Q&A column, 10/15

Editor: Frederick L. Kiechle, MD, PhD

Submit your pathology-related question for reply by appropriate medical consultants. CAP TODAY will make every effort to answer all relevant questions. However, those questions that are not of general interest may not receive a reply. For your question to be considered, you must include your name and address; this information will be omitted if your question is published in CAP TODAY.

Submit a Question

Q. We have always considered the absolute neutrophil count to include segmented neutrophils and bands only. Should other immature cells such as myelocytes, promyelocytes, and metamyelocytes be included in this calculation?

A. The absolute neutrophil count (ANC) is a critically important component of the complete blood count. The reference interval in adults is typically 1.5 to 8.0 × 109/L (1,500 to 8,000 cells/µL). Absolute neutrophilia is usually an indicator of systemic infection or inflammatory response. Neutropenia, on the other hand, strongly correlates with increased susceptibility to infection. The ANC should include segmented neutrophils and band neutrophils only. The rationale for excluding immature granulocytes (promyelocytes, myelocytes, and metamyelocytes) is that they lack the immunological function of band and segmented neutrophils in the clinical setting of infection. Mature neutrophils and bands possess the necessary cellular machinery to combat infectious microorganisms and clear unwanted cellular debris through mechanisms such as extravasation into tissue, degranulation, and phagocytosis.[1] The ANC can therefore be regarded as a functional measure with vital clinical utility.

Although not incorporated into the ANC, immature granulocytes should be recognized and included in the white blood cell differential. Identifying these cells in the peripheral blood may provide important diagnostic information, particularly in the setting of myeloid neoplasms. Blasts, when present, should be reported separately since their numbers are important for classifying acute leukemias, myelodysplastic syndromes, and myeloproliferative neoplasms. Historically, automated white blood cell differential counts performed by hematology analyzers were limited in terms of evaluating granulocytes, with the neutrophil category often including not only segmented neutrophils and bands but also at least a subset of immature granulocytes. Manual differential counts consisting of several hundred cells were typically required to accurately classify immature granulocytes, although this method may lack clinical relevance if a small proportion of immature granulocytes is present. Recent advances have improved the automated detection of immature granulocytes. Some modern automated hematology analyzers use a flow-cytometry–based approach to detect and quantitate immature granulocytes alongside the standard five-part differential. Recent studies evaluating this methodology have found that the instrumentation is quite accurate in classifying immature granulocytes up to a threshold of 10 percent of the total leukocytes.[2] However, identification of immature granulocytes by automated cell identification methods appears to lack sensitivity in screening for infection.[3] The ANC remains the most clinically important parameter in this regard.

1. Kumar V, Abbas AK, Fausto N, Aster JC. *Robbins and Cotran Pathologic Basis of Disease*. 8th ed. Philadelphia: Saunders/Elsevier; 2010.

2. Bourne S, Ma N, Gulati G, Florea AD, Gong J. Evaluation of automated versus manual immature granulocyte counts. *Lab Medicine.* 2013;44:282–287.
3. Ansari-Lari MA, Kickler TS, Borowitz MJ. Immature granulocyte measurement using the Sysmex XE-2100. Relationship to infection and sepsis. *Am J Clin Pathol.* 2003;120:795–799.

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Q. Are pediatric reference ranges for chemistry panels from tibial marrow the same as for peripheral blood? If not, what are they?

A. There is not enough information available in the literature to answer that question. Matrix effects from marrow tissue and bone particulates as well as equilibrium issues with systemic circulation are potential sources of interference with this type of specimen. There are only a small number of studies that compare intraosseous to venous specimen laboratory results. All of the studies are small but do show a correlation for red cell, hemoglobin, and hematocrit results. However, some studies have shown that the correlation between intraosseous and venous samples for common laboratory measures is dependent on the volume of marrow waste drawn. Additionally, we could not identify any manufacturers that have validated their respective instruments for intraosseous specimen types. Consequently, any testing of intraosseous blood would be considered a laboratory-developed test, thus requiring validation studies and development of reference interval ranges for the institution.

We recommend discussing this issue with your local pediatric emergency medicine physicians to assess how many of these specimens they might be sending under the guise of venous collected specimens and cautioning them that testing on such specimens has the potential to be erroneous due to matrix effects and systemic/intraosseous equilibrium issues.

1. Miller LJ, Philbeck TE, Montez D, Spadaccini CJ. A new study of intraosseous blood for laboratory analysis. *Arch Pathol Lab Med.* 2010;134(9):1253–1260.
2. Johnson L, Kissoon N, Fiallos M, Abdelmoneim T, Murphy S. Use of intraosseous blood to assess blood chemistries and hemoglobin during cardiopulmonary resuscitation with drug infusions. *Crit Care Med.* 1999;27(6):1147–1152.
3. Nicoll SJ, Rochester SJ. Blood sampling through intraosseous needles: time to stop? *Resuscitation.* 2008;79(1):168.

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Q. I've talked to other pathologists about their experience with speech recognition, and it tends to vary greatly from group to group. Some have an easy time and others find it difficult and just tolerate it. How can this varied experience with the same product be explained?

A. As I have mentioned in past articles in CAP TODAY, speech recognition is not a product/solution. It is a technology that can be used as part of an effective pathology reporting solution like our VoiceOver product. I can't speak entirely for other implementations of speech recognition technology, but among our VoiceOver client base we do see variances in initial adoption satisfaction. I would not objectively describe those variances as great, and they tend to narrow with time and experience. As I like to say, "The devil is in the details."

I recently wrote a three-part blog series intended to help pathology sites determine what solutions are best for them and how they can better predict success at their site. In the third part of the series, "Ways to make sure your speech recognition selection isn't a failure," I discuss the many variances in pathology laboratories that make it difficult to look at any one user, at any one site, and at any one AP system and predict your success based on their experience (https://j.mp/speechsolution). All users, sites, AP systems, and workflows are not created equal, and each combination brings its own unique implementation success challenge.

Since speech recognition technologies and solutions are not self-contained reporting solutions, they rely on the underlying AP system and its workflow, which are major variables in the user experience. Specifically, there are variances in:

- User role (pathologist, resident, PA, others)
- AP system (Cerner, Epic, Meditech, Soft, Sunquest, others)
- AP system infrastructure (client/server, virtual, or cloud)
- Workflow (gross dictation, microscopic dictation, autopsy, other)
- Organization type (academic hospital, private lab, hospital group, other)
- Site locations (multisite versus standalone lab)

In each case, different combinations of these factors create many permutations of variance with challenges to address to create similarly successful user experiences.

Finally, I asked my director of client services, Lindsey Pitsch, what she believed caused the biggest variations in initial user satisfaction and acceptance, and she said that in most cases there is a direct correlation between satisfaction and user involvement in the planning stages of the implementation process. She believes that sometimes administrators take over with the thought that it is better for the pathologists to not "waste" their time on a change that the administrators perceive to be an administrative task. The problem is that they aren't just replacing a dictation system. The change alters the user's daily workflow. We always request the presence of PAs and pathologists on project teams. We have historically seen that those clients with users who participate fully in the implementation process tend to have a much higher initial satisfaction rate. Their voices are heard and they know what to expect when they go live. When users are not involved, sometimes they receive the wrong message. They think speech recognition will never make a mistake or that on day one they will be exponentially faster than with transcription. By keeping users involved you can properly set and manage expectations, which will lead to a more successful user experience and perception.

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Dr. Kiechle is medical director of clinical pathology, Memorial Healthcare, Hollywood, Fla. Use the reader service card to submit your inquiries, or address them to Sherrie Rice, CAP TODAY, 325 Waukegan Road, Northfield, IL 60093; srice@cap.org. Those questions that are of general interest will be answered.

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