LEUKOCYTE DIFFERENTIAL AND RBC RETICULOCYTE COUNTS:
A case and proposal for simplifying lab reports by discontinuing reporting of percentage values

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As a result of changes in laboratory technology and methods of reporting, CBC results have become longer and more complicated. Currently there are 22 parameters reported with each CBC and differential test and this does not include many qualitative morphologic cell observations. Factors contributing to the complexity include the long standing tradition of reporting all parameters, the routine inclusion of parameters and indices reported by newer automated instruments, the general belief that “more is better,” and the intent of being all-inclusive in satisfying a diverse population of laboratory users. Previous newsletters have provided clinical guidance for the implications of technologic advances implemented in our laboratory for CBC testing in attempt to keep our users up to date of changes. Newsletters that have provided information on the clinical impact of our new CBC analyzer (April 2002), background information on the “Immature Reticulocyte Fraction” (IRF) reported with each reticulocyte count (November 2002), clinical utility of Platelet Reticulocytes (December 2006), and automated Immature Granulocyte counts (June 2007). Newsletters can be accessed online through the hospital’s public web address: www.childrens-mercy.org by accessing the Pathology and Laboratory Medicine department webpage.

Recent surveys of clinical practice indicate that much of the data reported in CBC results is not used. Not surprisingly; the survey indicated that more than 90% of pediatric physicians found that the Hemoglobin, Hematocrit, MCV, WBC, and platelet counts were frequently or always useful in the evaluation of patients with anemia or quantitative leukocyte or platelet abnormalities. Less than 50% of respondents found the RBC, MCH, MCHC, and MPV useful in similar circumstances. Red blood cell RDW was considered frequently or always useful by 70% of pediatric physicians as opposed to less than 50% of all other specialty physicians. Only 40% of physicians including a disproportionately higher number of new physician, found the Immature Reticulocyte Fraction useful in the assessment of anemia; most physician only consider reticulocyte percent and absolute retic counts. Greater than 90% of respondents found the WBC percentage values frequently or always useful as opposed to only 50% of respondent reporting absolute leukocyte subset counts as “frequently or always useful.” Reasons why most physicians prefer percentage over absolute cell counts are not clear though it was suggested that this preference reflects difficulty conceptualizing absolute counts per unit volume and difficulty remembering normal ranges as opposed to relative proportions. That fact that parameters are regarded as “rarely” or “not useful” is not taken to suggest that they should be dropped from reports. Rather on infrequent occasions, these parameters may be quite useful. For example, a high RBC count is useful for pointing to Thalassemia as a root cause for microcytic anemia as opposed to iron deficiency.

However, the preference for relative percentage data over quantitative values is quite surprising. Failure to convert WBC percentages into the absolute cell counts can result in misinterpretation of abnormalities. A reversal of the neutrophil to lymphocyte ratio can be misinterpreted as lymphocytosis, when in fact the patient is neutropenic. Significant lymphopenia is easily overlooked in an infected patient with granulocytosis, yet both aberrations are easily recognized when one looks only at the absolute neutrophil and lymphocyte counts. Delayed diagnosis of Severe Combined Immunodeficiency, AIDS and other immunocompromised states are some of the consequences of these types of errors. To facilitate correct interpretation of the differential count, many laboratories including our own, began reporting both percentages and absolute cell counts, adding length and complexity to the report. Some years ago we discontinued reporting normal ranges for percentage values since the practice may contribute to missing clinically significant cytopenias and cytoxes. Few institutions have gone so far as to discontinue reporting WBC differential percent values all together as I am proposing.

Only absolute counts reflect the pathophysiologic state and magnitude of host response to an illness and are more reliable parameters for tracking temporal changes during the course of disease or in response to treatment than relative percent values. Different leukocyte cell types often respond differently and independent of one another; these cellular responses may be missed when not converting to absolute values. Medical student curriculum is
beginning to incorporate these changes and approach and it is easier to teach the use of WBC differential with a quantitative approach than teaching and having to assimilate use of relative values. Much of current day practice preference is likely determined by what was taught which was shaped by outdated methods. In the past, absolute differential leukocyte counts were calculated from constituent parts (absolute neutrophil count = manual % neutrophils x WBC); this contrasts with modern analyzers that directly measure absolute leukocyte subset counts and then revert to calculating percentages. Access to only absolute values would not limit the ability to calculate various ratios of immature-to-mature cells for considering patient risks; one only needs to divide the corresponding absolute values to calculate these ratios (e.g. neutrophil I:T = sum of absolute unsegmented neutrophil count divided by total neutrophil count).

The laboratory would like the medical staff to consider a proposal to drop reporting percentage values for the different leukocyte subsets on laboratory WBC DIFFERENTIAL reports. This proposal is being put forth mainly in the interest of simplifying the medical record and improving patient safety by not providing redundant data that can be confusing and misinterpreted. The medical record is already overloaded with redundant data and the job of viewing and interpreting all the data needs to be simplified even beyond this proposal. The fact is “More” is not always better especially in this day and age of information overload. Investigators in the field of informatics have shown that as information density increases, search time increases and data retrieval accuracy falls. Instead of reporting the percentage values for various leukocyte subsets when a WBC differential is requested, the lab would report only absolute values and age-related normal ranges. This would include reporting neutrophilic bands and more immature granulocytes, lymphocytes, monocytes, eosinophils and basophils as number of cells per microliter rather than percentage of total leukocytes (e.g. Absolute neutrophil count = 3.5 x 10^3 / ul, absolute bands = 1.0 x 10^3 / ul, absolute lymphocyte count = 3.2 x 10^3 / ul, absolute eosinophil count = 0.60 x 10^3 / ul, etc). Please carefully consider the following before you submit comments to me dzwick@cmh.edu. This proposed change will not be made unless there is substantial support on the part of the medical staff of the hospital.

References: