# Impact of Internet Based Resources on Resident Teaching and Educational Conferences: Experience at a University Affiliated Hospital Network Comprising Academic and Community Based Pathology Practices

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## ABSTRACT

Background: Our geographically distributed hospital network comprises 19 hospitals, four of which are academic centers with subspecialty pathology sign-out. This milieu presents challenges to department wide resident education and academic conferencing. The Internet and other information technologies have been utilized to address these challenges, resulting in a large resource of on-line teaching cases, archived conferences, and annotated whole slide image teaching sets. These are collected primarily in the departmental web site (http://path.upmc.edu) as well as the departmental telepathology web site (http://telepathology.upmc.edu).

Design: The educational and academic mission of the distributed department is supported by three web-based systems: 1) a collection of multimedia teaching cases that are authored by residents and faculty (http://path.upmc.edu/cases.html); 2) daily internet broadcast and subsequent archival of the main academic conferences (http://teleconference.upmc.edu/pathconf/); and 3) subspecialty-based teaching collections of whole slide images created from glass slides. Scanning and annotation of the teaching collections is ongoing and will represent a substantial investment of departmental resources when complete.

Result: These resources have been accepted by residents, faculty, and departmental leadership. Currently 439 teaching cases and 639 archived departmental conferences are online with 60 to 100 unique users in a typical month, including 4,193 images. More than 2,750 whole slide images have been created, including a general pathology collection and four subspecialty collections (dermatopathology, bone and soft tissue, neuropathology, and genitourinary). The process of annotation is ongoing.

Conclusion: These internet-based pathology informatics resources have enriched our pathology educational and clinical resources. These resources have facilitated pathology education in a multi-hospital, partially subspecialty sign-out environment, and are readily available to all residents and faculty at our health system. These substantial digital media resources are widely utilized and represent a significant investment by a pathology department in order to facilitate pathology education and serve as a model for other institutes as they build their digital archives.

## BACKGROUND

Our health care organization educates pathology residents at five hospitals in a largely sub-specialty sign-out environment. This complicates access to teaching conferences and educational materials. Internet-based technologies have been in use for more than 10 years in a successful effort to address these challenges.

These applications fall into three categories: multimedia teaching cases; daily internet-broadcast and archival of educational conferences; and whole slide images (WSI, also known as "virtual slides"). This poster presents our experience in successfully providing internet-based educational resources, including WSI, for routine educational applications.

## DESIGN

Teaching cases (http://path.upmc.edu/cases.html) feature photomicrographs, gross photographs, and radiology images (Figure 1). CME credit is available via the departmental home page. Responsibility for authorship is assigned annually as part of the residents' schedule. Case creation is therefore an official activity within the department.

Daily educational conferences (http://teleconference.upmc.edu/pathconf/) are digitally recorded by telepathology personnel for live "webcast" via the Internet (Figure 2). The conference video is subsequently archived for later viewing. The archive is fully searchable, and the majority of archived conferences are available to the public.

WSI resources include teaching collections and conference materials. Teaching collections include more than 2,750 genitourinary, dermatopathology, neuropathology, and bone/soft tissue WSI (Figure 3). Weekly unknown conference slides are scanned and then made available through the residents' web site; image links are embedded within the clinical history sheet that is supplied by the conference moderator (Figure 4). WSI creation is supported by members of the telepathology group. To increase resident access to and utilization of WSI resources a web site has been created to provide "one-stop" access to these resources ("VirtualPath", Figure 3a).



**Figure 1. Monthly Teaching Cases.** Screen capture depicts a teaching case with available image types (radiology, gross pathology, and photomicrographs). Since 1995, more than 450 cases have been posted. Case authoring is a required activity for residents. (http://path.upmc.edu/cases.html)



**Figure 2. Educational Conferences.** The teleconference web page provides access to both live and archived conferences. Archives are searchable by date, subject, and presenter. Conferences are viewed in a separate video-viewer window (inset). (http://teleconference.upmc.edu/pathconf/)
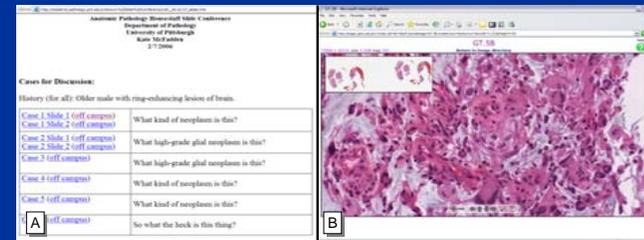


**Figure 4. Weekly Unknown Slide Conferences.** Recuts of glass microscope slides are provided to two of the teaching hospitals for residents to review. Following distribution, slides are now scanned and made available through the residents' web page (http://residents.pathology.pitt.edu/). **A)** This clinical history web document with WSI links closely approximates the paper-based version. **B)** Screen capture from one of the cases; this virtual microscopy software automatically loads with the slide within the web browser and requires no installation.
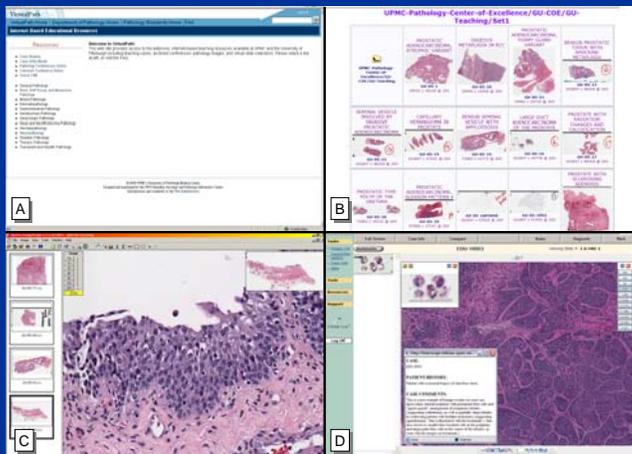


**Figure 3. Whole Slide Images.** Educational WSI resources exist in multiple systems and web sites, a potential barrier to use. **A)** "VirtualPath" is a newly-created web site that provides organized links to WSI resources, thus facilitating access by residents and faculty. **B)** Screen capture of GU teaching set directory; image thumbnails and diagnoses are displayed (http://image.upmc.edu/aw/index.ksh?dir=UPMC-Pathology-Center-of-Excellence). **C)** Image from a GU pathology teaching set; typical "virtual microscopy" controls are available. Thumbnails of currently open images are displayed at left. **D)** Image from a general pathology teaching collection; case details are presented in an overlaid window. Additional information (including graphical annotation) are potentially available (http://interscope.hillman.upmc.edu/eduslide/).

## RESULTS

Teaching cases have been regularly published since 1995; there are 455 cases including approximately 4,200 images. These are accessed regularly both from within and from outside the department. More than 675 educational conferences have been archived since 2002. These are accessed by approximately 60 to 100 unique users each month.

Thousands of WSI have been scanned and several hundred of these images have been annotated with additional information. The VirtualPath web site is not yet available outside of our institution. Residents and faculty have shown strong interest in unknown slide conference WSI. Telepathology personnel have successfully supported the timely creation of high quality WSI for these educational applications.

## CONCLUSIONS

- **Internet-based educational resources have enhanced pathology resident education in a multi-campus, subspecialty-organized environment for more than ten years**

- **Residents may "virtually" attend conferences that would otherwise be unavailable**

- **A web portal ("VirtualPath") can facilitate access to and utilization of whole slide image resources by residents as they rotate through various subspecialties**

- **Dedicated support personnel are crucial for successful provision of these educational resources without disrupting existing workflow**

- **Most of these educational resources are publicly available and may serve as models for others as they create digitally-based resources**

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