Optimizing Resident Education of Ophthalmic Pathology: Qualitative Assessment of Annotated Virtual Microscopy Web Site

Nicole Nikolic, MD1,2 Baltazar Espiritu, MD1 Deepak P. Edward, MD3 Jay Perlman, MD, PhD1,4

1 Department of Ophthalmology, Loyola University Chicago, Chicago, Illinois
2 Department of Ophthalmology and Visual Sciences, University of Chicago, Chicago, Illinois
3 Wilmer Eye Institute, Johns Hopkins University, Baltimore, Maryland
4 Hines Veterans Affairs Hospital, Hines, Illinois

Address for correspondence Nicole Nikolic, MD, Department of Ophthalmology and Visual Sciences, University of Chicago Medicine, 5841 S. Maryland Avenue, MC 2114, Chicago, IL 60637 (e-mail: nicole.nikolic@uchospitals.edu).

Abstract

Introduction Virtual microscopy is an exciting new modality that is being integrated into medical education. A nationwide collaborative effort between eight leading ophthalmology programs was undertaken to compile an extensive array of ophthalmic pathology slides to host online. To facilitate self-directed learning and assessment, Web site development included “hidden” interactive annotations, accessible only on demand, of relevant pathological findings.

Methods A small subgroup of 24 ophthalmology residents currently matriculated in their second, third, or fourth postgraduate year across eight institutions independently evaluated the Web site. Educational effectiveness was assessed by anonymous survey. Features qualitatively considered included (1) level of postgraduate training, (2) prior ophthalmic pathology Web site experience, (3) perceived educational values, (4) difficulties encountered, (5) Web site utility, and (6) usefulness of a free-text comment box.

Results Two-thirds of the participating residents had prior exposure to virtual microscopy as a resource tool. Positive assessments included the use of interactive annotations by which to facilitate self-directed learning and a user-friendly platform with good-to-excellent educational value relative to other ophthalmic-related Web sites. Negative assessment included little value in problem-based learning. Suggestions for improvement included integration with pathology-related lecture series led by an ophthalmic pathologist.

Discussion The use of a comprehensive online interactive virtual library of ophthalmic pathological specimens to facilitate autodidactic medical education is supported by a small subgroup of currently matriculated ophthalmology residents across eight institutions. Integration of prereview and postreview “quizzes” addressing relevant pathological topics is anticipated to further reinforce retention of fundamental pathological concepts.
Virtual microscopy has revolutionized the field and teaching
of pathology by integrating the virtual feel of light microsco-
py with digital scans of pathology slides. This has allowed for
digitizing stores of pathology tissue slides for online storage
and widespread access via private computer networks or the
Internet.1,4-6 Microscopic images are uploaded online for use
by anyone from any location, or they can be integrated within
an interactive lecture where a pathologist can lead the
discussion and direct attention to specific findings on the
virtual image. These images can then be used in conjunction
with image viewing software to navigate the image, zoom in
or out, and add annotations.1,2

We have developed an ophthalmic pathology virtual microsco-
py Web site under the auspices of the American Association of
Ophthalmic Pathologists (AAOOP) with the collaborative effort
of several ophthalmic pathologists. Using this site, ophthalmology
residents are trained on ophthalmic pathology by way of a
comprehensive virtual microscopy Web site (http://path.
bnbddev.com/index1a.htm), open for use by any member of the
public domain who wishes to utilize the resource, without need
for either compensation or registration. To foster more active
learning, the microscopy slides have hidden annotations, which
are invisible without use of the mouse over the area of interest.
The use of a “self-test” feature with interactive annotations
visible only when hovering over a point of interest on screen
in virtual microscopy for resident education is a unique teaching
tool, which we implemented to provide a more cohesive and
effective learning experience. The purpose of this study was to
obtain feedback on the educative value of the Web site for
ophthalmic pathology.

Materials and Methods

Virtual Microscopy Web Site at Loyola University
Chicago School of Medicine

To create an Ophthalmic Pathology Collaborative and Educa-
tional Resource (OPCER), a collaboration was forged between
several leading institutions: Johns Hopkins, Duke University,
University of Iowa, Northwestern University, the New York
Ear and Eye Infirmary, Rush University Medical Center,
University of Miami, and Loyola University Chicago.

Glass slides were collected from the ophthalmic pathology
collections of the Ophthalmic Pathologists from the previously
mentioned academic institutions. The slides were de-identified
and then converted into digital images via the Aperio slide
scanner. These digital images were then stored as Zoomify
images and hosted online by the Department of Ophthalmology
of Loyola University Chicago at http://path.bnbddev.com/index1a.
htm. The images are organized on the Web site by the following
categories: normal, eyelid, conjunctiva, cornea, glaucoma, retina,
uveal tract, nasolacrimal sac, orbit, infection, and inflammation.
Annotations were made first by identifying points of interest in
the image that were relevant toward making an accurate
diagnosis. Once identified, a new label was created, with both
a description of the findings and an appropriate icon pointing
out the structure or defect. These labels were then edited to be
visible only when the cursor driven by the individual hovered
over the specific point of interest in the current field of view.

Participants

The Web site was evaluated by 24 ophthalmology residents
who responded to the survey after it was sent out to eight
ophthalmology programs. Of this group, seven were in their
second postgraduate year, eight in their third postgraduate
year, and nine in their fourth and final postgraduate year.

Web Site Evaluation

An online evaluation was conducted to assess the residents’
impressions of the updated virtual microscopy site. The
evaluation was a formal online survey composed of seven
questions devised by the aforementioned corroborators of
the study. Elicited information included the following: their
level of postgraduate training, prior experience with virtual
microscopy, prior experience with ophthalmic pathology
Web sites, ease of Web site navigation, value of virtual
microscopy relative to other pathology Web sites, the
perceived educational value of our ophthalmic pathology virtual
microscopy site, and whether they prefer the addition of
annotations on the slides. An additional free-text comment
box was also included in the survey for the residents to leave
feedback, for consideration into future updates to the Web
site.

Results

At the time of the survey, the majority of residents (67%) had
prior experience with using virtual microscopy Web sites, and
62% reported previous use of an ophthalmic pathology Web
site. Junior residents were more likely to have had prior
experience with virtual microscopy, with 71% of PGY-2
residents having prior experience compared with 62% of
PGY-3 and 67% of PGY-4 responders. Interestingly, the group
with the highest rate of previous exposure to virtual microsco-
py also reported the lowest reported use of ophthalmic
pathology Web sites, with 43% having used the resource tool,
compared with the resident average of 63%.

With respect to positive feedback regarding the Web site,
the site was overwhelmingly described as being user friendly
(96%), of good-to-excellent educational value (96%), and was
overall more valuable relative to other ophthalmic-related
Web sites (68%). The residents were also unanimous in
finding the annotations on the various slides useful. As
illustrated in – Fig. 1, the residents found the most utility
of specific functions of the Web site with respect to resident
education, in using the site for self-directed learning (83%),
in preparation for ophthalmology board exams (71%), and for
use during lectures led by an ophthalmic pathologist (79%).
The residents also appear to find little utility in using the Web
site for problem-based learning (i.e., interactive lectures with
clinical scenarios incorporating relevant histopathology),
with only 29% believing it to be useful.

Encouragingly, the residents unanimously found the Web
site user friendly. The residents were also unified in believing
the educational value of our Web site to be good to excellent,
and 83% of them also felt our virtual microscopy site was more
beneficial compared with other ophthalmic pathology Web
sites they have previously used.
Discussion

In all, we found that our addition of hidden annotations was a success with respect to the residents’ unanimous agreement on the perceived utility of the function to the Web site. We also found that of the residents without previous use of virtual microscopy, all had indicated strong educational value and ease of use of our Web site. In regard to the educational value of the Web site, it was interesting to find that those without prior virtual microscopy use found our Web site to be more useful compared with other ophthalmic pathology Web sites. We offer that perhaps the reason for this was poor incorporation of the technology for those with prior experience.

While our study was limited by our sample size among responding residents, we believe the trends found in our survey are in line with general sentiments with our Web site and virtual microscopy technology overall. In the future, we plan to further the utility of the Web site with the addition of quizzes written in a fashion similar to pathology questions that appear on ophthalmology board examinations. These questions will focus on frequently asked topics and will have accompanying pictures from our collection of slides on our Web site, which can also be used to reinforce concepts for self-directed learning.

Given our findings, we highly encourage ophthalmology residents to incorporate this resource alongside their reading for self-directed learning, especially during study in preparation for their board examinations, as residents often find pathology to be one of the most difficult topics. Additionally, as an overwhelmingly majority of residents believed the Web site would be a useful adjunct to ophthalmic pathology lectures, it is our hope that our Web site is incorporated into programs nationwide to further enhance resident education in ophthalmology. Interestingly, very few residents felt that the use of virtual microscopy would be useful in problem-based learning. However, to acquire the particular fund of knowledge, that is, ophthalmic pathology, one focuses on refining pattern-based recognition—which is often honed by the method of study du jour, computer-based question banks written in the style of board exams.

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References