Training in Informatics
Teaching Informatics in Surgical Pathology

Lewis Allen Hassell, MD*, Kenneth E. Blick, PhD

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• Informatics • Surgical pathology • Milestones • Problem-based learning • Competency

ABSTRACT

This article presents an overview of the curriculum deemed essential for trainees in pathology, with mapping to the Milestones competency statements. The means by which these competencies desired for pathology graduates, and ultimately practitioners, can best be achieved is discussed. The value of case (problem)-based learning in this realm, in particular the kind of integrative experience associated with hands-on projects, to both cement knowledge gained in the lecture hall or online and to expand competency is emphasized.

OVERVIEW

What, me worry?
—Alfred E. Neuman

The ability to stand calm and "keep your head when all about you are losing theirs" ("If," Rudyard Kipling) can come from 1 of 2 sources: (1) the confidence born of solid preparation, study, drill, and experience under stress or (2) the nonchalance derived from some combination of ignorance and apathy, oft epitomized by the hero of *Mad* magazine (quoted previously). For practicing pathologists today, and for the soon-to-be practitioners of that art and craft, the latter approach to the issues surrounding the informatics field is a recipe for more than comic-book disaster. But the challenge has been centered on how to form the foundation of knowledge and integrate the kind of drill and experience within the protected environs of a training program that can formulate the former kind of calm. The prior articles in this volume and an extensive literature on this topic have made the case for the essential skills of pathology informatics (PI), and most practices currently have at least one and often many staff members using these to some degree or another. This article aims to describe a less-than-haphazard or nonchalant approach to acquiring and instilling those essential information technology (IT) skills and knowledge within the context of existing learning models and training programs. This approach entails a review of learning and teaching approaches in the existing graduate medical education setting (residencies and to a lesser degree fellowships) and the postgraduate environment.

THE WHAT—CURRICULUM CONTENT

Residency education generally, and pathology specifically, has migrated from a time-based apprenticeship model validated by a highly knowledge-based examination to an approach strongly emphasizing specific demonstrated competencies.[1] This follows a trend toward competency emphasis across medical education generally but most strongly manifests in graduate medical training.[2,3] Pathology has not been a laggard in this move and, accordingly, used the opportunity to flesh out learning and skill needs in an array of areas beyond conventional medical knowledge of diseases and morphologies to include the growing areas of molecular diagnostics, genomics, laboratory management, and informatics. The detailed and comprehensive exposition of the learning objectives and skill areas in informatics was developed soon after the Accreditation Council for Graduate Medical

Department of Pathology, University of Oklahoma Health Sciences Center, BMSB 451, 940 Stanton L Young Boulevard, Oklahoma City, OK 73104, USA
* Corresponding author.
E-mail address: Lewis-hassell@ouhsc.edu

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Education (ACGME) introduced its 6 competency areas by Henricks and colleagues[4] working in collaboration with the Association for Pathology Informatics (API). Significantly, their approach carefully divided the knowledge areas essential to pathologists along with the applications of that understanding in common use from the informatics proficiencies or skill sets to be sought or demonstrated by the learners.

The Pathology Milestones Project codified this effort on a broad scale into an array of competency statements and descriptors that capture different levels of competency within each area. Looking at the Milestones superficially, it might be concluded that only 1 category (Systems-Based Practice [SBP] competency 7—Informatics: Explains, Discusses, Classifies, and Applies Clinical Informatics) is pertinent to the topic of this article.[5] But in reality, a more comprehensive and inclusive definition, such as might be drawn from a review of model curricula of informatics, reveals that a host of other competency statements within the Milestones document also has direct bearing on informatics knowledge and skills (**Table 1**).

This question of what PI is and, therefore, what may need to be taught to enable practitioners to be proficient in it's essential uses is a nontrivial one—although neither is it a particularly foreign debate. Pathology has always fostered camps of *lumpers* and *splitters*, who look at their fields of investigation differently, broadly and narrowly, respectively (see, for example, Tischler[6]) Seen broadly, PI encompasses an extensive knowledge and skill base that enables effectively collecting, storing, managing, maintaining, retrieving, analyzing, interpreting, and creating data pertinent to the care of patients who come under the care of a laboratory or a caregiver using a laboratory. The required skill set may include the management of the metadata of the laboratory itself, the medical literature, or other data sets pertinent to 1 or more of the these activities. A more narrow definition is that proposed by Gabril and Yousef[7] of "using highly advanced technologies to improve patient diagnosis or management," which they largely distilled down to the use of current advanced tools in imaging and image transmission along with data mining. Although the authors acknowledge that a majority of "advanced practitioners" of PI will be using and managing those tools, the reality is that the broad definition means that every pathologist must have certain PI skills and knowledge to be effective. It is also the more broad definition that has formed the foundation of several recent solid textbooks in PI. **Table 2** summarizes the core curriculum content for residency-level training.

This curriculum content has recently been integrated into a tool for use by training programs, the result of joint work of the Association of Pathology Chairs (APC), College of American Pathologists (CAP), and API. This project and tool, Pathology Informatics Essentials for Residents (PIER), meshes well with the Milestone SBP7 and provides a graduated progression corresponding to the competency levels desired from residents during each year of training (**Fig. 1**). This program does not, however, attempt to address the broad needs (captured in **Table 1**) in the many other Milestones with PI components, perhaps with the recognition that a core understanding has many spin-off effects applied to other areas of training.

Looking further at postresidency-level training, either in a formal fellowship or a continuing medical education context, **Table 3** outlines recommended added content.[8] Training experience at this level, however, becomes more project driven and experiential, leading to a portfolio of competencies based on successful performance and endeavor in solving informatics-based problems.

THE HOW—METHOD(S) OF TEACHING/ LEARNING PATHOLOGY INFORMATICS

Unlike much of the training in anatomic pathology, which is individual patient case based and more easily organized around ongoing clinical materials, acquiring skills in PI cannot be readily compartmentalized into a single rotation of a few weeks (**Box 1**). Although the content and knowledge have been organized for transmission via texts[9,10] or lectures on an intermittent or even condensed basis and presented in a case-study format using more or less real situations, these approaches often fall short of producing the level of competency required in the SBP7 and other competencies listed in **Table 1**. Nevertheless, such efforts help build IT vocabulary and create the foundation from which more applied skills can be developed. The PIER approach also recognizes that although some content can be encapsulated into time blocks, the higher-level applications can best be acquired using a variety of approaches, including journals, texts, mentors, and project-based experiences.

Several model programs have published their approach to laying this foundation. For example, Dr Pantanowitz's group has applied the crowdsourcing power of a wiki to maintain the core content in their informatics block.[11] This approach builds on their prior efforts via a "virtual rotation"[12] and on efforts in other aspects of medical training where expertise may be otherwise difficult to