

COMMENTARY

Why the Basic Sciences?

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In any field of endeavor requiring manual skills and cognitive judgment, there are two large categories of people. The first are the technicians. They are highly trained in the operation of the equipment or performance of various procedures. Their knowledge and experience is limited to the operational aspects pertinent to their jobs. Though they are quite adept in their job-performance, they are not expected to know or understand the why or how of what they are doing. Their role is simply to follow the recipe or flow chart.

In a clinical setting, the technician generates data or performs a routine, repetitive, standardized procedure. They are neither responsible nor expected to determine what procedures or data is indicated nor to interpret the data generated. The technician does not develop the procedures or tests or establish their potential usefulness. Admittedly, with experience they do develop an intuitive understanding of the indication and interpretation of the tests and data, but they are still expected to confine their role to collection of the information.

The technologist represents the second group. These people by virtue of education, training and experience are the ones who are responsible for the technicians. Though they both work as a team and complement one another in their knowledge and skills, the technologists are necessary for the direction and supervision of the technicians. As such, the technologist must know *and* understand the how and why. They must be able to determine if results gathered are correct or not, if one procedure is indicated over another, and how to perform it properly. They need to be able to think through a problem when it deviates from the typical or expected. The technologists are the ones who develop the protocols, recipes, and/or flow charts. To accomplish this they need a comprehensive *understanding* of their domain.

In a clinical setting the physician is a technologist. Though there are others in the health care team that are deemed technologists, the physician must be the ultimate technologist as the physician has the final responsibility for the patient. The physician, as the ultimate technologist, must *understand* the working of their domain, the human

organism, in order to provide the requisite leadership and direction.

The basic medical sciences are the crucial foundation for understanding the operation of the human body in health and disease. To solve the problems that are present, whether typical or not, requires understanding of what is happening and how to correct it. This understanding of “basic sciences” is used each day when a physician confronts a patient and attempts to generate a diagnosis and treatment plan. The signs and symptoms displayed are the initial clues. These clues can and are assembled and interpreted as the body’s response to some anomaly. The understanding of how the system works (basic science) allows the physician/technologist to correctly solve the mystery (diagnosis) and establish an appropriate treatment plan. If things go awry (deviation from the flow chart/recipe) the physician/technologist can then adjust accordingly.

Examples of this abound, such as acid-base physiology, encompassing renal, respiratory, CNS, GI, and metabolic systems. Consider a child with the flu. Nausea and vomiting are common occurrences. They can quickly produce dehydration and metabolic acidosis. What happens next? What will dehydration produce? How? What steps can be taken to combat these effects? Why? The technician knows the list of signs and symptoms and the appropriate response for each (recipe/flow chart), while the technologist understands the why and how. The technologist will develop and refine the flow charts. The technician will blindly follow the orders.

The final question then is simply should we be training our students to be technicians or educating them to be technologists? The basic medical sciences, the why and how, are the foundations for clinical medicine. Clinical medicine is the application of the *understanding* of the science basic to medicine to attempt to achieve a desired outcome. The technologist understands when, why, and how to manipulate the system. The technician knows only to follow the flow chart. Which would you want directing your medical care?