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Owner	Carolyn Webb: Heme Technical Specialist
Area	Hematology
Applicability	Community Physician

CP Hematology Abnormal Specimen Handling

SCOPE

This procedure is intended for use with Sysmex XN and XN-L analyzers.

Effective 3/19/25 at the following locations:

- Drexel Town Square Health Center
- Moorland Reserve Health Center
- North Hills Health Center
- Tosa Health Center
- Town Hall Health Center
- West Bend Health Center

PURPOSE

The purpose of this policy is to provide guidance and resolution for samples that require special handling and, therefore, do not autovalidate in Caresphere or autoverify in Beaker.

For actions that require specimen to be sent to WDL, refer to "BEAKER Transferring Specimen from One Performing Lab to a Different Performing Lab" procedure.

PRINCIPLE

Caresphere OP Alerts and automatic reflex test rules provide an abbreviated instruction for what to do regarding certain flags. This procedure provides greater detail.

Be aware that there are technological differences between XN and XNL analyzers. In some cases, instructions will vary depending upon the analyzer series. For more detailed explanations of the flags and examples, refer to the appropriate attached flagging guide. Perform only the actions that have been approved in this procedure.

DEFINITIONS

XN analyzer = XN10, XN20, XN1000, XN2000

XNL analyzer = XN550

Interfering Substances = Some abnormal samples may interfere with automated cell counting methods. The following is a list from the Sysmex XN-Series Instructions for Use of possible substances that may interfere with these parameters. NOTE: Compromised samples, such as those not properly collected, stored, transported, or containing clots may cause misleading results. Always use good laboratory practices for inspecting specimens for acceptability and verifying results.

- WBC: Leukocyte aggregation, possibility of PLT clumps, cryoprotein, cryoglobulin, fibrin, giant platelets
- RBC: Erythrocyte aggregation (cold agglutinin), microerythrocytes, possibility of fragmented RBCs, leukocytosis (> 100,000/µL), giant platelets
- HGB: Leukocytosis (> 100,000/µL), lipemia, abnormal protein. The effect of abnormal proteins and lipemia may be removed by plasma replacement or plasma blank procedures.
- HCT: Erythrocyte aggregation (cold agglutinin), microerythrocytes, possibility of fragmented RBCs, leukocytosis (> 100,000/µL), severe diabetes (hyperglycemia), uremia, spherocytosis
- PLT: Possibility of PLT clumps, pseudothrombocytopenia, giant platelets, microerythrocytes, possibility of fragmented RBCs, fragmented leukocytes, cryoprotein, cryoglobulin
- RET: Erythrocyte aggregation (cold agglutinin), giant platelets, possibility of PLT clumps, fragmented leukocytes, malaria, Howell-Jolly bodies

TEST PARAMETER AFFECTED

Any Result outside of reportable range:

A. Caresphere will convert results outside of the reportable range into ">" or "<" values as appropriate

B. If a request is made by a physician to dilute the sample to obtain a result, contact leadership or pathology for further escalation. If dilution is approved, the sample must be sent to WDL for the dilution.

WBC/NRBC/Differential

Abnormal WBC scattergram Flag

A. Abnormal WBC scattergram flag is a non-specific flag which can be generated for a variety of reasons including increased numbers of abnormal cells, poor separation of WBC/NRBC populations or differential subpopulations, unlysed RBCs, high numbers of platelet clumps or other interfering substances and conditions.

B. This flag may impact WBC, differential and/or NRBC results. Look for dashes in place of numeric results or Asterisk next to results. (Note XNL analyzers do not report NRBC values.)

    1. If WBC or NRBC counts are flagged with (*) or have dashes (-- --) in place of numeric results, verify WBC and NRBC counts.

a. Check the sample for clots with sticks when making blood smear.
b. Review the peripheral blood smear to look for the presence of abnormal white blood cells, platelet clumps, giant platelets, micromegakaryocytes and lyse resistant RBCs such as sickle cells or Hemoglobin C crystals.
c. Perform a manual WBC and NRBC estimates and compare to the analyzer count
    i. The manual WBC estimate should be within 10% of the analyzer count.
    ii. The NRBC estimate, if it correlates +/- 10, accept the analyzer count.
    iii. If the estimates do not agree within stated limits, make a new smear to confirm the estimate. Two estimates must agree with each other within 10%.
    iv. If WBC is flagged with (*) or has dashes (-- --) in place of numeric result for original and repeat analysis, report out the manual estimation and add a comment that a manual estimate was performed.
d. If NRBCs or Micromegakaryocytes are present and are interfering with the WBC measurement, a count correction will need to be performed.
    i. WBC correction is required for specimens run on XNL analyzer when "NRBC?" is present in OP Alert and NRBCs are found on the blood smear.
    ii. Correction is less likely for the XN analyzer because the analyzer automatically corrects the total WBC and Lymphocyte counts for NRBCs counted by the analyzer. Consider correction if WBC is flagged with (*).
    iii. Use the following formula to correct the WBC count for interference:

$$\text{Corrected WBC} = \frac{\text{Uncorrected WBC X 100}}{\text{100 + \# of nRBCs and/or micromegakaryocytes}}$$

        a. Finding the Uncorrected WBC count on the Sysmex XN analyzer
            i. Under Explorer search for your sample accession number
            ii. Double click to open to results screen
            iii. Click the service tab
            iv. On the left hand side click WNR
            v. The uncorrected WBC count is the TNC-N

2. If differential results are flagged with (*) or have dashes (-- --) in place of numeric results, perform a manual differential via Cellavision or microscope as appropriate to your site.

Difference between WNR and WDF Flag on XN analyzer

A. This message is generated based on the ratio of the Total Nucleated Count in the WDF channel (TNC-D) to the Total Nucleated Count in the WNR Channel (TNC-N). The ratio is calculated as: (TNC-D / TNC-N). The message is generated when the ratio is > 1.3 or < 0.77. (This flag is not applicable to XNL analyzer)

B. Rerun the sample

C. If the message is not eliminated, verify WBC, NRBC and differential results

    1. Scanning the slide for abnormal cells and to estimate the WBC and NRBC counts
    2. Performing a manual differential if abnormal cells are observed
    3. If no abnormalities are found when reviewing the smear and the WBC and NRBC estimates are consistent with the analyzer reported results, the analyzer results may be reported.
    4. NOTE: If the analyzer has reported the WBC from the WDF channel, the WBC result will have the “&D” indicator adjacent to it.

WBC count Not Measured ("#NM")

A. For XN analyzer, if only a CBC or WBC count was ordered, run a differential off line on the XN analyzer. This can be accomplished using the manual mode on analyzer, typing in last four digits of specimen ID and telling analyzer not to read barcode.

    1. WNR and WDF channels both run a WBC count, if something is affecting the WNR channel, the WDF channel may be able to resolve the issue
        a. If a count is able to be obtained using the WDF channel, report out the WBC count from that channel

B. For XN and XNL analyzers, if a count is unable to be obtained, perform a manual WBC estimate and report estimate with comment that result is from estimate. See Manual Differential procedure for WBC estimate instructions.

Differential Result Not Measured

A. Perform manual differential (CellaVision is acceptable)

Definitive flag for WBC or Differential with no other alerts

A. Caresphere will add Pathologist Smear Review if appropriate.

B. During a Caresphere downtime, refer to Pathologist Smear Review criteria.

Differential Suspect Messages

A. If the OP alert states "Perform scan and MDIF if indicated", scan the smear for abnormal morphology (WBC or RBC) and agreement with the automated differential.

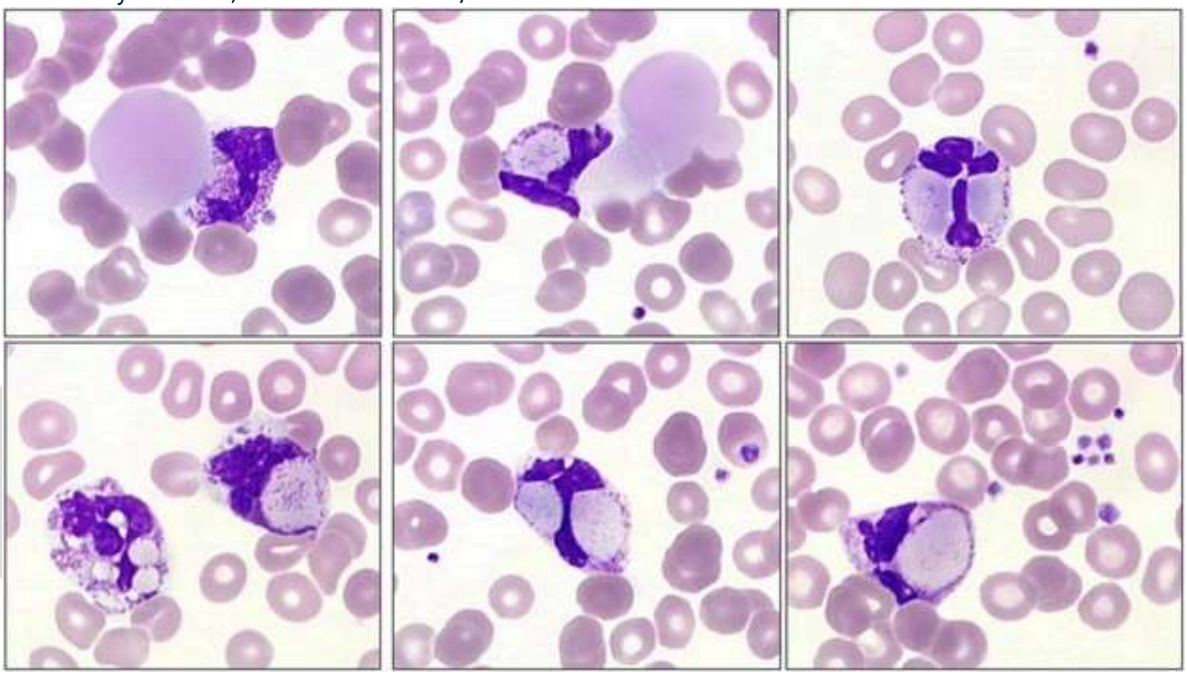
B. If abnormal cells are present or smear does not confirm automated count, perform a manual diff and/or morphology as appropriate (Cellavision is acceptable).If all agrees and no abnormal cells are present, automated differential can be reported.

C. If the OP alert states "IG >3%" and NEUTROPHIL is ordered, a manual diff must be performed (Cellavision is acceptable. Automated count cannot be used.)

D. If the OP alert states "perform manual microscopic", microscope must be used. Cellavision is not acceptable.

Cryoglobulins

A. Confirm presence of cryoglobulins on initial slide. Cryoglobulins appear as pale lilac amorphous cryoglobulin deposits between red blood cells. Neutrophils may phagocytize cryoglobulins resulting in compressed/distorted nucle.
Credit: Fayand et al, Brit Journal Haem, 2020



B. If warming corrects any of the parameters on the Sysmex those can be reported

C. If hemogram parameters do not correct on the Sysmex perform a spun crit-report spun crit if able

D. If Sysmex cannot determine platelet count, if able perform a platelet estimate

E. If cells are intact and discernible perform a manual differential

F. If nothing will correct and nothing can be determined on slide review report out parameters as Not Measured and place a comment of "Unable to Report Results due to Interfering Substances"

G. If this is not a known cryoglobulin patient- send the slide for routine pathology review

RBC/HGB/HCT/MCV/MCHC

NOTE: An MCHC up to 37.5 g/dL may indicate a normal specimen on the high end of normal range in which case no action is needed. This may occur more often in samples with higher hemoglobin and hematocrit results.

Consider the MCHC and the MCV together when evaluating results and the reasons for the interference.

Certain hemoglobinopathies (Examples: S-C, S-S, C-C, H-S) are known to produce hyper-dense RBCs with

increased MCHC values due to altered surface volume and/or deformability of the RBCs. In such cases, cell membrane changes produced by these hemoglobinopathies are not reversible or changeable. In individual patients, the quantity of hyper-dense RBCs may change when they are in crisis or from transfusion and/or drug therapies they are receiving. A smear review will reveal significant RBC morphology such as sickle cells and/or hemoglobin crystals.

Refer to the following table for possible interferences and corrective actions.

Pattern of Results	Encountered in
Low or Normal MCV High MCHC (>37.5 g/dL	• Hemolysis • Plasma electrolyte abnormalities (i.e., low sodium) affecting hematocrit results • Severe lipemia • Icterus • Severe Leukocytosis affecting hemoglobin measurement • Abnormal plasma protein precipitation affecting hemoglobin measurement **Refer to Troubleshooting Chart**
High MCV High MCHC (>37.5 g/dL)	• RBC Agglutination • Rouleaux **Refer to Troubleshooting Chart**

Troubleshooting Chart		
Low Sodium Affecting Hematocrit?	RBC Agglutination?	Severe Lipmemia, Icterus, Abnormal Protein or Leukocytosis affecting Hemoglobin Measurement or Hemolysis?
See Delta Check section below	See RBC Agglutination section below	See Turbidity/HGB Interference section below

RBC Abn Distribution and/or Abnormal, Dimorphic Population

The RBC Abn Distribution IP Message is generated when the histogram pattern from the RBC channel is abnormal or when RBC < 0.50 x 10^6 µL. Judgement for other RBC IP Messages is not performed when RBC is < 0.50 x 10^6 µL.

The Dimorphic Population IP Message is generated when there are multiple peaks in the RBC histogram pattern. This message may occur with the RBC Abn Distribution IP Message.

Dashes appear in place of affected results. For example, if there are multiple peaks present on the RBC histogram, there would be dashes in place of results for the RDW-CV. Sometimes this IP Message can cause the RBC, HCT, MCV, MCH, MCHC, RDW-SD and RDW-CV to be marked with an asterisk (*). The asterisk (*) indicates these results may be unreliable and should be confirmed by microscopic morphology exam.

A. scanning the peripheral smear for the presence of abnormal RBC morphology such as:
    1. increased anisocytosis
    2. multiple RBC populations
    3. fragmented RBCs
    4. poikilocytosis
    5. rouleaux
    6. RBC agglutination (If present, refer to “RBC Agglutination?” section of this procedure)
    7. Report any abnormal RBC morphology according Manual Differential procedure.

B. If no abnormalities are found when reviewing the smear and analyzer results are consistent with smear review findings, the results with asterisks (*) may be reported.

C. If dashes (— —) are in place of numeric data, rerun the sample. If dashes are still present, report as "not measured".

D. If the RBC morphology is normal and the MCHC is abnormal (37.5 g/dL) an interfering substance or condition may be present. Refer to Turbidity/HGB Interference? section of this procedure.

RBC Agglutination

Aggultination can be caused by cold agglutinins, warm auto agglutinins, and some medications. These drugs typically end with "-mab" in the name and the patient may be listed as a "research participant" in the left hand patient information column. The actions described below are only effective for cold agglutinins.

The RBC Agglutination? IP Message is determined by calculation and size comparison of certain RBC items (MCHC, MCH, RBC, Upper RBC histogram discriminator [RU%]*). *The RU% is not a reportable parameter, but it is used in the RBC Agglutination algorithm.

Asterisks (*) appear next to the RBC, HGB, HCT, MCV, MCH, MCHC and RET # parameters. The asterisk (*) indicates these results may be unreliable. **Note:** MCHC values <37.5 are acceptable and CBC results can be validated.

A. Scan the peripheral smear for the presence of agglutinated RBCs or visually check the sample tube for agglutination.

B. Order a rerun and repeat with prewarmed sample
    1. Place sample in 37°C heating block.
    2. Order a rerun in Caresphere
    3. After 15-30 minutes, manually mix the sample 15 times and run samples in manual mode.
        a. If the results correct (MCHC <37.5), report out the results.
        b. If the results **do not** correct, but improve, warm again for a maximum total time of 1 hour.
        c. If results do not correct after total warming time of 1 hour or if results are worse after warming, report only WBC (and Differential if ordered), Hgb, Platelet Count, MPV. Report RBC, HCT, MCV, MCH, MCHC, RDW as "Not Measured" with reportable test comment [MCHCIN] "Unable to perform other

test due to Other Substances."

Turbidity/HGB Interference

The Turbidity/HGB Interference? IP Message occurs when the MCHC is >37.5 g/dL and indicates that turbidity may be present in the diluted and lysed sample. This turbidity could interfere with the HGB detection light path and falsely increase the HGB value. An asterisk (*) will be next to the affected parameters (HGB, MCH, MCHC) and indicates these results may be unreliable.

A. Centrifuge an aliquot of the sample or inspect serum/plasma from chemistry sample from same collection. Inspect the plasma for lipemia, icterus, hemolysis. Document supernatant quality in Caresphere as internal order comment.
    1. If lipemia or icterus is present perform a plasma replacement procedure:
        a. Centrifuge an aliquot of blood from the primary tube to separate the cells from the plasma.
        b. Using a calibrated pipette, remove a measured amount of plasma removing as much plasma as possible without disturbing the buffy coat.
        c. Add back the same amount of CELLPACK DCL as the volume of plasma removed in step b. (Example: If 0.5 mL of plasma is removed then add back 0.5 mL of CELLPACK DCL.)
        d. Ensure a rerun is ordered in Caresphere before repeating the sample.
        e. Cap the tube and mix the sample by manual inversion 15 times until the cells are fully re-suspended in the CELLPACK DCL.
        f. Reanalyze the sample in the manual mode.
        g. Quality check results: WBC should match original result +/=5%, MCHC should be <37.5.
        h. Go to RERUN data and select results to report from appropriate runs.
            i. Report WBC/NRBC/DIFF and PLT/MPV from original run if they are not flagged with (*).
            ii. Report all RBC components from the second run.
    2. Hemolysis samples should be rejected and a redraw requested

B. Extreme leukocytosis may interfere with the RBC, HGB, HCT and MCV determinations. The degree of interference depends on the number and size of WBCs present in the sample in addition to the hemoglobin concentration of the sample. Evaluate the MCHC to help identify potential interference.
    1. If MCHC <37.5, report results
    2. If MCHC >37.5 and WBC/NRBC (XN analyzers only)/PLT/MPV results are reportable,
        a. select those results, add a reportable comment "specimen sent to WDL for additional testing" to WBC and click [Validate Sel].
        b. Order a rerun and send the specimen to WDL for further testing.
        c. Communicate RBC/Hgb/Hct parameter delay to provider when calling the critical value.

Hematocrit

A. **Hematocrit >55%**
    1. Alert the Coagulation Department as soon as samples are identified with a Caresphere Op Alert.
    2. Add HCT>55 FYI flag to the patient's chart.

B. If provider wants a hematocrit on a sample that was reported as "Not Measured", ask them to add a HCT order. Send the specimen, labeled with HCT label to WDL.

MCV

If MCV<70 or MCV>110:

A. Review smear for abnormal morphology.

B. If only morphology observed is related to cell size, report RBC Morphology "Present" along with "Morphology consistent with CBC results."

C. If abnormal shapes are observed, report RBC Morphology "Present" and indicate the specific abnormal morphology observed. See Manual Differential procedure for details.

DELTA Checks

MCV and MCHC are two calculations based on the RBC parameters of Red Blood Cell Count, Hemoglobin and Hematocrit. They are traditionally very stable and have limited physiologic changes over a short period of time. Variations in MCV and MCHC are caught using delta checks, which is when the result flags for a change over a specific period of time. There are a number of different reasons why MCV or MCHC will delta check; including but not limited to, hemolysis, mislabel, osmolality shifts, and recent transfusion. A thorough investigation of delta failures will ensure specimen integrity is intact.

A. **MCV**:
    1. Delta check will flag when MCV +/-5fL within 72 hours
        a. For a (+) MCV delta check, considerations include :
            i. Recent transfusion of LRBCs (↑/↓)
            ii. Specimen mislabels (↑/↓)
            iii. Significant change in patient glucose levels (High serum glucose = increasing MCV; Low serum glucose = decreasing MCV)
            iv. Significant change in patient sodium levels (High sodium = decreasing MCV, Low sodium = increasing MCV)
        b. If specimen mislabel is suspected, reject the specimen and request redraw.
        c. For all other situations, document investigation in Caresphere as an Internal Order Comments.
        d. If multiple patients are flagging for delta checks, investigate recent changes in analyzer reagents, especially diluent.

B. **MCHC**:

1. Delta check will flag when MCHC +/- 3g/dL within 72 hours
2. For a (+) MCHC delta check, considerations include:
    a. Recent transfusion of LRBCs (↑/↓)
    b. Specimen mislabels (↑/↓)
    c. New onset, acute hemolysis (↑)
3. If specimen mislabel is suspected, reject the specimen and request redraw.
4. For all other situations, document investigation in Caresphere as an Internal Order Comments.
5. If multiple patients are flagging for delta checks, investigate recent changes in analyzer reagents, especially diluent.

C. **Investigating Delta Checks**

1. Check specimen label for accuracy
2. Check integrity of specimen
3. Order rerun in Caresphere and repeat testing
4. Check age, storage, transport of specimen (must be <8 hours at room temp or <24 hours at refrigerator temp)
5. Check transfusion history record, if available
    a. Patients transfused with *significant* numbers of LRBCs over a short period of time will change their MCV with transfusion, such as patients with exchange transfusions or trauma patients.
6. Check concurrent chemistries if available (review by patient MRN in case multiple accessions exist for the same collection). Consult with the chemistry staff for guidance
    a. Look for supporting chemistry delta checks
    b. Review glucose, Na, and K results
    c. For higher than expected MCV: evaluate for *change* to a hyperglycemia, hypernatremia, hyperkalemia state to explain the increased MCV (this can be physiologic or from IV contamination)
        i. IV Contamination (more likely in inpatients): If the patient was receiving TPN (total parenteral nutrition) or dextrose or glucose infusions during the collection, IV contamination may be likely
        ii. Physiologic (more likely in outpatients): If the patient pathologically had a sudden change to high glucose, Na or K levels, then the result is likely expected
    d. For lower than expected MCV: evaluate for a *change* to a hypoglycemia, hyponatremia, hypokalemia state (physiologic)
        i. If the patient received too much insulin (leading to hypoglycemia), then the result is likely expected
        ii. If the patient pathologically had a sudden change to low glucose, Na, or K levels, then the result is expected

7. Check blood smear for previously described abnormalities and presence of polychromasia
8. Follow redraw process if specimen is hemolyzed, clotted, or if mislabel is suspected.
9. Notify lab leadership of any suspected specimen mislabel
10. Consult with technical specialist or Sysmex Technical Assistance Center (888) 879-7639 if reagent issue is suspected due to multiple delta check alerts in a short period of time.
11. Consult with Pathology for any challenging patients that need further investigation

Suspect, Fragments?

A. Scan the peripheral smear for the presence of fragmented RBCs and other poikilocytosis.
B. Report the presence of any clinically significant RBC morphology according to Manual Differential and Pathologist Smear Review procedures.

Platelet Count

The platelet count can be affected by EDTA sensitivity, drugs, or other conditions that cause an interference with the analyzer methodology. PLTF test is available on XN analyzers. PLTF measures platelets using a nucleic acid stain specific for platelet organelles and flow cytometry. The PLT-F result will have "&F" to the left of the result indicating the result was obtained in the PLT-F channel. PLTF should be reported when available.

PLT Abn Distribution

A. All analyzers
    1. Dashes may appear in place of data for the MPV or the MPV may be marked with an asterisk (*). The asterisk (*) indicates these results may be unreliable and should be confirmed by reviewing smear for giant platelets or schistocytes.
B. XN Analyzer:
    1. If PLT count is <150, Caresphere will reflex the PLTF test.
        a. In the absence of other platelet Messages or (*), the PLT-F may be reported with no further action.
        b. If on rerun an asterisk (*) is present on the PLTF result, proceed with smear review as described under XN-L Analyzer below.
    2. Note: Default setting is to mask Plt Abn Distribution flagging when PLT-F is utilized.
C. XN-L Analyzer
    1. Scan the peripheral smear to estimate the platelet count and review for the presence of abnormal RBC or PLT morphology such as:
        a. large or giant platelets
        b. small platelets
        c. platelet clumps
        d. fragmented RBCs

e. microcytic RBCs

f. parasites

2. If abnormal RBC, PLT or other morphology is noted, report according to Manual Differential procedure. NOTE: Reviewing the feathered edge and sides of the peripheral smear is suggested as platelet clumps and fibrin strands may migrate to this area during smear preparation.
3. If no abnormalities are found when reviewing the smear and the analyzer platelet result is consistent with smear review findings, the results with asterisks (*) may be reported.
4. If platelet estimate does not confirm accuracy of analyzer count, make a second smear to confirm previous estimate. Report any clinically significant RBC and/or PLT morphology. Report the PLT estimate and add reportable test comment PLTEST which expands to "Platelet count is a slide estimate"
5. If platelet clumps have interfered, see Platelet Clumping section below.

Platelet count <50

A. Check sample for clots and make a blood smear.

B. Perform platelet estimate to verify count, check for clumping and schistocytes.

1. Follow separate instructions below for presence of clumping.
2. If schistocytes are present follow pathology smear review procedure.

C. XN analyzer will perform PLTF. If no flags, PLTF can be reported.

PLT Clumps?

A. Check specimen for clot using applicator sticks.

1. If specimen is clotted or contains macroscopic fibrin strands, cancel the order in Caresphere. Follow redraw process to have sample recollected.
2. If no clot is found proceed with making a smear to check for microclots, fibrin strands, and platelet clumps.

B. When platelet clumping without fibrin is present:

1. Check to see if an extra blue top tube is available for citrated platelet analysis.
    a. If available, proceed to citrated platelet analysis section of this procedure.
    b. If no blue top tube is available, proceed through steps in this section.
2. If clumped platelets are seen on a smear and there is not a discrepancy between the platelet estimate and automated count, the following comment should be resulted in Caresphere: "Results may be inaccurate due to slight platelet clumping."
3. If clumped platelets are present to the extent that it is not possible to report instrument result or an accurate estimate,
    a. Report both the PLT and MPV as"Not Measured" **and**
    b. Add the reportable Caresphere test comment [PLTRED] which expands to "Unable to report platelet count or platelet estimate due to marked clumping.

Recommend ordering CPLT and drawing specimen in a Light Blue Top (Citrate) tube along with the Lavender (EDTA) tube for the CBC or PLTCT order."

4. If a qualitative assessment can be performed, report both the PLT and MPV as"Not Measured" **and** add the most appropriate of the following comments in Caresphere:
    a. Platelets clumped, unable to report count. Number appears adequate. [PLTCAD]
    b. Platelets clumped, unable to report count. Number appears decreased. [PLTCDE]
    c. Platelets clumped, unable to report count. Number appears increased. [PLTCIN]
    d. Note: Qualitative ranges are based on the reference range for platelets being 160-400,000/uL
5. Use Epic FYI to alert phlebotomy team to need for blue top tube in addition to the lavender tube for future CBC orders.
    a. Click on the **FYI** activity and then click the **New Flag** button.
    b. In the **Flag type** field, choose **Platelet Clump: lavender and blue tube needed.**
    c. In Summary space, add the .**CLUMP** SmartPhrase "CBC Platelet Clumping. CP Hub and Urgent Care labs draw extra citrate tube."
    d. The "Platelet Clump: lavender and blue tube needed" FYI flag will put a hold on all hematology results. When hold is present, check for citrated platelet count and blue top tube. Review slide for platelet clumps, even if there weren't any analyzer flags for platelet clumping.

C. When platelet clumping with fibrin strands is present follow the redraw process.
    1. If microscopic fibrin strands are present and the WBC and platelet estimates agree with analyzer results, the results can be reported.
    2. If microscopic fibrin strands are present and the WBC and platelet estimates DO NOT agree with analyzer results, DO NOT report any results and request a redraw. (Use Cancel/Reorder process for outpatients)

D. If no indications of clotting, fibrin strand, or platelet clumping are seen on the slide, verify the platelet and WBC counts by slide estimates. Look for potential causes of the flag or histogram abnormality (examples: nRBCs, Megakaryocyte bare nuclei, giant platelets). If PLT and WBC estimates agree within 20% of analyzer count, the results can be reported.

Citrated Platelet Count (CPLT)

A. Orders for a citrated platelet must accompany orders for a PLTCT or CBC

B. Before running CPLT, ensure that patient has PLATELET CLUMP FYI Flag on their chart. If it is not present, add it before running the sample.
    1. Scan in results entry or find patient specimen on the outstanding list
    2. Click the actions button
    3. Click Patient FYI

4. In the upper left corner click New Flag
5. The contact field should automatically populate
6. Under flag type select Platelet Clump: Lavender and blue tube needed
7. After filling in the flag type click accept in the lower right corner

C. Citrate Platelet samples are only stable for one hour at room temperature after collection.
    1. Samples outside of 1 hour or refrigerated are unacceptable

D. Run both specimens, and prepare and stain smears from both the lavender and blue top tubes

E. Review the slides and perform a platelet estimate. Multiply the estimate for the blue top by 1.1 to account for the sodium citrate anticoagulant present in the tube. Caresphere will automatically multiple the platelet count from blue top tube by 1.1.
    1. If the lavender top is acceptable, report EDTA platelet results, and delete the CPLT field with the following comment: "See platelet count reported from lavender top (EDTA) tube."
    2. If the lavender top contains platelet clumping, and the blue top is acceptable:
        a. Delete the PLT field with the following comment: "See platelet count reported from Na Citrate (blue top) tube." Ensure that this result has been verified in LIS before verifying the CPLT.
        b. Caresphere automatically adds the following comment to the CPLT field: "Platelet count derived from Na Citrate (blue top) tube."
    3. If both the lavender and blue top contain platelet clumping, perform a qualitative assessment using the guidelines listed in PLT CLUMPS? sectin of this procedure.

Reticulocyte Count

The RET Abn Scattergram IP Message can only be generated on the XN-Series if the reticulocyte parameter is ordered.

This IP Message indicates that the analyzer has detected increased activity in the RET-THR (threshold) area of the RET scattergram or increased activity in the RET-UPP (Upper Particle Plateau) area on the RET-EXT scattergram. RET-EXT scattergram: The RET-UPP area (green area past reticulocytes) is abnormal due to the possible presence of NRBCs, Howell-Jolly Bodies or parasites. These are not included in the reticulocyte count.

A. **Retic Abnormal Scattergram**
    1. When the RET Abn Scattergram flag is present and there is no asterisk (*) on the RET%, RET#, IRF and RET-He parameters, they may be reported without further review.
    2. When asterisks (*) appear next to the RET%, RET#, IRF and RET-He parameters, the asterisk (*) indicates these results may be unreliable and should be confirmed.
        a. Order rerun in Caresphere and send specimen to WDL for further testing.

REFERENCES

A. Sysmex America, Inc; XN-Series Automated Hematology Systems Flagging Interpretation Guide; Document Number: 1399-LSS, Rev. 3; Lincolnshire, IL; February 2021

B. Sysmex America, Inc; XN-Series Automated Hematology Systems Flagging Interpretation Guide; Document Number: CF-07937; Lincolnshire, IL; September 2023

C. Platelet count in sodium citrate-anticoagulated whole blood: Comparison to EDTA-anticoagulated results and stability over time - Weber - 2021 - International Journal of Laboratory Hematology - Wiley Online Library

D. Froedtert Hematology Collaborative Team Meeting Minutes

Attachments

- Appendix B: Rare vs Significant Fibrin
- Calling Critical Results Flow Chart
- Cryoglobulins.jpg
- XN-L Series Flagging Guide.pdf
- XN-series_Automated Hematology Sytems Flagging Interpretation Guide.pdf

Approval Signatures

Step Description	Approver	Date
Technical Specialists	Colleen Turtenwald: Technical Specialist	Pending
Technical Specialists	Carolyn Webb: Heme Technical Specialist	03/2025
Policy Owner	Carolyn Webb: Heme Technical Specialist	03/2025

Applicability

Community Physician

Standards

No standards are associated with this document