

542 The Application of *COL1A1-PDGFB* Fusion Gene Detection by Fluorescence In Situ Hybridization in Biopsy Tissue of Dermatofibrosarcoma Protuberans

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Background: Dermatofibrosarcoma protuberans (DFSP) is a dermal and subcutaneous intermediate tumour. Compared to other techniques, biopsy is not only a rapid outpatient procedure but also the optimal choice for unresectable patients with cutaneous tumor before neoadjuvant therapy. In DFSP, the rarity of tumours, atypical clinical manifestation and uncommon histological features may cause diagnosis pitfalls in the limited biopsy samples. The most remarkable cytogenetic characteristic of DFSP is the formation of the *COL1A1-PDGFB* fusion gene. The aim of this study was to analyse the clinical application value of fluorescence in situ hybridization (FISH) in biopsy of DFSP.

Design: Twenty-three consecutive biopsy specimens of DFSP, collected from 2007 to 2014, were reviewed for clinicopathological features and immunohistochemical staining results, and detected with the *COL1A1/PDGFB* Fusion Probe and the PDGFB Break Apart Probe using FISH analysis. Controls included 5 fibromatosis and dermatofibromas. The positive criteria for *COL1A1-PDGFB* gene fusion and *PDGFB* rearrangement were both 10% and more of the cells showed meaningful signals.

Results: The 23 tumour samples consisted of 10 punch biopsies and 13 shave biopsies (11 males and 12 females; mean age at diagnosis, 37 yr; range, 14 to 75 yr). Eighteen conventional DFSP, 1 Bednar tumour, 2 myxoid DFSP and 2 DFSP with fibrosarcomatous areas were included in the group. CD34 expression was strong and extensive in the spindle cell component in 19 cases (83%) of DFSP, including FS-DFSP, whereas one case of a conventional subtype was negative for CD34; One case of a conventional subtype and 2 myxoid subtypes had patchy CD34 expression. SMA was focal positive staining in 3 cases (13%). All cases were negative for desmin, S-100 protein, myogenin, Bcl-2, CD99, p16, p63, cytokeratin and EMA. In FISH detection, 21/23 cases (91%) were both positive for the *COL1A1-PDGFB* fusion signal and the *PDGFB* break apart signal. The percentage of *COL1A1-PDGFB* fusion gene was above 70% in 20/21 (95.2%) of DFSP. A *PDGFB* split signal pattern was observed in approximately 20%-80% of the interphase tumour nuclei.

Conclusions: This is one of the few study to demonstrate the great value of detecting *COL1A1-PDGFB* fusion translocation by both the Fusion Probe and the Break Apart Probe in biopsies of DFSP using FISH analysis. As a molecular cytogenetic technique, FISH could become a standard procedure to confirm unusual clinical presentation and validate complicated and suspected diagnosis in the routine biopsy of DFSP.

Education

543 Mentoring Residents in Academic Centers, the Cleveland Clinic Experience

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Background: Mentoring is widely recognized in academic and non-academic centers as a critical component of professional development. Even though the prevalence of mentoring in academic medical centers has been reported in the literature varying from 19 to 84%, there is limited experience in the pathology field (Zerzan J et al, Acad Med 2009). The goal of this study is to present some preliminary data on our own experience and the impact of an organized mentorship program.

Design: Our pathology department is a subspecialty based practice with more than 80 faculty members between anatomic and clinical pathology throughout the entire health system. Our ACGME accredited residency program includes a total of 29 PGY1-PGY4 residents. A pilot mentorship program was introduced to residents and staff volunteers, which included a training session that provided educational material, as well as basic guidelines and exercises examples on how to make the most out of the mentorship experience. Baseline and follow up surveys were obtained.

Results: Our pilot program included 19 staff (2 to >25 years in practice) and 20 residents (12 female, 8 male, PGY1 to PGY4). The baseline survey revealed that >85% of residents were interested in having a mentor. Even though 37.5% reported having at least 1 mentor before starting the program, 4 out of 5 residents struggled to find a mentor during the first year of training. Out of the entire cohort, the mentor-mentee match was successful in 94% of cases. Anecdotal feedback as well as follow up surveys from residents reported that mentors could help them achieve their goals, including development of career objectives (86%), fellowship/job search (67%) and overcoming daily obstacles (40%).

Conclusions: Our experience supports that mentor-mentee relations are greatly valued and key in professional development. Besides spontaneous mentoring, an organized mentorship program may be helpful as an additional tool to facilitate interactions early during residency and to support staff and residents through educational resources.

544 A Survey of Pathologists and Learners of Pathology on Pathology Information Consumption

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Background: Observational data suggests seekers of pathology information (PI) have focused questions and value the ease of finding info, based on web statistics; however, PI consumption is still incompletely characterized and infrequently stratified by practicing pathologist and learner. Where information is sought and what is important may give insight into how PI may be delivered in the future.

Design: An online survey was done using limesurvey (limesurvey.org). Participants were recruited from an open access pathology web site, via Twitter, email and word of mouth.

Results: A total of 59 participants completed the survey (25 pathologists, 33 learners (3 fellows, 30 residents), 1 other health professional) and were from various regions (North America 39, Asia 9, Europe 5, Africa 5, Other 1). Among learners (L) and pathologists (P) elements rated very important (VI) were images (70% L/60% P), followed by microscopic criteria (58% L/56% P) and IHC info (52% L/56% P). Learners and pathologists differed on the VI ratings for spot diagnosis quizzes (39% L/28% P), sign out examples (45% L/28% P), image annotations (27% L/48% P) and references (12% L/28% P). Both groups very frequently (VF) sought info via search engines (30% L, 32% P) and open access web sites not involved in the survey (42% L/36% P). Learners preferred login web sites (24% vs 12% VF) and colleagues (30% vs 16%), while pathologists preferred the primary literature (36% vs 6%) and review articles (24% vs 6%). Offline textbooks (28% vs 21%) and Wikipedia (16% vs 9%) were more VF used by pathologists; however, learners less frequently 'never' used Wikipedia (16% vs 6%).

Conclusions: The interest in images suggests that picture-matching is important and images showing variation likely desired. The interest in sign out examples among learners may indicate an increased desire for standardization. The differing importance placed on references and the medical literature may reflect a change in where individuals get information (media vs social media) and the ease of finding information/verification with other sources. PI seekers use a variety of sources. Offline resources remain important; however, learner-pathologist differences suggest that PI is increasingly being sought online and open access resources may be preferred.

545 Improving Patient-Pathologist Interactions Using Structured Communication Training for Pathologists- A Pilot Experience

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Background: Patients occasionally request communications with pathologists. Pathologists express discomfort or avoid direct patient interactions, as these are often triggered by negative events. If not handled with sensitivity, transparency and concern for the patient, these may cause greater distress for the patient, and negative outcomes.

Design: As part of the institutional communication and resolution program, several pathologists underwent structured communication training. This pilot evaluated comfort and quality of patient-pathologist conversations before and after training. Reports of patient experiences were collected from clinicians who interacted with the patients after the disclosure conversation.

Results: There were 5 communication events. 4 generated from erroneous reports, 1 of which led to a delay in diagnosis. 1 was a complex clinico-pathologic event. 2 involved untrained pathologists. 2 (1 before and after) involved the same pathologist. The quality of the conversations, as reported by pathologists and the patients, was better and more comfortable with a pathologist with training/coaching. Both patients who communicated with untrained pathologists expressed dissatisfaction with the communication. One reported the pathologist as insensitive and unsympathetic. Untrained pathologists were apprehensive, felt ill-equipped for the meeting and reported that patients did not appear to understand the complexity of pathologic diagnoses. They did not offer patients the opportunity for follow-up conversations. They were disinclined to participate in additional patient interactions. Patients who interacted with trained/coached pathologists expressed acceptance (1) and satisfaction for the transparency and quality for communication (1). Trained pathologists expressed greater comfort going into the meeting and navigating the discussion, and offered follow-up opportunities to the patients. They independently followed up with the patient (1) and the clinician (1).

Conclusions: Difficult conversations are a necessary part of a physician's life. They are likely to increase in frequency for pathologists, because of greater access to the pathology report for patients, and increasing involvement of the pathologist by the clinician in disclosure conversations. Communication training for pathologists may aid the pathologist in more comfortably and empathetically navigating conversations with patients and result in a more positive experience for the patient and the pathologist.

546 Cytology Cases of the Week: Five Years of Data on an Educational Tool That Improves Trainee Exposure to Cytology

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Background: Cytology is a major subspecialty within anatomic pathology, accounting for ~30% of the "practical with images" section of the anatomic pathology board exam. Further, the ACGME requires residents to examine 1,500 cytology specimens by the end of residency. Cytology cases of the week (COWs) were instituted in 2011 in an effort to increase trainee exposure to cytology. Here, we assess the effectiveness of COWs as a teaching tool.

Design: Images of 2-5 cases/week with basic clinical information are sent to residents on a weekly basis. Residents have one week to respond by email with diagnoses; after which, correct answers are emailed. Cytology resident in-service examination (RISE) scores were compared between participants in COWs and non-participants from 2011-2015. In addition, an anonymous survey was distributed to trainees using Qualtrics Survey Software to determine how often residents participated in COWs, reasons hindering or promoting participation, and perception of the effectiveness of COWs as a teaching tool.

Results: An unpaired two-sided t-test showed residents who participated in COWs scored 15.4% higher on the RISE than residents who participated minimally or not at all (p<0.05) over the 5-year period. Analysis of the years separately showed residents who participated in COWs on average had higher RISE scores than non-participants (6.7-25.2%), and this difference was statistically significant in 3 of 5 years (p<0.05). In 2016, COWs were not sent. An unpaired t-test comparing RISE scores for residents

who participated in COWs in 2011-2015 (n=68) to that of all residents in 2016 (n=31), showed a 14.4% decrease in the RISE scores of the residents in 2016 ($p < 0.05$). There was no correlation between percentage of correctly submitted answers for COWs and RISE scores. The survey response rate was 45.6% (26/57 trainees). The vast majority (83%) reported participating in COWs for self-study, while 17% reported participating for board preparation. The majority (86%) felt participation in COWs increased their cytology knowledge. Major reasons for not participating included technical challenges and time limitations.

Conclusions: COWs are an effective educational tool that increase resident fund of knowledge in cytology. Residents who participate in COWs perform higher on the RISE and simply participating in COWs is associated with higher RISE scores, regardless of percentage of correctly submitted answers. Additional technologies can be explored to overcome technical challenges and further encourage resident participation.

547 Digital Image Simulation Training for Cervical Cancer Screening in Low Resource Settings

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Background: The majority of women who die of cervical cancer live in low resource settings where screening services are scarce or non-existent. These settings often lack personnel who are trained to screen. We are developing a simulation education program using digital imaging to train inexperienced personnel to detect high risk lesions using rapid pattern recognition. Program development depends on: 1) image-based pattern recognition of high grade squamous intraepithelial lesion or higher (HSIL+) skills and 2) locational skills to find HSIL+. We report our experience in developing pattern recognition skills.

Design: We developed a bank of over 10,000 images of HSIL+ and lower than HSIL lesions (HSIL-), including mimics of HSIL+, such as endometrial cells, squamous metaplasia, and repair. We developed a curriculum of half hour didactic talks tailored to trainee performance on daily challenges of 10 to 30 images. For each image, the trainee provides a diagnosis of HSIL+ or HSIL- and level of confidence on a Likert scale of 0 (unconfident) to 5 (confident). During the daily practice period of two hours, the trainee rapidly diagnoses banked digital images. We use a number of simulation principles, such as immediate feedback, increasing challenge difficulty, and deliberate practice. In 2016, we began the training of research assistants who had no experience in the examination of slides or images. We measured the time to reach image recognition proficiency based on number of images examined.

Results: In pre-training assessments, trainees scored in the range of 40% with individual confidence levels of 0. The larger the number of images rapidly examined, augmented by more difficult images of artifacts and rare examples, the faster a trainee reached proficiency. By examining 500-1,000 images using deliberate practice, trainees were able to attain a score of 80% or higher with confidence levels of 4+. Rapid pattern recognition skills for proficient practice generally could be reached in three months with focused image review for three hours or less per day.

Conclusions: Trainees with no prior Pap test experience are able to gain proficiency in relatively short periods of time through simulation education with rapidly delivered digital images and daily assessment. This ability may assist in training cervical cancer screeners who would work in low resource settings. Currently, we are evaluating the components of skill decay over time and the relationship of image volume and skill level. We also are examining the ability of trainees to develop locational skills through simulation.

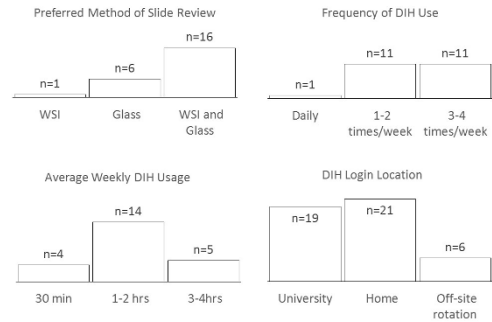
548 Whole Slide Digital Imaging in Pathology Resident Education

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Background: Whole slide imaging (WSI) consists of digitizing glass slides for microscopic evaluation, simulating traditional light microscopic images viewed at varying magnifications. WSI, performed in the Digital Histology Shared Resource in our University, is utilized for weekly unknown conference slides and accessed online via the Digital Image Hub (DIH). WSI's are then archived with the correct diagnoses and are available for future review by residents. We studied resident use of WSI in comparison to conventional glass slide review of the unknown conference slides.

Design: Online use of WSI, including number of logins per de-identified pathology resident and login location was tracked over a 4-week period. Residents completed an anonymous survey via SurveyMonkey.com regarding their use of glass versus digital slides.

Results: In a 4-week period, 84% of residents accessed the website at least once with individuals logging into the site 0-27 times (mean 8.4). Most residents (68%) accessed the website from both university and non-university computers with only 4 residents exclusively using university computers. Individuals more frequently accessed the website from the university with 34% of recorded logins taking place outside of the university. The survey was completed by 23 residents with selected results displayed in Figure 1. A combination of WSI and glass slides was preferred by most residents (70%), with weekly usage of up to 4 hours/week. Although tracking data revealed more frequent logins from university computers, nearly all residents reported accessing the DIH from home. Only 55% of residents reported using the DIH to also review archived unknown conference material. All resident responses listed convenience and/or access to slides outside of the hospital as the primary advantage to WSI. Reduced image quality/resolution of WSI was the chief disadvantage given in 88% of responses.



Conclusions: Implementation of WSI improves resident teaching by allowing access to slides from multiple locations with the only significant disadvantage being reduced image resolution. Most residents regularly use WSI in conjunction with glass slides to view unknown cases prior to conference. Review of archived digital material beyond the scope of unknown conferences is an additional, yet currently underutilized, educational tool.

549 Can Pathology Skills Be Learnt Exclusively Through Online Resources?: MOOC for PAPS - A Massive Open Online Course to Raise Pap Smear Cytoscreener Workforce in Low and Middle Income Countries

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Background: Cervical cancer screening is implemented through VIA programs, and not through Pap smears in Low and Middle Income Countries (LMICs). This has resulted in highly ineffective screening; Cervical cancer remains a high burden disease in these countries. The main reason cited by global organizations is that Pap smear screening skills CANNOT be taught in these countries. We hypothesized that Pap smear cytology can be taught by online courses. Thus, we implemented MOOC for Paps - a Massive Open Online Course for Pap smear technology, through Harvard's EdX platform.

Design: 20 lectures covering gynecologic cytology were developed and implemented through EdX platform. The lectures were developed as 10-15 minute modules, powerpoints with voice overs, spoken tutorials and videomicroscopy with voice based lecture. Lectures covered basic microscopy, gynecologic pathology and interactive modules.

Four students from Tirunelveli district in Tamilnadu, India were recruited and trained through our program. The students had two weeks of contact program, but the rest of the training were through books and online resources. The students were also continuously screening Pap smear slides from the cancer screening program that they are involved in and these slides were re-scored by another already qualified cytoscreener and a cytopathologist. Their skill levels were monitored through the slide reviews, periodic quizzes and unknown slides.

Results: The students showed progressive gain of skill in 1 year. The relative use of digital resources varied among students. By the end of one year, at least one student had gained the capacity for individual screening. All the students were at or above a concordance of 75% with cytopathologist.

Conclusions: It is possible to raise a cytoscreening skill set through online mediated courses alone.

As a next step, we will open a second comparison site, where students do not have any contact with a trained individual; a third comparison cohort of medical students (n=3) who will undergo global health missions will be trained rapidly through these modules. The second and third cohorts will be compared with the original cohort for acquisition of knowledge. By optimizing the MOOC for Paps program we aim to rapidly raise a cytoscreener workforce desperately needed for cervical cancer screening in LMICs.

550 Images in Pathology: Sketches from the Montreal General Hospital 1930 - 1950

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Background: Gross pathology can be taught using a variety of media. Ideally, it should be based on fresh autopsy or surgical specimens. However, the amount and variety of such material is not always available for adequate learning, and its use outside of the laboratory is not practical. Specimens preserved in formalin based solutions and located in museums have been used, but are effectively of historical interest. As a result, photographic images, either projected or printed, became an important teaching tool from the late nineteenth century onwards. Illustrations using media such as watercolor have also been used, particularly when photographic images failed to provide ideal colors or detail. An example of this is the Gzowski collection, created during the mid-twentieth century at the Montreal General Hospital (MGH). The purpose of this project was to highlight the relationship between art and gross pathology teaching.

Design: The collection, consisting of 459 drawings, was digitally scanned and categorized according to type of pathologic abnormality or surgical procedure, organ system and style of drawing.

Results: Of the 459 illustrations, 68% are pencil/charcoal drawings and 16% are watercolor; the remainder are ink. 84% illustrate a specific pathologic entity or anatomic variant; the remainder include illustrations of a variety of subjects, including

surgical procedures. Although every organ system is represented, 80 percent are of five: genitourinary (27%), gastrointestinal (18%), ear, nose and throat (14%), cardiovascular (13%) and gynecologic (8%).

Conclusions: Mary Gzowski was a medical illustrator at the MGH in the mid-twentieth century. Although not formally trained in medicine, she attended anatomy classes at McGill to better understand and represent the specimens that physicians asked her to depict. Her drawings were used in lectures and at conferences given by MGH physicians; some have captions suggesting that they were intended for textbooks. Hand drawn illustrations such as those made by Gzowski assist the viewer in the interpretation of pathologic abnormalities by emphasizing certain features through carefully applied shading and highlights. In this respect, aesthetic choices were associated with specific pathologic features. This aspect of traditional medical illustration is exemplified in Gzowski's collection, and her work demonstrates that, through art, even diseased organs can be rendered visually attractive.

551 #PathJC: The Founding and Success of the First Twitter Pathology Journal Club

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Background: Social media offers worldwide real-time connectivity. Although some medical specialties successfully use social media for online journal clubs, no such program has been established in pathology.

Design: We began an online pathology journal club using the microblogging platform Twitter (Twitter, Inc, San Francisco, CA, USA) with the hashtag #PathJC. A Twitter account, @path_JC, was created to moderate and advertise the sessions (twitter.com/path_JC), and a website hosts the journal club schedule and summaries (pathjc.wordpress.com, Automattic Inc, San Francisco, CA, USA). Journal clubs were moderated monthly from @path_JC utilizing articles broadly applicable to a wide pathologist audience, emphasizing open access articles. Moderation was rotated amongst pathologists with relevant subspecialty interest. Symplur Healthcare Hashtags (Symplur, LLC, Upland, CA, USA) was used to track analytics.

Results: The first #PathJC was July 26, 2016, with 32 participants and nearly 1 million impressions (tweet-views) in the first hour. To date, there have been 3 #PathJC discussions with a total of 417 participants, 3,702 tweets, and over 6.8 million impressions. Thus far, participants have represented at least 17 different countries. PathJC has been a PubMed Commons Journal Club member since September 2016, which serves as an archive for the discussions.

Date	Topic	Participants	Tweets	Impressions
July 26, 2016	PD-L1 in cervical cancer Mod Pathol. 2016 PMID: 27056074	32	497	957,728
August 23, 2016	NIFTP JAMA Oncol. 2016 PMID: 27078145	31	415	1,001,660
September 20, 2016	Gleason updates Arch Pathol Lab Med. 2016 PMID: 26756649	29	391	1,014,041
Total (July-Sept)		417	3,702	6,878,544

The #pathJC Influencers

Top 10 by Mentions

- @path_jc 980
- @marenwfynd 879
- @mgardnermd 422
- @chioseas 374
- @sara_jiang 352
- @pbalexo 326
- @gleason4plus5 296
- @kryer09 282
- @pembredrlu 277
- @geronimojlapac 259

Top 10 by Tweets

- @path_jc 337
- @marenwfynd 314
- @mgardnermd 269
- @sara_jiang 249
- @mvm0908 212
- @arnold_gi 84
- @smlungpathguy 79
- @pbalexo 78
- @idockr1 75
- @pathologyuams 63

Top 10 by Impressions

- @mgardnermd 1,880,885
- @mvm0908 876,020
- @marenwfynd 539,961
- @sara_jiang 538,512
- @humanpathology 296,649
- @thescap 199,971
- @carnold_gi 163,960
- @path_jc 153,050
- @pathologyuams 149,142
- @pbalexo 148,628

The Numbers

6,878,544 Impressions

3,702 Tweets

417 Participants

2 Tweet-to-Tweet Ratio

9 Path-to-Tweet Ratio

Conclusions: We report the first use of the Twitter platform for a pathology journal club. #PathJC has international reach with over 6.8 million impressions in only the first 3 months.

552 Creating Pathologists from a Post-Sophomore Externship: 15 Years and 98 Externs at an Academic Pathology Department

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Background: Medical student exposure to pathology and histology is a continued concern for departments across the country, especially as traditional pathology content is progressively trimmed from medical school curricula. In a longstanding effort to recruit and expose more medical students to the practice of pathology, our institution has supported a year-long post-sophomore pathology externship since the 1930s. The program currently employs 6 full-time medical students per year to work and essentially function as junior residents, taking an active role in delivering surgical pathology and autopsy services, with additional opportunities for teaching, research, and electives.

Design: We evaluated residency specialty choices for our department's former pathology externs who participated in the program from 1999-2014. We also surveyed these individuals about the location of their current practice, their reasons for pursuing the externship, and the role the externship has played in their current clinical practice.

Results: From 1999-2014, our department employed 98 externs, 46 (47%) of whom pursued careers in pathology after completion of the externship. This group represented 65% of all our medical school's graduates who subsequently matched into pathology during this time frame (2001-2016; 70 total). Of the former externs who chose pathology, 22 (48%) remained at our institution for residency training. In our survey group, the two most common reasons for student participation in the externship were: 1) interest in pathology and 2) uncertainty about specialty decision. Those who chose another specialty also validated the influence of the externship on their current practice, particularly in their understanding of the pathologist's role in healthcare and their ability to communicate with pathology colleagues.

Conclusions: Our externship program is exceptional in the number of students participating each year, and our institution shows a higher percentage of former externs pursuing careers in pathology compared to similar studies. The post-sophomore externship is an effective tool for recruiting medical students to a career in pathology, especially for students who are interested in the subject matter or undecided about their specialty choice. Additionally, an externship provides an opportunity to educate future clinical colleagues about the pathologist's role in the medical system.

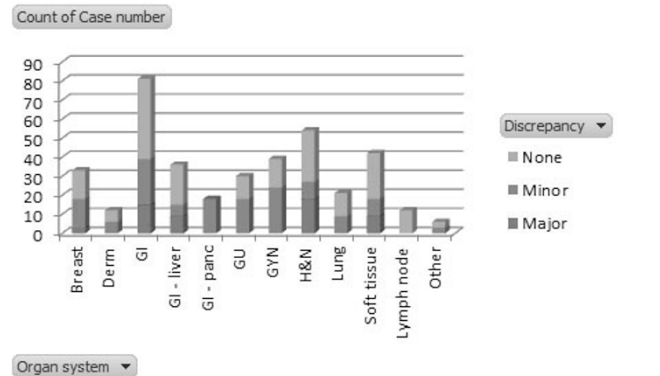
553 Closing the Loop: Improving Feedback Using LIS Based Reports for Resident Specific Practice Data

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Background: Direct feedback on resident crafted diagnoses is foundational to anatomic pathology (AP) education. Preview of cases by residents with real-time, verbal feedback while looking through a multi-headed microscope at sign out has been the traditional method at many institutions. Despite this mechanism of direct instruction, many residents perceive a lack of feedback or other data on their performance. In the 2016 Accreditation Council for Graduate Medical Education (ACGME) Annual Resident Survey, nearly one third of residents nationally reported receiving insufficient data about practice habits. We report a newly developed tool to provide residents with personal data about AP performance.

Design: Our institution recently implemented a new AP laboratory information system (LIS) which utilizes discrete fields for internal communication not viewable by clinicians or patients. We used the LIS discrete fields for preliminary diagnoses and resident assignment to track involvement with surgical pathology cases. These functions allow residents to permanently document their preliminary interpretations of cases for subsequent comparison to final reports. We then modified an LIS search function to identify all cases assigned to an individual resident and collate data from each case including preliminary and final diagnoses.

Results: The search results display in tabular format showing preliminary resident diagnoses and final sign out diagnoses side by side, providing easy comparison of diagnostic verbiage and evaluation of discrepancies. Also included are data on organ system and turn-around time (TAT). Results stripped of protected health information (PHI) can be exported into a spreadsheet to allow easy viewing, organization, and analysis including organ-based feedback and graphical displays of a resident's personal performance data (eg. figure 1 including discrepancies).



Conclusions: Utilizing simple modifications of data fields and report features in our LIS, we were able to customize pathology workflow to track and record pathology resident interpretations without compromising TAT, PHI, or final report clarity. This tool provides residents with aggregated performance data in a format that allows for personalized progress tracking and actionable feedback.

554 Developing Multimedia Resources Using Camtasia Studio 8 to Teach Pathology in the Era of Subspecialized Residency Education

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Background: Camtasia Studio 8 [CS8] (TechSmith, Okemos, MI) is a recording tool, which allows you to capture a digital recording of a computer screen with audio narration while providing hyperlinks to helpful references and quizzes. While didactics are necessary, one-on-one scope time is essential and is not easily reproducible. The features provided by this software can be combined with virtual microscopy to provide exposure to cases in a structured manner that stimulates learning as effective as one-on-one teaching in an accessible manner.

Design: Multimedia videos were prepared using thyroid cases to explain grossing technique and histologic diagnostic approach using whole slide scanned cases (Aperio ImageScan software, Leica Biosystems, Buffalo Grove, IL). The files were saved in mp4 format and published on our department intranet, Google drive (Google, Mountain View, CA), YouTube.com, and Screencast.com. Only screencast.com provides the ability to use proprietary data that is accessible to only proprietary users, while other platforms are only available for public viewing. Pre and post quizzes were given using a cloud based survey tool (SurveyMonkey, Palo Alto, CA). The quiz results were automatically emailed to a third party proctor. A focus group of 5 first year residents and 5 senior residents from three different institutions were asked to examine the videos using their device of preference. Focus group members were asked to provide feedback (0 - 5 scale, 0 - not useful and 5 - very useful).

Results: The members of the focus group overall rated the exercise as useful providing an average score of 4.8 out of 5 (range 4.0 - 5.0). The quality of the video microscopy was satisfactory. Among the first year residents, the posttest scores increased in all cases by an average of 1.5 out of 5 points. When comparing didactic lessons to narrated virtual slide demonstrations, the latter was rated higher (4.9 out of 5).

Conclusions: Videos with narrated virtual slide examination provide an efficient method to supplement the teaching pathology, providing residents with exposure to interesting cases, tracking their learning with quizzes and attempting to simulate the “sign-out” experience. The videos can be viewed on iOS and Android mobile devices as well as personal and work computers, providing an attractive learning method to trainees that are skillful at integrating these technologies into their daily routine.

555 pathCast: A Model for Pathology Education Using Web-Based Live Video Streaming

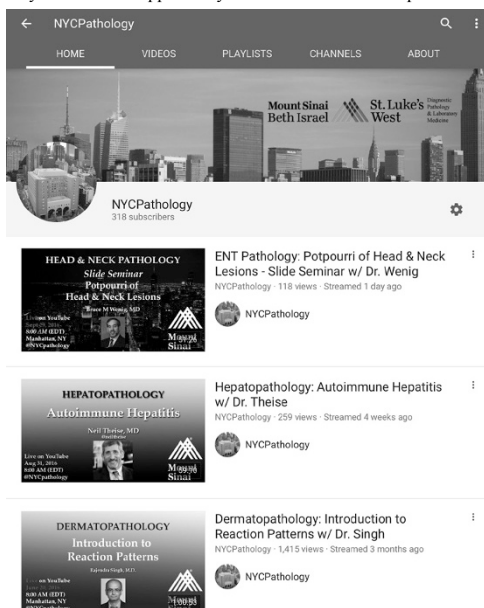
Emilio Madrigal, Abul Ala Syed Rifat Mannan, Shyam Prajapati, Neil Theise. Mount Sinai Health System, New York, NY.

Background: Structured pathology teaching and continuing medical education traditionally take the form of didactic lectures organized by residency programs or regional, national, and international organizations. Although such sessions are historically effective, the benefits are mostly limited to local attendees. We developed a method to disseminate pathology education on a global scale using readily available hardware and freeware internet services.

Design: A YouTube channel (youtube.com/NYCPathology) was created to host our online seminars, henceforth referred to as pathCast(s). Select lectures/slide seminars were featured as pathCasts and produced using a workstation with a microphone and a microscope-camera setup. Informative graphics were utilized to promote upcoming pathCasts through social networking websites and applications, including Twitter and WhatsApp. In creating the pathCasts, various web-based live streaming tools were tried: Periscope, GoToMeeting, and YouTube Live; all of which allowed user interaction via chat. The content was publicly broadcasted live, and upon conclusion, the stream was either manually or automatically archived in the aforementioned channel (Figure 1). All lectures were HIPAA compliant, and prior consent was obtained from the speaker.

Results: Over 5 months, 17 pathCasts were broadcasted. Of these, 13 originated from our institution, while 4 were guest webinars presented from different parts of the country. All lecturers were renowned experts in various fields, including dermatopathology and hepatopathology, to list a few. The pathCasts consisted of slideshow presentations (n= 9) and glass slide seminars (n= 8). The channel gained 316 subscribers, received 7,957 views from 106 countries or regions with a total watch time of 59,941 minutes. YouTube Live streams received an average peak concurrent views of 17.5 live viewers and a total of 118 live chat messages.

Conclusions: Web-based live streaming is an innovative and low-cost tool that allows successful dissemination of medical education to both resource-rich and resource-poor institutions. Our interactive method of broadcasting pathology seminars will allow expertise to be shared on a global scale, granting on-demand access to learners who otherwise may not have the opportunity to attend the session in-person.



556 Strategic Approach to Restructuring Surgical Pathology (SP) Resident Education in a Subspecialty (SS) Practice Model

Aparna Mahajan, Suzanne Selvaggi, Robert Corliss, Sara Gross, Erik Ranheim. Univ. of Wisconsin, Madison, WI.

Background: To keep pace with new developments and subspecialized nature of clinical practice, many academic pathology departments have transitioned to a subspecialized practice model in SP. We found that this transition posed challenges when structuring the residency education (RE) program in SP. The strategic approach adopted by our institution to manage this issue is discussed.

Design: At UW Madison, we instituted a SP Education Committee, comprised of SP faculty, director of SP, residency program director, laboratory staff and resident members, tasked to devise an educational program to meet resident’s needs in the new model. To match SS practice, a two year didactic curriculum was designed to supplement resident learning. Conference evaluations were implemented to provide rapid feedback to faculty. SS curricula with slide study sets and examinations were developed to support self-learning, and complemented by voluntary evening conferences. Most challenging was the balancing of resident service needs within acceptable duty hours. This was met by (1) creation of a unit system for busier SS to limit the number of large cases grossed by the resident, (2) implementation of a tumor board (TB) rotation to avoid previewing and sign-out interruption, (3) limiting biopsy sign-out to 3 days/week and utilizing the remaining 2 days for frozen sections and added preview/study time. Modules for laboratory management education in SP were implemented. We also introduced a frozen section block for our senior residents. To maintain renewed interest and resident motivation, we implemented formal year-end teaching sessions conducted by senior residents with an interest in SP.

Results: The immediate impact of these changes was improved resident morale and faculty satisfaction of resident performance. Restructuring grossing and minimizing interruption during preview and sign out enhanced the overall quality of resident work. Faculty evaluations on the TB rotation reflected high confidence by majority of the residents with improved organization and presentation skills. We observed improvements in our RISE scores and ACGME reviews. However, we believe that the true impact of these changes will be evident over time.

Conclusions: Moving to a SS practice model impacts residency education in SP. Adopting a strategic approach to understanding the issues and restructuring RE in this model has shown promising results within our department. We believe that discussing such educational strategies at national forums, leading to an exchange of ideas can help advance the quality of SP education in a SS setting.

557 Restructuring Resident Teaching Curriculum: An Institutional Experience

Abul Ala Syed Rifat Mannan, Malary Mani, Shyam Prajapati, Emilio Madrigal, Mark T Friedman. Mt Sinai Health System, New York, NY.

Background: Didactic sessions have historically been an important component of pathology curriculum. An ideal structure needs versatility with appropriate anatomic and clinical pathology (AP/CP) balance, board relevancy, and catering to needs of residents at different levels of training. This goal is difficult to achieve in a practical setting. In our AP/CP residency program, we sought to restructure our educational sessions to make it more efficient and diversified.

Design: During a 7 month period we introduced different teaching modalities to restructure the educational curriculum. Two separate questionnaires were distributed amongst residents and faculty members to evaluate their experience and were assessed on a Likert scale.

Results: Keeping pre-existing didactic lectures as constants, the new format for AP sessions included: unknown slide sessions, gross conference, invited guest sessions(lectures/ slide seminars/ webinars), AP journal club, and board review. For CP sessions: journal club, CP-call review session, and guest webinar. We introduced a “Boot Camp Series” comprising: grossing lectures, motivational guest webinar, and “how-to” workshops on grossing and microscope use. We also organized a 4-day CP-on-call workshop for new PGY-2 residents. A YouTube channel (youtube.com/NYCPathology) was created to upload and archive live lectures. All 20 residents and 10 faculty members participated in the survey. Majority agreed on an improved experience than prior years. Survey results are displayed in the tables.

Resident Survey I	Average response
Questions	
How would you characterize teaching structure since March 2016?	4.6
How is AP/CP balance?	4.1
How is the emphases on board relevant content?	4.0
How have guest lectures affected conferences?	4.8
How have YouTube channel affected conferences?	4.7
IResponses were on a 5-point scale (1 = much worse, 5 = much improved).	

Attending Survey I	Average response
Questions	
Teaching structure has changed from before March 2016	4.3
Since introduction of new format, I have an increased interest in participating	4.1
New format is more interactive	3.8
New format has influenced my teaching style	4.0
IResponses were on a 5-point scale (1 = strongly disagree, 5 = strongly agree).	

Conclusions: Restructuring has led to better balanced and diverse AP/CP curriculum. The Youtube channel has offered a novel online learning module for the residents. These efforts have proven effective as demonstrated through positive feedback by both residents and attendings.

558 RE-AIMing Education with Interactive Board Review Software to Increase Resident Knowledge Retention

Anthony Martinez, Christina Dean, Drew Davis, Krisztina Z Hanley. Emory University, Atlanta, GA.

Background: Previous research has shown that lectures are quite ineffective for stimulating higher-order thinking and passive learning lowers the concentration and attention span of students, ultimately decreasing learning. The goal of this educational initiative is to identify Pathology residents’ knowledge gaps using board review questions and improve knowledge retention related to these content areas. Secondary aims include program and implementation evaluations using the RE-AIM Framework Model developed by Glasgow et al. to evaluate the impact of the initiative based on the following criteria: Reach, Efficacy, Adoption, Implementation, and Maintenance.

Design: Chief resident led bi-monthly board reviews sessions were composed using interactive, free teaching software (Socratic). Questions were open to all resident learners (Reach) and were based on ASCP PRISE questions (institutional subscription purchased). In a large group format learners were exposed to the questions and images, questions were answered individually using the software, and group knowledge was assessed by aggregate responses. A tailored lecture followed each question specifically targeting the knowledge gap to re-enforce critical concepts. Evaluation of this intervention is multifaceted. Outcomes are evaluated on a recurring basis and include: knowledge retention, resident satisfaction and learner exposure to the sessions. Each RE-AIM criteria is scored on a 0-1 scale.

Results:

Q1 Participant Evaluations

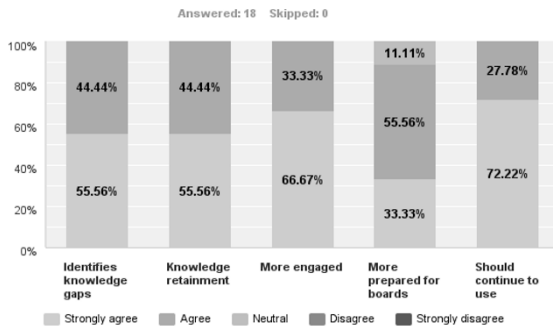


Figure 1

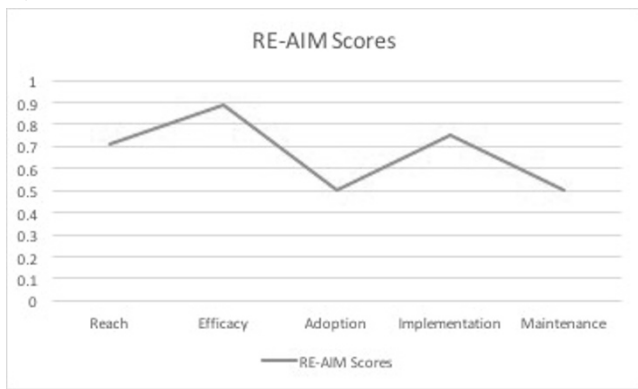


Figure 2

Conclusions: Interactive teaching can more effectively identify knowledge gaps than traditional passive-based lectures. Combining the use of interactive software with a more tailored lecture improves resident learning and knowledge retention. The systematic approach of the RE-AIM Framework Model for implementation evaluation effectively identifies areas for improvement. The measurement of additional objective data such as the comparison of Board/RISE scores is currently ongoing.

559 Integrating Neuropathology with the Neurology and Psychiatry Clinical Clerkships: The Future of the Undergraduate Medical Education

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Background: Neurology and psychiatry have traditionally been regarded as separate specialties, with their own unique approaches for assessing and treating patients. The fact that neurologists and psychiatrists approach brain disorders differently constrains the treatment of psychiatric disorders. This notion is ingrained in physicians as early as medical school, leading to a fractionalization of brain disorders as either having neurological or psychiatric bases. Although many authors have argued for ending this dichotomy, they have overlooked a crucial discipline necessary to attain this goal: neuropathology.

Design: Search of EMBASE, ERIC, MEDLINE, psycARTICLES, and psycINFO for letters, editorials, or original research on the design of combined undergraduate medical clerkships in neurology and psychiatry with significant neuropathology educational components published prior to September 30, 2016. Studies were summarized to develop evidence-based recommendations for the development of new neuropsychiatric educational curricula for medical students nationwide.

Results: Few undergraduate medical programs have considered combining neurology and psychiatry curricula and none has thoroughly integrated these specialties with neuropathology. Integrating neuroscientific knowledge into clinical practice requires a strong foundation in neuroscience, which must be established during medical school. At present, medical students are not generally exposed to pathology during the neurology and psychiatry clinical clerkships. In a recent survey, only 22% of medical schools accredited by the LCME integrated pathology sessions into student clerkships, and a third of residency program directors noted that new residents lacked pathophysiology knowledge.

Conclusions: Combining clerkships in neurology, psychiatry, and neuropathology, in which tissue biopsies are studied and correlated with clinical presentations, is essential given that molecular neuroscience advances (e.g., in NMDA-receptor encephalitis) have set the foundation for neuropathology’s integration with clinical neuropsychiatry, which is progressing toward using neuropathology in concert with cognitive-behavioral symptoms to probe the causes of psychiatric illnesses. Linkage of pathological changes to neuropsychiatric illnesses also has the potential to increase physicians’ empathy with their patients. We propose a curriculum, in which students on their neurology and psychiatry rotations work directly with neuropathologists, that would have pedagogical benefits for physicians nationwide.

560 Slide Sessions Led by Upper Level Residents Are a Useful Tool to Introduce First Year Residents to Surgical Pathology

Chelsea Mehr, Lauren E Schwartz. Hospital of the University of Pennsylvania, Philadelphia, PA.

Background: The transition from medical school to residency is especially unique in the field of pathology due to variations in medical school exposure. Because first year residents enter with different experiences, programs are challenged to address these disparities. Early teaching in surgical pathology is particularly important as first year residents enter busy surgical pathology rotations with complex cases and challenging workloads. Our institution wanted to provide teaching from both faculty and upper level residents that could help address learning gaps and provide a strong foundation for success in the early phases of residency and beyond.

Design: Our training program has instituted introductory twice weekly didactic sessions during the summer months designed for first year residents. The sessions have been divided into 10 sub-specialty organ systems with an attending and resident assigned to each organ system. The attending provides an introductory lecture and the resident leads a glass slide session each lasting 1 hour. The slide sessions discussed an average of 20.9 slides (range: 14-38) and the majority of sessions included both benign and malignant disease with a discussion of normal histology. After this series, we sought feedback from first year trainees regarding these sessions largely using a 5 level scale from “Not at All Helpful” to “Very Helpful”.

Results: Six of nine first year trainees responded to our request for feedback. All first year respondents (6/6) attended >75% of the introductory lectures and slide sessions. Feedback for the attending lectures was largely positive with half the respondents (3/6) indicating the lectures were “Helpful” and one additional (1/6) respondent indicating that the lectures were “Very Helpful.” All first year respondents (6/6) said that the slide sessions given by residents were “Very Helpful” with free response comments emphasizing the utility of resident led slide sessions, particularly the integration of a Powerpoint used alongside the glass slides.

Conclusions: The transition to residency requires first year residents to meet the demands of busy operating room schedules and complex cases early in residency. We implemented an introductory series that helped with this transition and surveyed first year trainees about their experience. First year trainees overwhelmingly attested to the utility of resident led slide sessions. We hope that other residency programs can benefit from similar didactic sessions and resident driven teaching can be applied throughout all stages of residency.

561 Reporting of Newly Adopted “World Health Organization (WHO) 2016 Classification” Nomenclature for Testicular Tumors by Pathologists

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Background: The WHO organized a meeting in March 2015 and released a new “Classification of Tumours of the Urinary System and Male Genital Organs” in early 2016 in a book form commonly known as “blue book”. A number of nomenclature changes and revisions were adopted for tumors of the testis which were announced right after the meeting as well as in subsequent major pathology meetings, seminars as well as in review articles. We reviewed our consultation cases to note the use of new nomenclature in pathology reports after the introduction of new classification and to evaluate the impact of currently available educational resources on universal adoption of this nomenclature.

Design: We reviewed pathology reports from orchiectomies referred to our institute for consultation during April 2015 – September 2016. Only cases with a primary diagnosis and available reports from referring institutes were included. We recorded use of new terminology including Germ cell neoplasia in situ (GCNIS), spermatocytic tumor (ST), sertoli cell tumor (SCT) NOS and variants, prepubertal-type teratoma (prePTT) and postpubertal-type teratoma (postPTT). The correct use of terminology in accordance with WHO recommendations in the reports was determined.

Results: Total of 458 cases with available reports were reviewed. GCNIS (previously intratubular germ cell neoplasia, ITGCN) was identified at our institute in 381 (83%) cases; however, it was reported in only 68 (18%) cases by referring institutes. Only 3 of 68 (4%) pathologists correctly named it as GCNIS while remaining used ITGCN. 2 ST and 4 SCT were reported with older terminology of spermatocytic seminoma and sclerosing SCT respectively. Among pure teratomas, we diagnosed 4 as prePTT and 6 as postPTT, while all of them were called teratoma at referring institutions. Among mixed germ cell tumors 107 postPTT were identified and were reported as teratoma externally as well as in our reports that we think may be appropriate in this setting.

Conclusions: Our study indicates that GCNIS is highly underreported. During 18 months following WHO meeting only 3 of 68 GCNIS cases were reported correctly. Similarly, new terminology use was nonexistent for other testicular tumors. This study emphasizes the need for further education and awareness of changes in WHO nomenclature. Since the acceptance of WHO classification is worldwide, its universal reporting should be standardized and be enforced in synoptic reports by regulatory organizations.

562 Using Smartphones to Capture, Share, and Experience Virtual Reality 3D Models for Pathology Education

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Background: Three-dimensional (3D) models can assist in understanding complex anatomic associations and concepts. Current mobile device technology allows for rapid and portable acquisition of photorealistic 3D models from physical objects. These models can also be viewed on smartphones in virtual reality (VR) environments. In this study, we aim to explore the educational uses of virtual 3D models created, shared, and viewed in VR with smartphones.

Design: Anatomic pathology specimens and forensic sculpture models were photographed in a 360° manner by three pathology residents using smartphones (Apple iPhone 6s, LG Nexus 4, and Samsung Galaxy Note 4) and a mobile photogrammetry application (Autodesk 123D Catch). The acquired texture-mapped mesh files were then cropped using open source 3D graphics software (Blender) on a laptop (Microsoft Surface 3) and exported in the .obj format. Edited models were uploaded to an online 3D model publishing platform (Sketchfab), where case notes and anatomical annotations were added. Links to the models hosted on Sketchfab were embedded into our departmental website and shared on Twitter.

Results: 3D models of surgical pathology specimens (n=5) and forensic sculptures (n=2) were created and made available on our website (bit.ly/3DPath). Residents found the creation and dissemination workflow to be intuitive. Textured models averaged 17.5MB in size and meshes contained an average of 101,145 vertices. Users were able to view the 3D models on conventional desktop monitors or mobile device, as well as, experience them in virtual reality using their smartphone and a stereoscopic viewer. Models were uploaded and shared using Sketchfab, which received total of 68 views and 4 downloads.

Conclusions: The described method was capable of producing photorealistic 3D models of anatomic structures, which were readily shared online. By utilizing case notes and annotations, these models show potential for electronic medical education. Editing of the model on a desktop computer is optional, and by forgoing this step, 3D anatomical models could be created, uploaded, shared, and experienced using a mobile device solely.

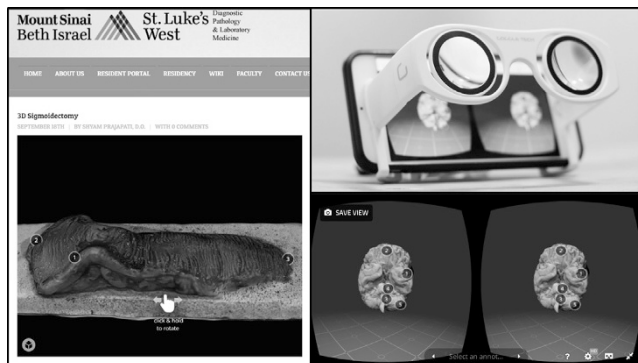


Figure 1: 3D model embedded into departmental website (left), mobile device and stereoscopic viewer (top right), and mobile display of side-by-side 3D model (bottom right).

563 MAP-IT Program to Enhance Professionalism in Pathology Residency Training

Sudarshana Roychoudhury, Michael J Esposito. Hofstra Northwell Health School of Medicine, New Hyde Park, NY.

Background: A core ACGME competency is professionalism. However, there are no definite guidelines for developing a curriculum in professionalism in residency training. The MAP IT program (mentoring and professionalism in training) was developed to promote humanism in the professional development of health care professionals in our health system. The pathology residency program utilized a modified version of this program to satisfy the ACGME professionalism competency.

Design: 21 trainees were divided into 3 groups, with a facilitator who was a graduate of the system MAP-IT program. Five 90 minute sessions in 6 months included topics on appreciative inquiry and active role modeling, conflict resolution, team building, feedback, mindfulness and physician well-being.

Results: Participants completed pre and post surveys using a Likert scale of 1-5 to grade responses.

Question	Pre survey	Post survey
Listen carefully to others	4.38	4.32
Inspire mentees to grow personally	4.0	4.05
Recognize and support emotions in difficult situations	4.19	4.16
Actively use teaching opportunities to illustrate humanistic care	3.57	3.68
Stimulate reflection by the team on patient care	3.74	3.67
Help others use social history for better patient care	3.43	3.63
Serve as a role model to build strong relationships with learners and colleagues	3.62	3.74
Serve as a role model to build strong relationships with patients	3.42	3.29
Explicitly teach communication and relationship- building skills	3.24	3.47
Inspire others to adopt caring attitudes towards patients	3.68	3.86
Colleagues come to know me as a good clinician and a caring person	3.90	3.89
Patients come to know me as a good clinician and a caring person	3.76	3.89

7/12 behavioral questions showed improvement in the post survey. Qualitative responses were very positive, e.g. one participant felt that the sessions helped them “understand the intricacies of work place relationships, ways of effective, respectful and productive communication and professionalism in the workplace”.

Conclusions: MAP IT helps develop skills in team building, conflict resolution and feedback which are essential in every stage of a productive and satisfying career. It provides a platform for sharing experiences, enhances interpersonal bonding and develops strategies to balance well being with professional commitments and growth. It is an effective educational tool that enhances training and can satisfy the ACGME professionalism competency.

564 Resident Perceptions of Training and Interest in Academic Pathology Practice

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Background: Little is known about how pathology residents view academic pathology practice. As the numbers of pathologists decrease, understanding factors motivating residents may help in recruiting qualified candidates into academic settings. A focus of this study is to identify factors highly correlated with interest in academic pathology practice among current U.S. pathology residents, especially those related to residency program and training experience.

Design: A seventeen item anonymous online survey was sent to the Program Directors of all 142 ACGME accredited U.S. pathology programs for distribution to their residents. Responses for questions of interest and importance utilized a Likert scale with five interest and importance levels. The data was analyzed utilizing Spearman coefficient (r), Fisher's exact test and chi-square test. Residents were asked, among other things, if they received appropriate guidance in the selection of pathology career or practice options, about their confidence level in their pathology career or practice choice, about feeling prepared for pathology career or practice choice, and about their overall satisfaction with the quality of their residency education as well as their level of interest in academic pathology.

Results: A total of 296 surveys (12.7%) were received. No statistical association was identified between interest in academic pathology and receiving guidance in career choice (p=0.5268). Female residents were more likely to disagree that they had received career guidance (p=0.0083). No statistical association was identified between interest in academic pathology and confidence level (p=0.2090), preparedness level (p=0.0857), or overall satisfaction level with training (p=0.1338). Age, gender or race did not alter the statistical associations. Underrepresented minority residents were more likely to disagree that they were satisfied with the quality of their training (p=0.0445).

Conclusions: Pathology resident's interest in careers in academic pathology is not based on their perceived level of career preparedness, their confidence level of their career choice or their overall satisfaction with their training programs. Receiving adequate career guidance did not affect their interest in academic pathology. Those interested in recruiting qualified candidates into academic practice should avoid making assumptions about levels of interest in academic practice based on resident's perceptions of their program and training experience.

565 Interventions in Pathology Education: A Systematic Review of the Tools Used to Measure Student Performance

Geoffrey Talmon, Sarah McBrien, Daniel Reiff, Andrew Braith, Erika Fennen, Yanwei Liu, Jonathan Ryder, Paige Scholar, Emily Zurbuchen. University of Nebraska Medical Center, Omaha, NE.

Background: Pathology education offers unique opportunities for instructional interventions in medical schools (laboratory and simulation activities, team-based learning, problem-based learning, eLearning modules, autopsy experiences). Measuring the effectiveness of these innovations is an integral part of the implementation process and should be done so in a rigorous, evidence-based manner.

Our initial impression of existing pathology education literature is that the tools used to measure an impact of an innovation on student performance often lacks approaches to measuring long-term retention and relies heavily on scales which measure student satisfaction or confidence and on pre- and post-test measures with small sample sizes.

Design: Six hundred fifty-five articles met the search criteria we developed with a medical librarian. Each paper was reviewed by two independent readers, the principal

and secondary investigators and a group of medical students. A subset of manuscripts reviewed by students was concurrently reviewed by the principal or secondary investigator to establish reliability of the student investigators' work.

Results: Fifty-five manuscripts met our inclusion criteria: empirical studies of interventions in undergraduate medical pathology education. Data extracted from each manuscript related to sample size, instructional aim, type of intervention, outcome measurement, significance of results, and strength of evidence.

The majority of the studies focused on interventions in the basic science phase

Basic Science Phase	43
Clinical Science Phase	8
Both	4

The instructional interventions described in these manuscripts focused on medical knowledge (49), clinical skills (5), attitudes and perceptions (17), laboratory skills (4), and patient and family interaction (2). Four manuscripts were categorized elsewhere, and each study could fit into more than one category.

One study was identified as multi-institutional, and none included analysis of learning in a longitudinal fashion. Sample size ranged from 34 students to 1501 students. Five authors did not indicate their sample size. Thirteen of the studies reviewed for this project utilized randomization of subjects.

Conclusions: The use of satisfaction surveys, pre- and post-tests, and confidence ratings were overwhelmingly used to measure the strength of an intervention. Readers cited difficulty identifying specific design details from the Method section of manuscripts. More rigorous inquiry and stronger reporting of methodology and results are needed to strengthen the body of pathology education research.

566 "Pathology Is Relevant, but We Don't Want to Do It." Medical Student Attitudes to Pathology Teaching and Understanding of Pathologists

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Background: Pathology departments play a key role in medical school teaching and patient care, yet few medical students select pathology as a career. Possible reasons for this include negative pathologist stereotypes, lack of awareness about what pathologists actually do, and trainee perception that pathology is a boring subject. This paper presents comparative findings between second year medical students and practising Canadian pathologists on pre-conceived notions of the working environment, lifestyle and personality of pathologists.

Design: Second year medical students at Western University (Ontario) and pathologists practising in Canada participated in incentivized on-line surveys. Descriptive and mean comparisons were used to understand whether their perceptions were similar or different.

Results: Survey response rates were 85% (145/171) for students and 19% (155/828) for pathologists. The majority of students (83%) stated that teaching in medical school was their main source of knowledge about pathology but only 33% agreed that they had a good understanding of what pathologists do. Seventy-five percent agreed that pathology teaching is as relevant as teaching in other specialties. While 67% thought pathology was an interesting subject, only one student intended to pursue a career in pathology. Comparatively, there were significant differences between pathologists' and medical students' views of the entertainment industry's portrayal of pathology, with students thinking the portrayal was more accurate ($t(295)=-4.679, p < .001, d=.55$). Pathologists were less satisfied with their careers than students perceived ($t(192.05)=-4.885, p < .001, d=.56$) although 74% were moderately or extremely satisfied.

Conclusions: Pathologists play a critical role in the health care system and lack of student interest in choosing pathology as a career may have long-term detrimental effects. After 2 years of integrated pathology teaching in our medical school curriculum, the majority of students do not have a good understanding of what pathologists do. It is imperative to understand why this is, and to address students' perceptions and attitudes towards pathology to inform how training can enhance interest in the field.

567 A Feedback-Based Training Module Improves Tumor Cellularity Estimation for Molecular Testing

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Background: Assessment of specimen adequacy for molecular testing is the responsibility of pathologists. Given the therapeutic implications in the era of personalized medicine, accurate determination of the percentage of genetic material contributed by lesional cells is imperative to ensure assay quality and appropriate interpretation of results. It is especially important to avoid overestimation in the setting of low tumor content as this can lead to overconfidence in a false negative result and a missed opportunity for effective targeted therapy. Multiple published studies expose significant variability and poor accuracy in tumor cellularity estimation, highlighting a need for evidence-based standardization and training. We present the results of an educational training module designed to address this problem.

Design: An overview of the importance of estimating tumor percent, key concepts, common pitfalls, pictorial diagrams, and virtual practice cases with immediate feedback on performance were compiled into a computer-based training module. The module was administered to a cohort of 7 pathology trainees and 1 experienced molecular pathologist. Participants completed pre- and post-training tests comprised of 10 H&E glass slides of lung adenocarcinoma from FNA and resection specimens. Duplicate slides (5) were included in each test to assess improvement. As a gold standard, tumor cellularity was directly assessed by manual cell counting on digitized slides. Estimation of tumor

purity based on the allele frequencies (AFs) of driver mutations detected in routine next generation sequencing-based testing was performed as an additional objective measure of tumor content and compared to the manual count.

Results: Review of molecular test requisitions revealed overestimation of tumor cellularity by an average of 22%. Pre-training slide set responses overestimated tumor by a mean of 12% (3 to 23%) with individual deviance up to 50%. Post-training responses showed 11% mean reduction and overall mean deviation within 1% (-14 to 13%) of the gold standard. A high concordance between manual cell counts and variant AF-based estimates was observed with a mean deviation of -1% (-17 to 7%).

Conclusions: Estimation of tumor percentage by pathologists is highly variable and demonstrates a strong tendency toward overestimation that could contribute to false negative test results. Our study shows that implementation of a simple standardized training module with immediate feedback yields significant performance improvement as demonstrated by more conservative and more accurate estimations.

568 The Use of Screencasts with Embedded Virtual Microscopy Cases to Teach Pulmonary Pathology in the Era of Subspecialized Residency Education

Mary Wong, Alberto M Marchevsky. Cedars-Sinai Medical Center, Los Angeles, CA.

Background: Academic pathology departments are increasingly subspecialized at a time when the amount of information that residents are required to learn during 4 years has skyrocketed. Our residents rotate through pulmonary pathology for 4 weeks, providing them with limited and intermittent exposure to cases. Screencasts are digital recording of computer screen output with audio narration. They can be combined with virtual microscopy to provide exposure to pulmonary cases in a structured manner that stimulates learning.

Design: Screencasts from neoplastic and non-neoplastic lung cases were prepared using Camtasia Studio 8 (TechSmith, Okemos, MI) and Powerpoint 2016 (Microsoft, Redmond WA) software. The files were saved in mp4 format and saved on our Intranet, YouTube.com and Screencast.com. They can be viewed using a web browser, a PC or MacOS computer and/or a mobile iOS or Android device. Files saved in screencasts.com require a proprietary viewer. Screencasts include a narrated presentation with clinical history, radiologic images, hyperlink to virtual microscopy slides prepared with Aperio scanner (Leica Biosystems, Buffalo Grove, IL), a quiz, a narrated description of the virtual slide by an attending explaining how to examine the cases and a final quiz. The quiz results are automatically emailed to an attending pathologist. A focus group of 5 residents was asked to examine the screencasts and provide feedback to various questions using a 0-5 scale.

Results: Screencast files are relatively small, up to 50 megabytes, and can be viewed from the departmental website, YouTube.com and Screencast.com using desktop computers and mobile devices. However, only files saved in screencast.com provide the ability to answer quizzes and email the results. The members of the focus group liked the technology and provided an average scores ranging from 4.4-4.8 to various questions. They found the quality of video satisfactory, preferred using computers rather than mobile devices and favored the use of screencasts lasting up to 10 minutes each.

Conclusions: Screencasts with embedded virtual microscopy provide an efficient method to supplement the teaching of pulmonary pathology, providing residents with exposure to interesting cases and stimulating their learning with quizzes. The screencasts can be viewed on computers and iOS and Android mobile devices such as cellphones and tablets, providing an attractive learning method to trainees that are skillful at integrating these technologies into their daily routine.

Endocrine Pathology

569 Pediatric Poorly Differentiated Thyroid Carcinoma: A Clinicopathologic Study

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Background: Pediatric thyroid carcinoma is uncommon, comprising less than 3% of all childhood malignancies and 10% of all thyroid carcinomas. The majority are papillary carcinomas (PTC). Poorly differentiated thyroid carcinomas (PDTCs) are extremely rare in this age group with existing literature limited to case reports, most lacking detailed description of tumor histology.

Design: We identified 4 cases of pediatric (age ≤ 21 years) PDTC from 2 institutions using the Turin criteria for diagnosis: solid/trabecular/insular growth pattern; absence of papillary nuclear features; and ≥ 3 mitoses/10 high power fields (HPF), tumor necrosis or convoluted nuclei. Clinical data was obtained by chart review. A literature review was also performed.

Results: Clinical and pathologic features are shown. Patient age ranged from 4 - 19 years (mean 13.5). The majority were female (M: F ratio of 3:1). One patient had a prior history of radiation exposure for a life-threatening right neck hemangioma at the age of 4 months. The mitotic index ranged from $<1-40/10$ HPF. Necrosis was seen in 3 of 4 (75%). All had lymphovascular invasion (LVI) and lymph node (LN) metastases; extrathyroidal extension (ETE) was present in 3 of 4 (75%). Two of 4 (50%) had associated well-differentiated PTC; the other 2 cases were TTF-1 and thyroglobulin positive. All underwent total thyroidectomy with radioactive iodine ablation. Two had distant metastases at the time of diagnosis (1 to lung/finger/scalp and 1 to lung and later to brain), both died of disease (DOD) at 8 months and 2 years, respectively. No clinical follow-up was available for the other 2 patients. Literature review identified 16 cases of pediatric PDTC, 11 with follow-up. None died of disease. However, Turin criteria could only be determined for 2 cases both of which lacked clinical follow-up.