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# ABSTRACTS

**EDUCATION**  
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**506 A #FASTPath to Advancement: Onboarding of a Novel Pathology-Specific Mentoring and Wellness Series**

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**Disclosures:** Christina Arnold: None; Michael Arnold: None; Kamran Badizadegan: None; Catherine Chung: None; Ogechukwu Eze: None; Tatiana Oberyszyn: None; Anil Parwani: None; Christopher Pierson: None; Wendy Frankel: None

**Background:** Ongoing healthcare changes have resulted in escalating workloads, waning time for wellness, rising physician burn-out, and academic attrition.

**Design:** Efforts to prevent faculty turnover and improve physician fulfillment culminated in the creation of a “FASTPath” (Faculty Advancement and Success Training Pathway) wellness series at our centers in July 2017. The curriculum is focused on wellness and pathology-specific success strategies, led by a committee of in-house pathology leaders and conducted over the first year of hire. Monthly, mandatory sessions cover a range of key topics: work-life integration, mentor selection, SMART goal development (Specific, Measurable, Achievable, Relevant, Time-Bound), conflict negotiation, annual review preparation, overview of promotion and tenure, presentation and teaching skills, burn out prevention, financial planning, implicit bias awareness, conducting interviews, mindfulness, ergonomics, and social media.

**Results:** Survey data comparing 7 FASTpath participants (FP) with 7 faculty hired before FASTPath (BFP) demonstrated that FP were more likely to set and accomplish SMART goals (set goals, FP= 100%, n=7 of 7 vs BFP= 43%, n=3 of 7; accomplish goals, FP= mean 2 vs BF= mean 1), and establish formal mentorship (FP= 100%, n=7 of 7 vs BFP= 14%, n=1 of 7). FP identified more friends and mentors within their department (FP= median 6.5, range 2-10 vs BFP= median 2, range 1-20), and rated FASTPath as helpful (median 81, range 50-100, scale 0-100). FP reported higher professional and personal satisfaction at the end of their first year (professional satisfaction, FP= median 85, range 50-90 vs BFP= median 70, range 20-90; personal satisfaction, FP= median 80, range 40-95 vs BFP= median 75, range 20-85). Improved retention was seen in FP (attrition FP= 0% vs BFP= 14%, n=1). Almost all BFP (85%, n=6 or 7) concluded FASTPath was advantageous and would have participated had it been available to them.

**Conclusions:** FASTPath was associated with higher professional and personal wellness. The new faculty participants were more likely to ask for help/mentorship, develop and accomplish short-term goals, and establish larger support networks. These benefits extended to existing faculty through mentorship opportunities, collaborations, and improved work culture dynamics. FASTPath was viewed favorably by faculty applicants and served as an important recruiting tool. Efforts to expand this program into non-pathology disciplines and at other centers are ongoing.

**507 “Learning Deeply”: Teaching Organ-Systems via Prototyping Deep Learning Algorithms; An example of Intraductal Proliferative Lesions of the Breast**

Charisse Liz Baste<sup>1</sup>, Alaa Alsadi<sup>1</sup>, Nasma Majeed<sup>1</sup>, Lucy Fu<sup>2</sup>, Elizabeth Wiley<sup>1</sup>, John Groth<sup>3</sup>, Tushar Patel<sup>1</sup>, Manmeet Singh<sup>4</sup>  
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**Disclosures:** Charisse Liz Baste: None; Alaa Alsadi: *Major Shareholder*, Diagnosis Protocol; Nasma Majeed: None; Lucy Fu: None; Elizabeth Wiley: None; John Groth: None; Tushar Patel: None; Manmeet Singh: None

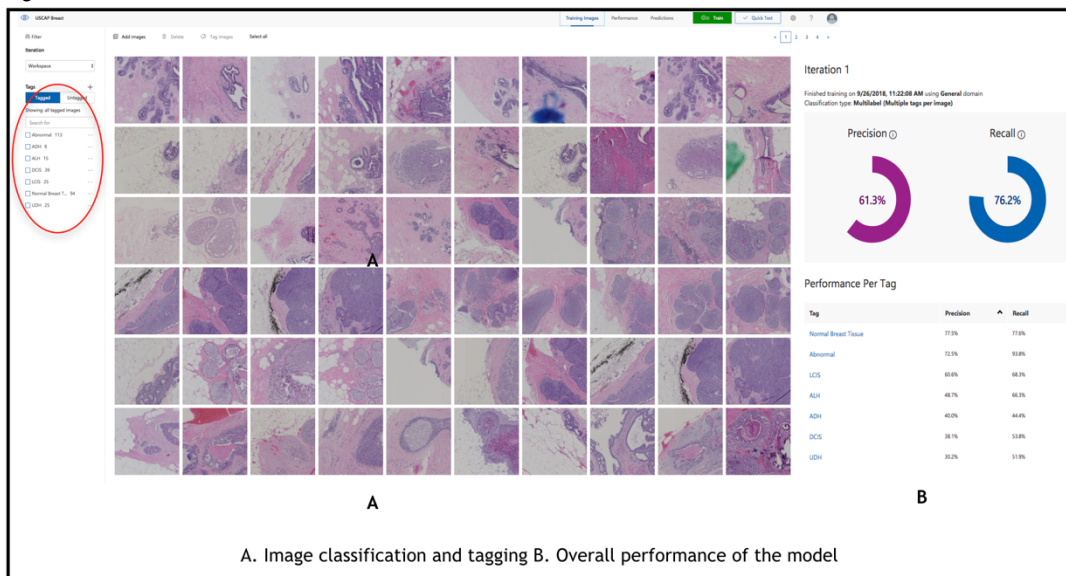
Informatics teaching is not standardized in residency programs. The current trend of utilizing a spiral curriculum, allows progression from simple to complex concepts, reinforcing and solidifying previous material while allowing for the exposure to new concepts. Early integration of informatics in resident education allows for the exposure to increasingly complex innovative technology tools, such as whole slide imaging, image analysis and artificial intelligence utilizing the spiral curriculum. We take on this dilemma by integrating concepts and practices needed for prototyping deep learning algorithms early into the resident curriculum, with obtaining feedback.

**Design:** Following a lecture on “Intraductal proliferative lesion of the breast” and informatics, faculty and junior resident convened to demo basic concepts of handling Whole Slide Image Viewer (Hamamatsu Nano Zoomer), Data Augmentation (Python libraries), Imaging Data Tagging and Labeling (Diagnosis Protocol), training epochs, validating, testing, and Neural Networks (Microsoft Customvision.ai) Accuracy and Loss. The resident captured 107 images of normal breast tissue and 134 images of intraductal proliferative lesions, at 100X magnification, without assessment of resident diagnostic accuracy.

**Results:** 241 breast images were collected from our departmental imaging archives followed by basic image augmentation techniques , sorting and multi tagging into normal breast tissue(107) versus abnormal(134), further subdivided into usual ductal hyperplasia(28), atypical ductal hyperplasia(13), atypical lobular hyperplasia(19), ductal carcinoma in-situ(42), and lobular carcinoma in-situ(32). The image data were uploaded to a deep learning platform (Customvision.ai from Microsoft) for neural network training followed by manual validation (See

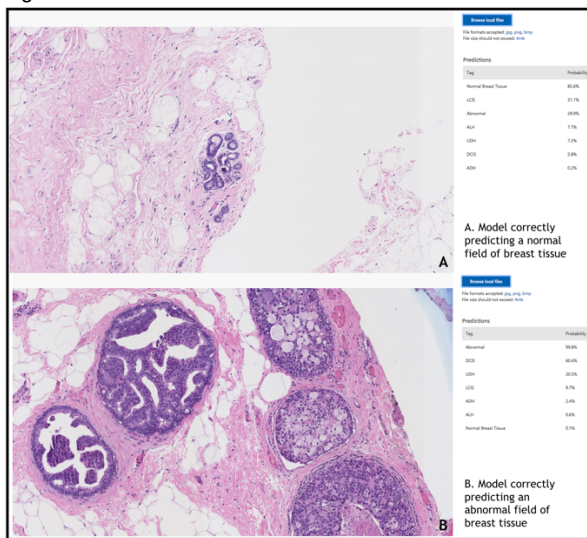
figures 1 and 2). The canned off the shelf neural networks performed decently (See figure 1). Positive feedback was verbally obtained from the junior resident.

Figure 1 - 507



A. Image classification and tagging B. Overall performance of the model

Figure 2 - 507



**Conclusions:** Augmenting the education of junior residents through exposure to digital image gathering, image pre-processing, training and deep learning was achieved with positive feedback. The integration of these technologies early in resident education will allow for a spiral curriculum to occur. Future directions will include the assessment of resident accuracy with increasing years of experience, test the potential impact on resident learning, and the percent of adoption of advanced learning technologies.

## 508 Implementation of a Practical Social Media Strategy: A Model for Pathology Organizations Based on Experience in Departmental and Statewide Pathology Organizations

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**Disclosures:** Adam Booth: None; Genevieve Crane: None; Jerad Gardner: None; Timothy Allen: None

**Background:** The number of pathologists active on social media has grown exponentially with profound impacts on discourse, networking, and education. A social media presence is virtually required for state pathology societies, subspecialty organizations, and departments. Our

objective is to develop a practical model for establishing and growing a social media presence for pathology organizations, while minimizing risk.

**Design:** We developed a hierarchical structure to limit individual time commitment while broadly increasing engagement, particularly from junior members. The critical first step was to assure leadership of the safety of the approach to the organization’s reputation. To this end, we developed a “Resident Responsibility Agreement” composed of three institutional social media documents and published guidelines for the use of social media by pathologists (AMA J Ethics. 2016;18:817-25). Trainees reviewed and signed the agreement prior to account access. The initial strategy focused on the Twitter social media platform.

**Results:** Implementation of the strategy in a large state pathology society included 8 academic institutions and 19 trainees developing unique daily posts (1A). Tweet activity was highest at the state pathology society annual meeting (1B) with the most impressions of individual tweets during 2 Young Pathologists Retreats held in the period of study (1C). The largest growth of new followers surrounded the first appearance of the accounts at the USCAP annual meeting (1D and 2A) and generated national and international awareness of the organizations (2B). Mentions by other accounts directly correlated with growth of followers and profile views (2A, 2C) as compared to the number of tweets (2D). Importantly, sustained tweet activity with continued growth of followers was achieved for 26 months (Table) with no posts leading to controversy or negative publicity.

Table: The Social Media Strategy Yielded Sustained Tweet Activity and Engagement.

	State Pathology Society					Pathology Department				
	Tweets	New Followers	Impressions	Profile visits	Mentions	Tweets	New Followers	Impressions	Profile visits	Mentions
Mar-17	6	109	56200	486	3	1	45	4924	129	4
Apr-17	26	67	53500	2230	51	7	39	6357	798	45
May-17	31	543	58800	3198	62	7	493	9828	1006	148
Jun-17	27	64	66700	1777	64	8	36	9696	800	302
Jul-17	24	80	63900	827	36	8	31	7716	302	21
Aug-17	38	74	235000	1344	75	6	33	9960	355	22
Sep-17	24	55	59100	683	43	12	23	11000	204	35
Oct-17	35	119	82400	1080	184	16	70	16200	475	97
Nov-17	28	96	63700	1189	105	15	71	41300	803	94
Dec-17	38	82	81600	1101	180	12	72	29800	604	77
Jan-18	77	122	139000	2700	336	24	48	48600	422	72
Feb-18	19	104	80700	1378	157	6	52	19100	308	60
Mar-18	30	145	99700	1468	215	13	100	34000	756	124
Apr-18	23	100	81400	1034	264	6	73	22000	501	105
May-18	25	113	97100	904	207	9	43	23500	358	61
Jun-18	22	77	96100	826	99	7	55	24700	276	80
Jul-18	29	123	94600	1811	137	6	59	19900	401	53
Aug-18	28	115	172000	1838	79	4	41	12300	348	57
Sep-18	19	78	53900	887	27	12	43	18000	431	74
Total over time period	549	2266	1735400	26761	2324	179	1427	368881	9277	1531
Total retained followers		2129					1376			

Figure 1 - 508

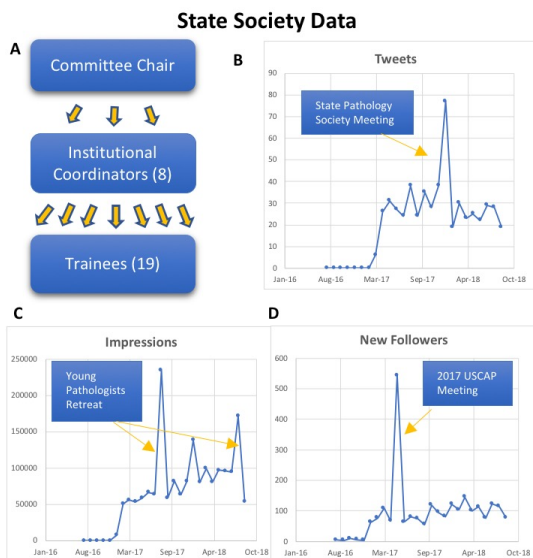
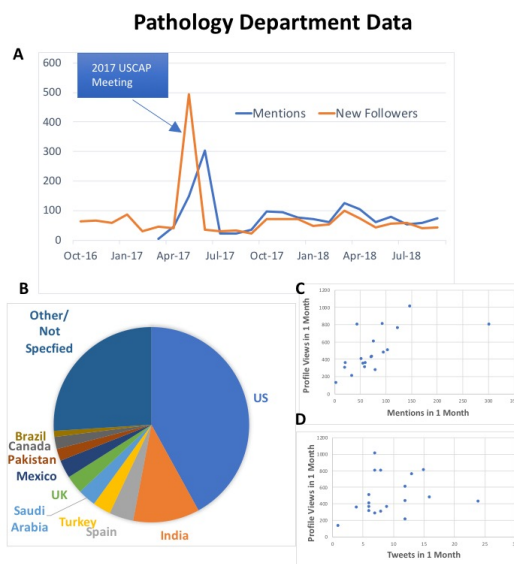


Figure 2 - 508



**Conclusions:** This model can be implemented by pathology organizations to strengthen member relationships and recruitment. In particular, we found account activity peaked surrounding events geared toward junior members, suggesting it is effective in reaching this audience. Social media has become an increasingly important means of collaboration and outreach in pathology. We present a practical, effective, and sustainable method for growing a society’s presence online. While the strategy presented focused on the use of Twitter, it can be readily expanded to other platforms with minimal adaption.

**509 Curriculum design: Involving Pathology Residents in Frozen Section Pathology Quality and Safety**

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**Disclosures:** Veerle Bossuyt: None; Andrea Barbieri: None; John Sinard: None; Vinita Parkash: None

**Background:** Residents and fellows at our institution have expressed in ACGME surveys that they have insufficient exposure to quality and safety education and projects in anatomic pathology. The Pathology Quality Improvement and Peer Review Committee (PQIPRC) committed to including residents and fellows in their activities related to intraoperative consultation optimization of test utilization and patient quality and safety.

**Design:** According to Kern’s model for curriculum development our approach followed (1) Problem identification and general needs assessment, (2) Targeted needs assessment (3) Goals and objectives (4) Educational strategies, (5) Implementation, (6) Evaluation and feedback. General and targeted needs assessments included a comprehensive literature review and guided interviews with stakeholders. The existing Anatomic Pathology Quality and Safety Curriculum was reviewed. The curriculum design includes an ongoing evaluation and feedback process.

**Results:** Needs of Learners/ Learners environment: The introductory anatomic pathology lecture series includes a basic introduction to principles of test utilization and QI principles in anatomic pathology. Trainees expressed the desire to be involved in FSQI during the FS rotation as well as on an ongoing basis throughout the year. Trainees specifically requested: involvement in departmental QI meetings and formal presentations; formal preparation for their role in FSQI; and involvement in QI projects. Trainees also requested guidance on how to deal with specific quality and safety issues for patients including: “dealing with the situation” “how to word things”. A small portion of the time on the FS rotation could be used for FSQI activities. The PQIPRC committee includes 6 faculty members with an interest in QI. Overview of the Curriculum: See Table 1.

Table 1. Overview of the curriculum

Content/ Activity	Educational Strategy	Objective
Introduction to principles of test utilization and QI	Case based and lecture	Learners will be able to outline principles of test utilization using Bayesian analysis and list basic QI terminology and processes
Introduction to interpersonal and group dynamics; Feedback training	Interactive session (practical scenarios)	1. Learners will develop increased appreciation for how different experiences, points of view, and cultural perspectives influence interpersonal and group dynamics. 2. Learners will apply a practical model for giving feedback including 3 strengths and 3 areas for improvement.
How to document and analyze an individual FS using the FS link QI module	Team based learning	Learners will use the FS link QI module to classify the appropriateness of a frozen section and identify and classify frozen section discrepancies in small groups of mixed experience levels
Communication and error disclosure training	Simulation	Learners will apply best practices for communication and error disclosure in a variety of simulations involving several pathologists, patients, treating physicians, and other members of the health care team
Analyze FSs for individual patients with the FSQI module paired with 1 of 6 PQIPRC faculty	Experience/ Role modeling	1. Each chief resident will analyze 4 weeks of frozen sections using the FS link FSQI module. 2. Each chief resident will demonstrate the ability to classify the appropriateness of a frozen section and identify and classify frozen section discrepancies as judged by the faculty supervisor during their last 2 week frozen section rotation [Entrustable professional activity (EPA) 15 and 16].
Present aggregate data/ events analysis to monthly PQIPRC committee meeting	Observe/ Present/ Coach	1. Learners will generate and interpret laboratory test utilization data for specific patient populations and find areas for improvement in test utilization by understanding ordering rationale and clinical utility for specific patient populations and identifying inappropriate utilization (under- or overutilization) [EPA15] 2. Learners will identify areas for improvement in quality and safety at the systems level by evaluating and interpreting aggregate data and participation in quality improvement meetings. [EPA16] 3. Learners will communicate effectively and with sensitivity.
Summary of events analysis and quality improvement initiatives at quarterly FS QI faculty meeting	Observe/ debrief	Learners will work with other healthcare personnel to drive both department and institutional change [EPA15 and 16]
Facilitated group reflection	Group Reflection	Chief residents and fellows will reflect on experiences and identify additional training needs
Educational objectives, Providing feedback	Documents provided/ Role play	1. Learners will outline educational objectives for the curriculum. 2. Learners will apply a practical model for giving feedback including 3 strengths and 3 areas for improvement.

**Conclusions:** Trainees, faculty and administration in our department recognize the need to increase training of residents and fellows in optimization of test utilization and patient quality and safety. We developed a curriculum based on involving residents with FS test utilization and QI data analysis, practice improvement, and dissemination in a safe and supportive learning environment.

**510 #DailyDx: A Model for a Sustainable, Accessible Daily Digital Unknown Slide Series for Pathology Training and Continuing Education**

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**Disclosures:** Cody Carter: None; Dustin Johnston: None; Ellen East: None

**Background:** Social media platforms such as Twitter (Twitter, Inc, San Francisco, CA, USA) are increasingly relevant in medicine, not only as tools for networking and information sharing, but for medical education. Unknown slide sessions, in which a set of histology slides are provided and then discussed in a group setting, are an educational tool employed by many pathology residencies and conferences. We initiated a Twitter-based unknown slide series with the goal of creating a consistent, interactive, weekday series.

**Design:** High-resolution photomicrograph images were captured from whole-slide images stored in a de-identified, institutional image database of over 12,000 slides accessible to the public for educational purposes. Case and image selection were performed by 2 pathology

clinical lecturers, with weekly case series subdivided by organ or subspecialty. Cases were published to Twitter with diagnostic and secondary questions, followed by answers and short disease summaries approximately 24 hours later. 4-5 cases were published per week for nearly 11 months (11/6/2017-9/26/2018), with a feedback survey issued through Twitter during the final month.

**Results:** 212 cases were published over 324 days. Overall, audience reach remained steady throughout, with a peak number of 15,780 impressions (actual views) and 1362 engagements for a single case, and over half of cases achieving greater than 7,400 impressions. There were 95 survey responses, which were predominantly pathology residents and fellows (45.7%), practicing academic pathologists (28.3%) and private practice pathologists (19.6%). 58.8% were from outside the U.S. from 33 different countries. 100% of respondents considered the series to be of excellent (76.4%) or good quality (23.6%; average or poor: 0%). 91.2% of respondents reported learning a new disease entity from the series. The majority rated image quality as far better than images used in standardized tests or practice questions (57.1%) and other Twitter/social media accounts (53.3%). Of those that took the Anatomic Pathology Board exam in 2018, 80.5% rated DailyDx as highly useful/relevant for the exam.

**Conclusions:** We provide a model for establishing a sustainable, sharable, globally accessible digital unknown slide series with high-quality images that can be either directly utilized or recapitulated by other training programs and practicing pathologists. Based on survey data, the series was reported to be a useful aid for expanding pathologists' diagnostic armamentarium.

## 511 Quality Assessment and Improvement of USCAP Annual Meeting Educational Offerings: A Report of the USCAP Education Strategies Committee

Yigu Chen<sup>1</sup>, Claire Kilfoyle<sup>2</sup>, David Kaminsky<sup>2</sup>, Laura Lamps<sup>3</sup>, Yael Heher<sup>4</sup>

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**Disclosures:** Yigu Chen: None; Claire Kilfoyle: None; David Kaminsky: None; Laura Lamps: None; Yael Heher: None

**Background:** USCAP is a premier ACCME accredited provider of continuing medical education (CME) in Pathology with more than 100 sessions hosted every year at the annual meeting (AM). The USCAP CME subcommittee undertook a systematic review of the post-education survey data to understand diverse participant needs based on background and training levels and to identify potential areas for quality improvement.

**Design:** Members of the USCAP Education Strategies Committee met to review AM 2017 educational offerings. Post-course survey data from all 58 short courses taught at the 2017 AM were selected for analysis. 1,075 participants responded to the post-course survey. Likert scale data ranged from "strongly disagree" to "strongly agree" and were converted into a numeric scale between 1 and 5. Differences between practice venues and participant training levels were also assessed for each survey question.

**Results:** Overall, more than 90% of the responses agreed or strongly agreed that USCAP CME courses were well designed and delivered. Trainees and attending pathologists were equally satisfied with the content, syllabus, and design of the courses (questions 703-712). However, a considerable difference was found between trainees' and pathologists' perceptions of whether knowledge learned in CME courses could be utilized to improve practice (questions 713-719). Course satisfaction scores were consistent across participants from academic medical centers, community hospitals, and independent pathology practices. Participants felt that patient safety and operational efficiency were inadequately represented in the CME courses (questions 720-722). [Figure 1] A positive correlation was confirmed between faculty performance scores and overall course evaluation scores using coordinate graphing. [Figure 2]



Figure 1 - 511

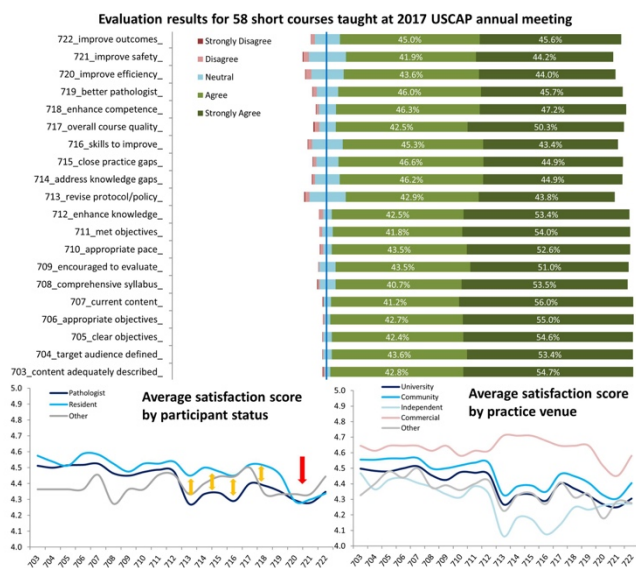
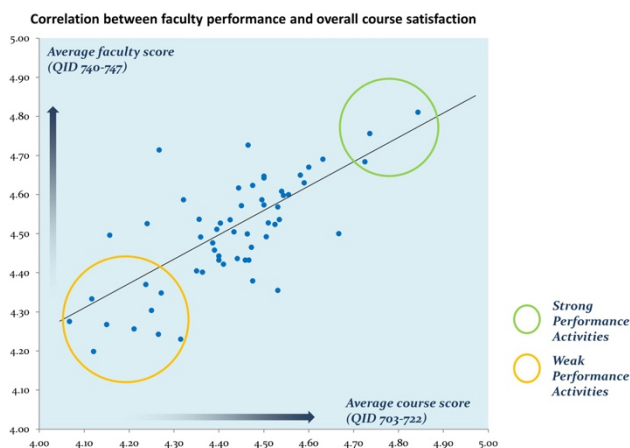


Figure 2 - 511



**Conclusions:** USCAP AM course participants are generally satisfied with the CME activities provided by USCAP. The perception of CME courses varies based on participant training level and on the milieu in which they practice. Thus, there may be an opportunity to further customize CME courses to meet different member needs. The study results also pointed to an improvement opportunity for integrating more patient safety and quality components into USCAP CME activities. Using standardized tools for quality improvement, these data analyses provided USCAP with a fresh way to broadly evaluate the quality of CME activities and faculty performance. The results may provide decision support for future educational strategies.

## 512 Art as a Learning Tool: Implementing Visual Art into Medical Student Histology Education

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**Disclosures:** Vincent Cracolici: None; Ryan Judd: None; Nicole Cipriani: None

**Background:** The incorporation of visual art into medical education has previously been successful in enhancing empathy & promoting holistic patient care. Most often, this exposure is via passive art appreciation or visiting an art museum. However, creating art to learn visual basic science concepts (such as histology) is rarely reported. Here, we evaluate student perceptions of visual art as an educational tool for learning medicine before and after creating art to learn histology, as well as compare objective measures of student performance between those who create art, and those who do not.

**Design:** 89 first-year medical students were enrolled in a 21-week long course which included histology content. 25 volunteers were recruited to complete an art curriculum as well as the traditional curriculum (experimental group, EG) during the term. The remaining students completed the traditional curriculum only (control group, CG). The EG was given art supplies & incentivized with prizes to draw or paint the histology course content while studying. Pre-term & post-term surveys were distributed. Exam & overall scores were also compared between groups. Statistical analysis was performed with Vassar Stats software.

**Results:** Most students viewed art as a valuable tool to learn concepts in medicine prior to and following the course. However, fewer admitted to using art to learn medical concepts. In the post-term survey, a higher percentage of students in the EG stated that they will use art to learn medical concepts in the future (p=0.03). More students in the EG considered themselves artistic, but this result was not significant. After the course, fewer students overall considered themselves to be artistic (p=0.03). See Table 1 for comprehensive responses. There was no significant difference in exam scores or overall course grades between the CG and the EG.

Table 1: Survey Results regarding Perceptions of Art as a Learning Tool and EG vs CG Post-Term Responses

	"I regularly use art to learn concepts in medicine"	"I consider myself an artistic person"	"Art is a valuable tool to help learn concepts in medicine"	"In the future I will use art to learn concepts in medicine"
Pre-Term Survey (n=64)	Y: 42% N: 48% Unsure: 9%	Y: 48% N: 41% Unsure: 11%	Y: 73% N: 8% Unsure: 19%	—
Post-Term Survey Overall (n=40)	Y: 40% N: 42% Unsure: 17.5%	Y: 27.5% N: 55%* Unsure: 17.5%	Y: 82.5% N: 5% Unsure: 12.5%	Y: 47.5% N: 12.5% Unsure: 40%
Post-Term Survey: EG (n=8)	Y: 37.5% N: 25% Unsure: 37.5%	Y: 50% N: 37.5% Unsure: 12.5%	Y: 100% N: 0% Unsure: 0%	Y: 75%* N: 0% Unsure: 25%
Post-Term Survey: CG (n=32)	Y: 40.6% N: 46.8% Unsure: 9.3%	Y: 22% N: 59% Unsure: 18.7%	Y: 75% N: 6% Unsure: 15.6%	Y: 40.6% N: 15.6% Unsure: 43.7%

\*p=0.03

**Conclusions:** Most students considered art to be a valuable educational tool while learning concepts in medicine, including all respondents from the EG. 47.5% of the class overall planned to use art in the future to learn medicine. This proportion was significantly higher among those who participated in the art curriculum (75% vs 40.6%). We hypothesize that creating visual art enhances the educational process in histology, & suggests students may favor incorporation of visual art more generally into medical education. Creating visual art may serve as an avenue for active learning of visually-based concepts including histology.

### 513 Cross-Residency Radiologic-Pathologic Correlation Curriculum: Teaching Interpretation of Specimen Radiographs to Pathology Residents by Radiology Residents

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**Disclosures:** Mia DeSimone: None; Ariadne DeSimone: None; Jane Brock: None; Shanna Matalon: None

**Background:** The College of American Pathologists requires pathology residents to attain competency in "Radiologic Pathologic Correlation," including correlation of radiographic information with histopathologic findings. This training was not formalized in our institution, therefore, we sought to establish a curriculum in the interpretation of specimen radiographs by pathologists. To achieve this, we developed a cross-residency educational initiative bringing together radiology and pathology residents.

**Design:** Didactic sessions on the interpretation of specimen radiographs were prepared by three pairs of radiology and pathology residents with mentorship provided by radiology and pathology attendings in the following sub-specialty areas identified as challenging and particularly relevant for accurate pathology diagnoses and cancer staging: breast, head and neck, and bone and soft tissue. The sessions will be held in October 2018. Before and after the sessions, pathology residents will complete a survey to assess perceived utility of the curriculum, confidence in their skills of interpretation of specimen radiographs, and understanding of the need for communication with radiologists. Pathology residents will also complete a practical assessment of their radiologic-pathologic correlation skills in interpreting unknown specimen radiographs. These quizzes will be blindly evaluated by both an attending radiologist and pathologist.

**Results:** The primary endpoint is improved accuracy in the interpretation of specimen radiographs in organ-specific areas and correlation with histological findings in pathology specimens, and improved understanding of their clinical relevance. The secondary endpoints include improved self-reported confidence in the interpretation of specimen radiographs, increased utilization of radiographs in specimen evaluation, and greater appreciation of the importance of radiologic-pathologic correlation for crafting a final pathology report.

**Conclusions:** Competency of skills in "Radiologic Pathologic Correlation" can be achieved by developing a cross-residency educational initiative that utilizes radiology resident skills to teach pathology residents. Survey results and quiz performance will be analyzed to determine the effectiveness of the curriculum. Once proven effective, the program developed will serve as the foundation for future training of pathologists to meet this benchmark.

## 514 Comparing Trainee/Senior Pathologist Performance in Interpreting Confocal Fluorescence Microscopy Images for Making Ex Vivo Tissue Diagnoses

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**Disclosures:** Erin Faber: None; Roland Bassett: None; Junsheng Ma: None; Savitri Krishnamurthy: None

**Background:** Optical imaging techniques such as confocal fluorescence microscopy (CFM) can be used to assess fresh tissue specimens. For CFM to be incorporated into clinical practice, trainees and experienced pathologists alike must be able to interpret CFM images. The objectives of our study were to evaluate a pathology trainee's ability to interpret CFM images after reviewing a training set of CFM images and to compare that trainee's diagnoses with those of a senior pathologist with expertise in interpreting CFM images.

**Design:** Tissue fragments (up to 1.0 cm x 0.3 cm) of breast, lung, and liver were stained with 0.6 mM acridine orange for 1 minute and then subjected to CFM using 488-nm and 785-nm wavelengths to create a teaching set of 33 images (8 breast, 16 lung, and 9 liver) and a testing set of 64 images (22 breast, 21 liver, and 21 lung). The imaged tissue fragments were then fixed in formalin and processed to prepare hematoxylin and eosin (H&E)-stained sections. After the trainee reviewed the training set, both the trainee and senior pathologist independently reviewed the testing set and diagnosed each case as benign or malignant. Using the H&E-based diagnoses as the standard, we calculated the sensitivity and specificity for making the diagnoses using CFM images for both the trainee and senior pathologist and used Cohen's kappa coefficient to assess inter-rater agreement.

**Results:** The trainee correctly categorized 24 of the 27 CFM images of benign tissues (9/9 breast, 9/10 lung, and 6/8 liver) and 34 of the 37 CFM images of malignant tissues (12/13 breast, 11/11 lung, and 11/13 liver). The senior pathologist correctly categorized all CFM images. The overall sensitivity and specificity for making the tissue diagnosis using CFM images were 91.9% and 88.9% for the trainee and 100% and 100% for the senior pathologist. The inter-rater agreement was almost perfect for breast ( $k = 0.91$ ), strong for lung ( $k = 0.90$ ), and moderate for liver ( $k = 0.60$ ). The overall agreement between the two readers was strong ( $k = 0.81$ ; 95% confidence interval, 0.66-0.95).

**Conclusions:** The high sensitivity and specificity for making the tissue diagnosis using CFM images, together with the excellent inter-rater agreement between the trainee and senior pathologist, indicates that CFM has potential for making tissue diagnoses ex vivo. The utility of CFM images in diagnosing tissues ex vivo needs to be further validated using a larger reader cohort that includes both trainees and established pathologists.

## 515 Introducing Medical Students to Pathology: Positive Impact of Five Minute Clinicopathologic Vignettes

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**Disclosures:** Jennifer Findeis-Hosey: None; Abberly Lott Limbach: None

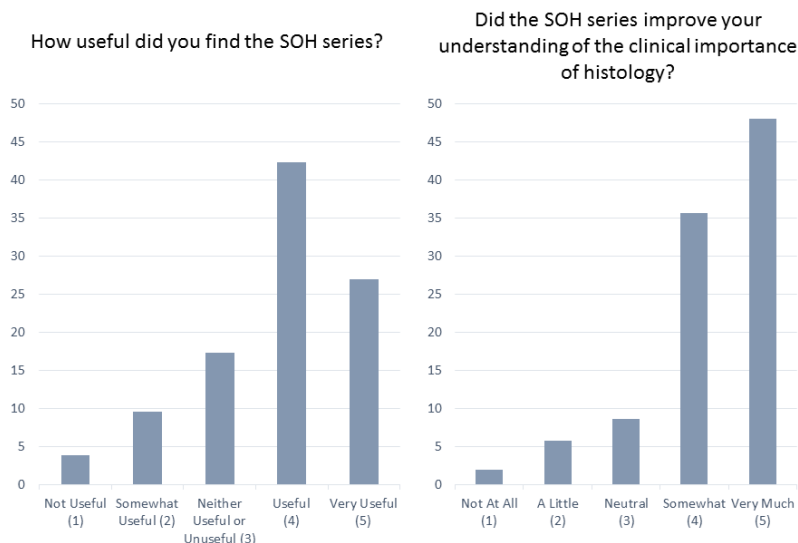
**Background:** With the continual evolution of medical school education to include more clinical experiences and less formal lecture time, pathology is at increasing risk for being forgotten. Data from the AAMC demonstrates that medical students from US schools are decreasingly likely to enter the field of pathology. In an attempt to (1) introduce first year medical students to the field of pathology and (2) emphasize the clinical correlation between histology and disease processes, we developed a series of 5-minute clinicopathologic correlates presented in the fall of the first year medical student curriculum entitled "Spotlight on Histopathology" (SOH).

**Design:** A series of seven clinicopathologic vignettes were developed and presented to the first year medical student class in their 14-week Human Structure and Function course, an integrated gross anatomy, histology, embryology, and physiology course. Each SOH vignette was presented in the last five minutes of the introductory lecture to the histology of an organ system, with vignettes distributed throughout the course. Topics included Introduction to Pathology, Degenerative Joint Disease, Papillary Thyroid Carcinoma, *H. pylori* Gastritis, Lymphoma, Molecular Adjuncts in Pulmonary Pathology, and Lynch Syndrome. End-of-course evaluations provided to the students assessed impact and usefulness of the SOH series (n=104 students).

**Results:** Seventy-two students (69.2%) responded that the SOH series was useful or very useful (avg. 3.79 +/- 1.1; Figure 1). Eighty-seven students (83.7%) responded that the SOH series improved their understanding of the clinical importance of histology (avg. 4.22 +/- 1.0), including nearly half (n=50; 48.1%) who scaled it as it 'very much' improved their understanding of the clinical importance of histology.

The SOH clinicopathologic vignettes provide a time efficient model for introducing first year medical students to pathology as an area of clinical practice. In our medical school the introductory histology course is taught entirely by basic scientists; through the SOH vignettes, pathologists are one of the first faces of clinically practicing physicians that the students encounter. By framing pathology as a clinical practice that illuminates the basic sciences, we may be able to counter the declining interest in pathology.

Figure 1 - 515



**Conclusions:** The SOH clinicopathologic vignettes provide a time efficient model for introducing first year medical students to pathology as an area of clinical practice. In our medical school the introductory histology course is taught entirely by basic scientists; through the SOH vignettes, pathologists are one of the first faces of clinically practicing physicians that the students encounter. By framing pathology as a clinical practice that illuminates the basic sciences, we may be able to counter the declining interest in pathology.

## 516 How to Teach Laboratory Stewardship in the Undergraduate Medical Curriculum? Results of a Needs Analysis

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**Disclosures:** Christine Garcia Roth: None; William Huang: None; Andrew Caruso: None; Navdeep Sekhon: None; Doris Kung: None; Jocelyn Greely: None; Ye Du: None; Jenelle Little: None; Elaine Fielder: None; Nadia Ismail: None

**Background:** The National Academy of Medicine has estimated that approximately 30% of health care spending constitutes waste, which includes low-value testing. In order to promote high quality care at a lower cost, various national specialty societies have developed evidence-based guidelines for appropriate test utilization as part of the Choosing Wisely Initiative. Operationalizing these guidelines into clinical practice requires educational initiatives across the continuum of medical education, including early in the medical education process. A needs assessment was performed to inform the design of an online case-based teaching tool with goal of teaching laboratory stewardship to medical students

**Design:** The needs assessment consisted of semi-structured interviews with Baylor College of Medicine (BCM) core clerkship directors (CCD), residency program directors (RPD), and a national survey to the Undergraduate Medical Educators Section (UMEDS) of the Association of Pathology Chairs. Manual content analysis was used to identify common themes.

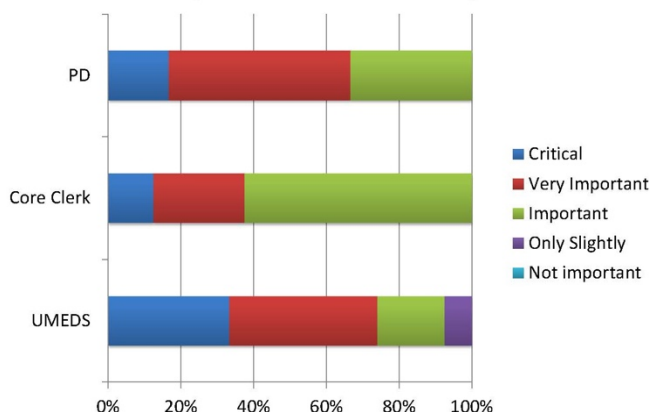
**Results:** Thirty eight percent (3/8) CCD, 74% (4/6) RPD, and 74% (20/27) UMEDS respondents ranked teaching laboratory stewardship as “critical” or “very important” in undergraduate medical education (Figure 1). 36% (5/14) of BCM directors did not have any current initiatives to teach HVC; the majority of the initiatives already in place were GME-related. Of the medical schools that responded to the UMEDS survey, HVC was taught in pre-clinical (12/27, 44%), clerkships (5/27, 19%), electives (4/27, 15%), free standing course (3/27, 11%), or other (3/27, 11%). During idea generation for potential scenarios, two major themes emerged regarding potential content to teach laboratory stewardship: appropriate ordering (knowledge of laboratory test indications, pre/post-test probability, appropriateness criteria, recognition of unnecessary testing), and interpretation (test specifications, factors which impact the test result, recognizing inaccurate results) - Table

1. Several UMEDS implementation recommendations included a focus on vertical integration throughout the preclinical and clinical curricula, with final reinforcement prior to graduation.

Test ordering	Test interpretation	Other
Avoid CK-MB testing in MI	Phenytoin levels – affected by albumin level	Transfusion guidelines
Avoid amylase testing in pancreatitis	Use of nomogram to interpret bilirubin levels in perinatal setting	Understand how labs are collected/test specifications
Avoid unnecessary Urinalysis/Urine cultures	Interpretation of rapid diagnostic flu testing	Transfusion reactions
Avoid wound culture in ED	Interpretation of non-invasive prenatal diagnosis	Point of care laboratory testing
Appropriateness of blood culture testing in community-acquired pneumonia	Hemolysis affecting lab values	
Lumbar puncture – test specifications	When a “normal” result is abnormal for a patient – normal ABGs in a patient with respiratory failure	
Frozen section	Abnormal labs due to drawing proximal to an IV line	
Avoid redundant daily labs	Peripheral smear review in TTP and malaria	
Lead screening in pediatric population	Effect of appropriate specimen collection on microbiological testing results	
Cancer screening guidelines (PSA)		
Correct ordering of thyroid tests		
Influenza testing		
Medical clearance for psychiatric unit – appropriate laboratory studies		
Appropriate initial evaluation and laboratory monitoring for antipsychotic medication		

Figure 1 - 516

### How would you rank the importance of teaching lab stewardship in UME?



**Conclusions:** The pathology stewardship educational project will focus on the 2 main curricular needs identified, the appropriate ordering and interpretation of laboratory testing, using a multidisciplinary approach to develop and implement the cases.

**517 A Modular Lab Medicine and Pathology Boot Camp for Junior Residents**Carlo Hojilla<sup>1</sup>, Brian Chow<sup>2</sup>, Catherine Streutker<sup>3</sup>, Eleanor Latta<sup>4</sup>, Rita Kandel<sup>2</sup><sup>1</sup>University of Toronto, Toronto, ON, <sup>2</sup>Mount Sinai Hospital, Toronto, ON, <sup>3</sup>St. Michael's Hospital, Toronto, ON, <sup>4</sup>Toronto, ON**Disclosures:** Carlo Hojilla: None; Brian Chow: None; Catherine Streutker: None; Eleanor Latta: None; Rita Kandel: None**Background:** Boot camp courses have shown to improve learning among residency programs, including Pathology. As modern training of pathology residents grows more complex, we identified a need for a baseline training program ("boot camp") that is ideally flexible, practical, and engaging.**Design:** Senior residents completed a needs-assessment survey, which identified a focus on the practical and technical aspects of the discipline. A two-week course was designed and piloted at the start of the academic year. The course is mainly delivered through an online learning hub tool provided by the university. Engagement is captured via the learning hub's built-in analytics. Impact is assessed via pre-camp, post-camp, and 1-month post-camp learning assessment. An online evaluation is collected after the course.**Results:** Greater than 90% of respondents identified a need for an introductory/boot camp course in their PGY1 year. More 'hands-on' experience on the practical and technical aspects of the discipline was specifically requested, such as exposure to the Histology and Molecular labs. The 2-week pilot boot camp was attended by 8 junior residents at the beginning of their core training. The course was delivered through three modular components comprising of didactic lectures, online case-based assignments, and hands-on lab seminars. The curriculum addressed topics identified in the needs assessment. Course website traffic increased during the duration of course, with resident-specific page-views and online interaction increasing by 6.6-fold and 85-fold, respectively during the pilot. Pre-, post-, and 1-month post-camp learning assessments demonstrated a sustained increase in scores among the participants. Evaluations showed overall satisfaction with speakers, topics, and quality of assignments.**Conclusions:** We piloted a boot camp course for junior residents using a modular and multi-component format. We demonstrated an increase in access as well as interactivity with the trainees for this online program. The course further showed improved and sustained learning for the participants. The further goal is to expand and improve based on the current cohorts' suggestions. The modularity and online delivery also permits a collaborative environment between training sites, to be explored in the future.**518 Visiting Lecturers Add Additional Value to Didactic Pathology Curriculum**Taylor Jenkins<sup>1</sup>, Sharon Song<sup>2</sup>, Kathleen Montone<sup>3</sup>, Lauren Schwartz<sup>4</sup><sup>1</sup>Hospital of the University of Pennsylvania, Philadelphia, PA, <sup>2</sup>Philadelphia, PA, <sup>3</sup>University of Pennsylvania, Philadelphia, PA, <sup>4</sup>Perelman School of Medicine at the University of Pennsylvania, Bala Cynwyd, PA**Disclosures:** Taylor Jenkins: None; Sharon Song: None; Kathleen Montone: None; Lauren Schwartz: None**Background:** Pathology residency programs (PRP) often include anatomic pathology didactics (APDs) in their curriculum. APDs are largely taught by internal faculty; however, academic pathologists are encouraged or required to give lectures at outside institutions for professional development and promotion. When faced with a gap in scheduling due to staffing issues, our program sought to invite outside pathologists to share their knowledge and perspectives.**Design:** Traditionally, our PRP APD curriculum consists of an introductory series geared towards PGY-1 residents (2.5 months/year) and a set of lectures and unknown sessions spanning all organ systems (19 months). To fill the gap in schedule, we trialed a visiting lecture series, inviting external pathologists to teach on a subject of their choice through a lecture and/or slide session. Financial support was not provided. After the series, we obtained feedback from the visitors and residents using a survey.**Results:** 14/26 residents required to attend APDs responded to the survey. They attended 5-10 (43%) and >10 (50%) of the 18 didactics. The majority preferred having guest speakers over in-house lecturers (77%), citing reasons such as gaining exposure to new perspectives and approaches to interpreting cases (81%), seeing a different variety of cases (55%), potential networking opportunities (45%), or less pressure felt during slide sessions (45%). Residents (86%) preferred a slide session component as it allowed for more interaction and showcased different methods for approaching real cases. Many (67%) guest lecturers heard about the opportunity through one of our faculty members and 17% through social media. The reported incentives for participating in our series were either promotion/networking (66%) or gaining teaching experience (33%), with most (75%) using personal, not institutional, funds to do so. The majority (92%) felt the sessions went well with good audience participation. All residents thought the visiting lecture series should be a recurring annual event.**Conclusions:** Our experience highlights the mutually beneficial value of networking, both from the perspective of residents and faculty. Through the visiting lecture series, people were afforded new and satisfying educational and professional opportunities. This series gave people the chance to interact with others in the larger pathology community. As costs were not an obstacle, other PRPs could implement a similar series to enrich residency training and promote faculty development.

## 519 Report on the Canadian Landscape of General (Anatomical/Clinical) and Community Pathology

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**Disclosures:** Ipshita Kak: None; Linda Kocovski: None; Heidi Paulin: None; Katherine Chorneyko: None; Vivien Frenkel: None; Jimin (Nancy) Liu: None

**Background:** The Executive Committee of the General Pathology (GP) Section of the CAP-ACP (Canadian Association of Pathologists) embarked on conducting national surveys with the primary goal of better understanding the current landscape of general (anatomical {AP}/clinical {CP}) pathology in Canada in order to help structure the committee's future goals.

**Design:** The GP Section Executive Committee developed two surveys. One survey was aimed at general (AP/CP) pathology trainees with 10 questions related to training, job preparation/acquisition and further education from the CAP-ACP. The second survey was directed at general and/or community pathologists with 42 questions regarding training background, work environment, work-life balance, scope of practice etc. The survey questions were approved by the CAP-ACP Executive and responses from participants were gathered over a 5-month period (February to June 2018).

**Results:** There were 99 survey participants comprising 21 trainees and 78 pathologists. The trainees ranged from first to final year of residency with the majority (52%) stating that they intended to complete a fellowship before starting a job, most commonly in forensic, gastrointestinal or genitourinary pathology. A large proportion (48%) indicated that they were considering pursuing a job at a community hospital with their main reason (71%) listed as personal interest. Most (91%) reported that they felt neutral, good or confident handling the different aspects of a job based on their GP training.

The pathologists' survey had good representation from most Canadian provinces. The majority (72%) responded that while they were trained in a GP or AP/CP program, at least half had completed one fellowship prior to their job. More than half of the pathologists have been in practice for more than 10 years with two-thirds (67.5%) working in environments where they oversaw more than one laboratory. Surgical pathology was reported as the common forte (77%) with microbiology (17%) and laboratory administration (15%) as self-identified areas of relative weakness. This was similar to the trainees' responses, perhaps indicating that these were areas of deficiency in residency training.

**Conclusions:** These are the largest and most current surveys assessing the scope of general pathology practice and training in Canada. The survey results will help guide the GP section committee in setting interim and long-term goals that are in line with the needs of trainees, pathologists and the communities they serve.

## 520 The When, Who, and What of Pathology Grand Rounds (PGR)

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**Disclosures:** Ayse Irem Kilic: None; Recep Nigdelioglu: None; Razvan Lapadat: None; Vijayalakshmi Ananthanarayanan: None; Guliz A. Barkan: None; Stefan Pambuccian: None

**Background:** PGR, or similar conference series are held with variable frequency in many academic pathology departments. However, in the absent of published data, their current role, whether it is teaching trainees, offering CME opportunities, a platform for faculty and trainees to present, building departmental cohesion, none or all of these, is unclear. The aim of this observational survey was to determine the current state of PGR.

**Design:** We identified all US ACGME accredited pathology residency programs and searched their websites for any information on PGR or similar recurring seminar/conference series. The frequency and timing of PGR was noted. For a select group of institutions representative of all US geographic areas and residency program sizes, we tabulated 2017-2018 PGR dates and titles, presenter (sex, degree(s), resident/fellow, faculty/academic rank, department, internal/visiting) and domain (AP/CP/research/education/special topics), subspecialty, and theme.

**Results:** 48 programs that had detailed informations about PGR on their websites. The PGR were scheduled weekly in (16), biweekly (13) and monthly (19) and took place most frequently on Thursday (14) and Wednesday (12), most often at noon (28) or in the morning (11) and less commonly in the afternoon (6). 518 PGR from 26 institutions were analyzed in detail. In 471/518 (90.9%) there was one presenter, while in the remaining 9.1% there were 2 presenters. Among the 565 presenters, there were 366 (64.8%) men and 199 (35.2%) women; there were 199, 103, and 102 full, associate and assistant professors, respectively, 102 residents and fellows and 54 nonacademic presenters. 365 PGR were given by presenters from the pathology department (213 AP and 92 CP faculty and 60 trainees); 227 were

given by visiting presenters. Most presentations were reviews, perspective and updates; research, education and special topics (professionalism, wellness, etc) were less frequent.

**Conclusions:** We found a wide variety of approaches to PGR, in terms of their frequency, timing, presenters, topics covered and themes. Residents and fellows were the presenters of a significant minority of PGR, but this was highly variable among institutions. Compared to their proportion of pathology residents, women are underrepresented as PGR presenters. All institutions offered CME, and their PGR covered a variety of topics related to AP, CP, education and professional issues, but none appeared to follow a systematic curricular structure

## 521 Augmented Reality Grossing Manual for Resident Training

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**Disclosures:** Ozlem Kulak: None; Anastasia Drobysheva: None; Neda Wick: None; Simone Arvisais-Anhalt: None; Charles Timmons: None; Jason Park: None

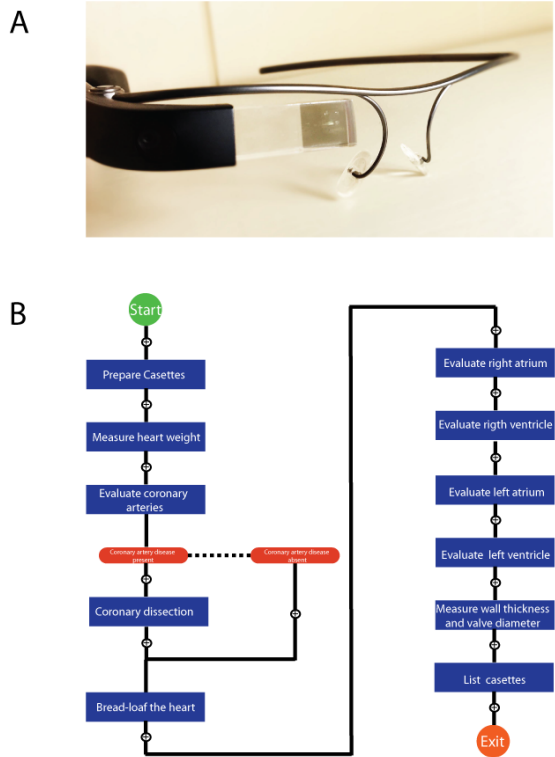
**Background:** Wearable technologies have the potential to improve information accessibility and enhance passive gathering of information. Smart phones, the antecedent technology, have demonstrated new opportunities in rapid information exchange and communication. The software interface for these wearable devices (Fig 1A) allows for control and manipulation via voice commands, gestures or simple tactile commands. This technology may have utility in pathology resident education by decreasing the barriers to accessing information and increasing the ease of recording and documenting tasks.

**Design:** We adapted a commercial logistics software (Proceedix, Belgium) to build an augmented reality grossing manual on the Google Glass Enterprise (Mountain View, CA) platform. The application is designed as a workflow manager that requests the user to enter descriptions, measurements and photos for specimens. This application is run by voice command in a hands-free manner. Reports that contain user's input such as dictated comments, photos and voice records are passively recorded and archived on a cloud-based server.

**Results:** Two organ grossing protocols were developed for heart and kidney explants. The protocols were created for specific procedures, measurements and/or image documentation. For heart dissection, the key protocol steps are weighing, coronary vessel evaluation, dissection of the heart chambers, and finally measurement of walls and valves (Fig 1B). For kidney dissection, the key protocol steps are evaluation of hilar vessels, ureters and parenchymal surface. For both protocols, the user is visually prompted by the smart glass device to perform each task and record a measurement. When the protocol is finished, an automated report is generated that contains the dictation, images, voice recordings and the timing of each step.



Figure 1 - 521



We have created two augmented reality grossing procedures on the Google Glass Enterprise smart glass platform. This wearable technology not only enables a voice-activated access to protocols, but also has the potential to enhance access to pertinent information such as the patient’s medical record. These augmented reality grossing protocols are useful for prompting the trainee to perform and document critical steps in a procedure. In addition, resident progress is automatically aggregated in terms of efficiency of performing the tasks in a timely manner. Performance data can be trended over time and compared to peers to document competency.

**522 Analyzing Anatomic Pathology On-call Summaries to Improve Pathology Resident On-call Experience and Patient Care**

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**Disclosures:** Ying Liu: None; Karen Matsukuma: None

**Background:** Pathology on-call experiences help prepare trainees for successful transition from residency to academic or private practice careers, and as such are an integral component of training. However, few data exist on the nature of the pathology resident on-call workload and experience.

**Design:** At our institution, pathology residents begin taking on-call duties in postgraduate year 2. Immediately following each 24-hour cycle, a detailed summary of all received calls is generated and sent to the appropriate anatomic or clinical pathology faculty and trainees as part of the routine patient care “hand off.” We reviewed the anatomic pathology on-call summaries from July 2016 to June 2018. For each documented call, we tabulated information pertaining to the date and time, reason for the call, and subsequent resolution.

**Results:** From the 138 anatomic pathology on-call summaries (of 510 possible call intervals) submitted during this period, 227 calls were received. Calls were most frequent on weekdays from 5-8pm and not surprisingly were due to after-hours frozen section requests (72 calls). The second most frequent call was from nursing staff inquiring about whether formalin should be added to a placenta or product of conception (25 calls); the third most frequent reason was in regard to proper specimen disposition and/or request for pathology to add formalin to the submitted specimen (18 calls).

**Conclusions:** A significant number of pathology calls are recurring pre-analytical issues that may be amenable to education of submitting physicians and staff. Additionally, only a fraction (30%) of the total expected number of call summaries were identified, in part due to limitations in retrieval of archival communications but also due to misunderstanding on the part of trainees in regard to whom summaries

should be sent. The latter deficiency has been subsequently addressed at several residency program meetings. To our knowledge, this is the first study analyzing anatomic pathology resident on-call workload. This information is useful in improving not only resident on-call experience (as fewer pre-analytical calls will increase resident time for other educational activities), but also the quality and efficiency of patient care. Future studies will include implementation of specific interventions and analysis of their effect on the number and nature of after-hours calls. Analysis of the clinical pathology on-call summaries is also planned.

### 523 An Internet-Based Method for Teaching, Learning, and Sharing of Pathology Cases

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**Disclosures:** Stephanie Liu: None; Ahmad Charifa: None

**Background:** Continuing technological advances are inevitably impacting the study and practice of pathology. We are seeing the transition from glass slide microscopy to virtual microscopy, which is serving as an accessible educational medium for medical students, residents, and fellows. These online databases and atlases provide a research tool to better inform us regarding the development of visual diagnostic expertise. Here, we describe a web-based platform without the necessity for plugins or other downloads. The images are stored on a cloud-based platform with easy accessibility and a robust user interface.

**Design:** PathPresenter is an innovative platform that allows pathologists to interface digital slides for daily use. The platform has three major areas: presentations, high yield cases, and an extensive searchable slide library. The platform provides a streamlined workflow for teaching and learning pathology. It converts conventional PowerPoint presentations with static images to live, interactive presentations using whole slide images. The slides on PathPresenter can be turned 360° and the user can easily zoom in and out. Annotation and presentation tools are also available in the presentation mode.

**Results:** Since going live in January 2017, PathPresenter has had close to 300,000 page visits, with over 53,000 users. The platform has been accessed in 161 countries, with the top three being the United States, Brazil, and India. The slide library contains 13,800 pathology slides in most subspecialties of anatomic pathology. Whole slide images can be accessed directly or downloaded from the platform slide library to create presentations saved in the user's profile. Individual whole slide images or presentations can be shared via email. Trainees can learn from and study the high yield cases. The platform is available on smart devices as well as conventional PCs.

Figure 1 - 523

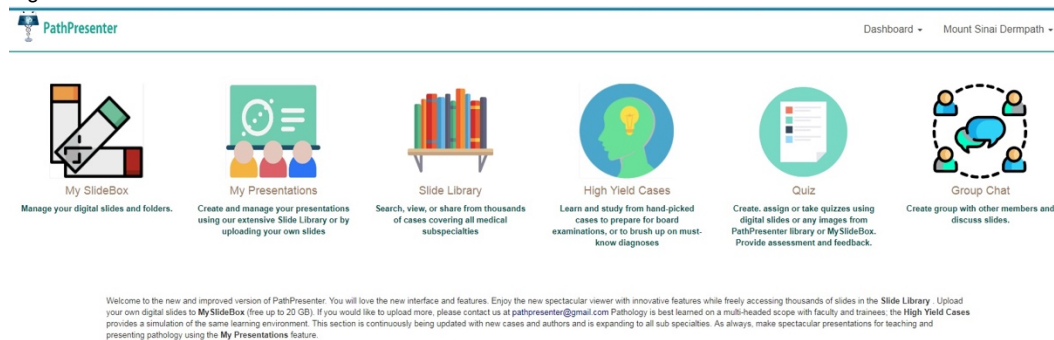
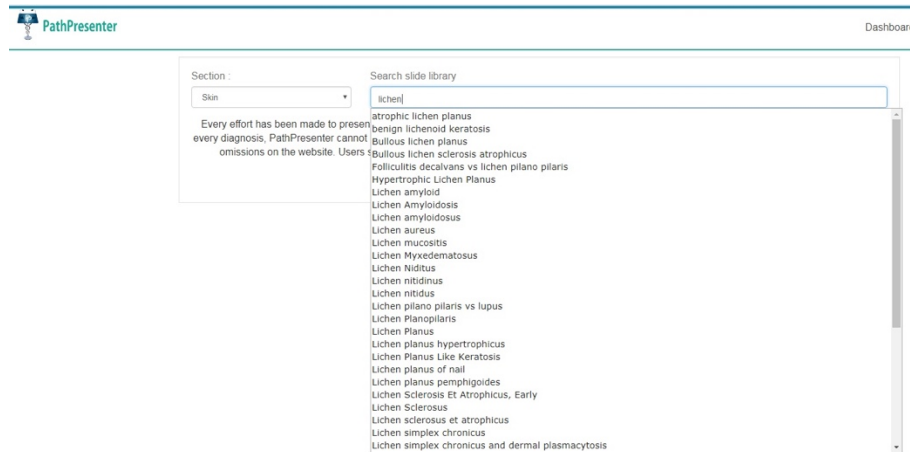


Figure 2 - 523



**Conclusions:** This innovative platform provides an attractive alternative for pathologists around the world. Academicians have access to high quality cases for teaching and have an exhaustive resource of digital slides available for use anytime and anywhere.

## 524 A Novel Method of Pathology Resident In-Service Evaluation

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**Disclosures:** Fang-I Lu: Non; Sharon Nofech-Mozes: None; Carlos Parra-Herran: None; Bojana Djordjevic: None; Elzbieta Slodkowska: None; Jelena Mirkovic: None; Christopher Sherman: None; Julia Keith: None

**Background:** An important component of a competency-based pathology resident training program is an effective in-service evaluation (ISE). Currently, ISE at University of Toronto is given at the end of the rotation and relies on summative written or oral feedbacks from staffs involved in the teaching of the particular resident. Such method tends to be subjective and over-generalized. Also, residents' case load and complexity are not tracked. Finally, no effective simulation method currently exists in report sign-out. Our goal is to develop a novel ISE and compare its performance to the current ISE.

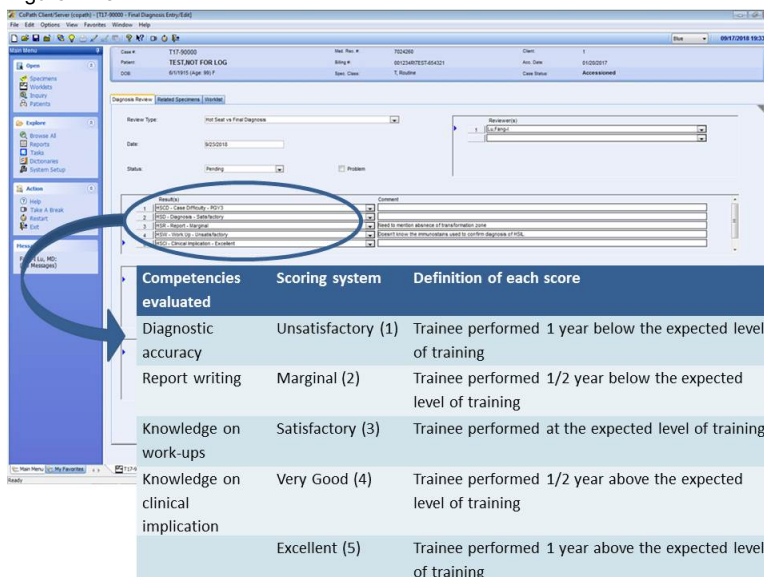
**Design:** All pathology trainees rotating through Sunnybrook Health Sciences Centre between January – September 2018 were involved in this study. The trainees previewed cases and entered their diagnoses in a mock “sign-out” field built into the departmental LIS system. For at least 20% of these cases, the trainees' performance in various aspects of competency was assessed and recorded in the LIS system by the supervising pathologists (Figure 1). The case number, final diagnosis and evaluation of all cases previewed by trainees were retrieved at the end of the study period. The residents' performance evaluation using the novel ISE was compared with the overall performance score from the current ISE. All participating trainees and pathologists responded to surveys on the effectiveness of the current ISE and of the novel ISE.

**Results:** Evaluation data for 7 residents (5 junior and 2 senior) and 2 fellows in various rotations by 9 pathologists are listed in Table 1. On average, each trainee had 28.6 cases evaluated, with 90% of these cases having at least the diagnostic and reporting skills evaluated. The residents' performance as evaluated using the novel ISE correlated well with the overall performance score as per current ISE. Compared to the current ISE, the novel ISE was rated by the trainees as a better simulation and offered a more objective, detailed and timely evaluation that accurately identified a trainee's strengths and weaknesses. For the participating pathologists, the novel ISE was rated as a more detailed, timely and easier to use evaluation compared to the current ISE.

Trainee (level of training)	Rotation	Novel ISE			Overall performance score from the current ISE
		# of cases evaluated	# of cases with diagnosis and report evaluated	% of competencies rated as satisfactory or better	
1 (SR)	Neuro	9	9	100	5
2 (JR)	Neuro	15	15	78.5	3
3 (JR)	Neuro	6	6	100	5
4 (JR)	Neuro	13	13	100	4
5 (JR)	Neuro	8	8	100	4
6 (SR)	Gyn, Breast	91	76	83.1 (Gyn), 89.2 (Breast)	2 (Gyn), 3 (Breast)
7 (F)	Gyn	40	33	98.5	N/A
8 (F)	Breast	71	68	93.9	N/A
9 (JR)	Surg Path	4	4	100	4

ISE: In-service evaluation; SR: Senior resident; JR: Junior resident; F: Fellow; Neuro: Neuropathology; Gyn: Gynecologic pathology; Breast: Breast pathology; Surg Path: Surgical pathology; #: Number; %: Percentages; N/A: Not available

Figure 1 - 524



**Conclusions:** The novel ISE is a feasible method of assessing pathology residents' performance, and links performance to specific cases thus improving the specificity and applicability of the feedbacks provided to the trainees.

## 525 Assessment of Global Health Education in Pathology: A Survey of the Current Approaches and Challenges to Establishing Global Health Electives in Pathology Training Programs

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**Disclosures:** Rebecca Marrero: None; Meredith Pittman: None; Rema Rao: None; Melanie Jhncilla: None

**Background:** Global health (GH) electives for medical trainees improve clinical skills, heighten awareness of healthcare disparities, and engender clinical and research interests in resource-restricted areas. Common barriers to the development of GH electives across medical specialties include lack of funding, supervision, and time, but there are no studies that address GH education in pathology. Our aim was to assess the status of GH education in pathology and to identify barriers to the development of GH electives in residency programs.

**Design:** A 26-item survey was developed and distributed via the Association of Pathology Chairs Program Directors (PRODS) member listserv; we received 30 responses. Topics included the availability of GH electives in the training programs and, if available, the structure of the elective (i.e. length, objectives, evaluation, and supervision), funding sources, and international partner sites. If an elective was not available, the survey queried barriers to the development of one. Finally, we used a Likert-type scale (0: strongly disagree-10: strongly agree) to evaluate the overall impressions of GH and GH education among participants.

**Results:** One third of the participating programs (10/30) offer a GH elective. About one resident a year participates, and electives typically last for 2-4 weeks. Visited countries include Haiti, Peru, and Uganda. Only two programs collaborate with partner organizations (ASCP and Partners in Health) and, while most electives were funded by internal department funds, two programs required residents to source their own funding. A research component is required for two electives, and in most cases, on-site faculty evaluates the rotating residents. Of the programs without an elective, most (67%) were interested in developing one but cited lack of funding as a major barrier to implementation. When asked about the importance of GH electives in pathology training, an average rating of 5.8 (range 0-10) was given by participants. Even so, most program directors acknowledged that pathology plays an important role in global healthcare and that exposure to alternative medical systems can be valuable.

**Conclusions:** Overall, very few existent GH electives for pathology trainees were reported in our survey. Even though program directors were keenly aware of global healthcare disparities and the need for pathology in these settings, they reported that lack of funding mechanisms prevent implementation of formal elective rotations in their programs.

## 526 Utilization of a Mock Tumor Board as a Multidisciplinary Preclinical Medical Student Experience to Increase the Visibility of Pathology and Demonstrate Bridges to the Clinical Curriculum

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**Disclosures:** Kristen Marrone: None; Brock Baker: None; Gregory Stachelek: None; Ashley Cimino-Mathews: None; Marc Halushka: None; Marissa White: None

**Background:** Increasing the visibility of pathology in integrated undergraduate medical education is paramount in an era of complex pathologic diagnoses, routine ancillary testing, and laboratory stewardship. To this effect, we introduced a 2-hour mock multidisciplinary tumor board into the preclinical neoplasia course. The objectives were to bridge the gap between the basic science of cancer and the clinical applications, and highlight the role of pathologists in the multidisciplinary care team.

**Design:** The mock tumor board team consisted of an oncologist, radiologist, radiation oncologist, surgeon, pathologist, emcee, and patient advocate. Playing these roles were a radiology resident, two radiation oncology residents, and pathology and oncology faculty members. Two cases were presented, a patient with infiltrating ductal carcinoma and a patient with lung adenocarcinoma. Pathology and imaging were presented, followed by discussion of the clinical stage and management. Ancillary studies such as molecular tests, and potential complications of treatment were also discussed. The second case included student participation with real-time clicker questions. Students assessed the session as a part of the course evaluation.

**Results:** 39 out of 120 students completed the course evaluation. When asked if the tumor board review session enhanced their understanding of the material, 77% strongly agreed or agreed, 21% were neutral, and 3% strongly disagreed. Responses were similar for the virtual microscopy and combined gross specimen and cancer imaging components of the course, where an average of 76% strongly agreed or agreed, 19% were neutral, and 6% disagreed or strongly disagreed. Written feedback was positive. Students commented that the session helped them synthesize the material and demonstrated multidisciplinary clinical applications. One student commented "Tumor Board Review is probably the best class I've had at Hopkins...It was a real treat to hear about clinical reasoning from different physicians about how to approach the same complex case as a team." Constructive feedback included shortening the length of the session.

**Conclusions:** The positive feedback demonstrates how interactive experiences may be effectively incorporated to reinforce the preclinical curriculum. It also demonstrates another method to highlight the role of pathology in patient care. With the suggested improvements, we aim to use our session as a model for other multidisciplinary preclinical activities that incorporate pathology.

## 527 Development of a Pathology Boards Review Tool

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**Disclosures:** Daniel Martig: None; Kristie White: None

**Background:** Our institution is developing a pathology boards review tool using a spaced-education model in which questions will be electronically delivered to trainees on a weekly basis over a 4-6 month period. Spaced education is a novel teaching method that combines two key principles from education, the spacing effect and the testing effect. Spacing effect refers to the phenomenon whereby learning is more effective when spread out over time in contrast to a single session, while testing effect refers to concept that long-term memory is increased by testing. This type of teaching has repeatedly shown to improve knowledge retention and user engagement, compared to traditional methods. We began by developing a curriculum content map in the focused area of hematopathology to pilot the initial launch of the tool.

**Design:** An initial list of hematopathology topics to include for boards review in AP and CP (n=221) was generated by 2 pathologists using a Delphi approach to reach consensus. To demonstrate content validity, a group of pathologists (n=14) was asked to rank the importance of each topic on a scale of 0-4 (0-absolutely do not include, 1-not very important, 2-somewhat important, 3-important, 4-very important).

**Results:** A ranked topic list was generated by ranking by the mean importance score. The topics were divided into rough quartiles. The ranked data was used to guide the generation of questions for a question bank in a weighted method, whereby topics in the 1<sup>st</sup> quartile have the greatest number of questions generated, and topics in the 4<sup>th</sup> quartile have the least. Questions were mapped to the topic list to ensure coverage of all topics in the question bank, and to identify topics in need of new questions. In addition, topics with a score of 2.0 or less were removed from the final topic list. Our poll also resulted in identification of 17 additional topics that were not included on the initial topic list.

Figure 1 - 527

Mean Score	Highest Ranked Topics
3.92	Acute promyelocytic leukemia with t(15;17)(q22;q12); PML-RARA
3.92	Chronic myelogenous leukemia, BCR-ABL1 positive
3.85	Hairy cell leukemia
3.77	Hemoglobin H disease
3.77	B-cell lymphoblastic leukemia/lymphoma, general
3.77	B-cell lymphoblastic leukemia/lymphoma with recurrent genetic abnormalities
3.77	Acute myeloid leukemia with t(8;21)(q22;q22) RUNX1-RUNX1t1
3.77	Burkitt lymphoma
3.77	Chronic lymphocytic leukemia/small lymphocytic lymphoma
3.77	Follicular lymphoma
3.77	Classical Hodgkin lymphoma
3.77	Epstein Barr virus
3.69	Iron deficiency anemia
Mean Score	Lowest Ranked Topics
2.08	Congenital Factor 7 Deficiency
2.08	Measurement and Interpretation of Antithrombin
2.00	Polycythemia due to Dehydration
2.00	P2Y12 inhibitors and Monitoring
2.00	Sucrose lysis and HAM test interpretation for diagnosis of PNH
1.92	Scott Syndrome
1.92	Interpretation of thromboelastography
1.85	Acute myeloid leukemia, FAB Classification
1.85	Endothelial Regulation of Hemostasis
1.77	Manual measurement of red cells
1.77	Primary Fibrinolysis - bladder ca
1.62	Interpretation of the Euglobulin lysis test (fibrinolysis)
1.46	Measurement of Plasma free hemoglobin

Figure 1. Table of highest and lowest ranked topics

**Conclusions:** The ranking method demonstrates validity of the content for the hematopathology section of our boards review question bank. The topic list allows mapping of content to ensure the questions reflect an appropriate breadth of coverage for reviewing for AP/CP boards. In addition, the ranking informs an appropriate depth of coverage for topics within the question bank. The methodology will assist us in creating topic lists for the remaining sections in our question bank, and will be transferrable to other pathology training programs that wish to develop boards review materials.

## 528 A Multi-Institutional Pilot of an Entrustable Professional Activity (EPA) Assessment Tool for Hematopathology Fellowship

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**Disclosures:** Daiva Mattis: None; Sonam Prakash: None; Lorinda Soma: None; Kristie White: None

**Background:** An entrustable professional activity (EPA) is a unit of professional practice to be entrusted to a trainee once they attain competence. These activities should define the practice of a specialty. We developed and piloted an EPA assessment tool for hematopathology fellowships at 2 institutions (Fig. 1) for composing a diagnostic report in hematopathology using the CAP GME committee EPA guidelines published by McCloskey et al in 2017.

**Design:** We performed a qualitative study on the use of this EPA assessment tool to gain insight into the experience of the faculty and trainees involved. A semi-structured interview was developed and consisted of 3 demographic and 6 open-ended questions. One of us (DM) conducted and recorded the interviews that were then transcribed. The de-identified transcripts were independently read by 3 investigators to generate codes for common themes, and the data was coded.

**Results:** We completed interviews with 12 faculty and 3 trainees at 2 institutions. Eight faculty had experience using the tool (users), and 4 did not (non-users). All 3 trainees had experience with the tool. Overall 83% of faculty felt the tool was useful for capturing the ability of a trainee to sign-out cases independently but indicated a need for multiple cases across a variety of entities. Two of the 3 trainees felt the tool was useful overall, and the third felt it provided no change.

When asked about the ease of determining what constitutes “meets expectations” in each of the 7 components assessed, there was a difference in opinion between users and non-users: 63% of the users found “#7: Recognize when expert consultation is needed” problematic as compared to 25% of non-users and only 42% of the users felt the tool was useful for capturing the trainee’s ability to form a differential diagnosis as compared to 83% of non-users. There were differing opinions on what constituted an expert consultation. Lastly, multiple benefits of the EPA tool over current assessment methods were given including objective, timely, structured and more detailed feedback.

Figure 1 - 528

Fig.1 EPA: Compose a diagnostic report for a hematopathology specimen Relevant ACGME Core Competencies (PC1, PC2, MK1, MK3, MK4, SBP4, PBL12, PROF1, PROF2, ICS1)		
Knowledge and Skill Components:	Needs Improvement	Meets Expectations
1. Verified proper identity of the patient diagnostic material (correct patient/specimen/date of collection).		
2. Evaluated and interpreted microscopic slides and laboratory data to formulate an appropriate differential diagnosis.		
3. Obtained ancillary studies as needed for diagnosis of case (IHC, special stains, cytogenetic/molecular testing, etc) with appropriate interpretation.		
4. Correlated with clinical history, radiology findings, prior hematopathology and surgical pathology history, current or prior laboratory data.		
5. Prepared a complete and accurately edited report with final diagnosis, including relevant clinical information and clinical correlations.		
6. Identified urgent diagnoses that need to be communicated with clinical provider.		
7. Recognized when expert consultation is needed.		

**Conclusions:** Our study of this EPA assessment tool illustrated significant benefits and positive experience for the vast majority of users. Based on our experience, component #7 may need modification or removal entirely. In addition, component #2 may need modification to ensure trainees are able to develop an appropriate differential diagnosis. Overall this EPA tool is adaptable for practice and may be of use to other institutions.

## 529 The Use Of A Case-Based Flipped-Classroom Model In Pathology Didactics

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<sup>1</sup>Seattle, WA, <sup>2</sup>University of Washington, Seattle, WA, <sup>3</sup>University of Washington Medical Center, Seattle, WA

**Disclosures:** Elizabeth Parker: None; Christopher Chandler: None; Deepti Reddi: None; Michi Shinohara: None

**Background:** Group learning has become a fixture of undergraduate medical education in the last 20 years. Problem based learning and the flipped classroom model are two of the most widely utilized group learning pedagogies. While these models have been successfully introduced at the undergraduate and medical school levels, use in graduate medical education has been limited mostly to clinical specialties (i.e., internal medicine). The use of group learning in diagnostic specialties (i.e., pathology) is not well described or studied. Here we examine how group learning is perceived and valued among trainees at the University of Washington Medical Center (UWMC) Department of Pathology didactic sessions.

**Design:** A case-based flipped-classroom model was used during seven regularly scheduled pathology didactic sessions held at UWMC attended by both pathology and dermatology trainees. Groups were provided with a case scenario and glass slides and prompted to come to a diagnosis and teaching points. An attending physician circulated providing guidance. After 15 minutes of group work, groups presented their case at a multi-headed microscope with the attending physician guiding the discussion. Participant opinions about the format and educational preferences were collected on pre and post-exposure surveys.

**Results:** A total of 18 complete post-exposure responses were collected. The overwhelming majority of respondents had prior experience with group learning models (problem-based learning, 89%, and flipped classroom 47%). Preferences for active learning versus passive learning methods were mixed (68% for group/active learning and 74% for lecture). Participants found the breakout group work and group presentations at the end of each session to be most valuable (average score 6.9 and 7.8 out of 10 respectively). The lack of required preparation for the sessions was not perceived as a benefit of the active learning sessions. Additionally, 78% of respondents felt the sessions could be improved by including an element of traditional lecture. Overall, 61% of respondents would recommend the format for future didactic sessions, 22% were unsure, and 17% were not in favor of the format.

**Conclusions:** The group learning model is generally well received among trainees attending pathology didactic sessions. However, preferences for learning methods are diverse and trainees prefer a mixture of both group learning and traditional lecture.

### 530 Do Physicians Speak The Same Medical Language?

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**Disclosures:** Elizabeth Parker: None; Soledad Jorge: None; Antonios Papanicolaou-Sengos: None; Nadia Giannakopoulos: None

**Background:** There is a dearth of information in the medical literature on how physicians define neoplasia terms. A terminology disconnect between the diagnosing pathologist and the treating clinician may result in under or overtreatment. We investigated the way physicians of various specialties and training levels interpret neoplasia terms and classify related lesions.

**Design:** Surveys were completed by 462 participants, including medical students (1.1%), post-graduate trainees (47.4%), and attending physicians (48.3%) from a variety of specialties (35.9% pathologists) and from around North America. Participants were asked to define a number of terms and decide whether various entities were benign, neoplasm, malignant or cancer.

**Results:** Respondents disagreed on the definition of these terms to varying extents depending on the term (Table 1). While there was general agreement that “carcinoma” is malignant and cancerous (99%), other terms like in situ carcinoma (CIS) have little agreement, with 22% of respondents categorizing CIS as benign, 57% as malignant, and 63% as cancer. Additionally, failure to consistently categorize a term as either benign, not malignant, and not cancer or not benign, malignant and cancer was common, with >30% (and up to 51%) of respondents providing inconsistent responses to 11 of the 19 terms (Table 1). When answers were scored against a key, there was a significant association between training level and percent score (p<0.0001). Relative to all practicing physicians, the mean score for fellows was 4.4 percentage points higher (p=0.055), for residents 6.5 percentages points higher (p=0.0002), and for medical students 10.6 percentage points higher (p=0.0002). There was a significant association between specialty and score (p<0.0001). Relative to other providers, the mean score of oncologists was 10.6 percentages points higher and the mean score of pathologists 15.6 percentage points higher. In a multivariate model only specialty was significantly associated with score (p<0.0001). The strongest predictor of score was being a pathologist (p<0.0001).

Sample Terms	% Responding “Yes”			% Responding consistently*
	Benign	Malignant	Cancer	
HG dysplasia (Barrett’s)	44%	13%	8%	49%
CIS	22%	57%	63%	57%
DCIS (breast)	19%	64%	63%	58%
Tubular adenoma	83%	0.4%	0.7%	82%
BCC (skin)	15%	74%	93%	84%
Papillary thyroid carcinoma	0.4%	95%	98%	94%
Carcinoma	0.1%	99%	100%	97%

\*Defined as either “benign, not malignant, not cancer” or “not benign, malignant, cancer”

HG = high grade. CIS = carcinoma in situ. DCIS = ductal carcinoma in situ. BCC = basal cell carcinoma

**Conclusions:** Across this medical professional cohort there is variability in definition and application of cancer-related terms. Results suggest a possible inverse relationship between consistent use of terminology and years of experience. Consistent use of cancer/neoplasia related terminology was strongly associated with being a pathologist. Pathologists are uniquely poised to act as ambassadors of cancer related terminology.

### 531 Pathology Digital Imaging Papanicolaou Screening as a Training Tool For Under Resourced Settings

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**Disclosures:** Stephen S. Raab: Primary Investigator, Agency for Healthcare Research and Quality; Zelma Cason: None

**Background:** Approximately 85% of cervical cancer cases and deaths occur in low and middle income countries. Low income countries (LIC) lack available resources, such as cytotechnology personnel. Our goal is to develop a digital imaging tool to train Pap test screening personnel in low income countries. We previously reported the effectiveness of training with rapid pattern recognition of PDF images. We now report the effectiveness of training de novo screeners using whole slide pathology digital images of conventional Pap tests.



**Design:** We recruited eight high school/college level students who had no background in microscopy first to undergo rapid pattern recognition training using JPEG Pap test images. The students learned to separate high grade or above lesions (HSIL+) from all other lesions (HSIL-) at a sensitivity of > 70% in 4-6 weeks using simulation principles of continuous assessment, feedback, and deliberate practice of looking at large volumes of images on their own. The final component of training involved simulation-based training of interpreting conventional Pap tests (mimicking technology in LICs). The students were provided a similar simulation-based program as described above and evaluated a total of 320 cases in six week sessions. We measured individual and group performance and change in performance over time

**Results:** The students received overall diagnostic accuracy grades with mean of 85 (range 82-92). The mean sensitivity and specificity was 63% (range: 62-68%) and 88% (range 84-91%). This level of detection is similar to what has been reported in the literature of HSIL+ detection (52-75%). Each student showed little change over time and plateaued at an acceptable level of HSIL+ detection almost immediately, likely demonstrating that previous rapid image pattern recognition provides an important component in learning. We found that students tended to miss different cases, indicating that if they worked in pairs, a second reviewer would have detected most errors. A high level of specificity was developed into the rapid image training, so that the number of false positives would not be too high.

**Conclusions:** We conclude that de novo students may be trained to perform at a high level of competency in examining whole slide digital images of conventional Pap tests in approximately three months. Improved detection could be achieved by secondary reviewing. As students plateaued at acceptable detection levels following rapid JPEG image training, the time in training with whole slide

### 532 Development of a Clinical Pathology Sign-out Application to Improve Workflow and Pathology Trainee Education

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**Disclosures:** Swati Satturwar: None; Bryan Dangott: None

**Background:** In most academic centers residents are expected to review daily cases, formulate reports and attend sign-outs. Clinical pathology (CP) sign-out often involves review and interpretation of paper reports and manual entry of narrative interpretations into the Laboratory Information System (LIS). To address some of the challenges inherent in this process, we developed a clinical pathology sign-out application (app) in May 2017.

**Design:** Custom software was designed to interact with the clinical and anatomic LIS (Sunquest® and PowerPath® Tucson, AZ) to create electronic work lists which encompass all clinical pathology case types requiring pathologist interpretation. The app automatically retrieves and integrates current and historic anatomic specimens. The work list feature shows the status of each case and the expected case volume for the day. Residents electronically sign-out each case prior to assigning cases to attendings. The app stores an electronic copy of the resident interpretation for comparison to the final attending report. The app automatically enters the narrative results into the LIS upon attending electronic signature. An eight question survey was given after one year of using the CP sign out app.

**Results:** Total 11/16 (68.7%) surveys were received. 91% of the users were moderately to extremely satisfied with utility of the CP sign out app. Majority of the users thought the app saves >35% time from the previous manual process (88%), improves ability to cover CP service (91%), and helps plan for the expected workload (91%). All the residents (100%) agreed that CP sign-out app improved their educational experience. 91% users agree that improved data safety was achieved by using the work list to eliminate the use of USB, email or text documents during transfer of cases between residents and attendings.

**Conclusions:** The CP sign-out app improved clinical pathology workflows and facilitated resident education. Electronically capturing history and retrieving all other associated anatomic specimen information resulted in improved final integrated diagnosis. Benefits were achieved in efficiency, billing, education, sign-out communication, and data security. Retrospective review of the cases allowed residents to refine their diagnostic reporting skills by the highlighting the differences between the attending final report and resident report. In addition, the archived reports can be used by the rotation director to assess the progress of the residents throughout training.

### 533 This is Jeopardy! A Service Coverage-Based Schedule Model for Pathology Training Programs

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**Disclosures:** Jason Scapa: None; Bitu Naini: None; Sheeja Pullarkat: None; Peggy Sullivan: None

**Background:** Scheduling rotations for pathology residency involves balancing educational requirements, service coverage, personal time off (PTO), and resident well-being. Absences, whether planned or unexpected, require cross-coverage from other residents which disrupts training and affects resident wellness. Additional stress occurs when trainees are required to find their own coverage for planned absences.

Many programs in clinical specialties use a “Jeopardy”-based system, where outpatient residents are pulled to cover vital services when a trainee is absent. Borrowing this concept, we created a “Jeopardy-Elective” (JE) rotation to improve the resident training experience.

**Design:** Our training program converted from a 12 calendar-month block to a 13 four-week block rotation model, creating an additional block for the JE service. During periods of adequate coverage, JE residents participated in a clinical service area of interest. We conducted an online survey of all residents trained in both models. We also compared PTO days scheduled before and after the new model.

**Results:** 12 of 16 residents completed a pre-intervention survey (75% response rate). For ‘ease of finding coverage’ in the old model, residents gave a rating of 2.4 out of 5 (with 5 being ‘very satisfied’). For ‘anticipated’ improvement score in the new model, residents gave a rating of 4.1 of 5 (with 5 being ‘major improvement’). In the old model, residents used 16.7 of 20 possible PTO days on average. Only 33% of residents used all PTO days. The new week-based model with ‘built-in’ coverage allowed prospective scheduling of 10 PTO days for all residents. In the first 3 months, the JE resident covered 3 unexpected absences due to illness or emergency. JE residents also enhanced their training with early or additional experiences in dermatopathology, molecular pathology, and cytology. A year-end post-intervention survey and final calculation of PTO days is planned.

**Conclusions:** Thus far, the coverage-based scheduling model with JE rotation has improved service coverage issues, enhanced resident well-being, and enriched resident learning experiences. We also anticipate an improved workplace culture of shared responsibility and team work. An important element of resident wellness is the ease and ability to take PTO and attend personal health care appointments. Thus, having creative, flexible models that address resident wellness while maintaining service coverage will be critical for all training programs.

### 534 Harmonization of Training, Training Requirements, Board Certification and Practice of Hematopathology

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**Background:** The practice of hematopathology (HP) has undergone major changes over the last few decades, and there is insufficient data to provide guidance to program directors (PD) or the ACGME responsible for fellowship programs and their evaluation, nor for the American Board of Pathology (ABPath) which is responsible for certification in HP.

**Design:** To better define current day practice of HP, characterize HP training programs, and get the input of PD and ABPath HP diplomates regarding the HP certification examination, 2 surveys were performed – one for the PD (n=68, 80% response rate) and one for HP diplomates 1+ to 10 years post-residency doing MOC/CC reporting in 2017 (n=196, ~ 34% response rate).

**Results:** 59% of diplomate respondents practice in a setting with 1-3 hematopathologists (HPist), 42% in an academic medical center, and only 18% practice >75% HP with 46% practicing ≤ 25% HP. While some aspects of HP are practiced by most HPists, others are practiced by only a subset [table 1]. Comparison to the median time spent training in the varied aspects of HP (# of weeks x % of time spent/week, very wide ranges), and diplomates’ perception of how the amount of training in each of these areas compared to what was needed in their current positions is also in [table 1]. PD felt trainees should conduct 500 BM exam, 400 lymph node/related tissue biopsy, 75 coagulation test, 40 classical cytogenetic, 50 hemoglobin analysis and 50 molecular clonality assay interpretations (median values with wide ranges), with a minority from pediatric patients. 76% of PD felt fellows should perform at least 5 BM exams and only 13% chose none. Specific areas on the certifying examination where >20-34% PD suggested increased emphasis included non-neoplastic WBC disorders, selected other benign areas (currently each 1-2% of exam), plasma cell/related neoplasms and administration/management (no areas >34%). The only areas where >16.1% PD suggested decreasing emphasis were hemostasis and thrombosis (31%) and non-neoplastic RBC disorders (44%). Diplomates’ perceptions about the examination are in [Table 2]. Some differences were observed depending on the work environment of the diplomates; however, they were generally not pronounced.

Table 1. Clinical task areas performed by hematopathologists in hematopathology training programs and among diplomates, time spent training in each area, and diplomate perception of amount of training versus amount needed.

Task	Training programs (n=68) where task is practiced by a HP	Diplomates practicing task (n=196)	Time spent in fellowship, median (weeks)*	Amount of training versus what is needed, diplomate survey#		
				Too little	About right	Too much
Bone marrow aspirate interpretation	100%	92%	12	2%	89%	9%
Bone marrow biopsy interpretation	100%	95%	12	2%	89%	10%
Performing bone marrow aspirations & biopsies	18%	16%	0.2	22%	58%	12%
Lymph node & related tissue interpretation	100%	95%	9.6	7%	86%	8%
Flow cytometry interpretation	100%	84%	7.6	6%	83%	11%
Complex coagulation testing interpretation (complex meaning beyond general PT, PTT, etc)	60%	34%	2	29%	56%	14%
Complex coagulation testing consultations (complex meaning beyond general PT, PTT, etc)	56%	23%	1	28%	57%	13%
Classical cytogenetics interpretation	31%	17%	1	17%	68%	8%
Cytogenetic FISH studies interpretation	47%	38%	0.8	17%	73%	7%
Cytogenetic/molecular array interpretation (aCGH, SNP)	25%	5%	0.3	26%	49%	7%
Molecular diagnostic testing: PCR clonality assay interpretation	57%	23%	0.8	18%	66%	7%
Molecular diagnostic testing: 'conventional' mutational & other assay interpretation	53%	19%	0.6	21%	64%	7%
Molecular diagnostic testing: NGS panel interpretation	44%	13%	0.4	26%	37%	7%
Hemoglobin analysis (HPLC, electrophoresis)	63%	27%	0.6	21%	61%	11%
Peripheral blood & fluid reviews	100%	91%	3.7	7%	85%	8%
Laboratory management - hematology	96%	56%	0.4	34%	58%	4%
Laboratory management - coagulation	60%	35%	0.2	31%	51%	6%
Laboratory management - flow cytometry	97%	33%	0.3	30%	54%	8%
Laboratory management - cytogenetics	19%	7%	0.1	29%	44%	6%
Laboratory management - molecular diagnostics	47%	13%	0.1	31%	46%	5%

#responses of "no training" not shown

\*Does not include time spent on "research" or 2.6 weeks spent on pediatric hematopathology. Due to these being estimates, the total weeks is greater than 52

Table 2. Diplomates perception about emphasis on certifying examination topic areas compared to what they felt they needed to know to succeed in their current position (n=193)

	Too Little	About Right	Too Much
Bone marrow pathology	6%	87%	2%
Lymph node & related pathology	6%	87%	3%
Flow cytometry	12%	80%	3%
Coagulation (hemostasis & thrombosis)	4%	59%	32%
Hemoglobin analysis (HPLC, electrophoresis)	4%	59%	31%
Non-neoplastic RBC/WBC disorders (other than hemoglobin analysis)	3%	69%	23%
Cytogenetics (classical & FISH)	4%	83%	7%
Molecular aspects of hematopathology	8%	80%	6%
Laboratory management	12%	68%	11%

% with no opinion not shown

**Conclusions:** In summary, these findings should encourage further discussion among the major stakeholders so that training, practice and board certification in HP can be more closely aligned. Different needs in different practice settings, even if not major, remain a challenge.

### 535 Competency-Based Medical Education in Pathology – a Pilot Study with Junior Residents

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**Background:** Competence By Design (CBD), the Royal College of Physicians and Surgeons of Canada’s model for competency-based medical education (CBME), will be implemented in all Canadian Anatomical (AP) and General Pathology (GP) programs in July 2019. We designed, implemented, and evaluated a 4-week pilot CBD rotation in July 2018 for junior residents, aimed at teaching and assessing potential Entrustable Professional Activities (EPAs) in the ‘Transition to Discipline’ stage of training.

**Design:** Pathology residents in postgraduate years one and two participated in the pilot rotation in an AP department. Three EPAs were chosen: basic specimen handling, summarizing clinical information for clinicopathologic correlation, and basic skills in microscopy. Several teaching sessions and assessments took place (Table 1).

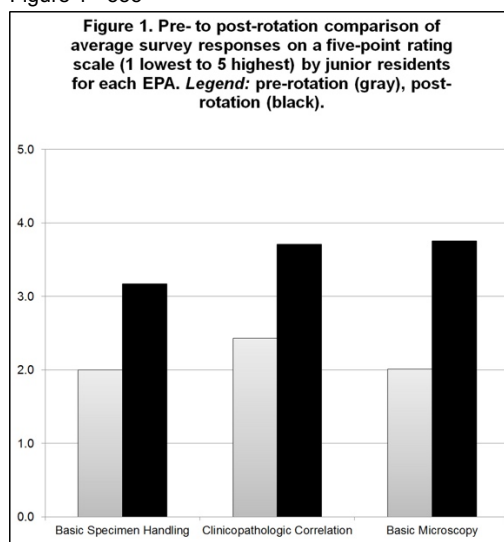
The rotation was evaluated using Opinio survey software with questions designed to assess acquisition of skills for each EPA. Residents were surveyed pre- (day 1) and post-rotation (day 30). Average responses on a five-point scale (1 lowest to 5 highest) were calculated and compared pre- to post-rotation for each EPA. Staff pathologists were also surveyed on day 30 and data was analyzed qualitatively.

**Results:** Junior residents (4 AP, 3 GP) and 12 staff pathologists (43%) participated. Residents had one to four months of prior pathology experience. Resident ratings of knowledge and skills in each EPA increased by an average of 1.2 to 1.7 points on a five-point scale over the course of the rotation (Figure 1). Feedback was reported as adequate by 86% of residents.

Most pathologists (92%) knew about CBD, but only 50% knew the term EPA. Attitudes about adopting CBD were split between positive/don’t know/negative. Staff ranked marking a quiz as the most preferable assessment for junior residents, over an end of rotation evaluation or multiple observation forms. Most pathologists (83%) reported that the rotation did not require more hours of teaching or evaluation of residents. Written comments provided suggestions for future rotations.

Table 1. Components of the CBD Pilot Rotation		
EPA	Teaching/Learning Activities	Assessment
Basic Specimen Handling	Gross rounds	Gross rounds observation
	Specimen handling lectures	
	Gross photography	
	Frozen section workshop	
	Shadow grossing technologists	
	Lab safety	
Clinicopathologic Correlation	Case selection, compilation, review	Peer assessment of resident case presentations
	Electronic records lecture	
Basic Microscopy	Histology/pathology microtutorials	Digital slide quiz
	Slide scanning	
	Ergonomics	
	Microscope basics	

Figure 1 - 535



**Conclusions:** Our study demonstrates that a CBD model can enhance specialty-specific skill acquisition and provide adequate feedback for junior residents, without increasing time spent teaching/evaluating by most pathologists. The study suggests that more than four weeks is needed to fully achieve Transition to Discipline EPAs. Resident self-evaluation surveys may help determine this timeline. Faculty development around CBME is needed to facilitate implementation.

**536 PGY-Tweet: Value of a Resident-Managed Department of Pathology Twitter Account for Education and Outreach**

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**Disclosures:** Imran Uraizee: None; Zhen Mei: None; Nicole Cipriani: None; Anthony Chang: None

**Background:** Social media applications, such as Twitter, have rapidly emerged as a powerful tool for pathologists, providing a novel educational platform with opportunities to share high-resolution multimedia, a means for worldwide networking, and a voice to garner interest and publicity for their specialty. Professional pathology organizations, peer-reviewed journals, and even academic departments have established Twitter feeds to advance educational missions and improve outreach. Resident-managed departmental Twitter accounts may offer a unique platform for delivering educational material, providing insight into trainee experiences, connecting with alumni, and increasing visibility on a national and international stage.

**Design:** A Twitter handle for our department was reactivated in July 2017 by two residents (IU & ZM), who managed the account and published three categories of tweets: (1) educational pearls from didactic conferences, (2) recognition of academic activities, and (3)

departmental marketing/promotion. The Twitter feed was also posted on the home page of the departmental website. Twitter analytics (<https://analytics.twitter.com>) was used to capture the number of tweet engagements from July 2017 to September 2018. Publicly-available demographic information from the list of followers was recorded.

**Results:** A total of 266 unique tweets (119 educational [45%], 84 recognizing activities [31%], and 63 promotional [24%]) and 76 retweets were published on the departmental Twitter feed from July 2017 to September 2018, averaging 23 tweets per month. Educational tweets averaged  $13 \pm 28$  engagements (interquartile range [IQR] 2-11), activity-centered tweets  $30 \pm 38$  engagements (IQR 6-38), and promotional tweets  $33 \pm 34$  tweets (IQR 10-40). A total of 364 followers, including 136 (37%) international followers from 41 countries, subscribe to the departmental Twitter feed as of September 2018. Among followers not affiliated with our medical center, 74 are trainees or medical students (20%) and 136 are attending pathologists (37%). Medical center affiliates subscribing to the feed (12% of all followers) include 11 current trainees, 10 residency alumni, 11 current departmental faculty, and 13 staff and faculty from other departments.

**Conclusions:** Resident-managed Twitter feeds for pathology departments are an effective and interactive platform for sharing educational pearls and promoting departmental accomplishments to a broad local, national, and international audience.