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Special Section on Telepathology

Virtual slide telepathology for an academic teaching hospital surgical pathology quality assurance program☆,☆☆

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Summary Virtual slide telepathology is an important potential tool for providing re-review of surgical pathology cases as part of a quality assurance program. The University of Arizona pathology faculty has implemented a quality assurance program between 2 university hospitals located 6 miles apart. The flagship hospital, University Medical Center (UMC), in Tucson, AZ, handles approximately 20 000 surgical pathology specimens per year. University Physicians Healthcare Hospital (UPHH) at Kino Campus has one tenth the volume of surgical pathology cases. Whereas UMC is staffed by 10 surgical pathologists, UPHH is staffed daily by a single part-time pathologist on a rotating basis. To provide same-day quality assurance re-reviews of cases, a DMetrix DX-40 ultrarapid virtual slide scanner (DMetrix, Inc, Tucson, AZ) was installed at the UPHH in 2005. Since then, glass slides of new cases of cancer and other difficult cases have been scanned the same day the slides are produced by the UPHH histology laboratory. The pathologist at UPHH generates a provisional written report based on light microscopic examination of the glass slides. At 2:00 PM each day, completed cases from UPHH are re-reviewed by staff pathologists, pathology residents, and medical students at the UMC using the DMetrix Iris virtual slide viewer. The virtual slides are viewed on a 50-in plasma monitor. Results are communicated with the UPHH laboratory by fax. We have analyzed the results of the first 329 consecutive quality assurance cases. There was complete concordance with the original UPHH diagnosis in 302 (91.8%) cases. There were 5 (1.5%) major discrepancies, which would have resulted in different therapy and/or management, and 10 (3.0%) minor discrepancies. In 6 cases (1.8%), the diagnosis was deferred for examination of the glass slides by the reviewing pathologists at UMC, and the diagnosis of another 6 (1.8%) cases were deferred pending additional testing, usually immunohistochemistry. Thus, the

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quality assurance program found a small number of significant diagnostic discrepancies. We also found that implementation of a virtual slide telepathology quality assurance service improved the job satisfaction of academic subspecialty pathologists assigned to cover on-site surgical pathology services at a small, affiliated university hospital on a rotating part-time basis. These findings should be applicable to some community hospital group practices as well.

1. Introduction

Telepathology has evolved from robotically facilitated telemicroscopy [1-4] and static image telepathology [5-7] into the current virtual slide telepathology (VSTP) [8-11], which is emerging as the preferred technology [4,8,11]. As the technology has improved and pathologists' skill with computer monitor-based image interpretation has developed, the scope of diagnostic applications in anatomic pathology (AP) has expanded as well.

This expansion of telepathology uses has paralleled the range of traditional routine light microscopy–based services: primary diagnostics [12-14], frozen section interpretation [2,15-22], remote site collaboration [3,23], subspecialty consultation from a distance [24], and quality assurance (QA) activities [25-28]. The experience with telepathology gained through the Arizona Telemedicine Program (ATP), Tucson, AZ, at the University of Arizona has included some of these different applications and provided enhanced proof-of-concept information. The University of Arizona's Department of Pathology implemented static image telepathology in Arizona, Mexico, and China in 1993 and robotic telepathology (RTP) in 2002 at several rural sites of the ATP in Arizona [7].

Support of QA activities by telepathology was initiated using either static image telepathology or RTP at rural sites, for review of diagnoses made by pathologists at small rural hospitals within Arizona. The QA guidelines were those of the AP laboratory at the remotely located institution and within the QA protocol for AP at University Medical Center (UMC), Tucson, AZ. Before the implementation of telepathology at such sites, the diagnostic review was achieved by routine methods of glass slide mailing/shipping and conventional light microscopic examination by the consulting pathologists at UMC, followed by a written report. The advantages of a telepathology-supported QA review were: (1) the real-time assessment of diagnostic findings and reporting back to the referring pathologist by telephone and/or fax; and (2) the opportunity to immediately request materials for additional specialized testing at UMC, should those be indicated.

A more recent QA activity that has been supported by VSTP has been the review of diagnoses from the affiliated urban hospital within Tucson by AP staff at UMC.

2. Materials and methods

Two university-affiliated hospitals are engaged in the VSTP QA program: the flagship hospital UMC, with approximately 20 000 surgical pathology specimens annually, and the University Physicians Healthcare Hospital (UPHH), 6 miles away, accruing about 2000 surgical pathology specimens per year. The 2 hospitals are currently competing independent corporations but share the same medical staff. UMC is a tertiary-care hospital staffed by 10 surgical pathology faculty members, many of whom have subspecialty pathology interests and expertise. UPHH has a single pathologist working part-time daily on their campus with coverage scheduled on a rotating basis from among the UMC staff pathologists. The UPHH pathologist-of-the-week travels back and forth between the 2 campuses.

Each institution has its own histopathology laboratory, transcription support, and Laboratory Information Systems (however, each hospital's Laboratory Information Systems has a noncongruent platform). Both institutions have a similar AP QA protocol, some components of which are: (1) confirmation of any newly made diagnosis of malignant neoplasm by at least one pathologist in addition to the primary pathologist rendering the diagnosis on-site; and (2) review of cases in which the diagnosis is challenging, rare, or discordant with clinical or other diagnostic modalities.

The VSTP-QA work flow model is as follows. The UPHH on-site pathologist evaluates the histopathology glass slides generated by the UPHH histology laboratory and drafts a written report which is in final form, except for the electronic signature. This report is transmitted by fax to the UMC AP Division, indicating the need for a same-day VSTP-QA review. Concurrently, the virtual slide images are acquired by a medical technologist using a DMetrix DX-40 ultrarapid virtual slide scanner (DMetrix, Inc, Tucson, AZ). This was installed at UPHH in 2005 [9]. The image is stored on a server locally and available for viewing over the secure Internet using a DMetrix Iris Virtual Slide Viewer (Fig. 1). For VSTP-QA, the images generated by the DMetrix virtual slide viewer are reviewed on a 50″ plasma screen monitor in mid-afternoon, at UMC, in conjunction with diagnostic glass slide reviews of the UMC in-house QA cases. Pathology faculty, residents, and medical students attend these daily conferences. These are held in a large surgical pathology