WAYNE STATE School of Medicine | Department of Biochemistry, Microbiology and Immunology

BMI Teaching Trends Newsletter – November 2021

Teaching Matters
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The Decline of Basic Sciences in Medical Education

The Flexner Report commissioned by the American Medical Association and under the aegis of the Carnegie Foundation sought to define what the modern medical school should be doing with its future physicians. That report identified a need for laboratory work and dissection as part of training medical doctors to foster their deep understanding of human physiology and anatomy so that they could better treat their patients. Abraham Flexner's tour of medical schools in the US and Canada found that most were woefully inadequate ultimately forcing mergers and closings and reducing the number of North American medical schools from 160 to 66 by 1935. An interesting anecdote from Flexner's numerous site visits was that the dean of one midwestern medical school rushed him past locked rooms that presumably housed the student teaching labs. When Flexner returned later and bribed a janitor to open a room labeled "Physiology", he found nothing other than some student desks with no lab equipment. His observation of the lack of teaching lab resources seems reflected in the medical schools of today that have eliminated lab experiences even eliminating cadaveric dissection. The rationale is usually money, declining faculty numbers and incentives, and the necessary time in the curriculum to meet the current trends in medical education such as healthcare systems and ethics. Unfortunately, the critical thinking practice provided by the basic sciences is being sacrificed.

In general, medical trainees perceive biomedical sciences as being less relevant to clinical care and is reflected by the common perception of medical students and recent graduates that "I learned everything that I need to know in clinic." This departure from reality coupled with the long-standing concern in medical education over the poor retention of basic science knowledge compelled a group in Toronto to conduct a metanalysis in 2016 of the amount of basic science articles published in high impact journals which presumably play pivotal roles in the lifelong education of medical doctors. This report looked at high impact journals from eight different clinical specialties (cardiology, endocrinology, gastroenterology, infectious diseases, nephrology, neurology, oncology, and pulmonology) between the period 1994 to 2013. Depending on the medical specialty, they found a 40–60% decline in basic science research articles over time. These authors used search terms for publications dealing with disease pathogenesis, human physiology, biologic markers of disease, and genetic polymorphisms. As a control for their search keywords

they used the Journal of Biological Chemistry, the Journal of Clinical Investigation, and Cell. Negative controls were the three highest-impact general medical journals: The Journal of the American Medical Association, Lancet and the New England Journal of Medicine which publish few basic science articles. They also controlled for the proportion of clinical trial articles which did not change over the 20-year period examined. This is a troubling finding in context of the Precision Medicine Initiative and the advent of 21st century personalized medicine which will require application of genomics and molecular biology in addition to the fundamental expectation that practicing physicians possess a deep understanding of the underlying pathophysiology of human disease. Editorial decisions for the high impact medical specialty journals surveyed in this report reinforce the subconscious message to the MD community that basic science research is not relevant or not worth the mental effort required to read the article. Are future physicians then destined to become technicians with only those few who have dedicated a significant portion of their training to research responsible for the practice of precision medicine?

The pressure for medical schools to increase curricular content at a time when a significant number are considering decreasing their program to three years contributes to curriculum hypertrophy resulting in less time for serious learning of the basic sciences. The rapid decline in knowledge that is superficially learned and assessed contributes to the decline as physician educators lacking a deep appreciation for the scientific attitude assume roles as medical school decision-makers. A 2018 Commentary in the Canadian Medical Education Journal *Do we pay enough attention to science in medical education?* provides a possible solution by addressing the inefficiency of traditional educational practices and offers hope with insight provided by the learning sciences. A collaborative approach between medical and general educators that began in the 1950s at the University of Buffalo School of Medicine offers the evidence-based solution of integrating basic science teaching into the clinical rotations. A drawback to this approach is that when a basic science concept is learned in the context of a clinical scenario, it may be remembered only in the context of a very similar scenario. A specific scenario may serve as a retrieval cue a short-circuit the student's deep learning of the concept. A way to overcome this limitation is through reinforcement, i.e. the application of a basic science principle with multiple scenarios (either with actual patient encounters or as part of problem-based discussions) to teach a core concept along. Unfortunately, the lack of incentives available for to basic science and clinical educators to form the necessary collaborations will limit these efforts for those medical schools that lack the needed vision. A statement from the 1910 Flexner report seems appropriate at a time when there is an acute need for healthcare professionals to embrace the basic sciences so that they can competently inform a science-adverse general public:

> *...undergraduate [medical] instruction will be throughout explicitly conscious of its professional end and aim. In no other way can all the sciences belonging to the medical curriculum be thoroughly kneaded. An active apperceptive relation must be established and maintained between laboratory and clinical experience. Such a relation cannot be one-sided; it will not spontaneously set itself up in the last two years if it is deliberately suppressed in the first two There is no cement like interest, no stimulus like the hint of a coming practical application.*