle cell disease patient in need of a red cell exchange
Level 5 *Recognized as an expert in providing comprehensive consultations*	• Independently manages blood product selection for a highly alloimmunized, peri-operative patient • Recommends therapeutic apheresis course of treatment for rare and unusual indications
Assessment Models or Tools	• Conference report • Consultation report review • Direct observation • Medical record review • Objective structured clinical examination (OSCE)
Curriculum Mapping	
Notes or Resources	• Centers for Disease Control and Prevention (CDC). National Healthcare Safety Network (NHSN). https://www.cdc.gov/nhsn/. 2020.

	• Padmanabhan A, Connelly-Smith L, Aqui N, et al. Guidelines on the use of therapeutic apheresis in clinical practice - evidence-based approach from the writing committee of the American Society for Apheresis: The eighth special issue. *J Clin Apher*. 2019;34(3):171-354. https://onlinelibrary.wiley.com/doi/abs/10.1002/jca.21705. 2020. • Tomasulo, P.A., Lenes, B.A., Noto, T.A., Klein, H.G. and Menitove, J.E. (1986), Automatic special case consultations in transfusion medicine. Transfusion, 26: 186-193. doi:10.1046/j.1537-2995.1986.26286152913.x • McLeod BC, Szczepiorkowski Z, Weinstein R, Winters JL. Apheresis: Principles and Practice, 3rd Edition. Bethesda, MD: AABB Press. 2010.

Patient Care 2: Therapeutic and Donor Procedures **Overall Intent:** To effectively manage apheresis procedures to optimize patient care	
Milestones	**Examples**
Level 1 *Manages uncomplicated apheresis procedures (e.g., therapeutic, hematopoietic progenitor cell collection, donor collections) with assistance*	• Participates in managing a patient with myasthenia gravis with therapeutic plasma exchange
Level 2 *Independently manages uncomplicated apheresis procedures*	• Identifies appropriate types of vascular access • Recommends treatment course for a patient with myasthenia gravis exacerbation
Level 3 *Manages complicated apheresis procedures, with assistance*	• Recognizes when peripheral vascular access is not suitable and central vascular access is necessary • Recognizes citrate toxicity and vasovagal reactions and suggests management plan
Level 4 *Independently manages complicated apheresis procedures*	• Makes recommendations for adjusting vascular access when access problems are encountered during procedures • Modifies apheresis parameters for a patient with recurrent adverse reactions during procedures • Prescribes treatment for citrate toxicity and vasovagal reactions • Recommends to referring physician when therapeutic apheresis is not indicated
Level 5 *Serves as an expert resource in apheresis management*	• Guides other blood bank professionals and clinicians in managing complex cases • Guides other transfusion medicine physicians making recommendations
Assessment Models or Tools	• Consultation report reviews • Direct observation • 360-degree evaluation
Curriculum Mapping	•
Notes or Resources	• CDC. National Healthcare Safety Network Biovigilance Component Hemovigilance Module Surveillance Protocol. https://www.cdc.gov/nhsn/pdfs/biovigilance/bv-hv-protocol-current.pdf. 2020. • Padmanabhan A, Connelly-Smith L, Aqui N, et al. Guidelines on the use of therapeutic apheresis in clinical practice - evidence-based approach from the writing committee of the American Society for Apheresis: The eighth special issue. *J Clin Apher*. 2019;34(3):171-354. https://onlinelibrary.wiley.com/doi/abs/10.1002/jca.21705. 2020.

Patient Care 3: Interpretation and Diagnosis **Overall Intent:** To integrate test results in recommendations for patient care	
Milestones	**Examples**
Level 1 *Develops a differential diagnosis based on test results, with assistance*	• Develops a differential diagnosis of immune and nonimmune causes in a platelet refractory patient • Develops a differential diagnosis for positive direct anti-human globulin test • Identifies clinically significant antibodies that can cause hemolytic disease of the fetus and newborn and hemolytic reaction
Level 2 *Independently develops a differential diagnosis based on test results*	• Differentiates between alloantibody and autoantibody after immunohematologic testing and review of transfusion history
Level 3 *Integrates test results and the clinical scenario to make recommendations for clinical care, with assistance*	• Knows when to send a residual component for culture in transfusion reaction evaluation • Recognizes the importance of weak D testing in a newborn for maternal Rh immune globulin administration • Identifies that least incompatible blood in a patient with an autoantibody can be used
Level 4 *Independently integrates test results and the clinical scenario to make recommendations for clinical care*	• Recommends management strategy for a patient with transfusion-associated circulatory overload requiring additional transfusion • Makes transfusion recommendations for severely anemic patient with autoimmune hemolytic anemia and chest pain
Level 5 *Serves as a local expert to inform clinical care*	• Partners with clinical teams in creating care guidelines • Establishes protocols for chronically transfused patients • Partners with hematologists/oncologists in management of bone marrow transplant patients
Assessment Models or Tools	• Direct observation • Medical record review • Multidisciplinary conferences • 360-degree evaluation
Curriculum Mapping	•
Notes or Resources	• Fung MK, Eder A, Spitalnik SL, et al. *Technical Manual*. 19th ed. Bethesda, MD: American Association of Blood Banks; 2017. • Simon TL, McCullough J, Snyder EL, et al. *Rossi's Principles of Transfusion Medicine.* 5th ed. Chichester, UK: John Wiley and Sons; 2016. • Harmening DM. Modern Blood Banking & Transfusion Practices. Philadelphia, PA: F.A. Davis 2019. ISBN-13: 978-0-8036-6888-1 • McLeod BC, Szczepiorkowski Z, Weinstein R, Winters JL. Apheresis: Principles and Practice, 3rd Edition. Bethesda, MD: AABB Press. 2010.

	• Bandarenko N, King K (ed). Blood Transfusion Therapy: A Physician's Handbook. Bethesda, MD: AABB Press. 2017. ISBN 978-1-56395-943-1 • Wong ECC, Roseff SD (ed). Pediatric Transfusion: A Physician's Handbook. Bethesda, MD: AABB Press. 2014. ISBN :9781563959035 • Therapeutic Apheresis: A Handbook. Schwartz J, Bandarenko N (ed). Bethesda, MD: AABB Press. 2019. ISBN 978-1-56395-997-4

Patient Care 4: Reporting **Overall Intent:** To generate effective transfusion reports and/or clinical notes for both simple and complex cases, while using nuanced language and providing appropriate recommendations	
Milestones	**Examples**
Level 1 *Identifies the key elements of a complete report and demonstrates understanding of timely reporting*	• Lists the key elements of a transfusion reaction report: clinical history, vital signs and symptoms, blood products, laboratory investigation, interpretation, and recommendations • Engages with transfusion medicine attending to promote prompt turnaround time
Level 2 *Generates timely reports for simple cases, including recommendations, with assistance*	• Drafts a report for a mild allergic transfusion reaction • Drafts a report for development of a new red blood cell alloantibody
Level 3 *Generates timely reports that includes ancillary testing for complex cases, with assistance; independently generates reports for simple cases*	• Generates a transfusion reaction report for suspected transfusion-related acute lung injury with assistance; includes language of uncertainty if case was probable but not definitive transfusion-related acute lung injury • Generates a report for patient with a cold autoantibody that includes thermal amplitude and cold titers
Level 4 *Independently generates timely reports that include ancillary testing for complex cases*	• Documents discussion of complex transfusion reactions with clinical providers • Generates complex interpretations for patients with Rh variants, integrating serologic and molecular test results and providing recommendations for transfusion • Generates reports for complex cases of hemolytic disease of fetus/newborn, including paternal zygosity testing, antibody titers, percutaneous umbilical blood sampling, and recommendations for intrauterine transfusion/perinatal management
Level 5 *Independently generates nuanced reports that expresses the ambiguity and uncertainty of complex cases*	• Consistently generates complex reports, incorporating serologic, molecular, histocompatibility, and specialized testing in various clinical care situations
Assessment Models or Tools	• Attending evaluation during daily sign-out • Discussion • Prospective review of reports • Review of reports at sign-out (real-time or retrospective) • 360-degree evaluation
Curriculum Mapping	•
Notes or Resources	• Reese EM, Nelson RC, Flegel WA, Byrne KM, Booth GS. Critical Value Reporting in Transfusion Medicine: A Survey of Communication Practices in US Facilities. Am J Clin Pathol. 2017;147(5):492-499. doi:10.1093/ajcp/aqx025 • Miller K, Akers C,. Davis AK, et al. The Evolving Role of the Transfusion Practitioner. Transfusion Medicine Reviews, Volume 29, Issue 2. 2015. 138-144. doi.org/10.1016/j.tmrv.2014.08.005.

	• Fung MK, Eder A, Spitalnik SL, et al. Technical Manual. 19th Edition. Bethesda, MD: American Association of Blood Banks; 2017. • Simon TL, McCullough J, Snyder EL, et al. Rossi's Principles of Transfusion Medicine. 5th ed. Chichester, UK: John Wiley and Sons; 2016. • Harmening DM. Modern Blood Banking & Transfusion Practices. Philadelphia, PA: F.A. Davis 2019. ISBN-13: 978-0-8036-6888-1

Medical Knowledge 1: Immunohematology Testing **Overall Intent:** To interpret donor and patient/recipient immunohematology results	
Milestones	**Examples**
Level 1 *Identifies components of basic donor and patient/ recipient immunohematology test results*	• Knows difference between ABO forward and reverse typing • Understands how to determine Rh type for transfusion recipient
Describes basic principles and methodology of immunohematology tests	• Understands the differences between tube testing, gel, and solid phase testing platforms used in immunohematology testing • Knows the difference between red cell alloantibody screen and panel • Knows clinically significant antigens that must be expressed on reagent antibody screening red blood cells • Understands minimum identification requirements for patient sample
Level 2 *Distinguishes normal and abnormal donor and patient/recipient immunohematology test results*	• Differentiates between type and screen versus a type and crossmatch and the clinical indications for each • Interprets a simple, single red cell alloantibody identification • Knows when weak D testing should be applied for donors and recipients
Differentiates donor versus patient/recipient immunohematology testing	• Identifies duration of validity of antibody screen and understands antibody evanescence in context of transfusion history
Level 3 *Interprets basic and complex donor and patient/recipient immunohematology test results, with assistance*	• Differentiates sample types for compatibility testing necessary for intrauterine transfusion • Interprets a multiple red cell alloantibody identification
Recognizes limitations of immunohematology testing methodology	• Understands the necessity of using dithiothreitol, polyethylene glycol, and advanced serological techniques • Understands that reverse ABO testing may not be valid in the neonatal patient due to lack of isohemagglutinins expression
Level 4 *Independently interprets basic and complex donor and patient/recipient immunohematology test results*	• Understands the methodology and interpretation of using absorption techniques when there is a combination of alloantibody and autoantibody present • Provides direction to differentiate between alloantibody versus autoantibody formation e.g., molecular testing, ZZAP, REST
Directs additional immunohematology testing as necessary to resolve complex problems	• Provides blood bank technologist with guidance in order to resolve anti-G in a woman of childbearing age, positive complement direct antiglobulin test due to drug interference, and interfering cold autoantibody with ABO reverse typing discrepancy

Level 5 *Serves as an expert resource in immunohematology*	• Develops algorithms to guide laboratory testing and blood product selection protocols for patients taking monoclonal antibody therapy
Assessment Models or Tools	• Consultation report review • Direct observation • Knowledge assessment examinations • Patient reporting conferences • Portfolio • 360-degree evaluation
Curriculum Mapping	•
Notes or Resources	• Fung MK, Eder A, Spitalnik SL, et al. *Technical Manual*. 19th ed. Bethesda, MD: American Association of Blood Banks; 2017. • Harmening DM. Modern Blood Banking & Transfusion Practices. Philadelphia, PA: F.A. Davis 2019. ISBN-13: 978-0-8036-6888-1 • Bandarenko N, King K (ed). Blood Transfusion Therapy: A Physician's Handbook. Bethesda, MD: AABB Press. 2017. ISBN 978-1-56395-943-1 • Wong ECC, Roseff SD (ed). Pediatric Transfusion: A Physician's Handbook. Bethesda, MD: AABB Press. 2014. ISBN :9781563959035 • Lin Y, Pavenski K, Saidenberg E, Branch DR. Blood group antigens and normal red blood cell physiology: a Canadian blood services research and development symposium. 2009;23(4):292-309. https://www.sciencedirect.com/science/article/abs/pii/S0887796309000571. 2020. • Poole J, Daniels G. Blood group antibodies and their significance in transfusion medicine. *Transfus Med Rev*. 2007;21(1):58-71. https://www.sciencedirect.com/science/article/abs/pii/S0887796306000617. 2020. • Simon TL, McCullough J, Snyder EL, et al. *Rossi's Principles of Transfusion Medicine.* 5th ed. Chichester, UK: John Wiley and Sons; 2016.

Medical Knowledge 2: Donor Management and Component Manufacture **Overall Intent:** To demonstrate knowledge of donor eligibility, testing, component manufacturing, and product disposition	
Milestones	**Examples**
Level 1 *Describes basic principles and methodology of donor infectious disease screening and eligibility* *Describes basic principles and methodology of component manufacturing*	• Differentiates between infectious disease serologic and molecular testing • Identifies basic components of donor eligibility assessment • Distinguishes product transport versus storage temperatures
Level 2 *Interprets donor infectious disease test results and determines donor eligibility, with assistance* *Identifies component acceptability criteria and potential issues in manufacturing*	• Understands that human immunodeficiency virus (HIV), Hepatitis B, and Hepatitis C are initially screened by pooled nucleic acid testing followed by individual donor nucleic acid testing if the pool is positive • Determines donor eligibility for whole blood donor with recent travel history to malarial endemic region • Understands when changes to expiration date of irradiated red cells are needed when the length of the expiration date is greater than 28 days • Understands quality assurance metrics for leukoreduced red blood cells and platelets
Level 3 *Independently interprets donor infectious disease test results, determines donor eligibility, and product disposition* *Resolves common manufacturing issues, with assistance*	• Seeks out guidance documents to assist with implementation of new infectious disease testing • Understands the changes to product expiration dates based on product modification in an open system • Determines product disposition when quality assurance metrics fail for leukoreduced red blood cells and platelets
Level 4 *Directs additional infectious disease testing as necessary to resolve donor eligibility issues* *Independently resolves common and unusual manufacturing issues*	• Understands when a donor hepatitis B core antibody is positive that temporary deferral and additional testing are warranted • Understands testing algorithm and timeline for donor re-entry after initial hepatitis C positive screening • Manages lookback process for newly positive HIV or hepatitis C donor, where there are specific US Food and Drug Administration (FDA) regulations
Level 5 *Serves as an expert resource in interpretation of donor infectious disease testing and donor eligibility*	• Implements new pathogen inactivation technology • Develops strategy for management of donor iron status

Suggests or implements workflow process changes to prevent manufacturing issues	• Manages lookback process for West Nile Virus positive donor when there is not specific FDA guidance
Assessment Models or Tools	• In-service exams • Knowledge exams • Product disposition report review • Report review • 360-degree evaluation
Curriculum Mapping	•
Notes or Resources	• American Association of Blood Banks (AABB). Blood Donor History Questionnaires. http://www.aabb.org/tm/questionnaires/Pages/dhqaabb.aspx. 2020. • Electronic Code of Federal Regulations. https://www.ecfr.gov/cgi-bin/ECFR?page=browse. 2020. • FDA. Blood & Blood Products. https://www.fda.gov/vaccines-blood-biologics/blood-blood-products. 2020. • Fung MK, Eder A, Spitalnik SL, et al. *Technical Manual*. 19th ed. Bethesda, MD: American Association of Blood Banks; 2017. • Simon TL, McCullough J, Snyder EL, et al. Rossi's Principles of Transfusion Medicine. 5th ed. Chichester, UK: John Wiley and Sons; 2016. • Harmening DM. Modern Blood Banking & Transfusion Practices. Philadelphia, PA: F.A. Davis 2019. ISBN-13: 978-0-8036-6888-1 • McLeod BC, Szczepiorkowski Z, Weinstein R, Winters JL. Apheresis: Principles and Practice, 3rd Edition. Bethesda, MD: AABB Press. 2010. • Bandarenko N, King K (ed). Blood Transfusion Therapy: A Physician's Handbook. Bethesda, MD: AABB Press. 2017. ISBN 978-1-56395-943-1 • Wong ECC, Roseff SD (ed). Pediatric Transfusion: A Physician's Handbook. Bethesda, MD: AABB Press. 2014. ISBN :9781563959035 • Therapeutic Apheresis: A Handbook. Schwartz J, Bandarenko N (ed). Bethesda, MD: AABB Press. 2019. ISBN 978-1-56395-997-4

Medical Knowledge 3: Apheresis **Overall Intent:** To demonstrate knowledge of competent and appropriate therapeutic apheresis practice	
Milestones	**Examples**
Level 1 *Describes basic principles, methodology, and risks of apheresis*	• Understands that the use of the anticoagulant sodium citrate in apheresis procedures can cause decreased ionized calcium, which may manifest as numbness, tingling, nausea, and/or tetany • Understands that therapeutic plasma exchange and red blood cell exchange use extracorporeal centrifugation technology
Identifies resources to guide apheresis practice	• Is aware of ASFA guidelines regarding indications, treatment frequency, and length of treatment for apheresis procedures
Level 2 *Uses basic clinical tests and physical exam findings/vital signs in the assessment and management of apheresis patients*	• Identifies key components of patient medical history and physical exam required to establish stability of clinical condition prior to performing procedures • Monitors coagulation parameters in apheresis procedures using albumin and saline as replacement fluids • Selects appropriate replacement fluids for plasma exchange procedures based on clinical condition
Demonstrates knowledge of diseases commonly treated with apheresis	• Understands that extracorporeal photopheresis is used to treat cutaneous T-cell lymphoma
Level 3 *Identifies potential complications of apheresis*	• Understands that small total blood volume pediatric patients may require red blood cells to prime the extracorporeal tubing and thereby avoid hypovolemia • Manages treatment of citrate toxicity during therapeutic plasma exchange
Seeks and integrates evidence-based information to inform application of therapeutic apheresis to uncommon cases, with assistance	• Understands how to assess appropriateness of apheresis for ASFA category 3 indications based on clinical context
Level 4 *Integrates advanced knowledge of common risk factors and complications in therapeutic apheresis*	• Identifies when consideration of the use of plasma may be necessary in therapeutic plasma exchange patients with abnormal coagulation parameters
Independently seeks and integrates evidence-based information to inform application of therapeutic apheresis to uncommon cases	• Uses knowledge of pathophysiology to develop individualized therapeutic plasma exchange treatment plans for patients with uncommon neurologic diseases
Level 5 *Serves as an expert resource in therapeutic apheresis*	• Acts as a consultant for other transfusion medicine physicians; assists in developing apheresis plans and protocols for uncommon diseases

	• Partners with other departments to develop and/or implement clinical trial protocols using therapeutic apheresis
Assessment Models or Tools	• Direct observation • In-service examination • Multidisciplinary conferences • 360-degree evaluation
Curriculum Mapping	•
Notes or Resources	• Fung MK, Eder A, Spitalnik SL, et al. Technical Manual. 19th ed. Bethesda, MD: American Association of Blood Banks; 2017. • Simon TL, McCullough J, Snyder EL, et al. Rossi's Principles of Transfusion Medicine. 5th ed. Chichester, UK: John Wiley and Sons; 2016. • Harmening DM. Modern Blood Banking & Transfusion Practices. Philadelphia, PA: F.A. Davis 2019. ISBN-13: 978-0-8036-6888-1 • McLeod BC, Szczepiorkowski Z, Weinstein R, Winters JL. Apheresis: Principles and Practice, 3rd Edition. Bethesda, MD: AABB Press. 2010. • Bandarenko N, King K (ed). Blood Transfusion Therapy: A Physician's Handbook. Bethesda, MD: AABB Press. 2017. ISBN 978-1-56395-943-1 • Wong ECC, Roseff SD (ed). Pediatric Transfusion: A Physician's Handbook. Bethesda, MD: AABB Press. 2014. ISBN :9781563959035 • Therapeutic Apheresis: A Handbook. Schwartz J, Bandarenko N (ed). Bethesda, MD: AABB Press. 2019. ISBN 978-1-56395-997-4

Medical Knowledge 4: Transfusion Practice **Overall Intent:** To demonstrate knowledge of blood components, blood bank testing, and supplemental testing results to guide transfusion practice and blood product selection	
Milestones	**Examples**
Level 1 *Describes blood components and their generally accepted indications*	• Lists red blood cells, platelets, plasma, cryoprecipitate, and granulocytes as blood components • Understands institutional guidelines for red blood cells, platelets, plasma, cryoprecipitate, and granulocytes utilization • Understands the appropriate indications for product modifications, including washing, irradiating, and leukoreduction of blood products • Describes the use and indications for allogeneic, autologous, and directed donation blood products
Level 2 *Identifies blood bank and supplemental testing (e.g., hematology, hemostasis) to guide transfusion practice, including blood product selection*	• Recognizes how to use coagulation parameters to determine necessity of plasma transfusion • Understands platelet count thresholds for prophylactic versus therapeutic platelet transfusions • Describes the use of pre- and post-transfusion platelet counts in order to assess platelet refractoriness
Level 3 *Interprets common supplemental testing results and integrates with blood bank testing results to guide transfusion practice*	• Integrates the use of blood components, cell salvage, and antifibrinolytics in peri-operative and hemorrhaging patients • Understands the role of human leukocyte antigen (HLA) antibody screening in determining need for HLA matched platelets in the platelet refractory patient
Level 4 *Interprets complex supplemental testing results and integrates with blood bank testing results to guide transfusion practice*	• Integrates standard coagulation testing with thromboelastography results to inform laboratory guided transfusion • Interprets indirect and direct anti-platelet antigen testing and makes appropriate platelet transfusion recommendations • Recognizes the impact of chemotherapy, antiplatelet agents, anticoagulants, erythropoietin, thrombopoietin, G-CSF on complete blood count (CBC) parameters, and makes appropriate transfusion recommendations
Level 5 *Serves as an expert resource in transfusion practice and sets institutional guidelines*	• Develops institutional guidelines for transfusion thresholds • Implements patient blood management program • Develops institutional massive/catastrophic transfusion protocols
Assessment Models or Tools	• Direct observation • In-service examination • Multidisciplinary conferences • 360-degree evaluation
Curriculum Mapping	•

Notes or Resources	• Carson JL, Guyatt G, Heddle NM, et al. Clinical practice guidelines from the AABB: Red blood cell transfusion thresholds and storage. *JAMA*. 2016;316(19):2025-2035. https://jamanetwork.com/journals/jama/article-abstract/2569055. 2020. • Choosing Wisely. American Association of Blood Banks. http://www.choosingwisely.org/societies/american-association-of-blood-banks/. 2020. • Hillyer CD, Shaz BH, Winkler AM, Reid M. Integrating molecular technologies for red blood cell typing and compatibility testing into blood centers and transfusion services. *Transfus Med Rev*. 2008;22(2):117-132. https://www.sciencedirect.com/science/article/abs/pii/S0887796307001113?via%3Dihub. 2020. • Kaufman RM, Djulbegovic B, Gernsheimer T, et al. Platelet transfusions: a clinical practice guideline from the AABB. *Ann Intern Med*. 2015;162(3):205-213. https://annals.org/aim/fullarticle/1930861/platelet-transfusion-clinical-practice-guideline-from-aabb. 2020. • Roback JD, Caldwell S, Carson J, et al. Evidence-based practice guidelines for plasma transfusion. *Transfusion.* 2010;50(6):1227-1239. http://www.aabb.org/programs/clinical/Documents/guidelines-for-plasma-transfusion.pdf. 2020. • Fung MK, Eder A, Spitalnik SL, et al. Technical Manual. 19th ed. Bethesda, MD: American Association of Blood Banks; 2017. • Simon TL, McCullough J, Snyder EL, et al. Rossi's Principles of Transfusion Medicine. 5th ed. Chichester, UK: John Wiley and Sons; 2016. • Harmening DM. Modern Blood Banking & Transfusion Practices. Philadelphia, PA: F.A. Davis 2019. ISBN-13: 978-0-8036-6888-1 • Bandarenko N, King K (ed). Blood Transfusion Therapy: A Physician's Handbook. Bethesda, MD: AABB Press. 2017. ISBN 978-1-56395-943-1 • Wong ECC, Roseff SD (ed). Pediatric Transfusion: A Physician's Handbook. Bethesda, MD: AABB Press. 2014. ISBN :9781563959035

Medical Knowledge 5: Cellular Therapy and Transplantation **Overall Intent:** To demonstrate knowledge of hematopoietic progenitor cell collection, processing, modification, testing, and storage	
Milestones	**Examples**
Level 1 *Describes different collection procedures and sources of hematopoietic progenitor cells and their clinical application*	• Describes cryopreservation technology and temperature monitoring for hematopoietic progenitor cell
Describes basic principles and methodology of product processing and manufacturing	• Describes the use and indications of autologous versus allogeneic hematopoietic progenitor cell products
Identifies the importance of specialized testing relevant to transplantation (e.g., human leukocyte antigen)	• Understands the role of pre-collection CD34 counts in determining hematopoietic progenitor cell apheresis product yield
Level 2 *Distinguishes clinical scenarios that require different hematopoietic progenitor cell sources*	• Describes indications for use of bone marrow, peripheral blood, and cord blood derived hematopoietic progenitor cells • Understands minimum collection yield criteria for hematopoietic progenitor cell collection
Identifies product acceptability criteria and special considerations for processing, manufacturing, and storage	• Demonstrates knowledge of pre-collection mobilization regimens necessary for successful hematopoietic progenitor cell collection
Describes specialized testing methods relevant to transplantation	• Understands criteria for assessing hematopoietic progenitor cell product sterility
Level 3 *Recognizes complications unique to hematopoietic progenitor cell source*	• Identifies risk factors or donor conditions that can complicate processing and storage
Recommends when special modifications are needed	• Recognizes when red blood cell reduction of product may be necessary in the setting of ABO incompatibility between donor and recipient
Integrates specialized test results relevant to transplantation, with assistance	• Understands degree of human leukocyte antigen matching between donor and recipient required for successful hematopoietic progenitor cell engraftment
Level 4 *Integrates knowledge of hematopoietic progenitor cell sources, collection, and monitoring of engraftment into patient care*	• Anticipates blood product support during engraftment process

Applies special modifications for patient care and assesses efficacy of product *Independently integrates specialized test results relevant to transplantation*	• Understands indications for and manufacturing process of chimeric antigen receptor T-cell therapy • Understands pre-transplant indicators impacting success of transplant
Level 5 *Serves as an expert resource in cellular therapy*	• Develops institutional policies and protocols for collection, processing, storage, and use of hematopoietic progenitor cell products
Assessment Models or Tools	• Direct observation • In-service examination • Multidisciplinary conferences • 360-degree evaluation
Curriculum Mapping	•
Notes or Resources	• AABB. AABB Cellular Therapies Certificate Program. http://www.aabb.org/aabbcct/certificate/Pages/default.aspx. 2020. • AABB. Standards for Cellular Therapy. http://www.aabb.org/aabbcct/Pages/aboutaabbcct.aspx. 2020. • Be The Match. https://bethematch.org/. 2020. • FDA. Cellular & Gene Therapy Guidances. https://www.fda.gov/vaccines-blood-biologics/biologics-guidances/cellular-gene-therapy-guidances. 2020. • Foundation for the Accreditation of Cellular Therapy. http://www.factwebsite.org/. 2020. • Fung MK, Eder A, Spitalnik SL, et al. Technical Manual. 19th ed. Bethesda, MD: American Association of Blood Banks; 2017. • Simon TL, McCullough J, Snyder EL, et al. Rossi's Principles of Transfusion Medicine. 5th ed. Chichester, UK: John Wiley and Sons; 2016. • Harmening DM. Modern Blood Banking & Transfusion Practices. Philadelphia, PA: F.A. Davis 2019. ISBN-13: 978-0-8036-6888-1 • McLeod BC, Szczepiorkowski Z, Weinstein R, Winters JL. Apheresis: Principles and Practice, 3rd Edition. Bethesda, MD: AABB Press. 2010. • Bandarenko N, King K (ed). Blood Transfusion Therapy: A Physician's Handbook. Bethesda, MD: AABB Press. 2017. ISBN 978-1-56395-943-1 • Wong ECC, Roseff SD (ed). Pediatric Transfusion: A Physician's Handbook. Bethesda, MD: AABB Press. 2014. ISBN :9781563959035 • Therapeutic Apheresis: A Handbook. Schwartz J, Bandarenko N (ed). Bethesda, MD: AABB Press. 2019. ISBN 978-1-56395-997-4

Medical Knowledge 6: Clinical Reasoning **Overall Intent:** To approach a diagnostic work-up in an informed and logical manner using appropriate resources to guide decisions	
Milestones	**Examples**
Level 1 *Demonstrates a basic framework for clinical reasoning* *Identifies appropriate resources to inform clinical reasoning*	• Navigates electronic health record, laboratory information system, Internet, and literature to locate necessary information and assess validity of information
Level 2 *Demonstrates clinical reasoning to determine relevant information* *Selects relevant resources based on scenario to inform decisions*	• Extracts pertinent clinical findings from the patient's medical record and distinguishes between relevant and extraneous data • Is aware of and uses appropriate algorithms, consensus guidelines, and published literature
Level 3 *Synthesizes information to inform clinical reasoning, with assistance* *Seeks and integrates evidence-based information to inform diagnostic decision making in complex cases, with assistance*	• Uses ASFA guidelines to inform diagnostic decision making • Uses published literature, FDA guidelines, and AABB guidance to direct work-up of donor who traveled to a Zika-endemic area
Level 4 *Independently synthesizes information to inform clinical reasoning in complex cases* *Independently seeks out, analyzes, and applies relevant original research to diagnostic decision making in complex clinical cases*	• Consults the literature to inform decision making in apheresis when no ASFA guideline is available • Uses clinical, laboratory, and epidemiologic data to guide testing and eligibility determination of a donor with babesiosis, and lookback of blood products recipients from this donor
Level 5 *Demonstrates intuitive approach to clinical reasoning for complex cases*	• Sought by attending faculty members and/or clinicians for expertise
Assessment Models or Tools	• Clinical management conferences • Consultation case logs • Presentations • Review of daily case reports
Curriculum Mapping	•
Notes or Resources	• Clinical reasoning relies on appropriate foundational knowledge that requires the learner to apply that knowledge in a thoughtful, deliberate and logical fashion to clinical cases to inform clinical care

	• Iobst WF, Trowbride R, Philibert I. Teaching and assessing critical reasoning through the use of entrustment. *J Grad Med Educ*. 2013;5(3):517-518. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3771188/. 2020.

Systems-Based Practice 1: Patient Safety and Quality Improvement (QI) **Overall Intent:** To engage in the analysis and management of patient safety events, including relevant communication with patients, families, and health care professionals; to conduct a QI project	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of common patient safety events* *Demonstrates knowledge of how to report patient safety events* *Demonstrates knowledge of basic QI methodologies and metrics*	• Has basic knowledge of patient safety events, reporting pathways, and QI strategies, but has not yet participated in such activities • Has knowledge of patient specimen labeling requirements and their role in preventing ABO mistransfusion
Level 2 *Identifies system factors that lead to patient safety events* *Reports patient safety events through institutional reporting systems (simulated or actual)* *Describes departmental and institutional QI initiatives*	• Identifies and reports a patient safety issue (real or simulated), along with system factors contributing to that issue • Is aware of improvement initiatives within the scope of practice • Knows FDA reporting requirements for suspected transfusion-related fatalities
Level 3 *Participates in analysis of patient safety events (simulated or actual)* *Participates in disclosure of patient safety events to clinicians and/or patients and families, as appropriate (simulated or actual)* *Participates in departmental and institutional QI initiatives*	• Reviews a patient safety event related to delays in blood product availability and has communicated with patients/families/other clinicians about such an event • Attends transfusion committee • Participates in a real/simulated root cause analysis • Participates in QI projects, but may not have yet designed a QI project
Level 4 *Conducts analysis of patient safety events and offers error prevention strategies (simulated or actual)*	• Collaborates with a team while leading the analysis of a patient safety event and can competently communicate with patients/families/other clinicians about such events

Discloses patient safety events to clinicians and/or patients and families, as appropriate (simulated or actual) *Demonstrates the skills required to identify, develop, implement, and analyze a QI project*	• Initiates and completes a QI project, including communication with stakeholders
Level 5 *Actively engages teams and processes to modify systems to prevent patient safety events* *Role models or mentors others in the disclosure of patient safety events* *Creates, implements, and assesses QI initiatives at the institutional or community level*	• Competently assumes a leadership role in patient safety and/or QI initiatives at the departmental and/or institutional level, potentially even assuming a role in initiating action or calling attention to the need for action
Assessment Models or Tools	• Chart or other system documentation by fellow • Direct observation at bedside or in meetings • Documentation of QI or patient safety project processes or outcomes • E-module multiple choice tests • Portfolio • Reflection • Simulation • 360-degree evaluations
Curriculum Mapping	•
Notes or Resources	• Institute of Healthcare Improvement. http://www.ihi.org/Pages/default.aspx. 2020. • Fung MK, Eder A, Spitalnik SL, et al. Technical Manual. 19th ed. Bethesda, MD: American Association of Blood Banks; 2017. • Simon TL, McCullough J, Snyder EL, et al. Rossi's Principles of Transfusion Medicine. 5th ed. Chichester, UK: John Wiley and Sons; 2016. • Harmening DM. Modern Blood Banking & Transfusion Practices. Philadelphia, PA: F.A. Davis 2019. ISBN-13: 978-0-8036-6888-1

Systems-Based Practice 2: Systems Navigation for Patient-Centered Care **Overall Intent:** To effectively navigate the health care system, including the interdisciplinary team and other care providers, and to adapt care to a specific patient population to ensure high-quality patient outcomes	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of case coordination*	• Identifies the members of the interprofessional team, including laboratory personnel, other specialty physicians, nurses, and consultants, and describes their roles but is not yet routinely using team members or accessing all available resources
Identifies key elements for safe and effective transitions of care and hand-offs	• Lists the essential components of an effective sign-out and care transition including sharing information necessary for successful on-call/off-call transitions for blood banking apheresis procedures, blood product inventory and ongoing surgical cases requiring blood products
Demonstrates knowledge of population and community health needs and disparities	• Understands issues related to access to care, scheduling appointments, and transportation
Level 2 *Coordinates care of patients in routine cases effectively using interprofessional teams*	• Contacts interprofessional team members for routine cases, but requires supervision to ensure all necessary referrals, testing, and care transitions are made and resource needs are arranged for limited inventory or specimens
Performs safe and effective transitions of care/hand-offs in routine situations	• Follows protocol for a routine service sign-out but still needs direct supervision to identify and appropriately triage cases or calls (priority versus non-priority case or call) and anticipatory guidance
Identifies pathology's role in population and community health needs and inequities for the local population	• Understands issues related to recruiting donors for specific patient populations such as sickle cell disease • Knows which patients are at high risk for specific health outcomes related to health literacy concerns, cost of testing or therapy, LGBTQ status, etc.
Level 3 *Coordinates care of patients in complex cases effectively using interprofessional teams*	• At interdisciplinary case coordination conferences, engages in appropriate discussion of patient care testing options and impact on therapy for complex transfusion medicine cases
Performs safe and effective transitions of care/hand-offs in complex situations	• For a patient undergoing apheresis in the intensive care unit (ICU), performs safe and effective transitions of care with transfusion medicine service, blood bank laboratory staff, and/or clinical care team • Coordinates reference lab testing

Identifies opportunities for pathology to participate in community and population health	• Appreciates the need for and uses clinic or local resources, such as when platelets or red blood cell products are in short supply, and calls upon available interprofessional team members to optimize care for multiple patients in need, noting this may require coordination with outside blood product suppliers as well as in-house physicians and blood bank personnel
Level 4 *Models effective coordination of patient-centered care among different disciplines and specialties*	• Role models and educates students and junior team members regarding the engagement of appropriate interprofessional team members, as needed for each patient and/or case, and ensures the necessary resources have been arranged • Proactively calls the outpatient doctor to ensure a discharged patient will be followed for therapeutic apheresis procedures, including laboratory monitoring and assessing vascular access
Models and advocates for safe and effective transitions of care/hand-offs within and across health care delivery systems	• Provides efficient hand-off to the ICU team at the end of an apheresis or critical transfusion event investigation, coordinates and prioritizes consultant input for a new high-risk diagnosis (such as leukostasis or thrombotic thrombocytopenic purpura) to ensure the patient gets appropriate follow-up
Recommends and/or participates in changing and adapting practice to provide for the needs of communities and populations	• Directs and manages clinic or local resources, such as when obtaining rare blood products or unusual, specialized testing • Works with clinical staff members to accommodate a patient with limited access to transportation
Level 5 *Analyzes the process of care coordination and leads in the design and implementation of improvements*	• Takes a leadership role in designing and implementing changes to improve the care coordination and laboratory workflow/menu process and design
Improves quality of transitions of care within and across health care delivery systems to optimize patient outcomes	• Identifies better hand-off tools for on-call transfusion medicine services or to improve teaching sessions
Leads innovations and advocates for populations and communities with health care inequities	• Designs a social determinants of health curriculum to help others learn to identify local resources and barriers to care and laboratory testing; effectively uses resources, such as telehealth for improved patient care
Assessment Models or Tools	• Case management quality metrics and goals mined from electronic health records (EHR), laboratory informatics systems • Chart review • Direct observation (including discussion during rounds, case work-up and case presentations)

	• Interdisciplinary rounds for high-risk patients/cases • Lectures/workshops on social determinants of health or population health with identification of local resources • Objective structured clinical examination (OSCE) • Report review • Review of sign-out tools, utilization and review of checklists between pathology services • 360-degree feedback from the interprofessional team
Curriculum Mapping	•
Notes or Resources	• Aller RD. Pathology's contributions to disease surveillance: sending our data to public health officials and encouraging our clinical colleagues to do so. *Archives of Path Lab Med*. 2009;133(6):926-932. https://www.archivesofpathology.org/doi/10.1043/1543-2165-133.6.926?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%3dpubmed. 2020. • CDC. Population Health Training in Place Program (PH-TIPP). https://www.cdc.gov/pophealthtraining/whatis.html. 2020. • College of American Pathologists. Competency Model for Pathologists. https://learn.cap.org/content/cap/pdfs/Competency_Model.pdf. 2020. • Kaplan KJ. In pursuit of patient-centered care. http://tissuepathology.com/2016/03/29/in-pursuit-of-patient-centered-care/#axzz5e7nSsAns. 2020. • World Health Organization (WHO). Framework for Action on Interprofessional Education and Collaborative Practice. https://www.who.int/hrh/resources/framework_action/en/. 2020.

Systems-Based Practice 3: Physician Role in Health Care System **Overall Intent:** To understand the physician's role in the complex health care system and how to optimize the system to improve patient care and the health system's performance	
Milestones	**Examples**
Level 1 *Identifies key components of the complex health care system (e.g., inpatient /outpatient care, blood donor center, finance, personnel, technology)* *Describes basic health payment systems (e.g., government, private, public, uninsured care) and practice models*	• Recognizes the multiple, often competing forces, in the health care system (e.g., names systems and providers involved test ordering and payment) • Recognizes there are different payment systems • Understands the requirements for contractual agreement between blood supplier and hospital • With direct supervision, completes a report following a routine patient specimen and apply appropriate coding in compliance with regulations
Level 2 *Describes how components of a complex health care system are interrelated, and how this impacts patient care* *Documents testing detail and explains the impact of documentation on billing and reimbursement*	• Understands the complexity of the competitive blood supplier environment and the impact it has on availability • Begins to think through clinical redesign to improve quality; sometimes modifies personal practice to enhance outcomes • Completes a report following a routine patient specimen and applies appropriate coding in compliance with regulations, with oversight • Compares and contrasts types of health benefit plans, including preferred provider organization and health maintenance organization
Level 3 *Discusses how individual practice affects the broader system (e.g., blood product inventory, product/test use, turnaround time)* *Engages with clinicians and/or patients in shared decision making, such as use of preauthorization for complex testing*	• Understands, accesses, and analyzes own individual performance data; relevant data may include consultation logs (e.g., on call cases) • Appropriately recommends human leukocyte antigen matched platelets and coagulation factor concentrates • Consistently thinks through clinical redesign to improve quality and modifies personal practice to enhance outcomes • Participates in blood utilization review
Level 4 *Manages various components of the complex health care system to provide efficient and effective patient care and transitions of care*	• Works collaboratively with the institution to improve patient resources or design the institution's testing needs assessment, or develop/implement/assess the resulting action plans

Practices and advocates for cost effective patient care with consideration of the limitations of each patient's payment model	• Performs blood utilization review and makes recommendations for improvements in practice
Level 5 *Advocates for or leads systems change that enhances high-value, efficient, and effective patient care and transitions of care* *Participates in health policy advocacy activities*	• Implements a change to improve patient blood management protocols
Assessment Models or Tools	• Audit of testing usage • Direct observation • E-modules • QI project
Curriculum Mapping	•
Notes or Resources	• Agency for Healthcare Research and Quality. Measuring the Quality of Physician Care. https://www.ahrq.gov/talkingquality/measures/setting/physician/index.html. 2020. • AHRQ. Major Physician Measurement Sets. https://www.ahrq.gov/talkingquality/measures/setting/physician/measurement-sets.html. 2020. • AABB. AABB Billing Guide for Transfusion and Cellular Therapy Services. http://www.aabb.org/advocacy/reimbursementinitiatives/Documents/reimbguidev071017.pdf. 2020. • American Board of Internal Medicine. QI/PI Activities. https://www.abim.org/maintenance-of-certification/earning-points/qi-pi-activities.aspx. 2020. • American Society for Apheresis. ASFA 2019 Reimbursement Guide. https://www.apheresis.org/page/ApheresisReimbursem. 2020. • Branda JA, Dighe AS, Dzik W, et al. The practice of clinical pathology: a quantitative description of laboratory director activities at a large academic medical center. *AJCP*. 2014;142(2):144-149. https://academic.oup.com/ajcp/article/142/2/144/1766212. 2020. • The Commonwealth Fund. Health Reform Resource Center. http://www.commonwealthfund.org/interactives-and-data/health-reform-resource-center#/f:@facasubcategoriesfacet63677=[Individual%20and%20Employer%20Responsibility. 2020. • The Commonwealth Fund. Health System Data Center. http://datacenter.commonwealthfund.org/?_ga=2.110888517.1505146611.1495417431-1811932185.1495417431#ind=1/sc=1. 2020. • Dzau VJ, McClellan M, Burke S, et al. Vital directions for health and health care: priorities from a National Academy of Medicine Initiative. *NAM Perspectives*. Discussion Paper,

	National Academy of Medicine, Washington, DC. https://nam.edu/vital-directions-for-health-health-care-priorities-from-a-national-academy-of-medicine-initiative/. 2020. • The Kaiser Family Foundation. www.kff.org. 2020. • The Kaiser Family Foundation: Topic: health reform. https://www.kff.org/topic/health-reform/. 2020.

Systems-Based Practice 4: Accreditation, Compliance, and Quality **Overall Intent:** To gain in-depth knowledge of the components of laboratory accreditation, regulatory compliance, and quality management	
Milestones	**Examples**
Level 1 *Demonstrates knowledge that laboratories must be accredited*	• Attends departmental quality assurance/quality control meetings, transfusion practice committees, blood utilization review committees, morbidity and mortality conferences and accreditation/regulatory summation meetings
Discusses the need for quality control and proficiency testing	• Lists menu of proficiency tests for transfusion medicine and reviews reports
Level 2 *Demonstrates knowledge of the components of laboratory accreditation and regulatory compliance (e.g., Food and Drug Administration, AABB, Foundation for the Accreditation of Cellular Therapy [FACT], College of American Pathology, Clinical Laboratory Improvement Amendments), either through training or experience*	• Understands record retention requirements • Understands the difference between moderate and high complexity testing • Identifies the education requirements of laboratory personnel who can perform testing in transfusion medicine
Interprets quality data and charts and trends, including proficiency testing results, with assistance	• Interprets reagent quality control and proficiency test reports
Level 3 *Identifies the differences between accreditation and regulatory compliance; discusses the process for achieving accreditation and maintaining regulatory compliance*	• Understands that an FDA inspection of a blood bank is regulatory, whereas an AABB inspection is for accreditation; knows that citations found on an FDA inspection carry greater consequences than deficiencies found during an accreditation inspection
Demonstrates knowledge of the components of a laboratory quality management plan	• Completes inspector training for an accreditation agency (e.g., College of American Pathologists (CAP)) to understand the process for achieving/maintaining regulatory/accreditation compliance
Discusses implications of proficiency testing failures	• Begins to actively participate in regular laboratory quality management duties
Level 4 *Participates in an internal or external laboratory inspection*	• Performs mock or self-inspection using an AABB/CAP checklist

Reviews the quality management plan to identify areas for improvement *Analyzes proficiency testing failures and recommends a course of action, with oversight*	• Assists in developing a strategy for handling quality control or proficiency testing failures
Level 5 *Serves as a resource for accreditation at the regional or national level* *Creates and follows a comprehensive quality management plan* *Independently formulates a response for proficiency testing failures*	• Serves on a committee for a regional or national accreditation agency • Serves as an AABB/CAP inspector • Oversees laboratory quality management as part of the duties as a medical director
Assessment Models or Tools	• Assignment of duties within departmental or hospital quality assurance/quality control committees • Documentation of inspector training and participation in fellow portfolio • Documentation of participation • Presentation at morbidity and mortality conferences • QI projects • Rotation evaluations • 360-degree evaluation
Curriculum Mapping	•
Notes or Resources	• CAP. Inspector Training Options. https://www.cap.org/laboratory-improvement/accreditation/inspector-training. 2020. • AABB Standards for Blood Banks and Transfusion Services (BBTS Standards) 32nd Edition. AABB Press: 2020 • https://www.fda.gov/media/84887/download • CFR Mini-Handbook: AABB Press: 2018, ISBN 978-1-56395-985-1 • https://manual.jointcommission.org/releases/archive/TJC2010B/MIF0173.html • http://www.factwebsite.org/Standards/ • Beal, S. G., Kresak, J. L., & Yachnis, A. T. (2017). Pathology Residents Comprise Inspection Team for a CAP Self-Inspection. Academic Pathology. https://doi.org/10.1177/2374289517699230 • Farzaneh T, Wang B, Clark N, et al. Crucial role for pathology residents in laboratory self-inspection, a single Institute's experience. Pract Lab Med. 2019 May 17;16:e00123. doi: 10.1016/j.plabm.2019.e00123. eCollection 2019 Aug.

Systems-Based Practice 5: Utilization **Overall Intent:** To understand and apply principles of laboratory resource utilization	
Milestones	**Examples**
Level 1 *Identifies general pathology work practices and workflow (e.g., blood product issuing, immunohematologic testing)*	• Identifies appropriate turnaround times for blood product and laboratory testing based on clinical scenario • Understands difference between urgent (STAT) and routine turnaround time
Level 2 *Explains rationale for optimizing utilization*	• Understands the utilization guidelines for blood products • Understands blood product inventory management from blood center distribution to transfusion service
Level 3 *Identifies opportunities to optimize utilization of pathology resources*	• Recognizes that molecular phenotyping does not need to be repeated • Practices good stewardship of blood products • Participates in blood utilization review • Is cognizant of appropriate staff utilization for apheresis procedures
Level 4 *Initiates efforts to optimize utilization*	• Educates clinicians about appropriate use of blood products and new transfusion guidelines • Educates clinicians about evidence-based apheresis guidelines • Performs blood utilization review and makes recommendations for improvements in practice
Level 5 *Completes a utilization review and implements change*	• Implements institutional policy change modifying blood product utilization guidelines
Assessment Models or Tools	• Audit of testing usage • Direct observation • QI project
Curriculum Mapping	•
Notes or Resources	• AABB. Guidelines for Patient Blood Management and Blood Utilization. https://marketplace.aabb.org/ebusiness/Marketplace/Guidelines-for-Patient-Blood-Management-and-Blood-Utilization/ProductDetail/1845. 2020. • Local coverage determination documents • Fung MK, Eder A, Spitalnik SL, et al. Technical Manual. 19th ed. Bethesda, MD: American Association of Blood Banks; 2017. • Simon TL, McCullough J, Snyder EL, et al. Rossi's Principles of Transfusion Medicine. 5th ed. Chichester, UK: John Wiley and Sons; 2016. • Harmening DM. Modern Blood Banking & Transfusion Practices. Philadelphia, PA: F.A. Davis 2019. ISBN-13: 978-0-8036-6888-1 • McLeod BC, Szczepiorkowski Z, Weinstein R, Winters JL. Apheresis: Principles and Practice, 3rd Edition. Bethesda, MD: AABB Press. 2010.

	• Bandarenko N, King K (ed). Blood Transfusion Therapy: A Physician's Handbook. Bethesda, MD: AABB Press. 2017. ISBN 978-1-56395-943-1 • Wong ECC, Roseff SD (ed). Pediatric Transfusion: A Physician's Handbook. Bethesda, MD: AABB Press. 2014. ISBN :9781563959035 • Becker J, Shaz B. Guidelines for Patient Blood Management and Blood Utilization. Bethesda, MD: AABB Press. 2011, ISBN: 978-1-56395-333-0

Practice-Based Learning and Improvement 1: Evidence-Based Practice and Scholarship **Overall Intent:** To incorporate evidence into clinical practice and is involved in contributing to the body of knowledge in pathology	
Milestones	**Examples**
Level 1 *Demonstrates how to access and select applicable evidence* *Is aware of the need for patient privacy, autonomy, and consent as applied to clinical research*	• Recognizes sources of primary literature • Identifies the need for Institutional Review Board (IRB) approval when collecting cases for a possible research project
Level 2 *Identifies and applies the best available evidence to guide diagnostic work-up of simple cases* *Develops knowledge of the basic principles of research (e.g., demographics, Institutional Review Board, human subjects), including how research is evaluated, explained to patients, and applied to patient care*	• Performs literature review to identify best practices for blood usage and apheresis • Understands the IRB protocol submission process
Level 3 *Identifies and applies the best available evidence to guide diagnostic work-up of complex cases* *Applies knowledge of the basic principles of research such as informed consent and research protocols to clinical practice, with supervision*	• Synthesizes literature to make recommendations for complex antibody evaluations and unusual apheresis cases • Drafts an IRB protocol with oversight • Drafts abstract or manuscript for publication
Level 4 *Critically appraises and applies evidence to guide care, even in the face of conflicting data* *Proactively and consistently applies knowledge of the basic principles of research such as informed consent and research protocols to clinical practice*	• Resolves conflicting data in transfusion practice or apheresis • Completes a peer review of a manuscript assigned by an attending • Drafts an IRB protocol with minimal oversight • Submits an abstract or manuscript for publication

Level 5 *Teaches others to critically appraise and apply evidence for complex cases; and/or participates in the development of guidelines* *Suggests improvements to research regulations and/or substantially contributes to the primary literature through basic, translational, or clinical research*	• Initiates a multidisciplinary team meeting to discuss complex cases • Serves on an editorial review board for a journal • Submits a grant proposal
Assessment Models or Tools	• Curriculum Vitae (CV) • Direct observation • Oral or written examination • Presentation • Research portfolio
Curriculum Mapping	•
Notes or Resources	• Institutional IRB guidelines • National Institutes of Health. Write Your Application. https://grants.nih.gov/grants/how-to-apply-application-guide/format-and-write/write-your-application.htm. 2020. • U.S. National Library of Medicine. PubMed Tutorial. https://www.nlm.nih.gov/bsd/disted/pubmedtutorial/cover.html. 2020. • Wiley Online Library. Author Guidelines. https://onlinelibrary.wiley.com/page/journal/15372995/homepage/forauthors.html. 2020.

Practice-Based Learning and Improvement 2: Reflective Practice and Commitment to Personal Growth **Overall Intent:** To seek clinical performance information with the intent of improving care; to reflect on all domains of practice, personal interactions and behaviors, and their impact on technologists, colleagues, and patients (if applicable) (reflective mindfulness); to develop clear objectives and goals for improvement integrated into some form of a learning plan	
Milestones	**Examples**
Level 1 *Accepts responsibility for personal and professional development by establishing goals* *Identifies the gap(s) between expectations and actual performance* *Actively seeks opportunities to improve*	• Considers broad goals for personal growth and educational achievement • Begins to seek ways to determine where improvements are needed and makes specific goals that are measurable and reasonable to execute and achieve • Identifies multiple sources for receiving feedback
Level 2 *Demonstrates openness to receiving performance data and feedback in order to inform goals* *Analyzes and reflects on the factors which contribute to gap(s) between expectations and actual performance* *Designs and implements a learning plan, with assistance*	• Increasingly able to identify performance gaps with regards to diagnostic skills and daily work; uses feedback from others • After working with an attending, asks for feedback about performance and opportunities for improvement • Uses feedback with a goal of improving communication skills with technologists, peers/colleagues, staff members, and patients (if applicable) • Develops personal goals for learning rotations and takes ownership of developing a timeline to achieve those goals
Level 3 *Seeks performance data and feedback with humility* *Institutes behavioral change(s) to narrow the gap(s) between expectations and actual performance* *Independently creates and implements a learning plan*	• Takes feedback from technologists, peers/colleagues, and supervisors to gain complex insight into personal strengths and areas for improvement • Acts on feedback and is appreciative rather than defensive • Documents goals in a more specific and achievable manner, such that attaining them is reasonable and measurable
Level 4 *Actively and consistently seeks performance data and feedback with humility*	• Is clearly in the habit of making a learning plan for each rotation

Critically evaluates the effectiveness of behavioral changes in narrowing the gap(s) between expectations and actual performance *Uses performance data to measure the effectiveness of the learning plan and improves it when necessary*	• Consistently identifies ongoing gaps and strategically chooses areas for further development
Level 5 *Models seeking performance data and accepting feedback with humility* *Coaches others reflective practice* *Facilitates the design and implementing learning plans for others*	• Actively discusses learning goals with supervisors and colleagues; encourages other learners on the team to consider how their behavior affects the rest of the team
Assessment Models or Tools	• Direct observation • Faculty evaluation • Portfolio • Review of learning plan • Self-assessment
Curriculum Mapping	•
Notes or Resources	• Burke AE, Benson B, Englander R, Carraccio C, Hicks PJ. Domain of competence: practice-based learning and improvement. *Acad Pediatr.* 2014;14: S38-S54. https://www.academicpedsjnl.net/article/S1876-2859(13)00333-1/fulltext. 2020. • Hojat M, Veloski JJ, Gonnella JS. Measurement and correlates of physicians' lifelong learning. *Academic Medicine.* 2009;84(8):1066-1074. https://journals.lww.com/academicmedicine/fulltext/2009/08000/Measurement_and_Correlates_of_Physicians__Lifelong.21.aspx. 2020. • Lockspeiser TM, Schmitter PA, Lane JL, Hanson JL, Rosenberg AA, Park YS. Assessing residents' written learning goals and goal writing skill: validity evidence for the learning goal scoring rubric. *Academic Medicine*. 2013;88(10):1558-1563. https://journals.lww.com/academicmedicine/fulltext/2013/10000/Assessing_Residents__Written_Learning_Goals_and.39.aspx. 2020.

Professionalism 1: Professional Behavior and Ethical Principles **Overall Intent:** To recognize and address lapses in ethical and professional behavior, demonstrates ethical and professional behaviors, and use appropriate resources for managing ethical and professional dilemmas	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of the ethical principles underlying informed consent, surrogate decision making, advance directives, confidentiality, error disclosure, stewardship of limited resources, and related topics*	• Discusses the basic principles underlying ethics (beneficence, nonmaleficence, justice, autonomy) and professionalism (professional values and commitments), and how they apply in various situations (e.g., informed consent process) • Obtains informed consent for procedures
Describes when and how to appropriately report professionalism lapses, including strategies for addressing common barriers; identifies and describes potential triggers for professionalism lapses	• Identifies and describes potential triggers for professionalism lapses, describes when and how to appropriately report professionalism lapses, and outlines strategies for addressing common barriers to reporting
Level 2 *Analyzes straightforward situations using ethical principles*	• Demonstrates professional behavior in routine situations and uses ethical principles to analyze straightforward situations, and can acknowledge a lapse without becoming defensive, making excuses, or blaming others
Demonstrates insight into professional behavior in routine situations; takes responsibility for one's own professionalism lapses	• Apologizes for the lapse when appropriate and taking steps to make amends if needed • Articulates strategies for preventing similar lapses in the future • Recognizes and responds effectively to the emotions of others
Level 3 *Recognizes the need and uses appropriate resources to seek help in managing and resolving complex ethical situations*	• Analyzes complex situations, such as how the clinical situation evokes strong emotions, conflicts (or perceived conflicts) between patients/providers/staff or between professional values; the fellow navigates a situation while not at his/her personal best (due to fatigue, hunger, stress, etc.), or the system poses barriers to professional behavior (e.g., inefficient workflow, inadequate staffing, conflicting policies) • Recognizes own limitations and seeks resources to help manage and resolve complex ethical situations such as: o requesting an ethics consult (e.g., Jehovah's Witness patient with potential transfusion needs) o submitting IRB review for a research project
Demonstrates professional behavior in complex or stressful situations	• Analyzes difficult real or hypothetical ethics and professionalism case scenarios or situations, recognizes own limitations, and consistently demonstrates professional behavior

Level 4 *Independently resolves and manages complex ethical situations* *Recognizes situations that may trigger professionalism lapses and intervenes to prevent lapses in self and others*	• Actively seeks to consider the perspectives of others • Models respect for patients and expects the same from others • Recognizes and uses appropriate resources for managing and resolving ethical dilemmas (e.g., ethics consultations, literature review, risk management/legal consultation)
Level 5 *Identifies and seeks to address system-level factors that induce or exacerbate ethical problems or impede their resolution* *Coaches others when their behavior fails to meet professional expectations*	• Identifies and seeks to address system-wide factors or barriers to promoting a culture of ethical and professional behavior through participation in a work group, committee, or task force (e.g., ethics committee or an ethics subcommittee, risk management committee, root cause analysis review, patient safety or satisfaction committee, professionalism work group, IRB, learner grievance committee, etc.) • Coaches others when their behavior fails to meet professional expectations, either in the moment (for minor or moderate single episodes of unprofessional behavior) or after the moment (for major single episodes or repeated minor to moderate episodes of unprofessional behavior)
Assessment Models or Tools	• Direct observation • Global evaluation • Mentor and program director observations • Multisource feedback • Oral or written self-reflection (e.g., of a personal or observed lapse, ethical dilemma, or systems-level factors) • Simulation
Curriculum Mapping	•
Notes or Resources	• American Board of Internal Medicine, ACP-ASIM Foundation, European Federation of Internal Medicine. Medical professionalism in the new millennium: a physician charter. *Ann Intern Med*. 2002;136:243-246. http://abimfoundation.org/wp-content/uploads/2015/12/Medical-Professionalism-in-the-New-Millenium-A-Physician-Charter.pdf. 2020. • American Medical Association. Ethics. https://www.ama-assn.org/delivering-care/ama-code-medical-ethics. 2020. • Brissette MD, Johnson K, Raciti PM, et al. Perceptions of unprofessional attitudes and behaviors: implications for faculty role modeling and teaching professionalism during pathology residency. *Arch Pathol Lab Med.* 2017;141:1349-1401. https://www.archivesofpathology.org/doi/10.5858/arpa.2016-0477-CP. 2020.

	● Byyny RL, Papadakis MA, Paauw DS. *Medical Professionalism Best Practices*. Menlo Park, CA: Alpha Omega Alpha Medical Society; 2015. https://alphaomegaalpha.org/pdfs/2015MedicalProfessionalism.pdf. 2019. ● Conran RM, Powell SZ, Domen RE, et al. Development of professionalism in graduate medical education: a case-based educational approach from the College of American Pathologists' Graduate Medical Education Committee. 2018;5: 2374289518773493. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6039899/. 2020. ● Domen RE, Johnson K, Conran RM, et al. Professionalism in pathology: a case-based approach as a potential education tool. *Arch Pathol Lab Med*. 2017;141:215-219. https://www.archivesofpathology.org/doi/10.5858/arpa.2016-0217-CP?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%3dpubmed. 2020. ● Domen RE, Talbert ML, Johnson K, et al. Assessment and management of professionalism issues in pathology residency training: results from surveys and a workshop by the graduate medical education committee of the College of American Pathologists. *Acad Pathol.* 2015; 2:2374289515592887. https://journals.sagepub.com/doi/10.1177/2374289515592887. 2020. ● Levinson W, Ginsburg S, Hafferty FW, Lucey CR. *Understanding Medical Professionalism*. 1st ed. New York, NY: McGraw-Hill Education; 2014.

Professionalism 2: Accountability and Conscientiousness **Overall Intent:** To take responsibility for one's own actions and the impact on patients and other members of the health care team	
Milestones	**Examples**
Level 1 *Responds promptly to instructions, requests, or reminders to complete tasks and responsibilities*	• Completes program and faculty evaluations and requirements in a timely manner • Timely attendance at conferences • Responds promptly to requests for consultations
Level 2 *Takes appropriate ownership and performs tasks and responsibilities in a timely manner with attention to detail*	• Completes transfusion reaction report in a timely manner and recognizes when completing that task on time will be difficult • Completes patient care notes in a timely manner, with attention to detail • Appropriately notifies day service about overnight call events during transition of care or hand-off in order to avoid patient safety issues and compromise of patient care
Level 3 *Recognizes situations that may impact own ability to complete tasks and responsibilities in a timely manner and describes the impact on team*	• Completes tasks in stressful situations and preempts issues that would impede completion of tasks (e.g., notifies attending of multiple competing demands on call, appropriately triages tasks, and asks for assistance from other residents or faculty members, if needed) • Reviews Case Logs, TMISE scores, evaluations, and portfolio and develops a learning plan to address gaps/weakness in knowledge, case exposure, and skills
Level 4 *Anticipates and intervenes in situations that may impact others' ability to complete tasks and responsibilities in a timely manner*	• Identifies issues that could impede other trainees from completing tasks and provides leadership to address those issues; escalates to communicating with attending if problem requires a system-based approach and needs addressing at a higher administrative level • Takes responsibility for potential adverse outcomes from miscommunication and professionally discusses with the interprofessional team
Level 5 *Takes ownership of system outcomes* *Designs new strategies to ensure that the needs of patients, teams, and systems are met*	• Sets up a meeting with the lead technologist to streamline a reflex testing algorithm and follows through with a system-based solution • Leads team to find solutions to problem
Assessment Models or Tools	• Compliance with deadlines and timelines • Direct observation • Mentor and program director observations • Multisource global evaluations, including from program administrator • Quality metrics of turnaround time on cases • Self-evaluations and reflective tools • Simulation
Curriculum Mapping	•

Notes or Resources	• AABB. Code of Ethics. https://www.aabb.org/membership/governance/Documents/AABB-Code-of-Ethics.pdf. 2020. • Code of conduct from fellow institutional manual • Expectations of residency program regarding accountability and professionalism

Professionalism 3: Self-Awareness and Help-Seeking **Overall Intent:** To identify, manage, seek assistance for, and improve personal and professional well-being for self and others	
Milestones	**Examples**
Level 1 *Recognizes limitations in the knowledge/skills/ behaviors of self or team, with assistance* *Recognizes status of personal and professional well-being, with assistance*	• Accepts feedback and exhibits positive responses to criticism • Monitors and responds to fatigue, hunger, stress, etc. in self and team members
Level 2 *Independently recognizes limitations in the knowledge/skills/ behaviors of self or team and seeks help when needed* *Independently recognizes status of personal and professional well-being and seeks help when needed*	• Identifies possible sources of personal stress or lack of clinical knowledge and independently seeks help • Identifies and uses well-being resources
Level 3 *Proposes and implements a plan to remediate or improve the knowledge/ skills/behaviors of self or team, with assistance* *Proposes and implements a plan to optimize personal and professional well-being, with assistance*	• With supervision, assists in developing a personal learning or action plan to address gaps in knowledge or stress and burnout within self or team • Regularly participates in well-being practices
Level 4 *Independently develops and implements a plan to remediate or improve the knowledge/skills/ behaviors of self or team* *Independently develops and implements a plan to optimize personal and professional well-being*	• Independently develops personal learning and/or action plans for continued personal and professional growth, while limiting stress and burnout within self or team • Facilitates well-being activities for self and others
Level 5 *Serves as a resource or consultant for developing a plan to remediate or improve the knowledge/ skills/behaviors* *Coaches others when responses or limitations in knowledge/skills do not meet professional expectations*	• Mentors patients and colleagues in self-awareness and establishes health management plans to limit stress and burnout

Assessment Models or Tools	• Burnout assessment • Direct observation • Group interview or discussions of team activities • Individual interview • Institutional online training modules • Mentor and program director observations • Participation in institutional well-being programs • Self-assessment and personal learning plan
Curriculum Mapping	•
Notes or Resources	• ACGME. Tools and Resources. https://www.acgme.org/What-We-Do/Initiatives/Physician-Well-Being/Resources. 2020. • Conran RM, Powell SZ, Domen RE, et al. Development of professionalism in graduate medical education: a case-based educational approach from the College of American Pathologists' Graduate Medical Education Committee. *Acad Pathol*. 2018;5:2374289518773493. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6039899/. 2020. • Hicks PJ, Schumacher D, Guralnick S, Carraccio C, Burke AE. Domain of competence: personal and professional development. *Acad Pediatr*. 2014;14(2 Suppl):S80-97. https://linkinghub.elsevier.com/retrieve/pii/S1876-2859(13)00332-X. 2020. • Joseph L, Shaw PF, Smoller BR. Perceptions of stress among pathology residents: survey results and some strategies to reduce them. *Am J Clin Pathol*. 2007;128(6):911-919. https://academic.oup.com/ajcp/article/128/6/911/1764982. 2020. • Local resources, including Employee Assistance Program

Interpersonal and Communication Skills 1: Patient- and Family-Centered Communication **Overall Intent:** To deliberately use language and behaviors to form constructive relationships with patients, to identify communication barriers including self-reflection on personal biases, and minimize them in the doctor-patient relationships; organize and lead communication around shared decision making	
Milestones	**Examples**
Level 1 *Uses language and nonverbal behavior to demonstrate respect and establish rapport* *Identifies common barriers to effective communication (e.g., language, disability) while accurately communicating own role within the health care system*	• Self-monitors and controls tone, nonverbal responses, and language and asks questions to invite patient/family/donor participation • Accurately communicates role in the health care system to patients/families/donor • Identifies common communication barriers in patient/donor care and recognizes when an interpreter is needed • Avoids medical jargon when talking to patients/donor, makes sure communication is at the appropriate level to be understood by a layperson
Level 2 *Establishes a relationship in straightforward encounters using active listening and clear language* *Identifies complex barriers to effective communication (e.g., health literacy, cultural)*	• Establishes a developing, professional relationship with patients/families/donor, with active listening, attention to affect, and questions that explore the optimal approach to daily tasks • Prior to an apheresis procedure, uses language to best explain what to expect with an understanding of the patients' level of health literacy • Meets with blood donors who have been deferred from donation and explains the patient or donor safety issue
Level 3 *Sensitively and compassionately delivers medical information, with assistance* *When prompted, reflects on personal biases while attempting to minimize communication barriers*	• Demonstrates respect for a Jehovah's Witness who does not want to a transfusion with thorough explanation of the risks and alternatives • Acknowledges uncertainty in daily tasks • Maintains eye contact with patient/donor when using an interpreter
Level 4 *Independently, sensitively, and compassionately delivers medical information and acknowledges uncertainty and conflict* *Independently recognizes personal biases while attempting to proactively minimize communication barriers*	• Is an active member of the care team in discussion with family regarding patients who refuse a transfusion • Is an active member of the care team in discussion with patients/donors who are subject to product look back • Takes steps to self-monitor for personal bias before communicating with patient/donor
Level 5 *Mentors others in the sensitive and compassionate delivery of medical information*	• Leads the sharing of an adverse event in face of patient/family/donor anger

Models self-awareness while teaching a contextual approach to minimize communication barriers	
Assessment Models or Tools	• Direct observation • Kalamazoo Essential Elements Communication Checklist (Adapted) • Self-assessment including self-reflection exercises • Simulation • Skills needed to Set the state, Elicit information, Give information, Understand the patient, and End the encounter (SEGUE) • Standardized patients or structured case discussions • 360-degree evaluation
Curriculum Mapping	•
Notes or Resources	• Dintzis SM. Improving pathologist's communication skills. *AMA J Ethics*. 2016;18(8):802-808. https://journalofethics.ama-assn.org/article/improving-pathologists-communication-skills/2016-08. 2020. • Dintzis SM, Stetsenko GY, Sitlani CM, et al. Communicating pathology and laboratory errors: anatomic pathologists' and laboratory medical directors' attitudes and experiences. *Am J Clin Pathol*. 2011;135(5):760-765. https://academic.oup.com/ajcp/article/135/5/760/1766306. 2020. • Laidlaw A, Hart J. Communication skills: an essential component of medical curricula. Part I: Assessment of clinical communication: AMEE Guide No. 51. *Med Teach*. 2011;33(1):6-8. https://www.tandfonline.com/doi/full/10.3109/0142159X.2011.531170. 2020. • Makoul G. Essential elements of communication in medical encounters: the Kalamazoo consensus statement. *Acad Med*. 2001;76(4):390-393. https://journals.lww.com/academicmedicine/Fulltext/2001/04000/Essential_Elements_of_Communication_in_Medical.21.aspx#pdf-link. 2020. • Makoul G. The SEGUE Framework for teaching and assessing communication skills. *Patient Educ Couns*. 2001;45(1):23-34. https://www.sciencedirect.com/science/article/abs/pii/S0738399101001367?via%3Dihub. 2020. • Symons AB, Swanson A, McGuigan D, Orrange S, Akl EA. A tool for self-assessment of communication skills and professionalism in residents. *BMC Med Educ*. 2009;9:1. https://bmcmededuc.biomedcentral.com/articles/10.1186/1472-6920-9-1. 2020.

Interpersonal and Communication Skills 2: Interprofessional and Team Communication **Overall Intent:** To effectively communicate with the health care team (i.e., laboratory team, resident/fellow team, faculty/fellow team, interdisciplinary care team, or any other functioning team in the program), including both inter- and intra-departmental and consultants, in both straightforward and complex situations	
Milestones	**Examples**
Level 1 *Uses language that values all members of the health care team* *Describes the utility of constructive feedback*	• Shows respect in health care team communications through words and actions in clinical consultation for apheresis • Uses respectful communication with clerical, nursing, and technical staff members • Listens to and considers others' points of view, is nonjudgmental and actively engaged, and demonstrates humility
Level 2 *Communicates information effectively with all health care team members* *Solicits feedback on performance as a member of the health care team*	• Communicates clearly and concisely in an organized and timely manner during consultant encounters, as well as with the health care team in general • Seeks feedback at sign-out
Level 3 *Uses active listening to adapt communication style to fit team needs* *Integrates feedback from team members to improve communication*	• Demonstrates active listening by fully focusing on the speaker (other health care provider, patient), actively showing verbal and nonverbal signs (eye contact, posture, reflection, questioning, summarization) • Verifies understanding of his/her communications by restating blood availability due to unexpected positive antibody screen • Raises concerns or provides opinions and feedback when needed to others on the team • Respectfully provides feedback to junior members of the medical team for the purposes of improvement or reinforcement of correct knowledge, skills, and attitudes, when appropriate
Level 4 *Coordinates recommendations from different members of the health care team to optimize patient care* *Communicates feedback and constructive criticism to superiors*	• Offers suggestions to negotiate or resolve conflicts among health care team members; raises concerns or provides opinions and feedback, when needed, to superiors on the team • Adapts communication strategies in handling complex situations
Level 5 *Models flexible communication strategies that value input from all health care team members, resolving conflict when needed*	• Communicates with all health care team members, resolves conflicts, and provides feedback in any situation

Facilitates regular health care team-based feedback in complex situations	• Organizes a team meeting to discuss and resolve potentially conflicting points of view on a plan of care (e.g., therapeutic apheresis for rare neurological condition, use of rare resources)
Assessment Models or Tools	• Direct observation • Global assessment • Multi-source assessment • Record or chart review for professionalism and accuracy in written communications • Simulation encounters
Curriculum Mapping	•
Notes or Resources	• Brissette MD, Johnson K, Raciti PM, et al. Perceptions of unprofessional attitudes and behaviors: implications for faculty role modeling and teaching professionalism during pathology residency. *Arch Pathol Lab Med*. 2017;141:1394-1401. https://www.archivesofpathology.org/doi/10.5858/arpa.2016-0477-CP. 2020. • Conran RM, Powell SZ, Domen RE, et al. Development of professionalism in graduate medical education: a case-based educational approach from the College of American Pathologists' Graduate Medical Education Committee. 2018;5: 2374289518773493. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6039899/. 2020. • Green M, Parrott T, Cook G., Improving your communication skills. *BMJ*. 2012;344:e357. https://www.bmj.com/content/344/bmj.e357. 2020. • Henry SG, Holmboe ES, Frankel RM. Evidence-based competencies for improving communication skills in graduate medical education: a review with suggestions for implementation. *Med Teach*. 2013;35(5):395-403. https://www.tandfonline.com/doi/full/10.3109/0142159X.2013.769677. 2020. • Roth CG, Eldin KW, Padmanabhan V, Freidman EM. Twelve tips for the introduction of emotional intelligence in medical education. *Med Teach*. 2019;41(7):1-4. https://www.tandfonline.com/doi/full/10.1080/0142159X.2018.1481499. 2020.

Interpersonal and Communication Skills 3: Communication within Health Care Systems **Overall Intent:** To effectively communicate using a variety of methods	
Milestones	**Examples**
Level 1 *Safeguards patient personal health information by communicating through appropriate means as required by institutional policy (e.g., patient safety reports, cell phone/pager usage)* *Identifies institutional and departmental structure for communication of issues*	• Identifies when it is acceptable to include protected health information when relaying clinical history to reference laboratory • Understands that protected health information should not be spoken over the phone in a public place • Identifies institutional and departmental communication hierarchy for concerns and safety issues
Level 2 *Appropriately selects forms of communication based on context and urgency of the situation* *Respectfully communicates concerns about the system*	• Identifies method for sharing results requiring urgent attention • Recognizes when a communication breakdown has transpired and respectfully brings the breakdown to the attention of the appropriate team member • Reports a patient safety event (actual or simulated)
Level 3 *Communicates while ensuring security of personal health information, with guidance* *Uses institutional structure to effectively communicate clear and constructive suggestions to improve the system*	• Communicates opportunities for improvement in the laboratory information system/EHR interface • Knows when to direct concerns locally, departmentally, or institutionally – appropriate escalation • Uses appropriate methods when sharing results requiring urgent attention • Uses institutional protocol for standardized hand-offs
Level 4 *Independently communicates while ensuring security of personal health information* *Initiates conversations on difficult subjects with appropriate stakeholders to improve the system*	• Talks directly to a colleague about breakdowns in communication in order to prevent recurrence • Participates in task force to update policy for sharing abnormal results • Improves methods for communicating system-wide call schedules, conference scheduling, etc.
Level 5 *Guides departmental or institutional communication around policies and procedures regarding the security of personal health information*	• Leads a task force established by the hospital QI committee to develop a plan to improve house staff hand-offs

Facilitates dialogue regarding systems issues among larger community stakeholders (e.g., institution, health care system, field)	• Works with information systems to implement improvements in the laboratory information system/EHR interface
Assessment Models or Tools	• Chart review for documented communications • Observation of sign-outs, observation of requests for consultations • 360-degree evaluation of verbal communications
Curriculum Mapping	•
Notes or Resources	• Bierman JA, Hufmeyer KK, Liss DT, Weaver AC, Heiman HL. Promoting responsible electronic documentation: validity evidence for a checklist to assess progress notes in the electronic health record. *Teach Learn Med.* 2017;29(4):420-432. https://www.tandfonline.com/doi/full/10.1080/10401334.2017.1303385. 2020. • Haig KM, Sutton S, Whittington J. SBAR: a shared mental model for improving communication between clinicians. *Jt Comm J Qual Patient Saf*. 2006;32(3):167-175. https://www.jointcommissionjournal.com/article/S1553-7250(06)32022-3/fulltext. 2020. • Starmer AJ, et al. I-pass, a mnemonic to standardize verbal handoffs. *Pediatrics*. 2012;129(2):201-204. https://pediatrics.aappublications.org/content/129/2/201?sso=1&sso_redirect_count=1&nfstatus=401&nftoken=00000000-0000-0000-0000-000000000000&nfstatusdescription=ERROR%3a+No+local+token. 2020.

In an effort to aid programs in the transition to using the new version of the Milestones, the original Milestones 1.0 have been mapped to the new Milestones 2.0. Also indicated below are where the subcompetencies are similar between versions. These are not necessarily exact matches but are areas that include some of the same elements. Note that not all subcompetencies map between versions. Inclusion or exclusion of any subcompetency does not change the educational value or impact on curriculum or assessment.

Milestones 1.0	Milestones 2.0
PC1: Consultation	PC1: Consultation
PC2: Interpretation, Reporting, and Diagnosis	PC3: Interpretation and Diagnosis PC4: Reporting
PC3: Procedures	PC2: Therapeutic and Donor Procedures
MK1: Fundamental and Diagnostic Knowledge	No match
MK2: Apheresis	MK3: Apheresis MK5: Cellular Therapy and Transplantation
No match	MK1: Immunohematology Testing
No match	MK2: Donor Management and Component Manufacture
No match	MK4: Transfusion Practice
No match	MK6: Clinical Reasoning
SBP1: Regulatory	SBP4: Accreditation, Compliance and Quality
SBP2: Health Care Teams	SBP2: Systems Navigation for Patient-Centered Care ICS2: Interprofessional and Team Communication
SBP3: Lab Management: Resource Utilization (personnel and finance)	SBP3: Physician Role in Health Care System SBP5: Utilization
PBLI1: Evidence-based Utilization	PBL1: Evidence Based Practice and Scholarship SBP5: Utilization
PBLI2: Process Improvement and Patient Safety	SBP1: Patient Safety and Quality Improvement
PBLI3: Research and Scholarly Activity	PBL1: Evidence Based Practice and Scholarship
PROF1: Receiving and Providing Feedback	PBL2: Reflective Practice and Commitment to Personal Growth
PROF2: Accountability, Honesty, and Integrity	PROF1: Professional Behavior and Ethical Principles PROF2: Accountability and Conscientiousness PROF3: Self-Awareness and Help Seeking

PROF3: Cultural Competency	SBP2: Systems Navigation for Patient-Centered Care ICS1: Patient-and Family-Centered Communication
ICS1: Communication with Health Care Providers, Families, Patients, and Donors (as applicable)	ICS1: Patient-and Family-Centered Communication ICS2: Interprofessional and Team Communication
ICS2: Personnel Management and Conflict Resolution	ICS2: Interprofessional and Team Communication
No match	ICS3: Communication with Health Care Systems

Available Milestones Resources

Clinical Competency Committee Guidebook, updated 2020 - https://www.acgme.org/Portals/0/ACGMEClinicalCompetencyCommitteeGuidebook.pdf?ver=2020-04-16-121941-380

Clinical Competency Committee Guidebook Executive Summaries, New 2020 - https://www.acgme.org/What-We-Do/Accreditation/Milestones/Resources - Guidebooks - Clinical Competency Committee Guidebook Executive Summaries

Milestones Guidebook, updated 2020 - https://www.acgme.org/Portals/0/MilestonesGuidebook.pdf?ver=2020-06-11-100958-330

Milestones Guidebook for Residents and Fellows, updated 2020 - https://www.acgme.org/Portals/0/PDFs/Milestones/MilestonesGuidebookforResidentsFellows.pdf?ver=2020-05-08-150234-750

Milestones for Residents and Fellows PowerPoint, new 2020 -https://www.acgme.org/Residents-and-Fellows/The-ACGME-for-Residents-and-Fellows

Milestones for Residents and Fellows Flyer, new 2020 https://www.acgme.org/Portals/0/PDFs/Milestones/ResidentFlyer.pdf

Implementation Guidebook, new 2020 - https://www.acgme.org/Portals/0/Milestones%20Implementation%202020.pdf?ver=2020-05-20-152402-013

Assessment Guidebook, new 2020 - https://www.acgme.org/Portals/0/PDFs/Milestones/Guidebooks/AssessmentGuidebook.pdf?ver=2020-11-18-155141-527

Milestones National Report, updated each Fall - https://www.acgme.org/Portals/0/PDFs/Milestones/2019MilestonesNationalReportFinal.pdf?ver=2019-09-30-110837-587 (2019)

Milestones Bibliography, updated twice each year - https://www.acgme.org/Portals/0/PDFs/Milestones/MilestonesBibliography.pdf?ver=2020-08-19-153536-447

Developing Faculty Competencies in Assessment courses - https://www.acgme.org/Meetings-and-Educational-Activities/Other-Educational-Activities/Courses-and-Workshops/Developing-Faculty-Competencies-in-Assessment

Assessment Tool: Direct Observation of Clinical Care (DOCC) - https://dl.acgme.org/pages/assessment

Assessment Tool: Teamwork Effectiveness Assessment Module **(TEAM) -** https://dl.acgme.org/pages/assessment

Learn at ACGME has several courses on Assessment and Milestones - https://dl.acgme.org/