Human PATHOLOGY

VOLUME 32 January 2001 NUMBER 1

Editorial

Rethinking Pathology Residency Training and Education

There has been continuing controversy over the length of training in pathology in the United States since 1985 when the American Board of Pathology introduced a mandatory fifth year of training. The original intent of the additional year, to provide an opportunity to broaden the clinical experience of trainees, was not realized from the outset. More than 30% of pathology residents entered their training with at least 1 year of clinical experience, and the remainder acquired their clinical knowledge in the course of their pathology training, rather than during a clinical year outside of a department of pathology, as initially specified by the American Board of Pathology.

A majority of Pathology department chairs are of the opinion that: (1) the fifth year requirement is unnecessary; (2) the extra year cannot be cost-justified; (3) the additional year may significantly reduce the pool of United States graduates for residency positions; and (4) the year adds significantly to the indebtedness of many residents. On the other hand, some chairs and program directors feel that the additional year is justified by the increasing complexity of the field and the benefits of additional clinical exposure during pathology residency training.

Some of the continuing concerns over, and objections to, the "fifth year" seem legitimate. However, eventually, external factors may affect both perceptions of optimal training experiences and the way education is delivered to residents and practitioners of pathology. It may turn out that length of training is less important than subject mastery. Also, in-service, computer-based competency testing by the American Board of Pathology could replace the conventional "final examination" approach to measuring performance and render the fifth-year issue moot. It is envisioned that, in the future, residents would be examined as they finish each training module, and training would be self-paced.

doi:10.1053/hupa.2001.22335

The current "one size fits all" approach to length of training, although convenient and practical from an administrative perspective, does not make sense. Variable length, customized training may emerge as the preferred education model as training programs incorporate new information technologies into their learning environments. Even today, the pathology training experience in the United States is extraordinarily variable from program to program, and the quality of residents varies as well. Although programs do meet certain time guidelines, as spelled out by the Residency Review Committee of the ACGME and the American Board of Pathology, the content of programs and experiences of residents is remarkably variable. Pathology faculties vary in size from less than a dozen staff members to well over 100. Some faculties lack staff members with subspecialty boards, whereas others offer several pathology fellowships directed by boarded subspecialists. The amount of research in pathology departments that train residents ranges from little if any funded research to over $25 million dollars per year at the largest research universities. And the amount of patient material is highly variable. For example, some departments see fewer than 10,000 surgical specimens per year, whereas others handle many times that number. Although programs are strictly regulated with respect to duration of training, programs are given great latitude with respect to their educational environment, the scope of residents' activities, facilities, opportunities provided for mastery of subject matter, teaching and research experiences, and exposure to state-of-the-art innovations. It may be worth thinking ahead and considering how telecommunications technologies, such as the Internet, may affect training and education.

Obviously, the world today is very different from the world of the 1980s when the fifth-year experience was implemented. Remarkable scientific advances have broadened the potential scope of practice and have made mastery of the entire body of pathology information an impossibility. Informatics has begun to move to

center stage, driven by many forces including the rapid evolution of genomics and proteomics as diagnostic modalities, the emergence of the concept of tailored therapies, and the need to manipulate large amounts of information in huge databases. Machine vision, robotics, chip-based diagnostics, and new imaging modalities, such as reporter gene MRI, promise to increase the value of pathology services while broadening the intellectual demands placed on laboratory practitioners.[1] As the field expands, the achievement of proficiency may be limited, in part, by the individual's learning skills, mastery of core analytical competencies, and exposure to case materials. Furthermore, as the range of identifiable subclassifications of disease expands through genomic and proteomic characterizations of lesions and analyses of polymorphism, case studies and simulations could play a greater role in keeping practitioners current. The Internet has become a major source of healthcare information and will be increasingly important in providing physicians with ready access to the medical literature and productivity tools. Pathologists may become central players in using computers and the Internet for patient report generation and distance learning.[2-6] Although the eventual role of the Internet in pathology education is a matter for speculation, examination of what is available on the Web today provides a glimpse into the future.

Today, there are over 20,000 English language healthcare Internet portals. Medical information is readily available to the general public as well as physicians.[7,8] An index of pathology Internet resources compiled at the University of Michigan provides hyperlinks to over 200 sites.[9] For pathologists in practice who are interested in surveying what is being taught in medical schools today, pathology curricula are available on the Web.[10-12] Pathology residency-level curricula are also beginning to appear[13,14] as well as virtual autopsies[15] and tours of virtual pathology museums.[16] Patient simulators[17,18] and other on-line productivity tools are available.[19,20] Several outstanding Internet interactive tutorials, including individual proficiency testing, are offered by the Johns Hopkins faculty. These convincingly show the power of technology.[21,22] Interactive tutorials for patients may contribute to an increasing level of patient sophistication with respect to their own healthcare.[23,24] For the pathologist in practice, as well as for residents, second opinions on difficult cases can be readily obtained by telepathology from Internet-based services originating in the United States[25] and in Europe.[26] Many pathology departments are investing heavily in digital microscopy, which will further reduce resistance to the use of telepathology. And finally, high-quality meeting proceedings can be viewed over the Internet.[27] With the widespread deployment of broadband Internet and video streaming, many courses and lectures will become available in this format in the near future.

How will this affect pathology training? The answer is, potentially in many ways. Medical students will come to their residencies with extensive experience in distance learning. To select a program, senior medical students will be able to preview and compare the curricula and case materials available at many programs and, through bidirectional video conferencing, meet, interview, and be interviewed by prospective faculty members. Virtual tours of departments, by video, will become commonplace, as is the case in the real estate industry today. Pathology departments may be able to achieve greater economies of scale by joining multiuniversity, Internet-based service and education consortiums. Potentially, training programs might be significantly improved by offering residents access to a broad range of high quality educational experiences from other institutions. Smaller departments may be motivated to join to fill gaps in their programs, whereas larger programs would benefit from time-sharing their super specialists. Telemedicine programs are currently showing that multi-site (multi-community) grand rounds are effective and that the sessions can be stored on a server for later viewing by video streaming. It may be only a matter of time until surgical pathology conferences, tumor boards, molecular pathology tutorials, and the like are offered in these formats. The importance of having a full range of training opportunities in-house may be diminished when comparable experiences can be gained in an interactive, distance-learning format. As pathology departments implement robotic microscopy (some already have this capability), multiheaded, microscope-diagnostic, and quality assurance sessions become possible, with pathologists sitting at video terminals in hospitals hundreds or thousands of miles apart. It is even conceivable that commercial reference laboratories would have a role in sponsoring multisite, video-conferenced educational programs.

If some of these changes take place, pathology training could be dramatically altered in major ways. The richness of the training experience could increase. The need to be on a service, waiting for a critical number of cases to come "through the door," might decrease if case materials are pooled from multiple institutions. The playing field could be leveled for smaller programs by making available learning experiences based on a larger number of specimens and specimens of greater complexity from other institutions. Through simulation and actual case workup experiences, core competencies may be gained in significantly shorter time frames. Access to the best teachers and top experts by video conferencing and through viewing video streamed tutorials, possibly linked to chat rooms, could greatly enrich learning experiences. Creating Internet-based proficiency testing modules is time-consuming and expensive, but the expense could be cost-shared by multiple institutions on a per-user or site license basis.

Another possibility is that the Internet will further blur the distinction between anatomic and clinical pathology by increasing the use of electronic patient records and by linking various laboratories by telecommunications. These laboratories will add incremental information to Internet-based patient electronic records at different times. As the range of genomic and proteomic tests on tissue specimens increases, more laboratories and more subspecialists may get involved in generating consolidated laboratory reports. Ultimate responsibility for a report will rest with a pathologist sitting at a worksta-

tion examining and manipulating data residing in multiple laboratory databases. Review of digital images of primary data, such as gels, cDNA micro-arrays, and histopathology specimens, may take place at a workstation linked to a distant laboratory information server. With this scenario, both anatomic and clinical pathology knowledge and skills will be essential to generate consolidated reports. The most valuable pathologists may be individuals who can integrate the information generated by multiple laboratory modalities. In terms of training, it might be reasonable to begin to think in terms of a primary certification in general pathology and subsequent subspeciality training in areas of anatomic or clinical pathology, if indeed such a distinction continues to have any validity.

It is our conviction that we cannot continue to train pathologists in a manner that has long since become outmoded. There are many different options to achieve a flexible program that would provide both basic training in pathology and opportunities to achieve, within a reasonable time frame, the requisite specialty skills. The current model was proposed at a conference held in Park City, Utah, in 1986.[28] The proposal called for a 3-year "core experience," followed by 2 years of subspecialty training. Whereas the Park City proposal focused on blocks of time, we suggest that this could be revised with schedules determined by the time required to achieve competencies on an individual basis. A modification of the Park City proposal could consist of a flexible "core" experience, with respect to time, in the basic disciplines of "anatomic" and "clinical" pathology. Following the **core experience, the trainee could pursue any number** of tracks leading to special competence in one or more disciplines including the currently recognized subspecialities and, in addition, molecular pathology and informatics. Concerted efforts should be made to enrich the core experience, while minimizing its duration, through the use of Internet-based distance education, telepathology-based conferencing with other institutions, and case simulations.[17,29]

We believe the time has come to re-evaluate the length and content of our training programs in the context of rapidly changing technologies and healthcare delivery systems. Ideally, residency program structure would be based on the achievement of defined outcome expectations rather than on an arbitrary schedule. The goals of mastery of core competencies, including analytical skills, should replace the current emphasis on residents spending 5 years of "hard time" in postgraduate education.

FRED GORSTEIN, MD
Editor, *Human Pathology*
Thomas Jefferson University
Philadelphia, PA

RONALD S. WEINSTEIN, MD
Associate Editor, *Human Pathology*
The University of Arizona
Tucson, AZ

REFERENCES

1. Keenan SJ, Diamond J, McCluggage WG, et al: An automated machine vision system for the histological grading of cervical intraepithelial neoplasia (CIN). J Pathol 192:351-362, 2000

2. Gorstein F, Trelstad R: The pathologist as student and educator. HUM PATHOL 21:1-3, 1990

3. Weinstein RS, Bloom KJ: Pathologist as information specialist. HUM PATHOL 21:4-6, 1990

4. Kayser K, Szymas J, Weinstein RS: Telepathology. Telecommunications and electronic education and publication in pathology. Heidelberg, Germany, Springer-Verlag, 1999, pp 1-186

5. Parker AL, Parker LA: Distance education versus in-classroom instruction, in Viegas SF, Dunn K (eds): Telemedicine-practicing in the information age. Philadelphia, PA, Lippincott-Raven, 1998, pp 135-152

6. Pathology Informatics Organization. Available at: http://www.pathologyinformatics.org

7. WebMD Corp (medical information). Available at: http://webmd.com

8. Medscape (medical information). Available at: http://www.medscape.com

9. Pathology Internet Resources. Available at: http://141.214.5.219/pathresourceak/path resources.html

10. Cornell University: Pathology coursework. Available at: http://edcenter.med.cornell.edu/Courseware/courseware.html

11. The University of Utah: Pathology coursework. Available at: http://www-medlib.med.utah.edu/WebPath/webpath.html

12. Pathology Atlas. Available at: http://www.med.uiuc.ed/PathAtlasf/titlePage.html

13. The Johns Hopkins University School of Medicine, Molecular Pathology Diagnostics Laboratories: Reference material. Available at: http://pathology2.jhu.edu/molec/

14. Pathology Informatics Exchange. Available at: http://path.upmc.edu/divisions/informatics/pix.htm

15. University of Leicester Department of Pathology. Available at: http://www.le.ac.uk/pathology

16. University of Connecticut Health Center, Pathology Web Center and Searchable Database. Available at: http://pathweb.uchc.edu/

17. Marshall University, Patient Simulator. Available at: http://medicus.marshall.edu/medicus.htm

18. Case studies. Available at: http://www.medstudents.com.br/main.html

19. Medical College of Wisconsin, Division of General Internal Medicine (online clinical calculator). Available at: http://www.intmed.mcw.edu/clincalc.html

20. Clinical calculator. Available at: http://medstudents.com.br/calculat/fena.htm

21. Tutorial and proficiency test. Available at: http://162.129.103.34/prostate/

22. Tutorial and proficiency test. Available at: http://162.129.103.34/bladder/

23. National Cancer Institute, National Institutes of Health: Patient information. Available at: http://cancernet.nci.nih.gov/

24. Mayo Clinic: Patient information. Available at: http://www.mayohealth.org

25. Armed Forces Institute of Pathology: Department of Telepathology. Available at: http://www.aflp.org/telepathology/

26. Union International Conte le Cancer-Telepathology Consultation Center. Available at: http://www.uicc-tpcc.charite.de

27. Advancing Pathology Informatics, Imaging, and the Internet: National Meeting Proceedings, 2000. Available at: http://apiii.upmc.edu/apiii2000/

28. Weinstein RS, Cotran RS, Dermen H, et al: Park City Report, Park City, UT, Association of Pathology Chairs, February, 1986

29. Dunn DE, Choi H, Almagro UA, et al: Telepathology networking in VISN-12 of the Veterans Health Administration. Telemed & e-Health J 6:349-354, 2000