The Rationale for a Methodical Approach to Interpreting the Complete Blood Count and Its Development

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LEARNING OBJECTIVES

1. Describe the value in using a methodical approach to interpretation of complete blood counts (CBC).
2. Explain how a methodical approach to CBC interpretation for laboratorians differs from that used by physicians and other care providers.

ABSTRACT

Using a consistent and methodical approach to interpreting results of a complete blood count can help ensure that reported results are accurate and no diagnostically significant results are overlooked. The approach presented in the Focus articles to follow was developed through observation of professionals and refined after use with hundreds of students. The approach is different than diagnostic algorithms used by care providers in that the steps aid in detection of spurious results that must be corrected before results can be reported by the laboratory.

ABBREVIATIONS: CBC - complete blood count

INDEX TERMS: Complete blood count, CBC, algorithm, blood cell count, quality control

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This edition of Focus emphasizes the development of a specific thinking skill: methodical interpretation of the complete blood count (CBC). In this context, "interpretation" will not mean using CBC results for diagnosis, though the following procedures contribute to that outcome. Rather, the emphasis will be on gleaning as much information as possible from the CBC results and ensuring that the results are reportable, after which, a diagnosis can be made. Ensuring that results are reportable is an important aspect that differentiates these procedures from most published diagnostic or management algorithms intended for care providers.

For each portion of the CBC (red blood cells, white blood cells, and platelets), diagnostic and management algorithms can be found in the literature. They apply CBC results to differentiate patient conditions or to effectively apply treatments. Although diagnostic/management algorithms are valuable to laboratorians, they fall short of meeting laboratorians' specific needs in two respects. First, they make assumptions that the CBC data have been interpreted and translated properly into the terms used in the algorithm and second, that the patient results are accurate and reliable.

As an example of the first shortfall (proper interpretation and translation), the diagnostic algorithm may refer to "anemia," while patient results are provided in terms of red blood cell counts, hemoglobin levels, and hematocrits. Laboratorians need to be able to translate those reported numerical values into the language of medicine in order to use diagnostic algorithms. Though most laboratorians learn to do this, the methodical approach in these articles will facilitate acquisition of that skill, particularly for laboratory students, and ensure that no diagnostic information provided in the results is overlooked.

The second shortfall of diagnostic/management algorithms is the underlying assumption that the patient results that are used in the algorithm are accurate and reliable. This is as it should be – care providers need to

trust laboratory results. However, laboratorians must remain a bit circumspect about test results until all quality control and quality assurance methods have been applied. It is the incorporation of those aspects in these procedures that truly makes them specific to the needs of laboratorians.

The procedures presented in the following articles are founded in my observations of the approach to CBC interpretation used by other laboratorians but also by the physician hematologists and pathologists with whom I have worked. I once asked a colleague to come to a class and think out loud through a CBC so that students could "observe" the process. Another time, I was writing examination questions with physician hematologists in the medical school and they would mumble their interpretations as they pondered an unfamiliar CBC. The similarities in the manner in which the individuals approached the data were striking and I decided that my students needed to learn this overtly. I then applied an instructional approach, learned from Dr. Steve Yelon at Michigan State University,[1] to make one's thinking processes visible to students. The result is essentially a procedure (so appropriate for laboratorians!) for interpreting the results of an extensive set of interrelated assays and calculations - the complete blood count. These procedural steps have been refined and revised extensively since I first began using them.

These articles make an assumption about the reader's background; that is, that the reader knows how the results of the measured parameters are generated for the CBC being interpreted. It is well beyond the scope of these monographs to explain the manner in which electrical impedance instruments count cells and contrast that with flow technologies, for example. However, it is critical that results be interpreted within the context of known interferences and with an understanding of the principles behind the assays. That added step cannot be fully addressed in these articles, but those instances where that understanding must be applied will be highlighted.

I wish to express appreciation to individuals who assisted, sometimes unknowingly, in the development of these procedures and articles. In addition to the colleagues who helped me "see" into their thinking processes, I must express appreciation to the many students whose stumbles revealed to me the weaknesses in the procedure that I taught them at that time. Thanks to physician colleagues who reinforced the value of this process when I taught it to medical students, sans the quality assurance portions. Appreciation is also due to Bernadette "Bunny" Rodak. As editor of her textbook, she accepted my proposal to add a version of these procedures to a chapter on peripheral blood film examination. Maybe it was not the best fit in that chapter, but I just wanted it to be some place in the book. Particular thanks then go to my co-author of that chapter, Lynn Maedel, who was one of those individuals whose thinking process inspired this and then who helped refine the procedures in print. More recently, my thanks go to Dr. Elaine Keohane, current editor of Rodak's Hematology, and to Elsevier Publishers for permission to share the content in this Focus series, while respecting their copyright concerns. And finally, thanks to my Focus co-authors whose examples bring the procedures to life and demonstrate why using these procedures can make a difference in the work laboratorians do.

REFERENCES

1. Yelon SL. Powerful Principles of Instruction. White Plains, NY: Longman Publishers USA; 1996.