Commentary

Environmental components and methods for engaging pathology residents in informatics training

Christopher A. Garcia, Jason M. Baron, Bruce A. Beckwith[1], Victor Brodsky[2], Anand S. Dighe, Thomas M. Gudewicz, Ji Yeon Kim[3], Veronica E. Klepeis, William J. Lane[4], Roy E. Lee[5], Bruce P. Levy[6], Michael A. Mahowald, Diana Mandelker[4], David S. McClintock[7], Andrew M. Quinn[4], Luigi K. Rao[8], Gregory M. Riedlinger[9], Joseph Rudolf, John R. Gilbertson

Department of Pathology, Massachusetts General Hospital, [4]Department of Pathology, Brigham and Women's Hospital, Harvard Medical School, Boston, [1]Department of Pathology, North Shore Medical Center, Salem, Massachusetts, [2]Department of Pathology and Laboratory Medicine, Weill Cornell Medical College, NY, [3]Clinical Chemistry and Laboratory Informatics, Southern California Permanente Medical Group Regional Reference Laboratories, North Hollywood, California, [5]Pathology and Laboratory Medicine Institute, Cleveland Clinic, Cleveland, Ohio, [6]Department of Pathology, University of Illinois at Chicago, [7]Department of Pathology, The University of Chicago, Chicago, Illinois, [8]Department of Pathology and Laboratory Services, Walter Reed National Military Medical Center, Bethesda, Maryland, [9]Department of Pathology, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania, USA

E-mail: *Dr. Christopher A. Garcia - Cgarcia14@mgh.harvard.edu
*Corresponding author

INTRODUCTION

Over the past several years, there has been increasing recognition of the importance of informatics in the practice of pathology, and this has led to initiatives that aim to integrate better and formalize instruction in informatics within the curriculum of pathology residency programs. The most notable of these programs is the Pathology Informatics Essentials for Residents resource developed by the Association of Pathology Chairs, Association of Pathology Informatics, and College of American Pathologists.[1] We believe that these initiatives are important. We also feel that the ultimate success of a residency-based informatics training program will depend greatly on the residency program's ability to interest and subsequently engage residents in informatics throughout the entire residency experience. In evaluating our own experience over the past 8 years, we feel that we have achieved a high level of success in supporting and cultivating resident interest in informatics, which has greatly aided the development of pathology informaticians. This development is distinct from, though related to, formal didactic training. Prior publications from our institution have proposed learning frameworks and teaching methodologies for teaching pathology informatics.[2] This manuscript differs in that we aim to both identify and describe the environment and the modalities that we believe have contributed to successfully engaging pathology residents in informatics education.

A HIGH LEVEL OF SUCCESS

We believe that the number of residents who elect to complete a fellowship in informatics is a legitimate and strong measure of a residency program's success in developing and supporting interest in informatics. In 2008, the Massachusetts General Hospital (MGH) began a formal pathology informatics fellowship program. It was joined in 2010 by the Brigham and Women's Hospital (BWH) to create the partners healthcare pathology informatics fellowship. Since 2008, the

Access this article online

Quick Response Code:

Website:
www.jpathinformatics.org

fellowship has trained 18 fellows. A series of articles have been published that describe the fellows, their career goals, and the structure of the fellowship.[3-7] All of them were highly qualified, and all of them have completed (or are completing) at least one pathology fellowship in addition to their informatics fellowship. Significantly, 10 (58%) of these fellows were internal candidates (seven were residency trained at MGH and three trained in residency at the BWH). We believe that our history of having one or more internal graduates over several years (from either the MGH or BWH pathology residency programs) who have been willing to commit 1 or 2 years of their lives to a fellowship in pathology informatics is unique, and that it is indicative of an environment and structure conducive to resident engagement in informatics.

ENVIRONMENTAL FACTORS THAT ENGENDER INTEREST IN PATHOLOGY INFORMATICS EDUCATION

Discussions with faculty and fellows have helped us identify two major environmental factors that are important in establishing and enhancing a resident's interest in informatics: A clear and articulated vision of the importance of pathology informatics from departmental leadership and a strong, widely distributed, and continuous informatics presence. We will discuss these below.

A Clear, Articulated Vision

We believe that, in order for trainees to be actively engaged in informatics education, they need to understand that informatics is central to both pathology practice and pathology's future. This vision must come from departmental leadership. If the leadership does not actively and publicly support the role of informatics (and especially if leadership is actively or passively opposed to the idea of informatics), it is virtually impossible to build informatics interest among trainees. In that case, an informatics training program for residents will most likely fail.

The partners healthcare programs have been fortunate to have active, open support from our pathology chairs. The visions of our chairs place informatics front and center in pathology's future. The current Informatics division and fellowship at MGH were established in 2007–2008 to support the leadership's long-term plan, in which genomics and informatics are considered the key growth and transformation agents in pathology for the foreseeable future. This vision is discussed with residents on a regular basis, including the first pan-department meeting of the academic year. Other examples of open support and vision include the decision of the pathology chairs in 2012 to implement a single, enterprise LIS suite

across partners prior to an enterprise-wide electronic medical record implementation. Another such example is the partners-wide pathology initiative of "Computational Pathology:" A long-term effort to improve and integrate AP; CP; Molecular; Imaging; and clinical data, as well as to use that information (and computational derivatives), to drive clinically relevant disease models; population models; decision support; and complex reporting.[8] In summary, all of the residents at MGH and BWH know (and are continuously reminded) that their chair and their leadership consider informatics a core component of pathology practice and a key to pathology's future.

A Strong, Widely Distributed, and Continuous Informatics Presence

Very early in its development, the Partners Informatics program made two decisions that resulted in the distribution of informatics activities widely across the department. The first was a conscious de-centralization of the informatics division and the second was to develop an informatics fellowship program. Neither of these initiatives was implemented with the residency in mind, but both created a strong, distributed, continuous informatics presence in the department that was visible to the residents.

When we decided to de-emphasize informatics as a division, we did so in an attempt to make informatics more relevant and transformative in our departments. We removed any of the pathology informaticians (MDs) from the division (except the division head), and embedded them in the traditional diagnostic divisions (e.g. AP, CP, blood bank, molecular) as teaching faculty with both diagnostic and informatics responsibilities. The idea was to make informatics more accessible to each aspect of our practice, and it has worked well. It has allowed informaticians to develop their own informatics initiatives in their area of diagnostic pathology. It has allowed division directors to support informatics directly, and it has created a low barrier for entry into informatics for diagnostic pathologists with nascent informatics interests. By 2012, we had approximately 25 pathology faculty members in Partners Healthcare (present in nearly every pathology subspecialty and activity) who are also considered informatics faculty. We define a pathology informatics faculty member as a pathologist, clinical scientist or high-level information technology (IT) director, who manages an IT/informatics facility, writes at least one informatics-related paper or delivers at least one informatics-related national lecture each year, and is willing to teach informatics skills or principles to residents or fellows. While some of these faculty members have completed fellowships in pathology informatics, the majority have gained their interests and expertise through undergraduate/graduate studies, research positions and projects, industry experience and/or professional management experience that includes responsibility for

an IT component or system. The Director of Pathology Informatics regularly meets with the affiliated faculty and staff who are involved in informatics, helping support and guide their efforts and developments through counseling and providing resources.

More importantly, the "diaspora of informatics" has created an accessible, visible, continuous informatics presence across the department. From a resident's point of view, it normalizes informatics in pathology. On a daily basis, and across the department, residents see respected pathologists signing out cases, running laboratories, and "doing informatics." It appears to be a natural and normal part of pathologist's duty and career. In addition, the creation of our informatics fellowship has greatly increased the visibility and accessibility of informatics projects within our department. It should be noted that our residents are not commonly in contact with the non-MD staff who are involved in informatics unless they are involved in a project that directly requires it.

Context and Characteristics of Educational Engagement that Enhance Resident Interest

During our discussions with faculty and fellows, we also have identified a few key contexts and attributes of instruction in pathology informatics that have been key to our success: Making the informatics educational engagement scalable to the interest level of each resident, teaching in the context of long-term and longitudinal engagement, presenting informatics as an intrinsic part of other pathology domains, and supporting interest in both information management and computational discovery. These findings have informed the suggested foundation, immersion, refinement, and expertise through the experiential learning framework.[2]

Flexibility and Scalable to the Interest of the Resident

Each resident brings with them different background knowledge and prior levels of mastery in areas of informatics, as well as different motivations, and interests in different areas of informatics. We have observed that there will be some residents who have no interest in the subject, as well as some who start their residency, wanting informatics to be significant part of their pathology career. It is important for a program to be able to provide educational and learning experiences that are appropriate to each resident's initial interest and skill, and that can scale to meet any growing interest as the resident develops. Our environment creates scalability through multiple educational modalities such as informatics lectures, mentorships, rotations, seminars,[9] retreats,[10] skill building exercises, operational projects, and research projects led by faculty in all areas of pathology. In our environment, many of these resources are supported within our fellowship program, but we do not believe that an in-house fellowship program in necessary for a

scalable informatics environment for residents.

Long-term, Longitudinal Engagement

To truly understand pathology informatics principles, one has to apply practically and investigate them. It is nearly impossible to provide for meaningful, experiential application in a lecture series or traditional informatics rotation that last on the level of days to weeks. Informatics initiatives normally occur over the course of months to years. Therefore, whenever possible, we employ models that allow the resident to have a long-term, longitudinal engagement with informatics that makes a resident responsible (with supervision) for a component of the informatics service for a long period of time. Examples include being in charge of managing synoptic reporting for the gastrointestinal (GI) service, or being in charge of implementing digital pathology support for clinical conferences. During that course, they still perform their duties on their scheduled rotations. The department should expect that their level of responsibility will go up over time, requiring less supervision. Over time, the resident will take ownership of the service, and will have encountered a wide range of issues and will have learned a wide range of informatics principles and IT strategies.

Informatics is Best Presented as an Intrinsic Part of other Pathology Domains

Although we have many faculty members with informatics responsibilities and projects, most of them do not consider themselves "informaticians." Rather, they consider themselves primarily clinical chemists, microbiologists, molecular pathologists, cytologists, and surgical pathologists. This reflects our understanding that different informatics needs and responsibilities permeate all aspects of our practices. As our healthcare setting is increasingly being driven by electronic healthcare information, it makes sense that the basic skills of managing information, informatics systems, and processes should be taught as they are practiced: Within their pathology domains and not as a separate subspecialty. More importantly, while some pathology residents are openly enthusiastic about informatics, all pathology residents are enthusiastic about pathology. In our experience, informatics is best presented and entered through the portal of traditional diagnostic pathology practice. Our previous example of a resident taking responsibility for the GI synoptic reports is a good example of engaging in informatics arenas (e.g. data quality) as a necessary part of the practice of GI pathology. This approach helps to engender informatics skills in practical situations, which will give residents a much better understanding of "informatics" than a traditional lecture series.

In a related approach, pathology informatics is a very wide domain and in our experience it not uncommon to find a resident completely bored by (for example) LIS

Management but completely fascinated by (for example) computational discovery. Working along the two axes of pathology subspecialty and informatics domain, one can usually find an area of interest for a pathology trainee.

CONCLUSION

While our field continues to formalize the content that we will teach to our trainees concerning pathology informatics,[1] we believe that the environment and methods that we use will be equally (if not more) important. We also believe that certain aspects of our departmental structure and residency environment, as well as some of the teaching modalities that we employ, have been key to our success in cultivating and sustaining the interest of our residents in pathology informatics. We do recognize that each practice and residency is unique, but we hope that the structures and attributes that we have described will be helpful to those looking to integrate or restructure their approach to teaching pathology informatics.

REFERENCES

1. Pathology Informatics Essentials for Residents Resource Page. Association of Pathology Chairs; 2014. Available from: http://www.apcprods.org/PIER/. [Last cited on 2015 Apr 30].
2. Rao LK, Gilbertson JR. Longitudinal engagement of pathology residents: A proposed approach for informatics training. Am J Clin Pathol 2014;142:748-54.
3. Levy BP, McClintock DS, Lee RE, Lane WJ, Klepeis VE, Baron JM, *et al.* Different tracks for pathology informatics fellowship training: Experiences of and input from trainees in a large multisite fellowship program. J Pathol Inform 2012;3:30.
4. Gilbertson JR, McClintock DS, Lee RE, Onozato M, Kuo FC, Beckwith BA, *et al.* Clinical fellowship training in pathology informatics: A program description. J Pathol Inform 2012;3:11.
5. Quinn AM, Klepeis VE, Mandelker DL, Platt MY, Rao LK, Riedlinger G, *et al.* The ongoing evolution of the core curriculum of a clinical fellowship in pathology informatics. J Pathol Inform 2014;5:22.
6. McClintock DS, Levy BP, Lane WJ, Lee RE, Baron JM, Klepeis VE, *et al.* A core curriculum for clinical fellowship training in pathology informatics. J Pathol Inform 2012;3:31.
7. Mandelker D, Lee RE, Platt MY, Riedlinger G, Quinn A, Rao LK, *et al.* Pathology informatics fellowship training: Focus on molecular pathology. J Pathol Inform 2014;5:11.
8. Louis DN, Gerber GK, Baron JM, Bry L, Dighe AS, Getz G, *et al.* Computational pathology: An emerging definition. Arch Pathol Lab Med 2014;138:1133-8.
9. Baron JM, Dighe AS, Arnaout R, Balis UJ, Black-Schaffer WS, Carter AB, *et al.* The 2013 symposium on pathology data integration and clinical decision support and the current state of field. J Pathol Inform 2014;5:2.
10. Lee RE, McClintock DS, Balis UJ, Baron JM, Becich MJ, Beckwith BA, *et al.* Pathology informatics fellowship retreats: The use of interactive scenarios and case studies as pathology informatics teaching tools. J Pathol Inform 2012;3:41.