
CRITERIA FOR REVIEW OF PERIPHERAL BLOOD AND BODY FLUID SMEARS

RC.HM.PR.008.r19

Principle

The following criteria are established to provide guidelines for the review of **peripheral blood and body fluid** smears by residents, fellows, pathologists or Microbiology personnel. This review should not hold up the reporting of results unless proper cell identification is in question.

When leaving a slide for review, ensure case is sent for path review in LIS; include a completed "Smear Review Checklist" which can be found in the labeled folder on the morphology bench (see Attachment A). Print barcoded collection label and affix to checklist. Place specimen on tracking list then print tracking list. Place slide, checklist and tracking list in designated "Path Review" **folder**. All bloods and body fluids should be archived for future retrieval if necessary. Ensure body fluid specimens are in containers that are appropriate for the specimen storage refrigerator.

NOTE: *Please save smears only on NEW PATIENTS or change in existing patients (FIRST TIME ONLY) who do not have a previous pathologist comment or recent bone marrow/path consult on record, unless otherwise noted.*

I. PERIPHERAL BLOOD:

- A. Whenever the identification of a cell is in doubt.
- B. Leukoerythroblastic blood picture **OR** myelodysplastic changes.
- C. **Erythrocyte abnormalities:**
 - 1. Any single RBC abnormality that is judged to be 3+.
 - ◆ Target Cells
 - ◆ Ovalocytes
 - ◆ Fragmented cells (schistocytes, burr cells, spur cells, helmet cells, etc.)
 - ◆ Acanthocytes
 - ◆ Tear drops
 - ◆ Spherocytes
 - 2. When sickle cells or cells with intraerythrocytic hemoglobin crystals are seen.
 - 3. Cabot rings (when associated with anemia).

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4. MCV > 114 fL (patient age >15 days) **OR** < 60 fL (only if a differential is ordered by clinician)
5. Schistocytes > 1/HPF **AND** PLT delta check **OR** thrombocytopenia

D. **Leukocyte abnormalities:**

1. Cases of absolute:
 - ◆ Lymphocytosis > 15.0 bill/L (**not known CLL by morphology or flow**) (patient age >1 year)
 - ◆ Monocytosis > 3.0 bill/L (patient age > 1 year) and persistent for 3 months
2. Presence of:
 - ◆ Blast of any type (myeloblast, lymphoblast, megakaryoblast)
 - ◆ Neutrophils <0.5
 - ◆ Pelgeroid neutrophils
 - ◆ Hairy cells or Sezary cells
 - ◆ Lymphoma cells
 - ◆ Plasma cells \geq 5%
3. Any suspect CLL (new cases only)
4. Any suspect Chronic Myelogenous Leukemia (absolute neutrophilia with left shift, eosinophilia and/or basophilia) or other myeloproliferative disorder (new or with significant change).
5. WBC > 100 bill/L.
6. Parasites / Intracellular bacteria or yeast.
Send directly to Microbiology for confirmation. Follow Suspected Peripheral Blood and Body Fluid Intracellular Organisms procedure.

NOTES:

1. A differential must be ordered if a case is going to be sent for a Path Review. If abnormalities (i.e. Leukoerythroblastic picture, lymphoma cells, myelodysplastic changes) are seen while reviewing a CBCND (e.g. for a platelet verification), order a CBCWD. Before validating results in WAM, a CBCWD must be ordered in Soft. From Soft Order Entry, change the order from CBCND to CBCWD. The CBCND results will transfer automatically to the CBCWD. Complete the differential in WAM, then follow SOP for ordering a path review and forwarding to pathologist. The slides, instrument and LIS printouts are saved for pathologist review.
2. A differential does not have to be added for MCV <60, platelets >1000, etc. if only a CBC is ordered.

E. **Platelet abnormalities:**

1. Absence of stainable granules (**majority** must be agranular).
2. Platelet count greater than 1000 bill/L.

II. **BODY FLUID:**

- A. Cell clumps of any type (**EXCEPT** those composed of granulocytes, lymphocytes, macrophages / histiocytes).
- B. Suspicious cells of any type.
- C. Frankly malignant cells.

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- D. Parasites / Intracellular bacteria or yeast.
Send directly to Microbiology for confirmation. Follow Suspected Peripheral Blood and Body Fluid Intracellular Organisms procedure.
- E. Lymphoma cells

III. PEDIATRIC HEMATOLOGY/ONCOLOGY PATIENTS:

New findings on known pediatric hematology patients should be brought to the attention of the pediatric hematologists.

IV. PEER REVIEW, STAT CASES AND CRITICAL VALUES:

- A. Always ensure that a second tech verifies the presence of blasts on the first-time occurrence before sending for Path Review.
- B. If there is uncertainty regarding the cell identification, forward the slide to the pathologist reading out cases that day. Afternoon, midnight and dayshift weekend/ holiday shifts should leave for pathologist review without paging resident on call (unless cell type in question is more than rare or few).
- C. If a new **acute** leukemia is suspected on a weekend, PM or midnight shift, ensure that the "Smear Review Checklist" is designated with a RED DOT or STAT sticker and that pathology resident or fellow on-call is notified.

NOTE: A pathology resident or fellow on-call must be notified when any new APL case is suspected, even if blast percentage is <20%.

- D. If a Path Review is required on a STAT specimen, ensure that the path review checklist is flagged as a STAT (STAT written on checklist, STAT sticker, red dot). Prior to 5PM, bring these cases **directly** to the bone marrow pathologist for that day. If that pathologist is not available, seek another pathologist and explain the urgency. Do NOT leave in hematology lab or bone marrow signout room for the next day. After 5PM or on weekends, if a pathologist is not available, contact the pathology resident or fellow on call to handle these STAT cases if clinically relevant (i.e. new leukemia).
- E. If critical values are present:
Once the case is saved in the LIS, a popup screen will appear, indicating that an order has been sent to the Call List.
- F. Any time there is a question, feel free to contact a pathologist, fellow or resident on call for assistance.

Authorized Reviewers

Medical Director, Hematology

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Attachments

Attachment A – SMEAR REVIEW CHECKLIST

Check the finding listed below for which you are requesting pathologist review. **Please save only on NEW PATIENTS or change in existing patients (FIRST TIME ONLY) who do not have a previous pathologist comment or recent bone marrow / path consult on record, unless otherwise indicated by reason.**

PERIPHERAL BLOOD REVIEW	CRITICAL RESULT REVIEW	PATIENT INFORMATION
WBC <input type="checkbox"/> Lymphocytosis >15.0 bill/L (patient age >1 yr) (not known CLL by morphology or flow) <input type="checkbox"/> Lymphoma cells <input type="checkbox"/> Neutrophils < 0.5 <input type="checkbox"/> Hairy cells <input type="checkbox"/> Sezary cells <input type="checkbox"/> ≥5% Plasma cells <input type="checkbox"/> Monocytosis >3.0 bill/L (patient age >1 yr) persistent for 3 months <input type="checkbox"/> Pelgeroid neutrophils	<input type="checkbox"/> Blasts of any type <input type="checkbox"/> WBC >100 bill/L <input type="checkbox"/> PLT > 1000 bill/L ***Call these results to the attending physician before sending to path review***	<div style="border: 2px solid black; padding: 10px; text-align: center;"> PLACE BARCODE LABEL HERE </div>
RBC <input type="checkbox"/> MCV>114 fL (patient age >15 days) <input type="checkbox"/> MCV<60 fL <input type="checkbox"/> 3+ single RBC abnormality <input type="checkbox"/> Sickle cells/ RBC crystals <input type="checkbox"/> Schistocytes >1/ HPF <u>and</u> PLT delta check <u>or</u> thrombocytopenia (<100,000)	BODY FLUID REVIEW <input type="checkbox"/> Cell clumps (NOT grans,lymphs,macros) <input type="checkbox"/> Suspicious/malignant cells <input type="checkbox"/> Lymphoma cells	Pertinent previous result data: Submitting to pathologist:(check applicable) <input type="checkbox"/> Pathologist Name (HEM2): _____ <input type="checkbox"/> Wright stained smear <input type="checkbox"/> LIS report <input type="checkbox"/> Analyzer Printout <input type="checkbox"/> Marked for Path Review in LIS <input type="checkbox"/> Tracked to CPATH in LIS
MISCELLANEOUS <input type="checkbox"/> Leukoerythroblastic blood picture <input type="checkbox"/> Myelodysplastic changes <input type="checkbox"/> Suspect CML/ CLL (NEW PATIENTS ONLY)	Pathologist Comments: 	History: (Obtained by resident/fellow)
RARE <input type="checkbox"/> Cabot rings (when associated with anemia) <input type="checkbox"/> Agranular platelets (seen in majority of cells) <input type="checkbox"/> Other (specify)	Technologist Name: 	AP Findings (obtained by resident/fellow)

***** Parasites or intracellular organisms (bacteria or yeast) are sent directly to Microbiology for confirmation *****

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Document Control

Location of Master: Hematology Procedure Manual

Master electronic file stored on the Clinical Pathology server:

S:\HEMACOAG\Document Control\Hematology\Procedure\Master Documents\Criteria Review.doc

Number of Controlled Copies posted for educational purposes: 0

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Location of circulating Controlled Copies: STAT Lab

Document History

Signature	Date	Revision #		Related Documents Reviewed/ Updated
Prepared by: Nancy Ramirez, (MT(ASCP)SH	12/1987			
Approved by: Joan C. Mattson, MD	12/1987			
Reviewed by: (Signature)	Date	Revision #	Modification	Related Documents Reviewed/ Updated
Joan C. Mattson, MD	12/1987		OK	
Joan C. Mattson, MD	03/02/1989		OK	
Joan C. Mattson, MD	03/12/1990		Added body fluid section	
Joan C. Mattson, MD	08/15/1991		Updated checklist	
Nancy Ramirez, MT(ASCP)SH	12/1991		Updated checklist	
Nancy Ramirez, MT(ASCP)SH	11/1992		Updated checklist	
Nancy Ramirez, MT(ASCP)SH	07/1993		Updated BF cell clumps	
Joan C. Mattson, MD	12/13/1993		OK; added EDTA specimen to be saved.	
Nancy Ramirez, MT(ASCP)SH	02/1994		Updated agranular PLT and items to save.	
Joan C. Mattson, MD	12/12/1994		OK-above noted	
Joan C. Mattson, MD	12/22/1995		Updated to include plasma cells >5% and intracellular bacteria.	
Joan C. Mattson, MD	02/07/1997		Pg. 1 review criteria of neutrophils from 1.5→1.0.	
Noelle Procopio, MT(ASCP)SH	01/05/1998		No change.	
Noelle Procopio, MT(ASCP)SH	06/08/1998		Chngd abs Mono to >2.0 (pg.3); added newborn mono (pg.3); deleted macrophage clumps	
Noelle Procopio, MT(ASCP)SH	01/04/1999		No change.	
Mary A. Zamboldi, H(ASCP)SH	09/17/1999		Added criteria: pancytopenia in EC pts; MCV>115, WBC>50 in EC pts; WBC>100	
Joan C. Mattson, MD	01/13/2000		Above noted.	
Joan C. Mattson, MD	12/05/2001		Added pg. 4	
Noelle Procopio, MT(ASCP)SH	12/30/2002		No change	
Joan C. Mattson, MD	02/21/2003		Added intracellular bacteria /	

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			yeast to body fluids, pg.2; updated BF path review, pg. 3	
Noelle Procopio, MT(ASCP)SH	04/08/2003		Updated mono criteria, pg. 1 & 3 (per Dr. Mattson).	
Joan C. Mattson, MD	12/04/2003		Updated buffy coat criteria, pg.3	
Noelle Procopio, MT(ASCP)SH	12/12/2004		No change.	
Joan C. Mattson, MD	01/18/2005	00	Standardized procedure format; added directive to send suspected microorganisms directly to Microbiology, pg. 2&3; updated cklist criteria, pg.4 (lymphocytosis, NRBC, schistocytes, parasites intracellular bacteria or yeast.	
Joan C. Mattson, MD	12/11/2006	01	Added note re suspect new leukemia on a baby or young child, pg. 3	
Ann Marie Blenc, MD	04/10/2007		No change; new director.	
Ann Marie Blenc, MD	07/30/2008	02	Update review criteria (delete WBC>50, abs.neutropenia <1.0, pancytopenia, leukocyte inclusions, baso >3.0, nRBC>10, HJ bodies, frequent giant plts); revised chklist form (landscape format, added critical review section); added note re calling critical values before sending for path review; updated note re red dot sticker to include all new leukemias and resident / fellow on call notification.	
Ann Marie Blenc, MD	11/07/2008	03	Under Principle, added comment re archiving blood for future retrieval. Changed Notes to IV (STAT Cases and Critical Values); added B, D, E and F under this category.	
Ann Marie Blenc, MD	04/02/2009	04	Added note re adding differential to CBC results requiring a path review; added directive to order allowable additional procedure if no gram stain ordered.	
Ann Marie Blenc, MD	03/10/2010	05	Added patient ages to MCV and lymphocytosis; added ensuring that STAT values are called before leaving for Path Review; added contacting resident or fellow if case is clinically relevant.	
Ann Marie Blenc, MD	05/04/2010	06	Clarified when to add a differential for path review.	
Ann Marie Blenc, MD	06/09/2010	07	Updated that all bloods and body fluids saved for path review are archived & in appropriate storage container.	
Ann Marie Blenc, MD	06/30/2010	08	Added Note under STAT Cases and Critical Values; enumerated Notes under Peripheral Blood.	
Ann Marie Blenc, MD	11/04/2010	09	Added first occurrence of neutropenia <0.5 to review criteria.	
Ann Marie Blenc, MD	07/19/2011	10	Removed directives to ensure results were in complete state before sending for path review (not	OK

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			applicable for SOFT LIS); removed references to irregular lymph chromatin (no longer reported); added SOFT instructions for ordering a CBCWD if sending for path review; adding directive for rare blast seen.	
Ann Marie Blenc, MD	06/21/2012	11	Updated criteria review per TR & GP concurrence.	OK
Ann Marie Blenc, MD	07/18/2012	12	Added persistent monocytosis for 3 months in body of procedure.	OK
Ann Marie Blenc, MD	11/12/2012	13	Removed reference to "rare" blast and directives; added "Peer Review" to section IV.	OK
Ann Marie Blenc, MD	03/09/2013	14	Updated monocytosis to greater than 3.0; updated directives to include WAM.	OK
Ann Marie Blenc, MD	10/09/2013	15	Updated worksheet steps re marking in LIS then tracking to pathologists; removed directive to print barcoded slide label; added to print barcoded collection label for Smear Review Checklist; added clarification on when to leave for pathologist/ resident on weekends/holidays, off shifts.	OK
Ann Marie Blenc, MD	04/22/2015		No change	OK
Ann Marie Blenc, MD	11/11/2015	16	Removed 3+ poikilocytosis from path review criteria; added platelets >1000 to CBCND exception.	OK
Ann Marie Blenc, MD	08/29/2016	17	Added space for pathologist (HEM2) assigned to review (Attachment A).	OK
Elizabeth Sykes, M.D.	02/02/2018		No change	OK
Ann Marie Blenc, MD	04/26/2018	18	Updated IV-C to indicate "acute" leukemia; added NOTE re: APL review. Updated logo.	OK
Peter Millward, MD	01/30/2019		New Medical Director	
Ann Marie Blenc, MD	05/01/2019	19	Updated MCV <66 review criteria to MCV <60.	OK

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