MODERN PATHOLOGY

ABSTRACTS

EDUCATION
(523-564)

USCAP 109TH ANNUAL MEETING
2020
EYES ON YOU

FEBRUARY 29-MARCH 5, 2020

LOS ANGELES CONVENTION CENTER
LOS ANGELES, CALIFORNIA

EDUCATION COMMITTEE

ABSTRACT REVIEW BOARD

523 Video Presentations on Social Media Supplement Pathology Education

Michael Arnold[1], Jerad Gardner[2], Selene Koo[3], Kamran Mirza[4], Sanjay Mukhopadhyay[5], Christina Arnold[6]
[1]Nationwide Children's, Dublin, OH, [2]University of Arkansas for Medical Sciences, Little Rock, AR, [3]Nationwide Children's Hospital, Columbus, OH, [4]Loyola University Medical Center, Maywood, IL, [5]Cleveland Clinic, Cleveland, OH, [6]The University of Colorado, Denver, CO

Disclosures: Michael Arnold: None; Jerad Gardner: None; Selene Koo: None; Kamran Mirza: None; Sanjay Mukhopadhyay: None; Christina Arnold: None

Background: Video presentations are increasingly being incorporated into formal education curriculums in medical schools and pathology residency programs. Social media platforms are emerging as tools for individual pathologists to create and present educational content. We present an overview of social media platforms for educational video presentations, and survey data from social media users comparing their experience with a social media presentation and a published manuscript.

Design: We have created pathology education videos and distributed them via YouTube, Facebook, and Twitter. Using analytic tools provided with these platforms, we have aggregated data about how users interact with these videos, including the total number of views, and the total view time. We surveyed social media users about a 90 second video describing placenta gross examination that was seen by encountered by 110,000 social media user accounts, with over 20,400 media views. We asked users to compare their experience with the video and with the Amsterdam Placental Workshop Group Consensus Statement by rating their experience on a 1 to 10 scale. The survey also asked the likelihood that respondents would refer back to the video or Consensus Statement, or provide these materials to trainees.

Results: Videos can be captured using a smart phone, selfie stick, and tripod. Editing can be done with software freely available on iPhone. Pathology related video postings on YouTube, Facebook, and Twitter have been viewed over 650,000 times, and have a total view time of over 4,700,000 minutes. Based on our survey, the social media audience rated their experience with a video and a Consensus Statement similarly (video = 8.3 of 10, Consensus Statement = 8.5 of 10). Many respondents reported they were somewhat likely or very likely to refer to video (70.5%) or to the Consensus Statement (83.9%), and were somewhat likely or very likely to provide these to trainees (video = 80.3%, Consensus Statement = 87.1%).

Conclusions: Videos presented on social media platforms offer an opportunity for educators to reach a global audience, and provide learners with educational opportunities tailored to different learning styles. Video presentations can be important supplements to pathology education. Learners rated their experiences with a video presentation similar to a publication on the same topic, and frequently reported that they would provide the video to trainees (80.3% of respondents).

524 In Search of the Perfect Tweet: Using Neural Networks to Determine Factors Influencing Engagement Rate of Pathology Twitter Posts

Adam Booth[1], Jerad Gardner[2], Sanjay Mukhopadhyay[3], Brian Cox[4], Raul Gonzalez[5]
[1]University of Texas Medical Branch, Galveston, TX, [2]University of Arkansas for Medical Sciences, Little Rock, AR, [3]Cleveland Clinic, Cleveland, OH, [4]Cedars-Sinai Medical Center, Los Angeles, CA, [5]Beth Israel Deaconess Medical Center, Boston, MA

Disclosures: Adam Booth: None; Jerad Gardner: None; Sanjay Mukhopadhyay: None; Brian Cox: None; Raul Gonzalez: None

Background: Social media has become a routine method of discourse, sharing, and engagement within the field of medicine. This is particularly true in the visually oriented specialty of pathology, allowing for easy sharing of pathologic images globally, including teaching cases and rare diagnoses. Our objective was to identify key characteristics of tweets that promoted high engagement rate (ER) among Twitter users.

Design: We retrospectively searched the personal Twitter feeds of four pathologists (all authors) for 50 sequential tweets meeting inclusion criteria as follows: original tweet from the author, at least 1 microscopic or gross pathologic image, and a comment with an educational point associated with the image. The content of each tweet was also evaluated for the number of characters used, hashtags, Twitter accounts tagged or mentioned, images used, linked primary literature or resources, and whether the tweet was informative or interactive in nature. For each tweet, the number of replies, retweets, likes, impressions, and engagements was also counted. ER was determined using the ratio of engagements to number of impressions in each tweet. A multilayer perceptron neural network and multiple linear regression analyses were employed to determine relative importance and estimated marginal means of each tweet's characteristics in relation to ER, with significance set at $P = <0.0033$.

Results: Likes, characters, retweets, and image number consistently exceeded 80% normalized importance and were targeted in multiple linear regression analyses (Figure 1). Adjusting for likes and retweets, multiple linear regression analyses identified that a midrange number of characters (F=6.369, P=0.00080), increasing number of images (F=4.442, P=0.000263), and the person tweeting (F=4.883, P=0.003) were all significantly associated with high ER. The impact of person tweeting was unrelated to that person's follower

count. The slope and estimated marginal means indicate that tweets with 51-100 characters and more images were associated with increased ER (Figure 2).

Figure 1 - 524
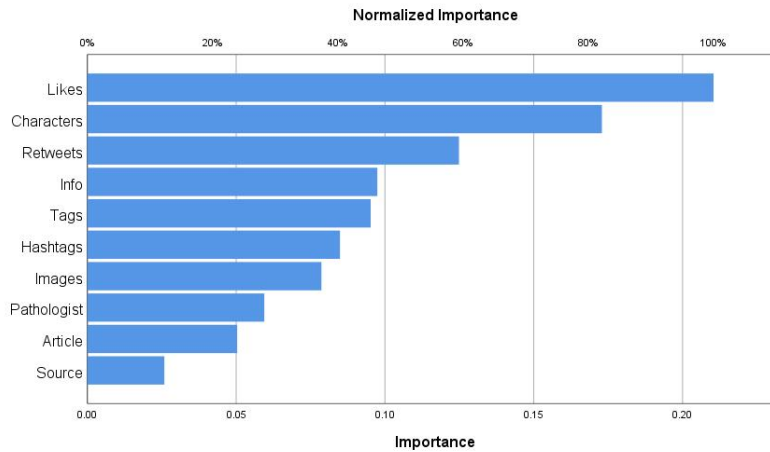
Figure 2 - 524

Linear Regression Analysis: Estimated Marginal Means
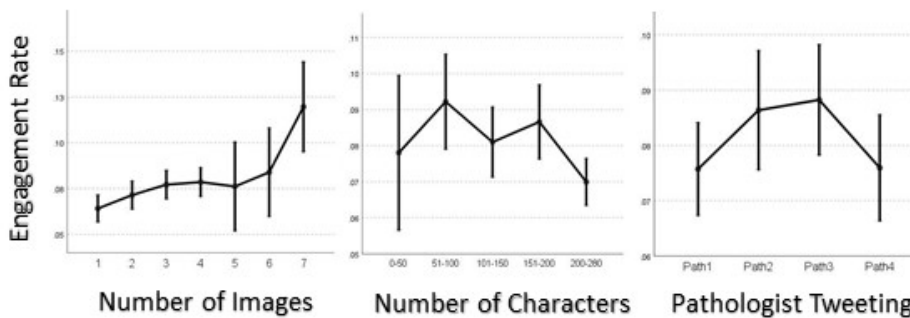
Conclusions: Our study found that increased engagement is significantly associated with tweets that are both succinct and illustrative. Person tweeting also impacted engagement, indicating that the style/personality of the poster is a relevant factor. These findings may be used by Twitter users within the field of pathology to increase the impact of their tweets for education and discourse.

525 Resident Training in Surgical Pathology After Partial Sub-Specialization: Lessons Learned in a Small Academic Setting

Bronwyn Bryant[1], Maria Barton[2], Nora Frisch[3], Frederick Eyerer[2], Alexandra Kalof[2]
[1]The University of Vermont, Burlington, VT, [2]The University of Vermont Medical Center, Burlington, VT, [3]Essex Jct, VT

Disclosures: Bronwyn Bryant: None; Maria Barton: None; Nora Frisch: None; Alexandra Kalof: None

Background: In 2015 the University of Vermont moved from general surgical pathology (SP) sign-out to partial sub-specialization with a GI service, Breast/Cervix (B/C) service, and a "General" service. Residents grossed, previewed, and signed-out every day with interspersed intraoperative consultation (frozen) training. The impact of this model on resident training and satisfaction is evaluated.

Design: The sub-specialization model required a minimum of 12 weeks on GI and B/C services, and 16 weeks on the "General" service. Cases evaluated by residents over an 8 week span were recorded and compared to the American Board of Pathology Blueprints.

Frozen training was increased in 2018. The number of frozen section residents participate was recorded over 1 year. The average number per day is extrapolated across 4 years of training and compared to ACGME requirements.

Satisfaction surveys were distributed to residents in 2016 and 2018, focusing on resident confidence in the gross evaluating and performing frozens, and overall satisfaction with the current training model.

Results: Over 8 weeks, residents and PAs grossed 41% and 56% of large specimens, respectively. Of specimens grossed by a resident, the distribution across service was 33% GI, 27% B/C, and 40% of General. 80% of residents reported feeling "not very confident" or "somewhat confident" in grossing General specimens. The minority of residents reported feeling "somewhat confident" in grossing GI and B/C specimens (35% and 45%, respectively; none selected "not very confident").

In 2015, residents participated in ~120 frozen cases across training. Many residents operated at the direct supervision level by the time they started taking call. Most residents reported feeling "not very confidence" or "somewhat confident" in technical and interpretive skills. Following the increase in frozen training in 2018, residents participated in ~176 frozen cases across training. Most residents reported more satisfaction with this model and increased confidence when starting call.

Conclusions: The requirement for residents to staff each bench has resulted in overexposure to GI and B/C pathology and inadequate training in other organ systems. Increasing requirements for training in other areas of pathology (e.g. informatics) prevents adding weeks to the SP curriculum. Training in SP must optimize education and shift to competency-based training. The conflicting interests between resident education and workforce needs is discussed.

526 The Use of Anki Digital Flashcards for Pre-Clinical Pathology Medical Education Review

Christopher Chandler[1], Elizabeth Parker[2], Jose Mantilla[1], Mara Rendi[3]
[1]University of Washington, Seattle, WA, [2]Seattle, WA, [3]Edina, MN

Disclosures: Christopher Chandler: None; Elizabeth Parker: None; Jose Mantilla: None; Mara Rendi: None

Background: Pre-clinical medical education is increasingly shifting towards earlier clinical didactics and organ system blocks. As a result, pathology education is being integrated into the curriculum rather than offered as a course. Digitally savvy medical students are looking beyond the curricula to open source and commercial education platforms to organize, study, and augment their coursework. Here we examine how second year medical students at the end of their pre-clinical education use Anki, an open source digital flashcard program, as a tool to review pathology images prior to USMLE Step 1.

Design: A deck of 97 digital flashcards with pathology images was created from University of Washington and University of Michigan whole slide image archives. Diagnoses were confirmed by pathologists (authors JM, MR). All UW second year medical students (2018-2019) were invited to participate. Respondents were sent a pre-survey with qualitative questions and a 10 question content examination after which access was granted to the Anki deck. Two months later, prior to starting clinical education, respondents were sent the post-survey consisting of qualitative questions and a 10 question content examination. Exported Anki deck usage statistics were also collected.

Results: A total of 106 of 271 students (39% response rate) completed the pre-survey and were given access to the Anki deck. The overwhelming majority of respondents had used Anki before (92%). Confidence with pathology image recognition was low (46% "not" confident and 53% "somewhat" confident). The average score on the pre-survey content examination was 5/10. Forty three of the 106 respondents completed the post-survey (41% response rate). Confidence with pathology image recognition increased (74% "somewhat" and 21% "very" confident). Most respondents (76%) felt that Anki was either very (53%) or extremely (23%) useful for studying pathology images, spent between 1 and 5 hours studying the cards (68%) and took 30-60 minutes to complete the entire deck (38%). Fifteen individuals submitted detailed Anki deck usage statistics (14% response rate). The average score on the post-survey content examination was 7/10.

Conclusions: Many medical students are using Anki to study (36% of the class) and would recommend using Anki to study pathology images. With the trend toward integrated, organ-system based medical education, digital platforms such as Anki may offer an efficient means for medical students to review vetted pathology content.

527 Wellness Initiative Program and Effect on Pathology Resident Burnout Rate

Kaitlin Collura[1], Michelle Nagurney[2], Joanna Chan[2]
[1]Philadelphia, PA, [2]Thomas Jefferson University Hospital, Philadelphia, PA

Disclosures: Kaitlin Collura: None; Michelle Nagurney: None; Joanna Chan: None

Background: Increasing rates of physician burnout are reported across many medical specialties, including Pathology. In 2014, 52.5% of pathologists experienced symptoms of burnout compared to 37.6% in 2011. Suicide and depression rates in physicians are also higher than the average population. As a result, the ACGME began a campaign, in 2015, to foster resident wellness. The campaign calls for strategies to develop resiliency, identify problems, and promote well-being. While wellness initiatives may not change underlying mental

illness, they may mitigate environmental factors that can exacerbate mental illness or suicidal behavior. Here we report results from a recently implemented resident wellness initiative (WI).

Design: The WI has three focus areas: access to wellness resources, resident wellness activities, and wellness education. Emails and flyers highlighting available mental and physical health resources were distributed to residents. Wellness activities and education targeted four areas of well-being: professional, physical, psychological, and social. Wellness activities included faculty-hosted happy hours, rock climbing, bowling, and an ice cream social to foster intra-departmental camaraderie. A wellness retreat helped educate residents on the importance of wellness. To evaluate the level of burnout experienced by residents and their perception on the program's culture of wellness, residents completed a wellness needs assessment, prior to and six months into the WI.

Results: Following implementation of the WI, the reported burnout rate among residents decreased from 17% to 9%. Residents who reported the residency program fostered a culture of wellness doubled from 33% to 66%. Residents reported improved satisfaction with social activities, professional development, and mentorship. However, residents noted continued dissatisfaction with an insufficient emphasis on financial advising and family support.

Conclusions: Burnout among resident physicians is a widespread issue and is not unique to Pathology. Establishing a resident WI may promote resident well-being, as demonstrated in these results. Following implementation of a WI, reported resident burnout rates decreased by nearly half. While survey results show improvement in many areas, focal dissatisfaction persists. Future studies are needed to fully assess the long-term success of WIs on the well-being of residents and to assess the generalizability of these programs to other medical specialties.

528 Mindfulness Based Stress Reduction Increases Pathology Resident Self Wellness

Kaitlin Collura[1], Joanna Chan[2]
[1]Philadelphia, PA, [2]Thomas Jefferson University Hospital, Philadelphia, PA

Disclosures: Kaitlin Collura: None; Joanna Chan: None

Background: Stress during medical residency is a common, complex issue influenced by time demands, level of social support, and environmental factors. Increased stress levels can lead to resident burnout, and may contribute to the high rates of depression and suicide seen among physicians. In 2015, the ACGME began a campaign to promote resident wellness by calling on programs to implement strategies to develop resiliency, identify problems, and promote well-being. Mindfulness based stress reduction (MBSR) strategies have been shown to decrease burnout, improve mood, and increase compassion in healthcare providers. We implemented a wellness retreat to educate residents on the principles of mindfulness and provide them with stress reduction strategies.

Design: Residents were relieved of clinical duties to attend a one-day mindfulness retreat focused on stress reduction strategies. The retreat included didactic content and instructional sessions. Residents practiced stress reduction techniques including body scan, mindful movement, mindful communication, and sitting meditation. An instructional yoga session was also held to help residents practice healthful stress reduction. Residents completed a survey at the beginning of the retreat to assess their level of stress, ability to focus at work, and knowledge of stress reduction techniques. Following the retreat, residents completed a survey to assess their likelihood of burnout given their new knowledge of mindfulness practices.

Results: Prior to the retreat, 30% of residents reported feeling stressed at work and 30% reported they did not know good stress reduction techniques. Following the retreat, 100% of residents reported they would apply the mindfulness principles taught during the retreat to their regular practice and felt that these principles would decrease their likelihood of burnout. In addition, 94% of residents felt that the retreat improved their sense of professional, personal, and psychological well-being.

Conclusions: Stress is inevitable in medical training and throughout one's career. Inability to cope with stress can lead to burnout, career dissatisfaction, and possibly depression. Providing residents with stress management techniques may help improve their sense of well-being, as demonstrated by these results. Future studies include long-term assessment of resident stress management techniques and assessing the efficacy of wellness techniques besides MBSR in resident wellness.

529 Implementation of a Wellness Committee is Associated with Increased Overall Wellness in Pathology Education

Carla Ellis[1], Melanie Wooten[2]
[1]Emory University, Atlanta, GA, [2]Atlanta, GA

Disclosures: Carla Ellis: None; Melanie Wooten: None

Background: With the rise of burnout, depression and suicide in medicine, a specific wellness initiative for post graduate medical education was mandated by the Accreditation Council for Graduate Medical Education (ACGME) in 2017. Specifically, the "creation of a

learning environment with a culture of respect and accountability for physician wellbeing is crucial to the ability of those working in it to deliver the safest and best possible care to patients". Shortly thereafter, the graduate medical education office at our institution administered the Masloch Burnout Inventory (MBI) to 1,266 residents and fellows. Our pathology training program averaged a burnout rate of 62% (range 0-100%). We now demonstrate the results of establishment of a wellness committee in pathology and its associated effect on overall wellness.

Design: Based on the ACGME requirement, a wellness committee was initiated as a subcommittee of the resident program evaluation committee in the department of pathology and laboratory medicine. Two chairpersons (one faculty, one trainee) were selected and a committee of faculty, trainees and staff was established. The chairpersons applied for and received a budget from the departmental chairman. Monthly events based on the 8 tenets of wellness were planned for an entire year and a follow up survey was distributed approximately 12 months after the MBI results.

Results: A computerized survey was completed by 36 of 48 total pathology trainees for an overall response rate of 75%. 91.7% of respondents either "strongly agreed" or "agreed" that the wellness committee had both "positively impacted their personal wellness" and also that of the "pathology training program overall". Respondents felt that the wellness committee could help in all 8 tenets of wellness, with more than 50% choosing emotional, physical, and social. The complete distribution of response percentages when queried "which of the 8 tenets of wellness should receive the most focus" are indicated in the table.

Emotional	Spiritual	Intellectual	Physical	Environmental	Financial	Occupational	Social
54.3	25.7	40.0	68.6	37.1	37.1	34.3	62.9

Conclusions: Establishing a wellness committee as an ancillary component of educational training for pathology residents and fellows significantly improves trainee wellness while simultaneously satisfying the requirement mandated by the ACGME. Additional techniques implemented included partnering with the wellness efforts of the school of medicine, community and philanthropic efforts, and a social media presence to communicate success.

530 Why Choose Pathology? A National Online Survey of Medical Students, Junior Doctors and Pathologists

Timothy Fielder[1], Francesca Watts[2], Catriona McKenzie[3], Ruta Gupta[1]
[1]Royal Prince Alfred Hospital, Sydney, NSW, Australia, [2]Department of Tissue Pathology and Diagnostic Oncology, Royal Prince Alfred Hospital, Sydney, NSW, Australia, [3]Royal Prince Alfred Hospital, Camperdown, NSW, Australia

Disclosures: Timothy Fielder: None; Francesca Watts: None; Catriona McKenzie: None; Ruta Gupta: None

Background: There is a broadening gap between workforce supply and demand with a decline in medical graduates pursuing pathology careers in Australia, the USA and globally. We seek to inform future recruitment strategies by exploring the factors which drive medical students and prevocational doctors (PVDs) to consider pathology training.

Design: Informed by literature review, an online survey using the REDCap platform targeting Australian medical students, PVDs, pathology trainees and pathologists was created. We elicited which factors, on a 5-point Likert scale, were important to respondents when deciding on a career, and collected demographic data and free-text qualitative data on participants' attitudes toward pathology as a career. The data were analysed using logistic regression in SPSS.

Results: 1278 valid responses were obtained including 728 from students and PVDs (Fig. 1). 6.5% of students and PVDs were very interested in a career in pathology. Students and PVDs with an interest in a career in pathology were more likely to be older (OR 1.17, 95% CI 1.01-1.35) and more likely to be studying postgraduate medicine (OR1.76, 95% CI 1.16-2.65). They were more likely to value opportunities for research (1.92, 95% CI 1.28-2.88) and intellectual stimulation (OR 2.08, 95% CI 1.27-3.40) when choosing a career. Those who were uninterested in pathology were more likely to value patient interaction (OR 0.31, 95% CI 0.21-0.46) and self-identify as extroverts (OR 0.58, 95% CI 0.44-0.76) (Fig. 2).

From free-text data, the three most common reasons for considering a pathology career cited by students and PVDs were intellectual stimulation, lifestyle benefits, and specific prior exposure to pathology. The three most common reasons for rejecting pathology were lack of patient interaction, a lack of prior exposure to pathology, and a lack of interest in the subject.
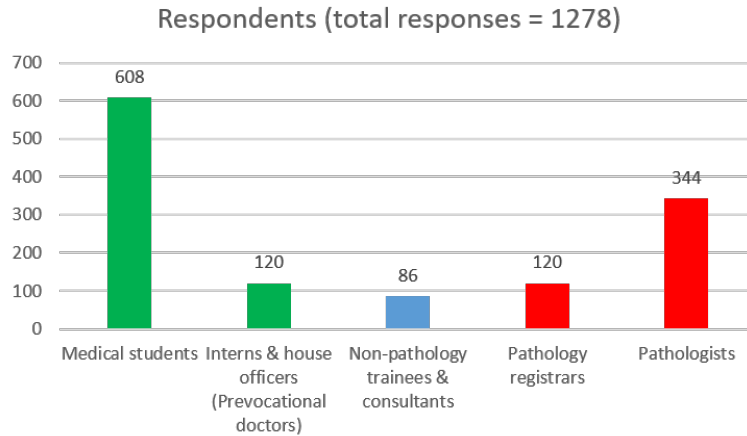
Figure 1 - 530

Respondents (total responses = 1278)

Figure 2 - 530

Figure 2: Factors predicting an interest in pathology as a specialty choice					
Results of logistic regression analyses performed separately on specialty factors, training factors and demographic factors, respectively. Green cells: positive relationship. Red cells: negative relationship.					
	Interested in pathology	**Uninterested in pathology**	**P value**	**Odds ratio**	**95% confidence interval**
Specialty Factors					
Importance to patient care	55.8%	66.3%	0.513	0.869	0.569-1.325
Opportunity for patient interaction	42.4%	69.1%	0.000	0.308	0.205-0.464
Opportunity for research	33.9%	21.4%	0.002	1.917	1.276-2.879
Intellectual stimulation	84.1%	74.1%	0.004	2.076	1.267-3.401
Training Factors					
Postgraduate program	26.75%	73.25%	0.007	1.757	1.163-2.654
Undergraduate program	17.54%	82.46%			
Exposure to pathology at medical school: rotations, electives, etc.	39.16%	31.2%	0.073	1.396	0.970-2.010
Demographic Factors					
Prior qualifications (Honours/masters/pHD)	34.13%	26.24%	0.471	1.171	0.762-1.8
Age group	Median 25-27	Median 22-24	0.033	1.169	1.013-1.349
Children or dependents	11.5%	4.2%	0.268	1.545	0.715-3.339
Self-rated extroversion	10.24%	18.8%	0.000	0.578	0.441-0.758
Self-rated ambiversion	37.35%	47.1%			
Self-rated introversion	52.41%	34.1%			

Conclusions: Students and PVDs interested in pathology value opportunities for research and intellectual stimulation; conversely a lack of exposure to the specialty was a commonly cited reason for not considering a career in pathology. Students in postgraduate programs were more likely to be interested in a career in pathology compared to undergraduate students, possibly due to differences in curricula. Increasing exposure by providing rotations in pathology as well as promotion of the intellectual and scientific aspects of the discipline are necessary in order to address workforce shortages.

531 Wooing Medical Students Towards Pathology and Research

Michelle Figueroa-Andere[1], Miguel Angel Paz González[2], Paula Sainz[2], Irma Erana-Rojas[3]
[1]Tecnologico de Monterrey, Monterrey, Mexico, [2]Tecnologico de Monterrey, Monterrey, NL, Mexico, [3]Tecnologico de Monterrey, San Pedro Garza Garc, MEX, Mexico

Disclosures: Michelle Figueroa-Andere: None; Miguel Angel Paz González: None; Paula Sainz: None; Irma Erana-Rojas: None

Background: As pathologists, we play an important role in the knowledge of diseases, by integrating the basic sciences and clinical elements of every case in order to reach a diagnosis. Case reports are essential in the study of pathology since they allow medical students to experience a real clinical scenario and to contemplate the decision-making process that is carried out during the approach of a

patient. They also encourage students into critical thinking and developing differential diagnoses, while approaching them to research. The purpose of this study was to promote pathology and research in students by developing a case report in poster format, as well as to evaluate students' perception of the activity.

Design: The Seminar included 274 students, divided into teams of four to six members. Each pathology teacher selected intriguing cases for students to analyze, provide a diagnosis, prepare an abstract and a poster. At the end of the course, there was a poster presentation where they were evaluated and given feedback by tutors. A post-seminar online survey was distributed among the students to acknowledge their expectations about the pathology research activity; statistical analysis of the results was performed with Stata Statistical Software.

Results: A total of 55 posters were presented at the seminar. Students' perception was evaluated with an online survey (n=89). 64% said that after the assignment they were more likely to participate in research, 82% of students agreed that the assignment helped them learn more about pathology and 42.7% said their interest in pathology as a specialty increased. A Kruskal-Wallis H test was conducted to determine if the acquired knowledge and experience of the activity varied across the school year of the students. However, no statistically significant difference was found (Table 1). This demonstrates that the overall experience and skills that the students acquired during the project is independent of their attending year.

Table 1. Results of the questionnaire applied to the students who participated. Results of Kruskal-Wallis H test and p-value are reported for each question.

| Questionnaire | Median | IQR* | Kruskal-Wallis H test | |
Items			X^2 (df)	p-value
1. The search for academic papers helped me learn more about the contents of this subject. (n=89)	5	1	3.419 (3)	0.331
2. Preparing the poster helped me learn more about pathology. (n=89)	5	1	1.285 (3)	0.732
3. Preparing the poster helped me improve my ability to analyze scientific papers. (n=89)	4	1	2.302 (3)	0.512
4. Preparing the poster improved my academic writing skills. (n=89)	4	1	2.892 (3)	0.408
5. Preparing the poster helped me improve my teamwork skills. (n=89)	4	1	2.583 (3)	0.460
6. Preparing the poster helped me improve my skills to write a research paper. (n=89)	5	1	3.331 (3)	0.343
7. Overall, the pathology seminar assignment met my expectations. (n=89)	4	1	2.262 (3)	0.519
8. As a result of the poster assignment, I am more likely to participate in research activities during my future career. (n=89)	4	2	3.027 (3)	0.387
9. As a result of the poster assignment, my interest in pathology as a specialty increased. (n=89)	3	2	2.035 (3)	0.565
10. If at this time you were asked about the case you presented at the seminar, how likely is it that you could answer the questions? (n=89)	4	2	0.139 (3)	0.986
11. The feedback from the judges and / or audience during the presentation was useful to complement my work. (n=71)	4	2	2.822 (3)	0.419
12. Orally presenting the poster helped me learn more about the case. (n=71)	4	2	4.698 (3)	0.1953
13. As a result of the poster presentation I was able to improve my oral presentation skills. (n=71)	4	1	4.282 (3)	0.232

* Interquartile Range. df: degrees of freedom

Figure 1 - 531

Preparing the poster helped me learn more about pathology. (n=89)

Figure 2 - 531

As a result of the poster assignment, I am more likely to participate in research activities during my future career. (n=89)

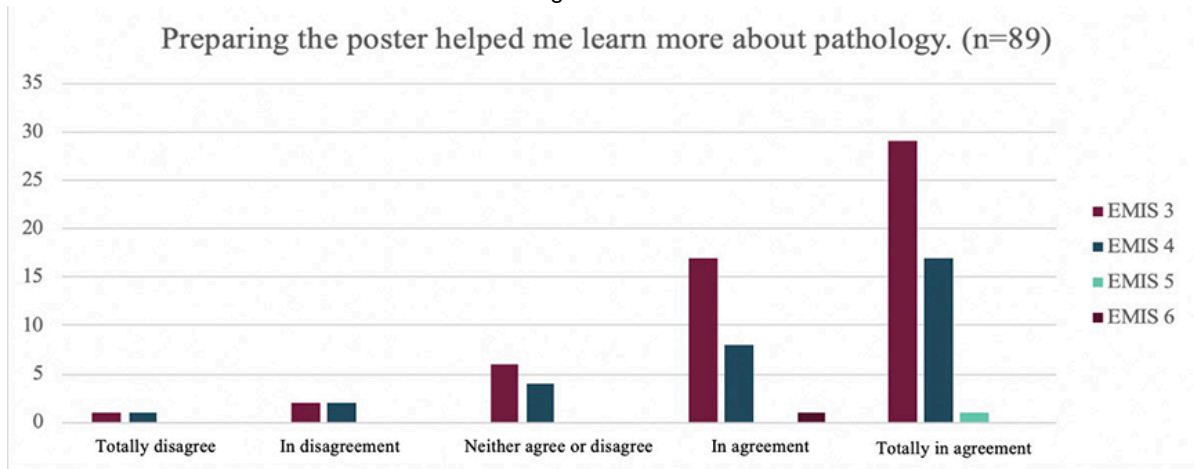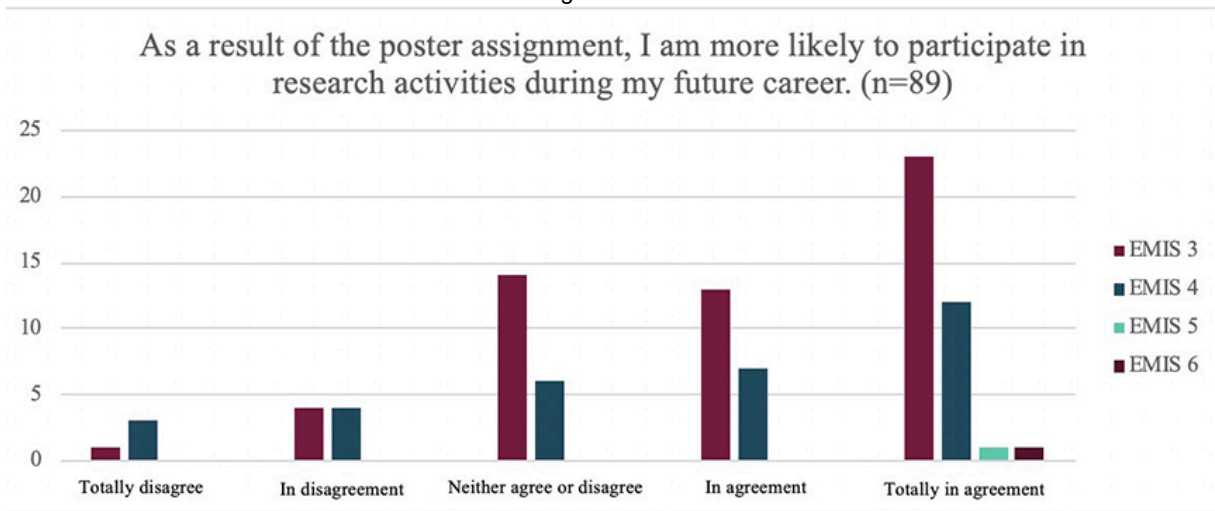**Conclusions:** Most students agreed that after the activity, they were more interested in pathology as a specialty and that they were more likely to participate in research. Students mastered how to make a case report, a poster, and how to make an oral presentation to experts in the field. Thanks to interventions like this, medical students can be exposed from early stages of their training to educational experiences that attract them into the path of research and pathology.

532 Defining the Landscape of Pathology Education at U.S. Medical Schools: Survey and Correlation with Interest in Pathology Residency

Kara Gawelek[1], Scott Lovitch[1]
[1]Brigham and Women's Hospital, Boston, MA

Disclosures: Kara Gawelek: None; Scott Lovitch: None

Background: Over the past decade, the traditional two-year, lecture-based preclinical curriculum at U.S. medical schools has increasingly been replaced by integrated and truncated curricula with pedagogy emphasizing active learning, frequently resulting in elimination of a dedicated pathology course from the curriculum. However, the format and scope of student exposure to pathology in this new landscape has not been formally assessed. Over the same time period, the number of U.S. medical school seniors applying for pathology residency has declined by nearly 30%. In this study, we sought to determine how, and to what extent, U.S. medical students are exposed to pathology in the preclinical curriculum, and whether extent of exposure correlates with frequency of students applying for residency in pathology.

Design: Websites of U.S. allopathic medical schools were searched for information about their pathology curriculum and coded for the presence of a dedicated pathology course or, in its absence, incorporation of pathology as a longitudinal curricular theme. The percentage

of students in each graduating class who matched in pathology in 2018 and 2019 was obtained from NRMP Main Residency Match data made available by the schools.

Results: Of 156 U.S. allopathic medical schools (distinct programs within the same institution were considered separately), 96 (61.5%) provided sufficient data for analysis; 25 (26%) reported offering a dedicated preclinical pathology course, and of those that did not, 52 (73%) described pathology as a longitudinal theme. At programs offering a dedicated pathology course, 0.85% of students matched into pathology in 2019; the frequencies for programs without a pathology course, with and without pathology as a longitudinal theme, were 1.15% and 1.22%, respectively. Similar percentages were observed based on 2018 match data. These differences were not statistically significant.

Pathology Curriculum Description	Number of programs	% Matching in Pathology (2019)	% Matching in Pathology (2018)
Dedicated Course	25 (26%)	0.85%	1.06%
No Dedicated Course, Longitudinal Theme	52 (54%)	1.15%	1.15%
No Dedicated Course, No Longitudinal Theme	19 (19%)	1.22%	0.95%

Conclusions: Only one-fourth of U.S. medical schools continue to offer a dedicated preclinical pathology course; one-half describe pathology as a longitudinal theme without a dedicated course. The presence or absence of a dedicated pathology course did not appear to correlate with likelihood of matching in pathology, although analysis was limited by the small number of students applying. More detailed evaluation is necessary to assess the extent to which the status of pathology in preclinical curricula drives student interest, and to identify approaches to attract talented students to the specialty.

533 Design of a Workplace-Based Assessment Instrument for Assessing Pathology Trainee's Performance of Intra-Operative Consultations

Marcio Gomes[1], David Driman[2], Farhan Bhanji[3], Nancy Dudek[4]
[1]The Ottawa Hospital/University of Ottawa, Ottawa, ON, [2]London Health Sciences Centre, London, ON, [3]McGill University - Royal College of Physicians and Surgeons of Canada, Montreal West, QC, [4]The Ottawa Hospital - University of Ottawa, Ottawa, ON

Disclosures: Marcio Gomes: None; Farhan Bhanji: None; Nancy Dudek: None

Background: With the implementation of Competency-based Medical education (CBME) in the United States and Canada, well-designed workplace-based assessment (WBA) instruments are required to document competence of pathology trainees. Assessment in pathology has been typically done using end-of-rotation evaluations, written and oral examinations, which do not reflect the ability to perform tasks / entrustable professional activities (EPAs) of a pathologist. Proposed assessment models of the Accreditation Council for Graduate Medical Education (ACGME) include WBA, but no specific tool for pathology is available. A number of WBA tools are available in other specialties, such as the Mini-Clinical Evaluation Exercise (Mini-CEX) and the Ottawa Surgical Competency Operating Room Evaluation (O-SCORE). In this study, we designed a WBA instrument for assessing intra-operative consultations (IC), a prototypical pathology EPA.

Design: An experienced pathologist with interest in medical education (MG) reviewed the O-SCORE, considered key features of IC and identified the essential content of an assessment tool designed to evaluate competence in IC. The instrument was iteratively refined through: 1) Consultation with an assessment expert; 2) University of Ottawa pathologists' and residents' feedback; 3) Feedback from participants of a national workshop who rated trainee's performance on video recorded scenarios; 4) Canadian pathology experts' and residents' survey feedback on the revised instrument; and 5) Consensus agreement by the authors.

Results: An 11 item-instrument was designed to assess trainee's performance from case preparation to post-procedure plan. It includes 8 items rated on a 5-point scale, 1 yes/no question regarding the trainee's readiness to practice independently, and 2 open-ended questions asking about one aspect performed well and one requiring improvement. The O-SCORE entrustment-aligned rating scale anchors were used. They range from 1 = "I had to do" (i.e., trainee required complete hands-on guidance or did not do the procedure) to 5 = "I did not need to be there" (i.e., trainee had complete independence and is practice-ready) (figure 1).

Figure 1 - 533

Intra-Operative Pathology Consultation Assessment

Trainee:	Pathologist:
Date:	

The purpose of the assessment is to support resident learning and to assess how they performed TODAY. With that in mind, please use the scale below to evaluate each item, irrespective of the resident's stage/level of training – for the FIRST intra-operative (frozen section) consultation of the day. Please complete the form at the end of the procedure and also provide feedback to the resident.

SCORING SCALE		
1	I had to do it	Requires complete hands on guidance, did not do, or was not given the opportunity to do
2	I had to talk them through	Able to perform the tasks but requires or demands constant direction
3	I had to prompt them from time to time	Demonstrates some independence, but requires/demands intermittent direction
4	I needed to be in the room just in case	Independence but unaware of risks or not self-confident and still requires or demands supervision for safe practice
5	I did not need to be there	Complete independence, understands risks, performs safely, practice ready

			Score
1	Pre-procedure plan	Assesses required clinical/radiological and prior pathological information, understands the intended surgical procedure and impact of pathological diagnosis	
2	Case preparation	Ensures the frozen section room is ready for use (instruments/fixatives/reagents etc)	
3	Surgery-pathology contract/handover	Verifies clinical indication for intraoperative consultation, understands surgical approach and determines shared goals of care	
4	Technical performance	Efficiently performs steps (recording gross features, appropriate representative sections, orientation of tissue, handover to technologist etc) and preserves/prepares the specimen for final assessment	
5	Diagnostic interpretation	Identify histological abnormalities, integrates clinical-radiological-pathological features, accounts for procedural limitations, provides a safe and accurate diagnosis in a timely fashion	
6	Post-procedure plan	Documents intraoperative consultation properly and handles/orients tissue appropriately for permanent pathological assessment	
7	Efficiency and flow	Economy of movement and flow; adequate handling of multiple specimens	
8	Communication / Collaboration	Professional and effective communication/collaboration with professional team (technologist, surgeon, circulating nurse, pathologist etc)	
9	Resident is able to safely perform this procedure independently (circle one) (NB: This is a global assessment which does not require a score of 5 on all preceding categories.)	yes	no
10	Give at least one specific aspect of procedure done well:		
11	Give at least one specific suggestion for improvement:		

Signatures:

_____ _____
Pathologist   Resident

Conclusions: To our knowledge, this is the first WBA instrument specifically designed for pathology. We demonstrated the steps to ensure that the construct being assessed is accurately and completely represented in our instrument. We are conducting a pilot study at Western University to gather validity evidence to support its use.

534 Reaching Millions: How #TwitterHomework is Transforming Pathology Pedagogy

Hans Hamnvag[1], Austin McHenry[2], Aadil Ahmed[3], Levent Trabzonlu[1], Christina Arnold[4], Kamran Mirza[1]
[1]Loyola University Medical Center, Maywood, IL, [2]Loyola University Chicago Stritch School of Medicine, Chicago, IL, [3]Yale University School of Medicine, New Haven, CT, [4]The University of Colorado, Denver, CO

Disclosures: Hans Hamnvag: None; Austin McHenry: None; Aadil Ahmed: None; Levent Trabzonlu: None; Christina Arnold: None; Kamran Mirza: None

Background: In response to the emerging community of pathologists and pathology-related material on Twitter, we describe the implementation of a novel pedagogical tool for pathology education #TwitterHomework – a means for medical students to use Twitter as a resource for education, networking, and professional development during pathology electives.

Design: We describe medical student use of this microblogging service and present qualitative data from 32 survey responders. Additionally, we used Twitter analytical software (Symplur, Signals) to understand the frequency, distribution, and reach of this Twitter use.

Results: From August 1, 2017 to January 2, 2019 elective medical students composed a total of 527 original tweets (14.2 tweets per user, mean = 14.2, median = 10) that generated 78,422 impressions. Participation varied with 43.24% of the students composing <10 original tweets, 35.14% between 10-19 tweets, 16.22% between 20-29 tweets, and 5.41% composing 30 or more tweets. The network surrounding the hashtags was analyzed and we found that 810 non-student users retweeted the students a total of 3,399 times, and this engagement resulted in 6,360,731 impressions.

Figure 1 - 534

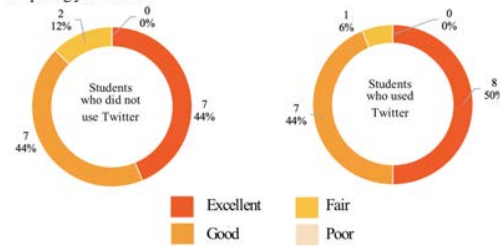1. Do you intend to choose Pathology as your career specialty (or have you already)?

Students who did not use Twitter
9 60%
6 40%

Students who used Twitter
6 35%
11 65%

■ Yes ■ No
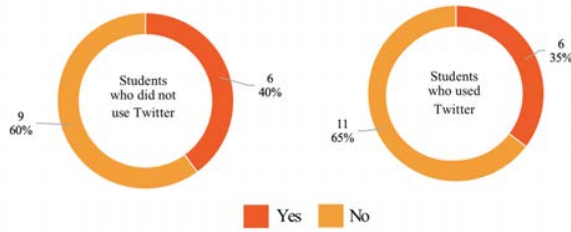
2. Which of the following best describes your overall Pathology elective experience?

Students who did not use Twitter
0 0%
4 27%
6 40%
5 33%

Students who used Twitter
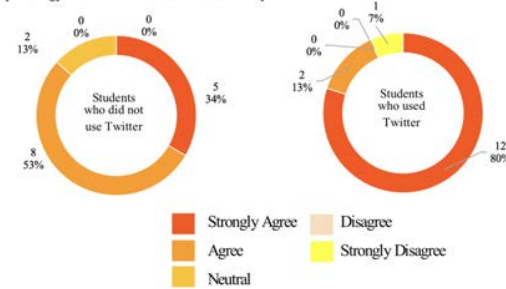1 6%
0 0%
5 29%
11 65%

■ Excellent ■ Fair
■ Good ■ Poor

Figure 2 - 534

3. Which of the following best describes your understanding of the field of Pathology after completing your elective?

Students who did not use Twitter
2 12%
0 0%
7 44%
7 44%

Students who used Twitter
1 6%
0 0%
8 50%
7 44%

■ Excellent ■ Fair
■ Good ■ Poor

4. Please describe your level of agreement with the following statement: What I learned during my pathology elective will be useful to/for/in my future career.

Students who did not use Twitter
0 0%
0 0%
2 13%
5 34%
8 53%

Students who used Twitter
1 7%
0 0%
0 0%
2 13%
12 80%

■ Strongly Agree ■ Disagree
■ Agree ■ Strongly Disagree
■ Neutral

Conclusions: Based on user biography, we discovered that most of the retweeting was done by pathologists and pathology residents. Respondents who used Twitter described their experience as positive overall. They found reliable pathology information on Twitter, described it as helpful in increasing their overall medical knowledge, and think it contributed positively towards their own professional development. To the best of our knowledge, this represents the first report describing the implementation and results of establishing a Twitter-related aspect to pathology education. Herein, we recommend the use of Twitter as a complement to traditional teaching to enhance a medical student's experience, and propose that this strategy may also benefit pathology residents, fellows, and established pathologists.

535 A Competency-Based Tool for the Formative In-Service Assessment of Pathology Trainees

Rachel Han[1], Shachar Sade[2], Carlos Parra-Herran[2], Elzbieta Slodkowska[2], Julia Keith[3], Sharon Nofech-Mozes[2], Jelena Mirkovic[2], Bojana Djordjevic[3], Fang-I Lu[2]
[1]Department of Laboratory Medicine and Pathobiology, Faculty of Medicine, University of Toronto, Vaughan, ON, [2]Sunnybrook Health Sciences Centre, University of Toronto, Toronto, ON, [3]University of Toronto, Toronto, ON

Disclosures: Rachel Han: None; Shachar Sade: None; Carlos Parra-Herran: None; Elzbieta Slodkowska: None; Julia Keith: None; Sharon Nofech-Mozes: None; Jelena Mirkovic: None; Bojana Djordjevic: None; Fang-I Lu: None

Background: Competency-based medical education relies on frequent formative in-service assessments (ISA) of trainees to determine their progression. In the current model of ISA at our institution, trainees receive an end-of-rotation evaluation based on summative feedback collected from staff pathologists. We sought to develop a tool for the ISA of trainees that provides competency-based case-to-case feedback.

Design: Pathology trainees rotating through our institution between March and September 2019 were included in the study. After previewing cases, trainees entered their final diagnoses into our Lab Information System under a designated mock "sign-out" field. Trainees were then evaluated by staff pathologists using a competency-based scale on their ability to diagnose, report, work-up, and/or comment on clinical implications (Figure 1). Case numbers, trainees' diagnoses, pathologists' diagnoses and evaluation data were provided to trainees and staff pathologists at the mid and end of rotations for review. Evaluation data were retrieved at the end of the study period for analysis. All participating trainees and pathologists responded to a survey on the effectiveness of the current and novel ISA.

Results: Seven trainees (5 junior, 2 senior) on 11 rotations and 11 pathologists were involved in this study (Table 1); 8 rotations were completed. On average, 37.3% of the cases previewed by the trainees were evaluated using the novel ISA. The senior trainee had a higher proportion of diagnoses rated as "Can perform independently" than junior trainees (75% vs 43.3%). Moreover, the majority of trainees demonstrated improvement in overall performance throughout their rotations as reflected by improved % of all competencies rated as "Can performed independently". Interestingly, trainees' performance as evaluated using the novel ISA did not always correlate with their overall performance score of the current ISA. Compared to the current ISA, the trainees and pathologists rated the novel ISA as more detailed and timely and a better simulation of pathology practice . The pathologists also rated the novel ISA as being more objective. The majority of trainees reviewed the diagnoses and evaluation data at the mid and end of rotations. The majority of the supervising pathologists used the novel ISA data to provide trainee feedback at the end of rotations.

Trainee / Level	Rotation	Cases evaluated / All cases previewed	Cases with diagnoses rated as "Can perform independently" using novel ISA, classified by case complexity	Diagnostic performance trend during the rotation using novel ISA (1st week ⇒ last week)	Overall performance trend during the rotation using novel ISA (1st week ⇒ last week)	Overall performance score of current ISA (1= significantly below expected level; 5= significantly above expected level)
1/JR	Breast	25/38	All: 5/15 (33.3%) S: 2/7 (28.6%) I: 1/4 (25%) C: 2/4 (50%)	Improved (50 ⇒ 100%)	Improved (38.9 ⇒ 66.7%)	4/5
	GI	36/79	All: 15/33 (45.4%) S: 14/26 (53.8%) I: 1/6 (16.6%) C: 0/1 (0%)	Not improved (50 ⇒ 50%)	Slightly improved (50 ⇒ 55%)	4/5
2/JR	Breast	9/15	All: 4/9 (44.4%) S: 1/2 (50%) I: 2/5 (40%) C: 1/2 (50%)	Improved (20 ⇒ 75%)	Improved (25 ⇒ 54.5%)	4/5
	Gyne	24/35	All: 16/23 (69.5%) S: 11/16 (68.7%) I: 4/6 (66.6%) C: 1/1 (100%)	Not improved (75 ⇒ 68.8%)	Not improved (76.9 ⇒ 57.5%)	4/5
3/JR	Derm	23/82	All: 9/23 (39.1%) S: 9/12 (75%) I: 0/9 (0%) C: 0/2 (0%)	Not improved (42.1 ⇒ 20%)	Not improved (35.5 ⇒ 36.8%)	3/5
	Gyne (in process)	13/29	All: 6/13 (46.1%) S: 6/9 (66.6%) I: 0/2 (0%) C: 0/2 (0%)	NA	NA	NA
4/SR	Breast	16/113	All: 12/16 (75%) S: 4/5 (80%) I: 6/7 (85.7%) C: 2/4 (50%)	Not improved (75 ⇒ 50%)	Improved (61.5 ⇒ 83.3%)	4/5
5/JR	Neuro	1/3	All: 0/1 (0%) S: 0/1 (0%)	NA	NA	3/5
6/JR	Gyne	52/120	All: 36/50 (72%) S: 29/34 (85.2%) I: 4/11 (36.3%) C: 3/5 (60%)	Improved (0 ⇒ 66.7%)	Not improved (84.8 ⇒ 78.3%)	5/5
	Breast (in process)	1/5	All: 0/1 (0%) C: 0/1 (0%)	NA	NA	NA
7/SR	Derm (in process)	1/19	All: 0/1 (0%) C: 0/1 (0%)	NA	NA	NA

Abbreviations: JR: Junior resident; SR: Senior resident; All: All cases; S: Simple cases; I: Intermediate cases; C: Complex cases; NA: Not applicable.

Figure 1 - 535

Competencies evaluated	Scoring system	Definition of each score
Diagnostic accuracy	Cannot perform (1)	Trainee needed guidance throughout
Report writing	Can perform with assistance (2)	Trainee needed some guidance
Knowledge on work-ups	Can perform independently (3)	Trainee did not require any guidance to perform at the level of a practicing pathologist
Knowledge on clinical implication		

Conclusions: The novel ISA improves the objectivity, specificity and applicability of trainee evaluation by linking performance to specific cases.

536 A Residency Educational Intervention to Refine the Evaluation of Dysplasia in Barrett's Esophagus

Naomi Hardy[1], Kristen Stashek[2], William Twaddell[3]
[1]University of Maryland Medical Center, Baltimore, MD, [2]University of Maryland School of Medicine, Baltimore, MD, [3]Baltimore, MD

Disclosures: Naomi Hardy: None; Kristen Stashek: None; William Twaddell: None

Background: Evaluating for the presence of dysplasia in the setting of Barrett's esophagus is the most important predictor for development of adenocarcinoma. Interobserver variability and lack of agreement, especially in categorizing low grade versus reactive changes, make this a particularly challenging area to gain competency in during residency training. Utilizing a teaching framework that evaluated four elements key to the diagnosis of dysplasia [SACI--surface maturation (including emphasis on the "4-lines" noted in reactive surface mucosa), architecture, cytology, and inflammation], we assessed whether diagnostic accuracy could be improved in pathology trainees.

Design: Biopsies and mucosal resections of Barrett's esophagus were reviewed by two gastrointestinal pathologists at a single academic medical center and were characterized as either negative (n=10), indefinite for dysplasia (n=9), low-grade dysplasia (n=11), or high-grade dysplasia (n=11). The cases were scanned into a slide scanning system (Aperio) with pictures taken at low and high magnification, and uploaded on to an online survey distributed to trainees to assess degree of dysplasia. Two weeks following the initial assessment, a 30-minute resident-led lecture stressing the SACI framework was given, with an immediate re-take of the survey, and all residents completing both pre- and post-assessments (n = 14). Pre- and post-lecture scores were analyzed with T-tests, and mean scores between PGY levels were compared using ANOVA.

Results: On the initial pre-lecture survey the mean overall percentage correct across PGY levels was 65% with an increase to 73% following the lecture (p = 0.06), with the fourth year class showing statistically significant improvement following the educational intervention [mean scores shifting from 70% to 87% correct (p = 0.003)]. While not statistically significant (p =0.09), improvement was also noted in the first year class (52 to 64% correct).

Conclusions: A resident-run educational teaching intervention utilizing the SACI framework with emphasis on the "four-lines" led to decreased interobserver variability in diagnosing dysplasia amongst pathology trainees. The intervention was most helpful for residents in their final year of training, but overall improvement was noted throughout the residency program. These findings suggest that targeted educational content, led by senior residents with attending oversight, can be utilized to improve diagnostic accuracy amongst pathology trainees.

537 Training Physician Extenders in the Clinical Practice of Diagnostic Hematopathology: A Novel Approach to Building Expertise and Improving Quality and Efficiency

Lisa Hartzheim[1], Curtis Hanson[1], Cynthia Lathrop[1], Janice Hodnefield[1], Matthew Howard[1], Mechelle Miller[1], Dana Roh[1], Simon Althoff[1], Kristy Zirkle[1], Cynthia Hengel[1], Aliaksandra Liapich[1], Kerri Sullivan[1], James Hoyer[1], Dong Chen[1], April Chiu[1], Rebecca King[1], Horatiu Olteanu[1], Adam Wood[1], Debbie Bennes[1], Roeun Im[1], Trey Thompson[1], Cecelia Meyers[1], Laura Schroeder[2], Jennifer Embers[1], Kaaren Reichard[1]
[1]Mayo Clinic, Rochester, MN, [2]Mayo Clinic Rochester, Eyota, MN

Disclosures: Lisa Hartzheim: None; Curtis Hanson: None; Cynthia Lathrop: None; Janice Hodnefield: None; Matthew Howard: None; Mechelle Miller: None; Dana Roh: None; Simon Althoff: None; Kristy Zirkle: None; Cynthia Hengel: None; Aliaksandra Liapich: None; Kerri Sullivan: None; James Hoyer: None; Dong Chen: None; April Chiu: None; Rebecca King: None; Horatiu Olteanu: None; Adam Wood:

None; Debbie Bennes: None; Roeun Im: None; Trey Thompson: None; Cecelia Meyers: None; Laura Schroeder: None; Jennifer Embers: None; Kaaren Reichard: None

Background: With increasing case volumes, case complexity and time needed for non-clinical responsibilities, it is crucial for hematopathologists (HPs) to identify workflows to improve efficiency and provide high quality, timely diagnostic review and reporting. Our Hematopathology (HP) practice created a curriculum to train allied health staff (AHS) to become Physician Extenders (PEs). PEs are highly competent in recognition and diagnosis of hematologic disorders. As such, PEs are integrated into the diagnostic team to work closely with HPs and ultimately improve efficiency and quality in patient care.

Design: The scope of PE duties was determined based on practice needs. This includes morphologic evaluation of peripheral blood, bone marrow aspirate/biopsy, ordering/utilization of appropriate tests, interpretation of flow cytometry histograms and creation of preliminary reports. AHS were selected based on laboratory experience, attention to detail, communication and interpersonal skills, ability to work independently and desire for continual learning.

Results: We created a 9-12 month curriculum that progresses from simple to complex hematologic disease entities (Figure 1). Checklists outline the goals/objectives to ensure transparency of expectations for HPs and PEs. The primary methods of educational content delivery are case-based review with HPs/senior PEs, self-directed learning and attendance at lectures. HPs perform PE competency assessments by reviewing cases that are independently worked up for diagnostic/reporting accuracy and appropriate use of ancillary tests. Upon successful completion of training, PEs are integrated into the clinical practice team to manage cases and prepare diagnostic reports for HPs. Ongoing post-training competency assessment and continuing education occur on a regular basis.
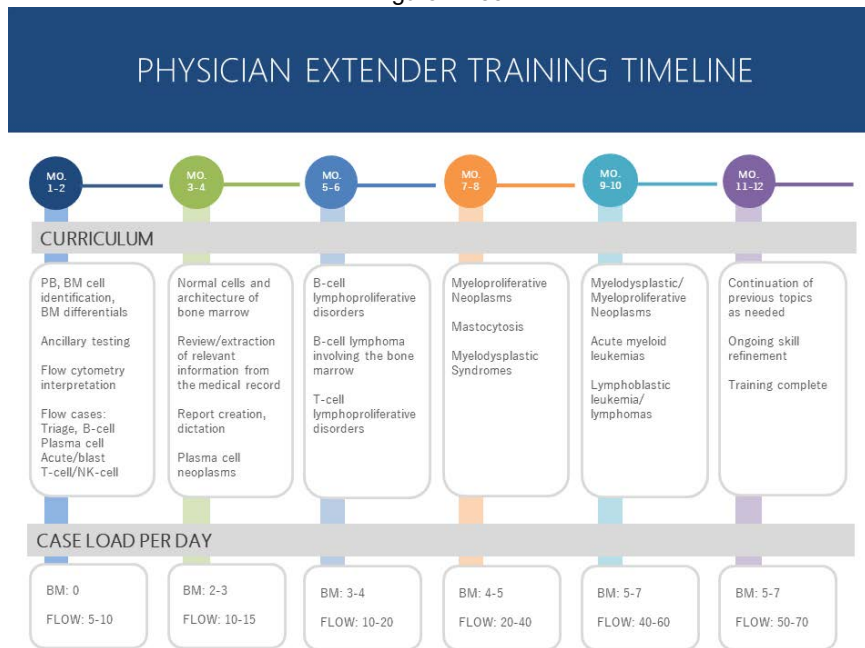
Figure 1 - 537

Figure 2 - 537

Conclusions: To develop an individual to excel as a PE, training requires a robust curriculum that is hands-on, case-based and supplemented with resources, includes a variety of teaching strategies, incorporates progressive responsibility, has dedicated HP trainers and occurs in a collegial learning environment (Figure 2). Our program has proven to develop successful PEs who are essential members of our practice. This is validated by growth of the PE work unit from 1 to 7 PEs over 22 years. Integration of PEs into HP practice is vital to sustaining superior patient care by improving the quality of practice, efficiency of case handling, diagnostic and reporting accuracy and turn-around time.

538 Glass to Digital Concordance: The Computer Learning Platform Experience with Multiple Biomarkers

Dorothy Hayden[1], Joseph Herndon[2], James Campion[3], Isaac Bai[4], Amy Hanlon Newell[5], Michelle Allen[6], Ehab ElGabry[7], Paula Rodgers[2]
[1]Roche Diagnostics, Tucson, AZ, [2]Roche Tissue Diagnostics, Tucson, AZ, [3]Roche Diagnostics, Tucson, AZ, [4]Ventana Medical Systems, Inc., Oro Valley, AZ, [5]Ventana/Roche, Oro Valley, AZ, [6]Roche, Tucson, AZ, [7]Tucson, AZ

Disclosures: Dorothy Hayden: *Employee*, Roche Molecular Solutions; Joseph Herndon: *Employee*, Roche Tissue Diagnostics; James Campion: None; Isaac Bai: None; Amy Hanlon Newell: *Employee*, Roche; *Employee*, Roche; Michelle Allen: *Employee*, Roche Tissue Diagnostics; Ehab ElGabry: None; Paula Rodgers: *Employee*, Roche

Background: Every year pathologists are inundated with new immunohistochemical biomarkers and complex scoring algorithms. In order to assess the potential scope of digital training at our institution and to address the growing need for standardized immunohistochemical training for all pathologists, we evaluated the adequacy of the Computer Learning Platform (CLP) across multiple biomarkers spanning several indications and having multiple cellular and stromal localizations.

Design: CDx pathologists (6) assigned raw score staining percentages to five different biomarkers with different cellular localizations. The study participants evaluated twelve cases (case = H&E, NRC, and IHC) per biomarker for a total of 60 cases. The list of biomarkers is as follows: Biomarker 1 – stromal localization in pancreatic cancer; Biomarker 2 – nuclear localization in gastric cancer; Biomarker 3- immune cell only localization in renal cell carcinoma; Biomarker 4 – tumor cell membrane (4a) and immune cell (4b) localization in non-small cell lung carcinoma; and Biomarker 5 - cytomembrane localization in small cell lung carcinoma. Case evaluation was performed by pathologists already trained to the biomarker and its indication with no refresher training prior to the initiation of the study. The study began either with Manual reads (glass) or CLP reads (digital, see Figure 1). After a two-week washout, the participants evaluated the same cases on the opposite modality to the first reads.

Results: After correcting for immune cell tolerances (2% for Biomarker 3 and 15% for Biomarker 4b modified to 10% for both immune cell biomarkers) and negating data entry errors (e.g. values greater than 100% and text characters), the glass slide score concordance with the digital platform scores was 86.2%. The intra-reader agreement rate is similar to that observed in manual read (glass) only precision studies.

Primary Analysis	Sensitivity Analysis
Included all data entries (data entry errors) for each pathologist and used original tolerances	Erroneously entered values (e.g. text characters) were omitted and used modified tolerances
Biomarker 1 = 93.1 (67/72)	Biomarker 1 = 93.1% (67/72)
Biomarker 2 = 81.9% (59/72)	Biomarker 2 = 84.3% (52/71)
Biomarker 3 = 66.7% (48/72)	Biomarker 3 = 90.3% (65/72)
Biomarker 4a = 78.9% (56/71)	Biomarker 4a = 81.8 (54/66)
Biomarker 4b =98.8% (48/72)	Biomarker 4b = 94.1% (64/68)
Biomarker 5 = 72.2% (52/72)	Biomarker 5 = 90.3% (65/72)
OPA =81.9% (353/431)	OPA = 86.2% (361/419)

Figure 1 - 538
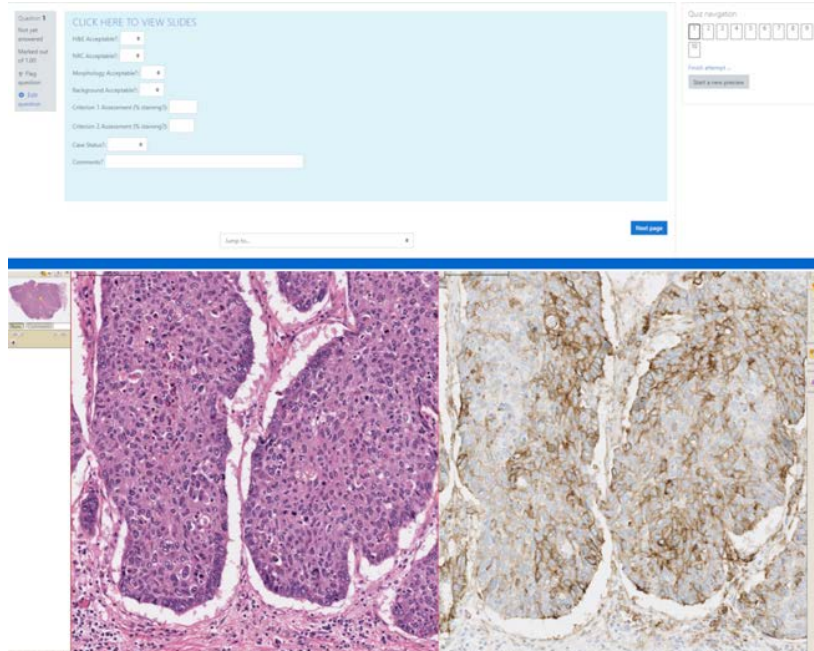
Conclusions: Tumor diagnoses as well as therapeutic decisions increasingly relies upon the accurate assessment of immunohistochemical biomarkers. This study clearly demonstrates staining characteristics and reproducible algorithm assessment is achievable using the Computer Learning Platform across multiple different biomarkers with different localizations and indications. This study highlights the CLP's utility as a standardized independent audit-proof teaching and testing environment for many different biomarkers.

539 Applicability of the WHO Classification of Tumours of the Urinary System and Male Genital Organs: A Survey Among Pathologists of a Lower Middle-Income Country - Implications for Global Health

David Henriquez Ticas[1], Giovanni Molina Paredes[2], Daniel Rosen[1]
[1]Baylor College of Medicine, Houston, TX, [2]General Hospital of the Salvadoran Social Security Institute, San Salvador, El Salvador

Disclosures: David Henriquez Ticas: None; Giovanni Molina Paredes: None

Background: New developments in genomics and other fields have transformed the practice of pathology, including tumor classification. The World Health Organization (WHO) Classification of Tumours, provides an international standard for diagnosis. An increasing number of tumors are now defined by specific molecular profiles or requiring ancillary studies for the diagnosis. These high-complexity tests are usually not available in developing countries, widening the gap in pathology practices and potentially increasing health inequities. We aim to explore the opinion of pathologists in a lower middle-income country regarding the applicability of the most recent WHO classification of genitourinary tumors to their practice.

Design: We developed a 15-item survey in Spanish, utilizing a free web application (Google Forms, Google LLC), distributed to pathologists in a low middle-income income country, as defined per the World Bank. The survey was divided into two parts: the first one was a list of statements associated with a Likert scale, based on selected items of interest of the most recent WHO Classification of genitourinary tumors. The second one consisted of a series of general questions regarding perceived barriers in the applicability of the WHO diagnostic criteria and proposed ideas for solutions.

Results: We received 21 responses from pathologists from 5 different institutions. When asked about selected items of interest of the most recent WHO classification, most of the respondents are aware of the diagnostic criteria and apply them when possible (table 1, partial list of items), 66% (14/21) use morphologic criteria only. Only a few respondents (14%, 3/21) think the classification is adequate for their practice. The majority (86%, 18/21) have access to an immunohistochemistry lab with at least a basic panel of antibodies. None of the respondents have access to molecular testing in the country. When asked about the most important areas of collaboration, one of the most utilized words was "molecular". A majority (90%, 19/21) is interested in participating in global health initiatives related to quality improvement.

	Agree/Strongly agree	Neutral	Disagree/Strongly disagree	Total
In my practice, I utilize the ISUP/WHO to classify the nuclear grade in clear cell renal cell carcinoma	12	2	7	21
I utilize the modified Gleason score system and prognostic grade groups in my reports in cases of prostatic cancer	19	1	1	21
In my practice, I determine and report the status of HPV infection in cases of penile cancer	5	5	11	21
I am aware that the intraductal carcinoma of the prostate is a newly recognized entity in the 2016 WHO classification	15	3	3	21
Cribiform glands in cases of prostatic carcinoma should be assigned Gleason pattern 4.	15	3	3	21

Conclusions: Most surveyed pathologists perceived that the applicability of the WHO classification for genitourinary tumors is partially limited, predominantly due to the lack of access to molecular testing and narrow ancillary studies options. We hope this data can provide a useful starting point for the advance of global health initiatives in under-resourced settings.

540 Assessment Question Types Correlate with Student Performance in Pathology

Tahyna Hernandez[1], Varsha Nair[1], Alexandros Polydorides[2]
[1]Mount Sinai Health System, New York, NY, [2]Icahn School of Medicine at Mount Sinai, New York, NY

Disclosures: Tahyna Hernandez: None; Varsha Nair: None; Alexandros Polydorides: None

Background: Assessments of student knowledge (quizzes, exams, etc.) aim to evaluate the success of continuously evolving medical education curricula. General Pathology is a first-year course covering universal disease concepts (inflammation, neoplasia, etc.). We aimed to characterize the types of questions in the course assessments and their relationship to student performance.

Design: Test questions were characterized across a set of variables: type (multiple choice/matching), presence of an image, simple recall (straightforward data recollection), second order (requiring initial level of understanding), presence of clinical vignette (if so, simple or complex), and whether repeated from previous tests (verbatim or with slight modifications). To assess cognitive level, we used a 3-tier Bloom taxonomy pyramid with level 1 being remember (recall facts and basic concepts), level 2 understand (explain ideas or concepts) and level 3 apply (use information in new situations). We determined percent correct attempts for each variable and calculated difficulty and discrimination scores. Statistical significance was evaluated using chi-square ($P<0.05$).

Results: Assessments comprised 3 quizzes and a final (with a total 125 questions) and we collected data from the last 3 years (420 students) for a total of 52,500 scored attempts. Overall, 86% of attempts were correct. Of all questions, 22 (18%) were matching and 102 (82%) were multiple choice, 31 (25%) contained an image, 121 (97%) were simple recall, 49 (39%) were second order, and 77 (62%) included a clinical vignette, 5 (4%) of which were complex. Of 70 questions in the final, 31 (44%) were repeats from prior quizzes with 4 (6%) being verbatim. In terms of Bloom, 76 (61%) of questions were level 1, 44 (35%) level 2, and 5 (4%) level 3. Students scored significantly worse in the following question types (all $P<0.001$): multiple choice (85% vs. 92%), image (84% vs. 87%), not simple recall (81% vs. 86%), second order (85% vs. 87%), complex clinical vignette (76% vs. 87%), not repeats (84% vs. 92%), and Bloom level 3 (69% vs. 87%). Calculated difficulty scores mirrored the percent answered correctly and more difficult question types had better discrimination scores.

Conclusions: Certain characteristics (multiple choice, image, not simple recall, second order, complex clinical vignette, not repeats, and Bloom level 3) result in more difficult test questions. Assessments should include various question types as needed for optimal discrimination of student performance

541 Computer Learning Platform Utility for Standardized Biomarker Training

Joseph Herndon[1], Dorothy Hayden[2], James Campion[3], Valerie Cousineau[4], Michelle Allen[5], Paula Rodgers[1], Ehab ElGabry[6]
[1]Roche Tissue Diagnostics, Tucson, AZ, [2]Roche Diagnostics, Tucson, AZ, [3]Roche Diagnostics, Tucson, AZ, [4]Roche Molecular Systems, Inc., Tucson, AZ, [5]Roche, Tucson, AZ, [6]Tucson, AZ

Disclosures: Joseph Herndon: *Employee*, Roche Tissue Diagnostics; Dorothy Hayden: *Employee*, Roche Molecular Solutions; James Campion: None; Valerie Cousineau: None; Michelle Allen: *Employee*, Roche Tissue Diagnostics; Paula Rodgers: None; Ehab ElGabry: None

Background: The number of companion diagnostic biomarker assays has risen and scoring algorithms have become increasingly complex. It is imperative for patient care that we provide a standardized training and testing platform to ensure robust clinical trial reads by satisfactorily trained clinical pathologists. This study verifies that the Computer Learning Platform (CLP) can facilitate standardized and independent training of pathologists sufficient to subsequently evaluate glass slides with great proficiency.

To determine whether the CLP biomarker training was sufficient for subsequent scoring algorithm application on glass slides, three naïve pathologists trained solely and independently on the CLP for a single biomarker (Biomarker A; Gastric indication). Training sufficiency was verified by administering a glass slide test set following the digital training.
The digital training module for Biomarker A consisted of the following:
a) A presentation reviewing the biomarker biology, staining characteristics, and scoring algorithm details.
b) A digital scope training module and self-study module with annotated cases demonstrating the staining characteristics, challenges in the interpretation of the biomarker, and application of the scoring algorithm.
c) A digital mini-test allowing the trainee practice in applying the algorithm.
d) A digital final test assessment of 40 consensus scored cases spanning the range of biomarker staining.
e) Digital training sufficiency for Biomarker A was verified by administering a glass slide cohort of 100 randomized consensus scored cases which spanned the staining range.

Results: Readers in this study completed training for Biomarker A on the CLP by passing the final test (Table 1). Readers then applied the scoring algorithm to a 100-case glass slide set and achieved a high concordance rate to consensus scores (Table 1, Pooled overall percent agreement = 96.7%).

Reader	Biomarker A Digital Final Test Results (40 digital cases)	Subsequent Glass Cohort Results (100 glass slide cases)
Trainee 1	PPA=100%, NPA=100%, OPA=100%	PPA=98.0%, NPA=100%, OPA=99.0%
Trainee 2	PPA=95%, NPA=100%, OPA=97.5%	PPA=90.0%, NPA=100%, OPA=95.0%
Trainee 3	PPA=95%, NPA=100%, OPA=97.5%	PPA=92.0%, NPA=100%, OPA=96.0%
PPA: Percent Positive Agreement, NPA: Negative Percent Agreement, OPA: Overall Percent Agreement		

Conclusions: We have optimized biomarker training and testing by creating a CLP that consists of slide viewing software coupled to a learning management system. The CLP enables slide display, and, coupled with the learning management system, allows independent biomarker training and testing with automatic randomization of cases and automatic calculation of OPA, NPA, and PPA. CLP provides a tool that could facilitate the rapid, convenient, and simultaneous training of pathologists worldwide.

542 The "Gross-to-Scope" Educational Program: An Initiative for Team-Building, Quality Improvement, and Closing the Pathology Loop for Gross Room Personnel

Brittney Imblum[1], Evan Stern[1], Danielle Fortuna[1]
[1]Hospital of the University of Pennsylvania, Philadelphia, PA

Disclosures: Brittney Imblum: None; Evan Stern: None; Danielle Fortuna: None

Background: Pathologists' assistants/technicians (PA/techs) work alongside pathologists in grossing, frozen section, and autopsy. Although their contribution to diagnoses and patient care is seen daily, due to many factors, providing case follow-up (final diagnosis, interesting findings, etc.) or feedback may not be part of routine workflow. We identified that case follow-up to "close the pathology loop" is significant in quality improvement in the gross room, as the effects extend beyond the confines of the gross bench to impact team dynamic, teaching of pathology trainees, morale, and fulfillment. Gross-to-Scope program provides follow-up in empowering, educational conferences for PA/Techs, fosters continued learning, team-building, and emphasizes that a final diagnosis is a collaborative effort. This also provides pathologists, especially trainees, with teaching opportunities.

Design: Our Gross-to-Scope program is a monthly conference for PA/Techs led by a resident, fellow, and attending, and is guided by questions submitted by PA/Techs from their cases. It combines gross, microscopic, and clinical findings in a hybrid powerpoint/glass slide format around a multi-headed microscope (Fig1). To assess initial needs and outcomes, we conducted anonymous surveys, which

included core statements (regarding current follow-up and team dynamic) and prospective impact of follow-up. A scale from 1 to 10 was used (i.e. 1: strongly disagree). Unique identifiers were used for future pairing of surveys to evaluate changes.

Results: In our pre-surveys (before program start), all PA/Techs strongly agreed that follow-up would improve skills and contribute positively to team and overall experience (mean: 8.2-10). The feeling of being integral to a diagnosis had a mean of only 6.2. Post-surveys (after one conference) showed higher scores in areas of receiving follow-up, learning new things, and feeling integral to making a diagnosis (Fig2). Six available paired pre/post-surveys showed a significant difference in the core statements (p = 0.041).
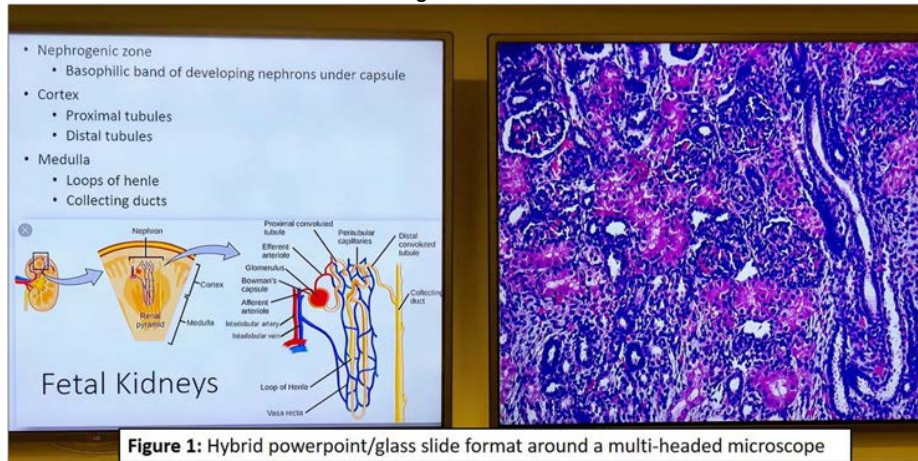
Figure 1 - 542

Figure 1: Hybrid powerpoint/glass slide format around a multi-headed microscope

Figure 2 - 542
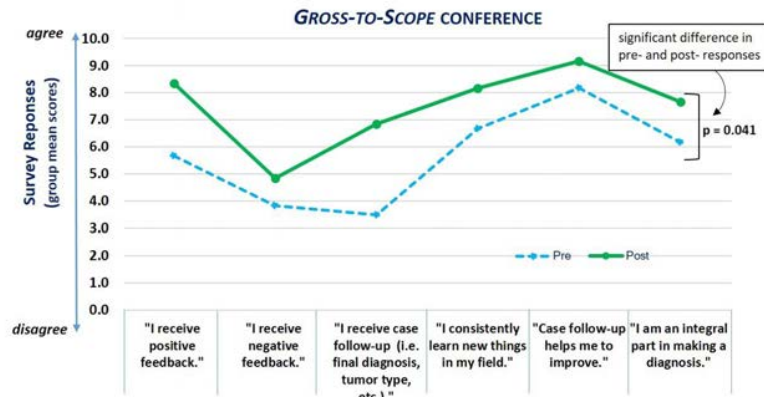

Figure 2: Survey responses before program initiation (pre-) and after (post-) first conference

Conclusions: Our Gross-to-Scope program identified an opportunity for quality improvement by providing case follow-up to PA/Techs. Case follow-up and feedback is highly sought by PA/Techs, and there are early, but significant positive changes in receiving follow-up and team dynamic. "Closing the pathology loop" with our new program for PA/Techs will continue to have effects extending beyond the gross bench and autopsy suite.

543 Availability and Characteristics of Pathology Residents Work and Lounge Space

Anna-Karoline Israel[1], Kelley Suskie[1], Linda Schiffhauer[2], Christa Whitney-Miller[1], Tamera Paczos[1]
[1]University of Rochester Medical Center, Rochester, NY, [2]University of Rochester, Webster, NY

Disclosures: Anna-Karoline Israel: None; Kelley Suskie: None; Linda Schiffhauer: None; Christa Whitney-Miller: None; Tamera Paczos: None

Background: There is increasing evidence that open floor plan and shared offices may negatively impact employee interaction and productivity. URMC Department of Pathology and Laboratory Medicine residency program is currently in the process of designing a new space for residents. We are interested in what work and lounge areas are available in residency programs throughout the country.

Design: A questionnaire assessing the availability and specifics of resident work and lounge space was distributed through the pathology residency coordinators national email network. Participation was voluntary and anonymous. In house residents were interviewed on their ideas of an ideal resident space and a literature review on impacts of shared office space was performed.

Results: Amongst our local pathology residents there was 100% agreement that each resident should have an individual work space for their personal use during a given academic year. A lounge area with comfortable seating was desired for social interaction and while on call. Our national questionnaire was answered by 33 programs throughout the country. 79 % of responding programs were part of an academic medical center. The remaining 21 % were community practice, private hospital, not-for-profit institution and university-community hospitals. Greater than 90 % (32/33) of respondents provide a designated residents room. Out of 24 programs that operate at multiple sites, 14 programs provide a designated resident room at each of their satellite sites and 8 provide a designated residents room at the main site with touchdown spots for residents specifically at the satellite sites. 91% (29/32) of programs with a resident room provide individual desks for each resident, with 24% of those providing a separate office for the chief resident(s). Only 9 % of respondents do not provide individual desks for residents and distribute work stations on a day to day basis. 81 % of programs have a resident lounge area provided by the program or the hospital with 75 % of those providing spatially separate resident work areas. Table 1 highlights aspects of shared offices space discussed in literature.

Advantages	Disadvantages
Greater employee satisfaction	Distraction/Lack of concentration
Egalitarian system with equal working conditions for all employees	Loss of architectural and psychological privacy
Projecting an image of being modern and forward thinking	Difficulties to deal with confidential matters
Facilitating closer work relationships	Private conversations easy to overhear
Increased Networking opportunities	Increased distrust between employees and negative interpersonal relationships between employees
Higher productivity	Higher levels of uncooperative behaviors from colleagues and less friendships among co-workers
Improving flexibility of space use	Disagreements of ambient environment
Cost savings	Hot-desking is in particular associated with increased social demands
Colleagues working closely on a project/common goal do not report increased negative social impacts	Decreased supervisor support
Table 1: Analysis of Shared Office Spaces - what the Literature Discusses	

Figure 1 - 543   Figure 2 - 543
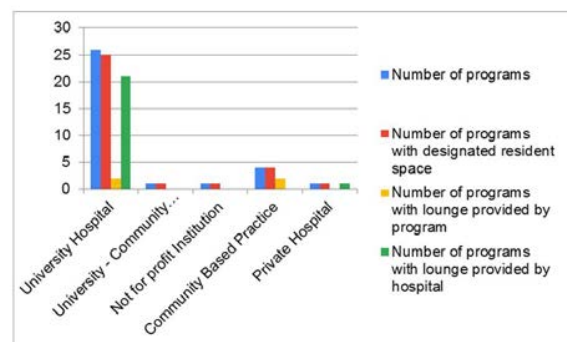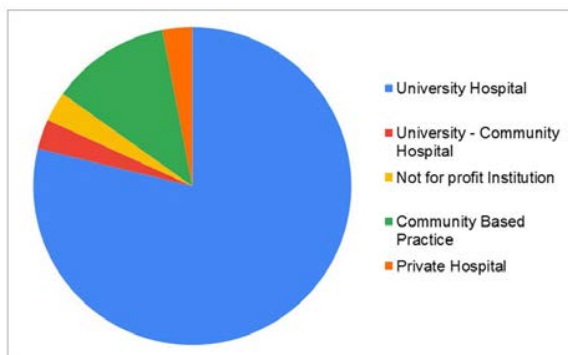
Conclusions: In summary the majority of residency programs surveyed offer designated resident space with separate work areas for each resident. A survey of our individual residents revealed unanimous agreement that this was the preferred work environment. In addition, a lounge area was desirable, with 81 % of respondents providing this for their trainees.

544 Competency by Design (CBD) Implementation in the Anatomical Pathology Residency Program at the University of Ottawa

Osama Khan[1], Shahidul Islam[2]
[1]University of Ottawa, Ottawa, ON, [2]Ottawa Hospital /University of Ottawa, Ottawa, ON

Disclosures: Osama Khan: None; Shahidul Islam: None

Background: The Anatomical Pathology (AP) residency program at the University of Ottawa (UofO) is comprised of a subspecialty signout system which allows residents to develop expertise in disease diagnosis. In 2016, formal measures were taken to implement competency-based medical education (CBME) in the AP program. This is a revolutionary change as pathology education has been quite traditional over the last 100 years in Canada. Here we discuss the detailed steps taken to prepare for the rollout of CBD on July 1st 2019.

Design: 3 meetings were held over 2 years at the Royal College of Canada starting 2016 for the transition of CBME in AP at the UofO. The core competencies were developed in October 2017. The AP program website was re-designed to incorporate all relevant CBME documents/resources. The clinical competence committee (CCC), who will decide on resident transition through the competencies was created in June 2018. The entrustable professional activities (EPAs), milestones and assessment tools were integrated into Elentra, the CBD electronic platform. Residents, Residency Program Committee (RPC) and CCC members helped design the Curriculum Map (the rotation schedule to align with the stages of CBD and the PGY levels). Residents played an integral role in creating clinical scenarios which would best align with the EPAs. 4 CBD lunch and learn sessions then took place. Finally, a pilot study was initiated involving the residents and CCC to perform work -based assessments on the EPAs. CBD was officially rolled out on July 1, 2019.
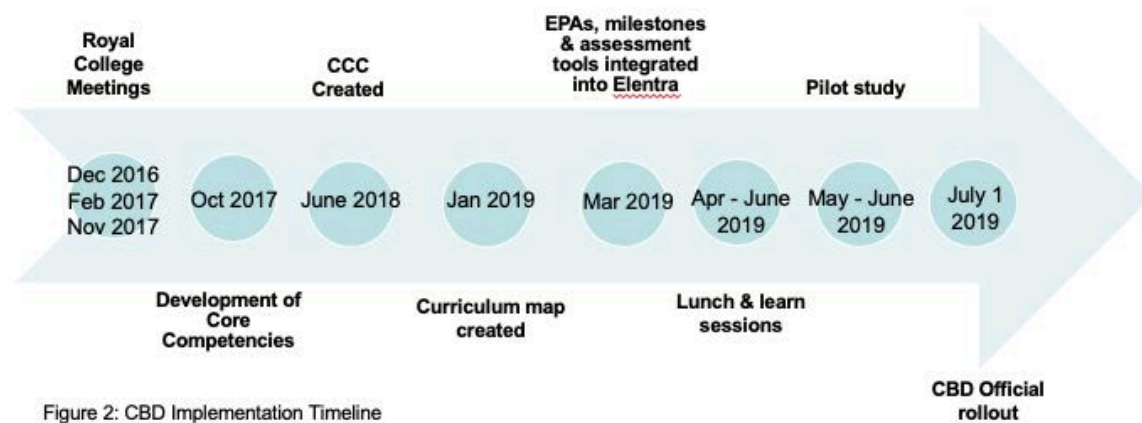
Results: A questionnaire was sent to the AP program 1 month post CBD implementation. Responses from 42 respondents including staff and residents were obtained. The questionnaire consisted of 9 questions on a 5 point likert scale covering website resources, lunch and learn sessions, integration of EPAs into Elentra and learner feedback. Respondents mostly agreed (4 out 5) with statements covering the above areas. Respondent feedback focused on increased time commitments and need for EPA/milestone optimization.

Figure 1 - 544

Figure 1: UOttawa AP Program Curriculum Map

Figure 2 - 544

Figure 2: CBD Implementation Timeline

Conclusions: We have outlined the process of CBD implementation in the AP program which was a collaborative undertaking. Our 1 month questionnaire revealed staff and residents have had an overall positive experience with the CBD rollout. Comments/feedback revealed potential areas of refinement within the CBD model. We plan on sending out questionnaires at 6 and 12 month intervals and setting up a focus group with the residents to obtain feedback on the CBD process.

545 Utilizing Interactive Online Case-Based Modules to Enhance Foundational Knowledge in Pathology for Medical Students

Lauren Kroll-Wheeler[1], Alexander Taylor[2], Bronwyn Bryant[3], Allecia Wilson[2], Madelyn Lew[2]
[1]Ann Arbor, MI, [2]University of Michigan, Ann Arbor, MI, [3]The University of Vermont, Burlington, VT

Disclosures: Lauren Kroll-Wheeler: None; Alexander Taylor: None; Bronwyn Bryant: None; Allecia Wilson: None; Madelyn Lew: None

Background: Studies evaluating teaching methods in post-graduate education show that traditional didactic lectures are less effective than active learning strategies in promoting long-term retention of information. Such studies have prompted educational reform in medical school curricula nationwide in ways that utilize technological and non-technological platforms increase active learning, where students are engaged in the learning process by participating in activities that focus on critical thinking. Due to this paradigm shift and the decreased contact pathologists have with students in a condensed didactic curriculum at our institution, interactive online modules were utilized to enhance delivery of pathology content during the clerkship year. This study highlights the design of these online cases as well as student perspectives of their utility in enhancing their knowledge base in pathology.

Design: Case-based interactive online modules were developed by faculty and trainees. The modules present information through text, videos, and hyperlinked references and utilize both word- and image-based multiple-choice questions to engage students and promote critical thinking. Each answer option has feedback to provide reasoning as to why each answer was correct or incorrect (Figures 1-2). 9 assigned modules were to be completed by students during their week-long rotation in Pathology in clerkship year. A post-rotation survey was provided to students to assess their perspective of the utility of the online modules in enhancing their pathology knowledge base.

Results: Of 149 students who completed their Pathology rotation, 95 (64%) completed post-rotation surveys. 30%, 44%, 21%, and 5% of respondents reported spending 0-2, 3-5, 5-10, and >10 hours on the assigned modules, respectively. 64% of respondents either agreed or strongly agreed that the online modules were effective in enhancing their understanding of key concepts in anatomic and clinical pathology (Table 1).

The Pathology online modules were effective in enhancing my understanding of key concepts in Pathology				
Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
10.53%	53.68%	22.11%	11.58%	2.58%

Figure 1 - 545
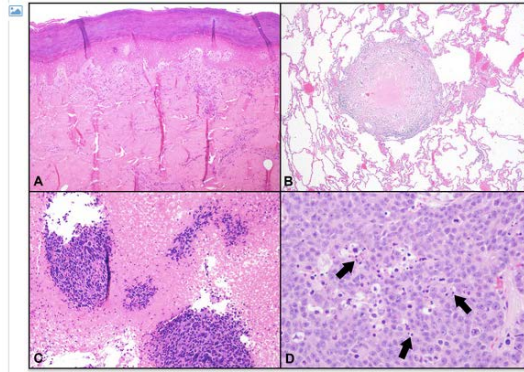
What cell-injury process is represented in each image?

Expand all answers

✓ Image A

Ischemic necrosis. The epithelium is dead, with loss of nuclei in keratinocytes and the beginning of epidermal clefting. The underlying dermis is fibrotic These changes are a result of slowly progressing vascular occlusion in a patient with diabetes.

✓ Image B

Caseating necrosis. This image shows a caseating granuloma with histiocytes (immune cells) trying to wall-off the central, caseous material.

✓ Image C

Coagulative necrosis. Sometimes referred to as tumoral necrosis. The tumor has outgrown it's blood supply, causing cell necrosis. Note how the cells around blood vessels are preserved.

Figure 2 - 545

The pathologist calls into the OR and tells the surgeon the ovarian mass is involved by a "high-grade malignant neoplasm, favor carcinoma". What is the next best step in operative management?

Expand all answers

✓ Remove the contralateral ovary, uterus, omentum, regional pelvic lymph nodes, and all suspicious tumor deposits in the peritoneal cavity.

CORRECT. This completes the surgical staging of the patient and serves two purposes.
(1) Microscopic evaluation of the extent of disease (including the contralateral ovary, uterus, omentum, lymph nodes, and peritoneum) provides important information for staging the patient.
(2) Removing all macroscopic disease (optimal debulking) is an important prognostic factor for patients with ovarian carcinoma.

✗ Remove the contralateral ovary and uterus.

INCORRECT. Ovarian carcinoma often spreads throughout the peritoneal cavity, and removing the omentum, regional lymph nodes, and any suspicious tumor deposits to evaluate for microscopic disease is standard of care.

✗ The main lesion has been removed, close the patient.

INCORRECT. Ovarian carcinoma often spreads throughout the peritoneal cavity, and removing the uterus, contralateral ovary, omentum, regional lymph nodes, and any suspicious tumor deposits to evaluate for microscopic disease is standard of care.

✗ Diagnostic tissue is obtained. Place an intraperitoneal port (for intraperitoneal chemotherapy) and close the patient.

INCORRECT. Ovarian carcinoma often spreads throughout the peritoneal cavity, and removing the uterus, contralateral ovary, omentum, regional lymph nodes, and any suspicious tumor deposits to evaluate for microscopic disease is standard of care.

Page 12 →

Conclusions: Using online modules structured as case-based presentations can promote understanding of pathology concepts in a way that increases student engagement and active learning. As new curricula decrease traditional pathology lecture/lab hours, these modules may be utilized during clinical rotations or as supplemental activities for didactic sessions to enhance student understanding of pathology content. Student focus groups can be utilized to optimize learning content and content delivery in the modules.

546 Simulation-Based Training for Fine Needle Aspiration Cytology (FNAC) Technique: A Validation Study

Tania Labiano[1], Xiaoyin Jiang[2], Idaira Exposito[3], Lara Pijuan[4], Jordi Temprana-Salvador[5], Fuensanta Caballero-Aleman[6], Qing Zhao[7], Enrique Poblet[8], Eduardo Alcaraz-Mateos[9]
[1]Complejo Hospitalario de Navarra., Cizur Menor, NAVARRA, Spain, [2]Duke University, Durham, NC, [3]La Laguna, Santa Cruz Tenerife, Spain, [4]Hospital del Mar, Sabadell, Barcelona, Catalonia, Spain, [5]Vall Hebron University Hospital, Barcelona, Spain, [6]Morales Meseguer University Hospital, Murcia, Spain, [7]Peking Union Medical College, Peking, Beijing, China, [8]Reina Sofía University Hospital, Murcia; University of Murcia, Murcia, Spain, [9]Hospital Universitario Morales Meseguer, Murcia, Spain

Disclosures: Tania Labiano: None; Xiaoyin Jiang: None; Idaira Exposito: None; Lara Pijuan: None; Jordi Temprana-Salvador: None; Fuensanta Caballero-Aleman: None; Qing Zhao: None; Enrique Poblet: None; Eduardo Alcaraz-Mateos: *Speaker*, Inventor of FioNA (Sawbones, WA, USA)

Background: Simulation-based training is increasingly considered essential for acquiring skills in healthcare professions. Fine Needle Aspiration Cytology (FNAC) is a minimally-invasive diagnostic procedure, with diagnostic yield highly dependent on the skill of the proceduralist. A novel FNAC simulator is commercially available, but no validation study has yet been made to determine its validity as a teaching tool. The aim of this study is to report face, content and construct validity of this simulator.

Design: A multi-institutional and international subject recruitment included 79 participants from 19 different countries, divided into 4 study cohorts: medical students (MS, n=14), residents (R, n=22), junior pathologists (J, n=17), and senior pathologists (S, n=26), regarding the degree of expertise. Participants performed 2 palpation-guided FNAC (solid (1) and cystic (2) simulated scenarios) using the FioNA simulator trainer (Sawbones,USA) while they were video recorded. Measured outcomes included time to complete both procedures (T1 and T2) and an objective structured assessment of technical skills (OSATS) checklist evaluation by one instructor using well defined criteria (construct validity). A post simulation questionnaire was completed by participants to assess face and construct validity (Figure1).

Results: We found statistically significant differences in the time (T1) among the groups (lower for J or S than for MS or R) ($p<0.001$), where lower was considered better (in contrast, statistically significant differences in T2 were not found). Higher expertise level was associated with better OSATS scores both in cystic and solid scenarios ($p<0.05$), both for performance aspects and degree of emptying the cystic simulated scenario ($p<0.01$). Face validity was demonstrated with an average score of 8.88 out of 10 (range 6,80-10, SD:0.85), without significantly differences among the groups. Content validity or educational value was also proved: 92.31% of all participants agreed that the simulator allowed FNAC training (92.31% palpation, 100% technique, and 98.47% smear preparation).

Figure 1 - 546

Face validity:

1. What is your opinion of the outer appearance of this simulator?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

2. Is it clear in which location you will be performing the procedure?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

3. How realistic are the lesions (texture, color, size)?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

4. How realistic does the tissue feel when you are performing the FNA?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

5. How realistic does the sample feel when you are performing the smear?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Content Validity (Educational value):

6. The simulator allows training in nodule palpation? :

| YES | NO |

7. The simulator allows training in FNA technique?

| YES | NO |

8. The simulator allows training in smear preparation?

| YES | NO |

9. The variation of exercises and its difference in required skill level offered by the simulator is adequate.

| YES | NO |

10. The simulator is a good way to prepare for a real-life FNA procedure.

| YES | NO |

Conclusions: This study represents the first reported validation study of a commercial simulator for FNAC. Face, content and construct validation were demonstrated, thus the simulator may be considered as a valid training tool. Standard considered features as performance time and OSATS forms may be helpful in order to define participants' experience.

547 Developing an Interactive and Illustrative Laboratory Management Curriculum for Cytopathology Trainees

Marcos Lepe[1], Zubair Baloch[2], Sharon Song[2], Christopher Preciado[2]
[1]Hospital of the University of Philadelphia, Philadelphia, PA, [2]Hospital of the University of Pennsylvania, Philadelphia, PA

Disclosures: Marcos Lepe: None; Zubair Baloch: None; Sharon Song: None; Christopher Preciado: None
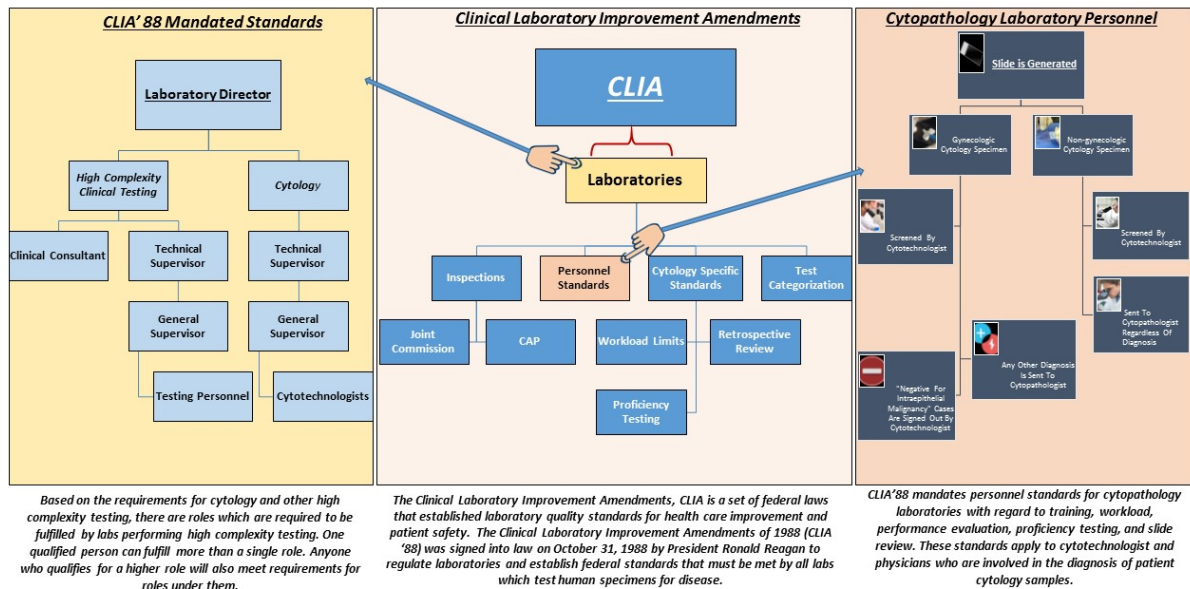
Background: Laboratory management is a critically important but often overlooked element of cytopathology curricula, with new-in-practice pathologists frequently reporting limited exposure to the topic during their training. While many resources are available, the scope of the topic is broad and scattered across different textbooks, papers and websites. To facilitate instruction, we have designed curriculum for cytopathology trainees that consolidates these resources and distills the essentials of laboratory management into an easily digestible and interactive format.

Design: The curriculum content includes a pre-test to assess the trainee's knowledge and a tree of clickable subject headings covering basic laboratory management topics that a graduating cytopathology fellow should be familiar with. Each heading is linked to a summary of the subject using tables and visual diagrams with hyperlinks to specific online resources and additional, detailed information. A post-test will be included to provide instant feedback.

Results: Many resources are available online and in the literature that can be used to develop an interactive curriculum on cytopathology laboratory management (Fig 1). The curriculum should address the following main headings: agencies and regulations, organizations, hierarchical review of slides, laboratory personnel, cytopathology workload limits, proficiency testing, reimbursement, QC/QI, maintenance of certification, and patient safety.

Figure 1 - 547

Key Elements of Laboratory Management Curriculum for Cytopathology Trainees

Based on the requirements for cytology and other high complexity testing, there are roles which are required to be fulfilled by labs performing high complexity testing. One qualified person can fulfill more than a single role. Anyone who qualifies for a higher role will also meet requirements for roles under them.

The Clinical Laboratory Improvement Amendments, CLIA is a set of federal laws that established laboratory quality standards for health care improvement and patient safety. The Clinical Laboratory Improvement Amendments of 1988 (CLIA '88) was signed into law on October 31, 1988 by President Ronald Reagan to regulate laboratories and establish federal standards that must be met by all labs which test human specimens for disease.

CLIA'88 mandates personnel standards for cytopathology laboratories with regard to training, workload, performance evaluation, proficiency testing, and slide review. These standards apply to cytotechnologist and physicians who are involved in the diagnosis of patient cytology samples.

Conclusions: The wealth of information about cytopathology laboratory management can be consolidated and formatted into an easily navigable, concise and dynamic curriculum. This covers the basic topics a cytopathology fellow should be familiar with and through pre- and post-test evaluations can help prepare them for board certification and their future cytopathology practice.

548 Globalizing Pathology Education: The Instant Messaging (IM) Experience

Rifat Mannan[1], Naushad Shah[2], Mrinmay Mallik[3], Abdullah Alharbi[4], Simran Bhattacharyya[5], Gustavo Caballero[6], Raimundo Silva[7]
[1]Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA, [2]Ekopath Metropolis Lab, Guwahati, Assam, India, [3]Mubarak Al Kabeer Hospital, Hawally, Kuwait, Kuwait, [4]King Fahad Armed Forces Hospital, Jeddah, Makkah, Saudi Arabia, [5]University of Maryland, College Park, MD, [6]Fundación Favaloro, Buenos Aires, Argentina, [7]LAPAC, Teresina, PI, Brazil

Disclosures: Rifat Mannan: None; Naushad Shah: None; Mrinmay Mallik: None; Abdullah Alharbi: None; Simran Bhattacharyya: *Advisory Board Member*, Hospital of University of Pennsylvania; Gustavo Caballero: None; Raimundo Silva: None

Background: IM applications have revolutionized global communication, providing a user friendly platform to instantly share text and multimedia messages. We sought to assess usefulness of IM as a teaching and learning tool for pathology.

Design: Three of the authors were creators of several IM groups, dedicated to learning pathology, and in operation for 1 month to 2 years. Data was collected regarding different types of shared educational contents and discussions. An online questionnaire was circulated to assess views about utility of IM in learning pathology.

Results: Six IM groups were analyzed (5 on "WhatsApp" and 1 on "Telegram"), having a total of 1074 members from different countries, comprising medical students (n=252), pathology residents/fellows and practicing pathologists (n=822, combined). Contents shared included image based case discussions, teaching sessions utilizing image/audio/video, open access journal articles, video lectures, web links, information about upcoming conferences / CMEs, among others. During the period of operation 2315 images, 160 web links, 114 documents, and 8 videos were shared across 6 groups. The online questionnaire was responded by 236 respondents from 27 countries, including medical students (12%, 29/233), residents/fellows (43%, 100/233) and practicing pathologists (45%, 104/233). Detailed results are presented in Table 1. Majority (94%, 223/236) found IM in a group to be useful learning tool, citing ease of access on a mobile device (28%), utilizing small breaks during work (20%), and interactiveness (19%) as prime reasons. Most (94%) found discussions relevant, as they perceived they were learning new entities (36%), found it helpful in resolving learning /diagnostic difficulties (30%), or as a collaborative learning process (27%). Combination of images and texts was the preferred learning media (68%). Majority (74%) thought discussions did not interfere with patient privacy. Nearly 2/3 (66%) preferred IM over other social media platforms as a learning tool.

Table 1: Survey questionnaire and responses

Questions	Response (%)
I find "instant messaging (IM)" in a group such as this) to be a useful learning tool for enriching pathology knowledge	• Yes (94) • No (6)
I find "IM" a useful learning tool	• It is user friendly (18) • easy to access on mobile phone (28) • helps me utilize my small breaks during the day 20) • interactive (19) • gives a "real-time" learning experience (15)
I visit the group	• Once a day (54) • Twice a day (29) • Once in 3 days (6) • Once a week (6) • Once every fortnight (1) • Once a month (3) • Never (1)
The discussions in the IM group are relevant to my learning needs	• Yes (94) • No (6)
I find the discussions in the group useful because	• It helps me resolve difficult learning questions (13) • It helps me resolve difficulties in diagnosing a case (17) • I am learning new entities/ recent advances (36) • It promotes collaborative learning from peers (27) • It helps me develop interpersonal relationship with peers (7)
What type of media do you prefer as a more effective learning tool in an IM group?	• Texts based discussions (4) • Images (gross/microscopic) (19) • Combination of texts and images (68) • Audio (1) • Video (5) • Documents/journal articles (3)
Do discussions in the group interfere with patient privacy?	• Never (74) • Sometimes (11) • Not sure (15) • Often (0) • Almost always (0)
As a learning tool, how do you compare IM to other social media platforms (Twitter, Facebook, Instagram, etc.)?	• Much better (37) • Better (29) • About the same (31) • Worse (3) • Much worse (0)
What is your current professional level	• Medical student (12) • Pathology trainee (43) • Practicing pathologist (45)
What is your country of origin?	• India (93), USA (63), Brazil (31), Saudi Arabia (8), Argentina (5), Kuwait (4), Canada (4), United Kingdom (3), Singapore (2), Colombia (2), Romania (2), Denmark, France, Czech Republic, Italy, Greece, North Macedonia, Pakistan, Malaysia, Philippines, South Korea, Syria, Oman, Iran, Sudan, Chile, Mexico, (1 each) #

numbers in parenthesis refer to number of respondents from each country

Conclusions: IM applications offer a versatile and user-friendly social media platform that can be utilized as a learning tool, for both students and practicing pathologists. Members can actively interact in a "real time" manner, learn from their peers across the world, and also benefit from exposure to geographically unique disease entities. It can also be a useful teaching tool, where short contents can be shared, and provide the students a unique experience of "Learning Pathology on the Go".

549 Incorporating a Flipped Classroom in Graduate Medical Education for Pathology Residents Using a Team-Based Approach

Padmini Manrai[1], Maria C. Olave[1], Esther Yoon[2], Mina Xu[1], Malini Harigopal[3]
[1]Yale University, New Haven, CT, [2]The University of Texas MD Anderson Cancer Center, Houston, TX, [3]Yale University School of Medicine, New Haven, CT

Disclosures: Padmini Manrai: None; Maria C. Olave: None; Esther Yoon: None; Mina Xu: None; Malini Harigopal: None

Background: Teaching pathology residents at our institution typically involves one-hour didactic lectures, a model that has been cumbersome both for teacher and learner. The flipped class room model has been an effective tool in undergraduate medical education, but its use in graduate medical education has been limited to a select few medical specialties. Pathology (one of the most visual medical specialties) has not been extensively studied using this model. We designed and implemented an innovative curriculum by using a team-based flipped classroom for pathology resident teaching. Our goal was to examine how participation and collaboration with peers can assist resident learning and engagement.

Design: Approximately 20 residents (divided into 5 teams) participated in the study over 4 sessions. Sessions were led by both faculty and fellows in Breast/Cytopathology. Residents were given 5-8 histology slides with a brief clinical history prior to the session and expected to preview using review books and online resources for reference. The flipped classroom sessions were conducted at a multi-headed scope. At the end of the discussion, teaching points were reviewed by the instructor. We surveyed residents using a Likert rating scale (assigning values from strongly disagree to strongly agree) with free space for open ended comments.

Results: Polling revealed that 50% of residents felt that working in a team made it easier to participate during an unknown session. A similar percent of residents felt that working in a team was an effective format for learning material and felt more engaged (45%). The survey showed 14% of residents found that working in a team did not make it easier to participate during the unknown session and did not feeling more engaged during the session when working in a team as compared to working alone (see Figure 1).

Figure 1 - 549
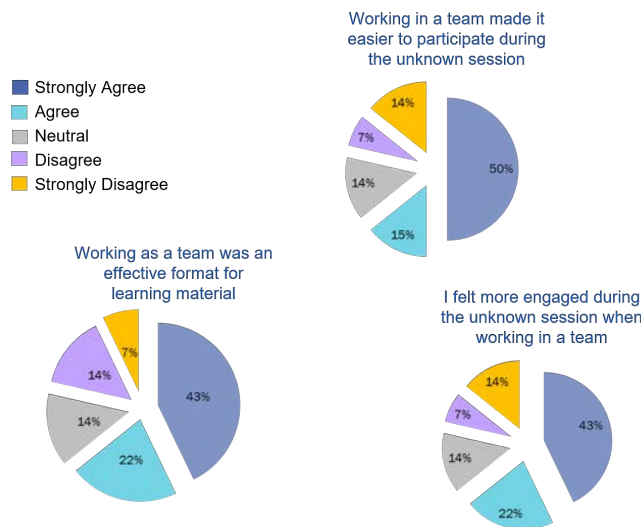
Conclusions: The flipped classroom approach was well accepted and most residents felt sessions to be more effective and engaging than traditional didactic lectures. Residents enjoyed working as a team and felt more comfortable participating, however, some residents did not prefer the team approach. In a large academic center, learning styles are likely to vary and curriculum adaptation helps ensure all learners reach milestones. Combining traditional didactic lecture with group learning case based slide sessions could reach a greater number of residents. The flipped classroom is also a useful training tool for fellows to improve their teaching skills.

550 Telepathology Expert Consultation Platform: Experience from Kilimanjaro Christian Medical Centre, a Tertiary Hospital in Tanzania

Alex Mremi[1], Cristina Costales[2], Danny Milner[3], David Howell[4], Dianna Ng[5], Allison Hall[6]
[1]Kilimanjaro Christian Medical Center, Moshi, Tanzania, [2]Los Angeles County+USC Medical Center, Los Angeles, CA, [3]ASCP, Chicago, IL, [4]Duke University Medical Center, Durham, NC, [5]University of California San Francisco Medical Center, San Francisco, CA, [6]Department of Pathology Duke University Medical Center, Durham, NC

Disclosures: Alex Mremi: None; Cristina Costales: None; Danny Milner: None; David Howell: None; David Howell: None; Dianna Ng: *Primary Investigator*, Cepheid, Inc.

Background: Cancer is a leading cause of death globally. Adequate and timely access to specialized pathology services is needed to scale up cancer control but there is an extreme shortage of pathologists in low- and middle income countries (LMICs) including Tanzania. Telepathology, the use of telecommunication to transmit pathology images and data between two or more remotely located sites, increases access to specialized pathology services. Through a partnership with the American Society for Clinical Pathology (ASCP), Duke University and University of California San Francisco, Kilimanjaro Christian Medical Centre (KCMC) implemented a telepathology consultation program

We aimed to evaluate our experience with the telepathology platform by assessing the concordance between local pathologists diagnoses and expert consult diagnoses made remotely.

Design: Consecutive cases submitted to KCMC Pathology Department from November 2018 through August 2019 were routinely reported using a light microscope by two local pathologists. Digital whole slide H&E images of challenging cases were shared with sub-specialized pathologists at Duke University and University of California San Francisco via the Motic telepathology system. The concordance between the two diagnoses was described.

Results: Of 2569 specimens submitted to the KCMC Pathology Department, 273 (10.7%) were considered challenging and shared with experts via telepathology. Distribution of the cases was as follows: Hematopathology 24.5%, Head and Neck 16.5%, Soft tissue and Bone 15.4%, Gastrointestinal and liver 10.2%, Breast 9.9%, Genito-urinary 9.6%, Gynecologic 8.8%, Dermatopathology 5.1% (Fig 1). The average turnaround time was 5 days, ranging from 0 to 31 days. In 68.8% of the cases, primary diagnoses agreed with the expert consultations. There was partial agreement in 16.6% of the cases and complete disagreement in 11.1%. In 3.5% of cases, expert pathologists required immunohistochemistry, improved histology sections or additional clinical data for diagnosis confirmation (Fig 2). Telepathology had the potential to improve clinical care because the updated or refined diagnosis suggested alternate treatments or a difference in prognosis.

Figure 1 - 550

Figure 1. Proportion and distribution of surgical pathology cases received by the Kilimanjaro Christian Medical Centre Department of Pathology categorized by specialty from November 2018 through August 2019.
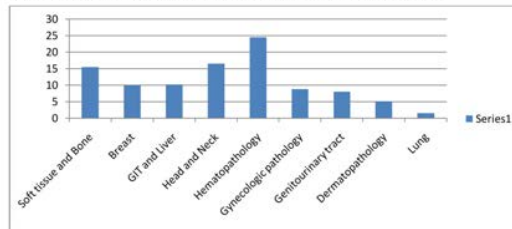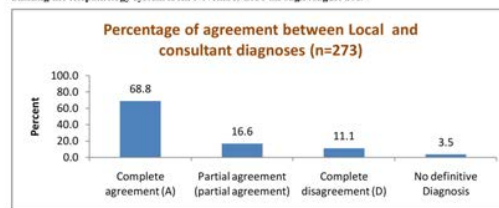

Fig 2. Correlation between local Kilimanjaro Christian Medical Centre pathologists and consultant pathologist diagnoses utilizing the telepathology system from November 2018 through August 2019

Conclusions: The results of our initial ten month study period indicated that telepathology is implementable in a limited resource setting and provided inexpensive, timely specialized pathology solutions. The platform has also been used in quality assurance, mentorship, education, and research.

551 Effectiveness of Pathology Digital Imaging Simulation Training for Assessing Diagnostic Strengths and Weaknesses in Trainees

Stephen S. Raab[1], Zelma Cason[1]
[1]University of Mississippi Medical Center, Jackson, MS

Background: We previously have shown that pathology trainee simulation-based medical education (SBME) using rapid pattern recognition (RPR) methods rapidly improves diagnostic performance compared to usual apprenticeship methods. In this study we examined the effectiveness of RPS SBME in detecting diagnostic strengths and weaknesses in trainees of varying skill sets.

Design: We recruited 10 international pathology trainees who had variable levels of experience in diagnostic pulmonary cytopathology to participate in RPR SBME training using pulmonary JPEG images. RPR consisted of examining JPEG images for generally less than 5 seconds. The students were first asked to separate primary malignant from benign lesions and then to classify malignant lesions into the 4 WHO categories of malignancy. We used simulation principles of continuous assessment and feedback. The students sequentially completed a 20 JPEG pre-test to establish baseline, six 20-slide training modules (separating the categories of small cell, squamous cell, adenocarcinoma, and large cell carcinoma), 5 practice modules of mixed cases, and finally a 20-slide post test. We measured individual and group performance (weaknesses and strengths) and change in performance over time.

Results: Experienced students (n=5) had similar pre and post test scores (range 80-100%) and novices (n=5) had low pre test scores (20-40%) with some degree of improvement on the post test (40-60%). The RPR method identified main causes of misinterpretation that varied in student populations. Experienced students generally missed images with artifacts (80% of errors) and novices missed images with artifact (20% of errors) and images with subtle differences in cellular criteria (80%) (i.e., differentiating chromatin patterns in different malignant categories). Novices gradually improved in recognizing cellular criteria over the 5 practice modules.

Conclusions: We conclude that RPR SBME is valuable in assessing baseline student skill levels and in designing educational content. Training in recognizing artifacts is important for all students. The educational model of providing a large number of images to recognize differentiating cytologic criteria is important in novice training. This finding indicates the importance of deliberate practice involving examining hundreds to thousands of images.

552 Measuring the Efficacy of Pathology Career Recruitment Strategies in US Medical Students

Dana Razzano[1], Rugved Pattarkine[2], Humayun Islam[2], Patricia Adem[2], Angelica Mares[3], John Fallon[4], Patrick Lento[1]
[1]New York Medical College, Valhalla, NY, [2]Westchester Medical Center, Valhalla, NY, [3]New York Medical College, Hartsdale, NY, [4]Brody School of Medicine at East Carolina University, Greenville, NC

Background: Multiple articles and surveys in the literature suggest that medical students find a career in pathology undesirable and believe it is disproportionately focused primarily around autopsy. Most articles propose various interventions to recruit more people into a career in pathology. There are currently no reported studies in the literature that have attempted to measure the effectiveness of the suggested recruitment strategies. This pilot study is the first part of a larger multi-institutional study wherein we measure the effect of applied interventions and document the changes in attitude about the field of pathology in medical students.

Design: An anonymous survey was given to 1st year medical students (MS-1) at one institution before and after listening to a 10-minute pathology career presentation. The same survey was given to 3rd and 4th year medical students before and after a 4-week pathology elective at the same institution. Survey responses were analyzed using a two tailed t-test to measure the effectiveness of the presentation and the elective on influencing opinion regarding the field of pathology.

Results:

47 MS-1s answered the pre-presentation survey and 46 answered the post. A total of 5 students (MS-3 & 4) answered the pre-rotation survey and 4 answered the post. Both the career presentation and the pathology elective statistically increased all student's perceived understanding of what a pathologist does on a daily basis ($p<0.05$). The estimated amount of time that a pathologist spends performing or interpreting autopsy varied considerably between years, and showed a decrease in the pre-and post-presentation group ($p=0.1149$). The post presentation group was the only group to show increased interest in the field of pathology ($p<0.05$).

Pre-Surveys	MS-1 (n = 47) Pre-Presentation	MS-3 (n=2) Pre-Rotation	MS-4 (n=3) Pre-Rotation	MS-1 (n = 46) Post-Presentation	MS-3 (n=2) Post-Rotation	MS-4 (n=2) Post-Rotation
Estimate of % of time spent during a given day that pathologists participate in performing or interpreting results from autopsy.	47%	70%	45%	39% (p=0.1149) 4 answered as "Depends"	80% 1 answered as "Depends"	50%
On a scale of 0-10, with 0 = No interest and 10= Plan to specialize in this field, how interested are you in a career in Pathology and Laboratory medicine?	2.9	6.5	2.7	4.2 (p=0.0065)	4.5	2.5
On a scale of 0-10, with 0 = No concept of what pathologists do on a daily basis, and 10 = Extremely familiar with what pathologists do on a daily basis, how familiar are you with the daily job responsibilities of pathologists?	3.9	4	5	6.3 (p=0.0001)	7.5 (p=0.0474)	8 (p=0.0339)

Conclusions: Our study suggests that pathology career recruitment strategies can have a beneficial effect on student perceptions of the field and considerations for a career in pathology. The students expressed increased confidence that they better understood what pathologists do on a daily basis after both interventions. Overall, the presentation seemed to have greatest effect on increasing student understanding of how much time a pathologist spends performing or interpreting an autopsy and for generating greater interest in pursuing pathology as a potential career. A larger sample size from our own institution, as well as additional contributions of other institutions with various recruitment strategies, would enhance our assessment.

553 Frozen Section Laboratory Simulation Curriculum: A Novel Method to Improve and Assess Intraoperative Consultation Education

Erica Reed[1], Carrie Bowler[1], Suvra Roy[2], Jordan Eldersveld[3], Malvika Solanki[3], Xunda Luo[4], Aqsa Nasir[5], Karen Fritchie[3]
[1]Mayo Clinic Rochester, Rochester, MN, [2]The University of Texas MD Anderson Cancer Center, Houston, TX, [3]Mayo Clinic, Rochester, MN, [4]Northwestern University Feinberg School of Medicine, Chicago, IL, [5]Emory University, Atlanta, GA

Disclosures: Erica Reed: None; Carrie Bowler: None; Suvra Roy: None; Jordan Eldersveld: None; Malvika Solanki: None; Xunda Luo: None; Aqsa Nasir: None; Karen Fritchie: None

Background: Simulation experiences have been shown to have positive implications on the learning process, both in technical and soft skill acquisition, as it provides a safe environment for development, timely feedback on performance, assessment of competence, and an opportunity to improve patient care. To date, there has been extensive implementation of simulation based curricula in undergraduate and graduate medical education for many procedural-based medical disciplines; however, there is limited use within the field of surgical pathology. We sought to investigate the impact of a frozen section simulation curriculum experience on trainee integration into the novel frozen section practice at Mayo Clinic.

Design: Current trainees within the Surgical Pathology Fellowship program whose primary residency training occurred external to Mayo Clinic (n=8) participated in a 30-minute simulation experience which modeled the current practice at our institution prior to their first frozen section rotation. Trainees were given a variety of simple and complex specimens which required orientation, triaging, and interacting with the Pathologist Assistants. They also participated in histologic evaluation, communication with surgical team members, and reporting. A post-intervention survey was sent to all the trainees assessing 13 variables associated to their perceived levels of: preparedness to begin the frozen section rotation, level of confidence to execute tasks, and effectiveness of the simulation experience on their learning. Survey questions used a five point scale. Open ended questions were used to assess qualitative data.

Results: Surveys results indicated that 100% of the 7 respondents felt better prepared to take on the role of a surgical pathologist at the frozen section lab post-simulation. Furthermore, 100% of trainees (7/7) reported that they: understood the purpose of the simulation, knew what to expect, and the scenario embedded real life distractors. Narrative responses revealed that the simulation experience provided a chance to acquire skills needed for the frozen section, supported their learning experience, and allowed for reflection on behaviors and actions. Trainees felt that the most effective components of the simulation were the opportunity to multitask, communicate with colleagues, and build confidence prior to working in the frozen section lab.

Conclusions: The frozen section simulation curriculum experience has had a positive impact on the trainees' self-reported levels of preparedness for the

554 Leveraging the Diagnostic Text Archive for Trainee Education: A Web-Based Tool for Rapid Searching

Scott Robertson[1], Alexander Baras[2]
[1]Cleveland Clinic, Cleveland, OH, [2]Baltimore, MD

Disclosures: Scott Robertson: None; Alexander Baras: None

Background: A pathologist's ability to write diagnostic text is a key aspect of our job, and learning this skill is essential for pathology training. This is often a trial and error process, which slowly improves over time, shaped by feedback from the attending pathologist. To speed learning, it would be useful for the trainee to have a resource containing examples of how expert pathologists sign-out particular cases. An institution's archive of diagnostic text can potentially fill this role. However, the search functions of modern laboratory information systems (LIS) are not optimized for rapid searching and may require some amount of technical knowledge to use effectively. Therefore, our goal was to make resource that pathology trainees could use during their preview time to rapidly search the diagnostic archive, to improve their written diagnoses.

Design: We designed a simple, web-based, search application which queries a database of anatomic pathology records. The website was written in Django 2.1, a Python-based web-application framework. The website was designed around a Javascript plugin called jQuery QueryBuilder, which provides an intuitive search interface (Fig 1). When the user submits a search, QueryBuilder outputs dynamically-constructed SQL commands, which are sent to the database. Matching case records are displayed to the user on-screen. Only information with limited PHI is returned: age, sex, accession number, assigned pathologist and diagnostic text (Fig 2).

Our database was constructed in Microsoft SQL Server 12.0. It was populated with case data extracted from our institution's LIS (Copath Plus, Cerner). We extracted nearly all routine and consult surgical pathology cases from our LIS, containing cases from across the Cleveland Clinic Health system. New cases are automatically added on a daily basis.

Results: The database contains diagnostic text from approximately 3.8 million cases, signed out by 231 staff pathologists from 1980 to the present. This resource was deployed in Feb 2019. Since that time, it has completed 10,993 searches. Searches are fast, with a mean latency of 0.72 sec from submission to results return (standard deviation, 1.6 sec). Our trainees use this resource heavily, as searches by our residents and fellows comprise 75% of overall search activity.

Figure 1 - 554

Figure 2 - 554

Conclusions: We found that diagnostic text archive is valuable resource, and can be leveraged for trainee education using a simple web-based application.

555 Query-Based Clinical Pathology On-Call Logs: An Interactive Web-Based Repository to Facilitate Teaching and Address Common Pages

William Rothwell[1], Jonathan Stefely[1], Tasos Gogakos[1], Tyler Miller[1], John Branda[1], Long Le[1], Emilio Madrigal[2]
[1]Massachusetts General Hospital, Boston, MA, [2]Boston, MA

Disclosures: William Rothwell: None; Jonathan Stefely: None; Tasos Gogakos: None; Tyler Miller: None; John Branda: None; Long Le: *Advisory Board Member*, ArcherDx; *Stock Ownership*, ArcherDx; Emilio Madrigal: None

Background: Call duty is fundamental in clinical pathology (CP) residency education in that it allows residents to develop their problem-solving skills, ultimately improving patient care. Unlike anatomic pathology call, CP call covers a more comprehensive set of issues. A common teaching strategy to support junior and seasoned residents faced with challenging calls is to keep logs of on-call experiences. Traditionally these logs have been maintained as flat documents rather than in a database, limiting their utility. We created a lightweight module to store and query on-call experiences dynamically, facilitating organization and metadata retrieval during our weekly call conference and in real-time.

Design: Leveraging our department's online content management platform, based on a MediaWiki stack, we designed a custom database table, and a 15-field input form (Table). Seven fields were stored as a MySQL MEDIUMTEXT data object, which can be as large as 16,777,215 characters and allows us to search the input text fully. The system employs our institution's Lightweight Directory Access Protocol for user authentication. CP log entries are credited to the logged-in user completing the form and saved with a date/timestamp. A free-text and multi-filter search tool was created to facilitate cross-referencing between logs.

Results: In two months, residents have logged 51 calls, 30 (59%) flagged as educational. Post-launch, we continued iterative and incremental development to enhance the educational and clinical utility of our application. For rapid question-based learning, we added a dedicated text field for clinical questions. To accelerate case review for group rounds and individual study, "previous" and "next" navigation buttons were implemented.

TABLE. CP log form fields and corresponding MySQL database data types.

Form Field	MySQL Data Type
Service	Varchar
Page date/timestamp	Datetime
Page service	Varchar
Page text	Mediumtext
Medical record number	Integer
Brief case title	Mediumtext
Question(s) and/or request(s)	Mediumtext
Clinical history	Mediumtext
Action taken	Mediumtext
Outcome	Mediumtext
Notes	Mediumtext
Reference(s)	Text
Educational case?	Tinyinteger
User	Datetime
Creation date/timestamp	Varchar

Conclusions: Previously, our weekly conferences relied on page summaries archived in a variety of non-standardized formats. Our new repository has already improved the educational value of our conference by streamlining page entry and presentation. Rather than informal presentations, the display of logged entries, in which residents crystallize the most salient points of their page, aid in systematic review of each case and fosters critical thinking among attendees. The underlying data model and software are flexible enough to accommodate the inevitable evolution of the educational needs and goals of our program. As the repository grows, we plan to use it as a resource for updating existing practice manuals and potentially exploit it for retrospective studies.

556 Resident Case Tracker: A Database Software Application for Improved Feedback, Diagnostic Accuracy Analysis, and Resident Training

Nathaniel Smith, Brooke Army Medical Center, San Antonio, TX

Disclosures: Nathaniel Smith: None

Background: Acquiring objective and comprehensive feedback on resident performance can be notoriously difficult. Here, we describe the implementation of a custom software application ["Resident Case Tracker" (RCT)] which has provided markedly improved evaluative analysis for our residency program.

Design: RCT was implemented utilizing the Visual Basic for Applications framework within Microsoft Access. Residents and faculty sign in to a password-protected graphical user interface frontend with restricted access to their own cases and evaluations stored in a secure and encrypted backend database. For each signout, the resident enters their diagnoses, comments, and potential questions for each case. Faculty are provided a signout queue to review the resident diagnosis and select from a dropdown box whether they "Agree", "Partially Agree", or "Disagree" and input their own comments (Figure 1). Residents and faculty can review the agreement level and comments for each case, overall signout agreement percentages, and have the option of opening and reviewing groups of cases by agreement status (Figure 2). Cases are autonomously classified into organ systems enabling the resident to review organ-specific performance for any date range. Additionally, a signout evaluation is automatically generated for faculty completion and stored alongside the other archived data. Administrative access allows program directors (PDs) and Clinical Competency Committee (CCC) members to readily review evaluation summaries, signout statistics, discrepant cases, and organ system performance at both an individual and residency-wide level.

Results: A marked increase in completed evaluations and feedback were collected in the initial 24 months of implementation. In total, 1,113 signouts and evaluations were generated which comprised 41,718 individual cases.

Figure 1 - 556

Figure 2 - 556

Conclusions: RCT is an invaluable tool for our residency program and has provided unparalleled feedback and data analytics. Residents have access to every completed signout with the ability to learn from discrepant cases while also seeing improvements in diagnostic acumen over time. The PDs and CCC are able to monitor resident milestones much more effectively while more readily identifying residents who would benefit from targeted study. We will likely offer free use of the software to other residency programs under an open source license in the future.

557 On A Mission: Crafting a Focused Mission Statement Using Appreciative Inquiry

Anna Tart[1], Susanne Jeffus[2], Jennifer Laudadio[3], Tim Atkinson[3], Sara Shalin[3]
[1]University of Arkansas for Medical Science (UAMS), Little Rock, AR, [2]University of Arkansas Medical Sciences, Little Rock, AR, [3]University of Arkansas for Medical Sciences, Little Rock, AR

Disclosures: Anna Tart: None; Jennifer Laudadio: None; Sara Shalin: None

Background: Appreciative inquiry (AI) is a technique rooted in focusing on a group's strengths in order to gain insight and define goals within an organization. Typically, AI follows a process of 1) discovering current strengths, 2) dreaming of the ideal future state, and 3) building the organization in a way to achieve these goals. This sequence is often conducted over the course of 3-4 sessions in which the organization members discuss ideas in a small group setting to encourage participation from each individual. Our program evaluation committee (PEC) proposed to use an adapted protocol of the AI technique in order to develop a mission statement for the residency program.

Design: As part of the Accreditation Council for Graduate Medical Education (ACGME) requirements, Pathology residency programs are to have a mission statement, which should align with the sponsoring institution's mission and the residency program's aims. The PEC desired resident input for the creation of the mission statement. Residents were taught about the process of AI in a 1-hour informational session. To accomplish the "discovery" phase, posterboard was displayed int he resident workroom for four weeks with prompts to encourage residents

to write down current strengths of the program. Then, a second posterboard gave residents the opportunity to note unifying themes (identified in the "discovery" phase) and brainstorm ideas about their ideal residency program (the "dream" phase). After six additional weeks, all 18 residents met to discuss the accumulated responses.

Results: AI identified 5 core principles as foundational program strengths that contribute competent and successful graduate pathologists for our community. These principles were clinical collaboration, quality teaching, diagnostic ability, mentoring, and professional leadership. The core principles were crafted into a mission statement for the residency program that was subsequently refined and adopted by our PEC.

Conclusions: We present our experience of using AI to design a meaningful mission statement for the residency program. By involving all of the residents, and focusing on the existing strengths of our program, we are confident that the mission statement accurately reflects our goals for training future pathologists. This exercise in AI was a positive experience and provided a unique approach to fulfill ACGME requirements.

558 Pathology Rotations Embedded Within Surgery Clerkships Can Shift Student Perspectives About Pathology

Alexander Taylor[1], Lauren Kroll-Wheeler[2], Allecia Wilson[1], Madelyn Lew[1]
[1]University of Michigan, Ann Arbor, MI, [2]Ann Arbor, MI

Disclosures: Alexander Taylor: None; Lauren Kroll-Wheeler: None; Allecia Wilson: None; Madelyn Lew: None

Background: Medical school curricula nationwide have undergone significant changes to reflect paradigm shifts in education that focus on reducing time traditional didactic sessions. These changes frequently lead to a decrease in pathology lecture/lab hours, drastically reducing the exposure students have to pathology, which can contribute to lower levels of recruitment into pathology. Additionally, students often progress through medical school curricula without a clear understanding of the role Pathology plays in daily healthcare delivery. This study evaluates the impact of an established mandatory 1-week rotation through Pathology during the Surgery Clerkship has on medical student perspectives on pathology's role in medicine as well as their interest in selecting pathology as a career choice.

Design: Since October 2018, medical students rotate through a newly established 3-month Surgery Clerkship, which is divided into 2 months of surgery rotations and 1 month of Applied Sciences. The Applied Sciences month consists of 4 1-week rotations through anesthesiology, anatomy, radiology, and pathology (Figure 1). During the pathology rotation, students participate in a variety of anatomic and clinical pathology activities including autopsy, surgical pathology sign-out sessions, and small group sessions (Figure 2). An 8-question survey was distributed to 149 students to evaluate changes in their perspectives Pathology as a specialty, their understanding of Pathology, and likelihood of choosing Pathology as a career as a result of this rotation.

Results: Of 149 students, 74 (49.7%) students responded with results summarized in Table 1. Of note, 80% and 86% of rotating students agreed or strongly agreed that the rotation resulted in a greater understanding of pathology workflow and how pathology fits into the larger role of healthcare, respectively. 62% and 66% of respondents also noted that the rotation had a positive impact on how they view pathology and pathologists, respectively.

Table 1: Results of Student Survey

Question:	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)	Mean
I have an increased understanding of the daily workflow of a pathologist	21.62%	66.22%	8.11%	2.70%	1.35%	4.04
Because of this rotation, I now understand the difference between anatomic and clinical pathology.	20.27%	39.19%	33.78%	5.41%	1.35%	3.72
I have an increased understanding of how pathology fits into the larger pictures of healthcare delivery after this rotation	31.08%	55.41%	9.46%	2.70%	1.35%	4.12
Using the information gained from this rotation, I feel I can better use laboratories and tests to optimize patient care.	16.22%	47.30%	31.08%	2.70%	2.70%	3.72
I find the work of a pathologist more interesting that I had prior to this rotation.	16.22%	28.38%	29.73%	16.22%	9.46%	3.26
This rotation has made a positive impact on how I view pathology.	18.92%	43.24%	24.32%	9.46%	4.05%	3.64
This rotation has made a positive impact on how I view pathologists.	16.20%	50%	24.32%	8.11%	1.35%	3.72
After completely this rotation, I am more likely to consider pathology for residency.	5.41%	8.11%	28.38%	27.03%	31.08%	2.30

Figure 1 - 558

Figure 2 - 558

Applied Sciences – Pathology Weekly Schedule					
	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
A M	Autopsy/ Gross Pathology	AP signout session	AP signout session	AP signout session	Study period
P M	Study period	CP – Micro small group session	CP – Chemistry Smal group session	CP – Blood Bank small group ession	Surgery clerkship lectures

Conclusions: Embedding a pathology rotation in surgery can positively impact medical student impressions of pathology as a whole and can enhance understanding of how pathology integrates into healthcare delivery. Although the number of students who will pursue pathology as a residency may still be relatively low, there may still be an increase in interest than prior to rotation. Other institutions may work with surgery counterparts to embed pathology curricula to optimize medical student exposure to pathology.

559 The Study of Medicine and Molecular Pathology Association During Resident Training (SMMART) Program: A Solution of Molecular Pathology Training for Residents

Helena Tomac Pavosevic[1], Minghao Zhong[1]
[1]Westchester Medical Center, Valhalla, NY

Disclosures: Helena Tomac Pavosevic: None; Minghao Zhong: None

Background: The molecular pathology (MP) has been integrated into our routine practice in almost all pathology branches. However, the MP training for most residents (who will not go through MP fellowship training) is not adequate. This is due to: limited MP rotation time in core curriculum; complexity of MP tests; inadequate MP pathologists; residents with different backgrounds and expectations of MP; limited department resources. In order to overcome these limitations, we developed a 4-year long, flexible, extracurricular program: SMMART program (figure 1) for resident's MP training.

Design: A retrospective review was performed for the residents at our institution between 2007 and 2018, which trains 12 residents over a 4-year AP/CP training program. Residents were assessed for the number of accepted journal publications and United States and Canadian Academy of Pathologists (USCAP) Annual Meeting presentations, feedback of SMMART program.

Results: 1. 37 posters/abstracts were presented at USCAP within the past 3 years (2016-2018) including 2 platform presentations. This correlated to >1 poster per resident every year for all residents.

2. Almost all residents have journal publications before graduation. At least 2 resident's publications had >10 in accumulated impact factor. Some residents are able to publish in prestigious journals in surgical pathology, such as: American Journal of Surgical Pathology.

3. Almost all residents who participated SMMART program have a positive feedback.
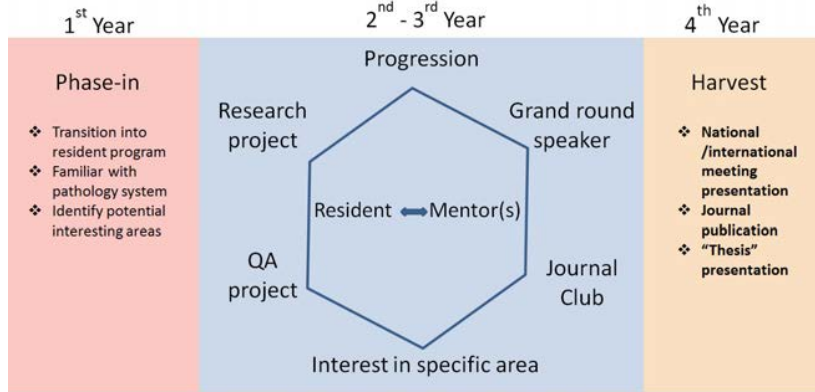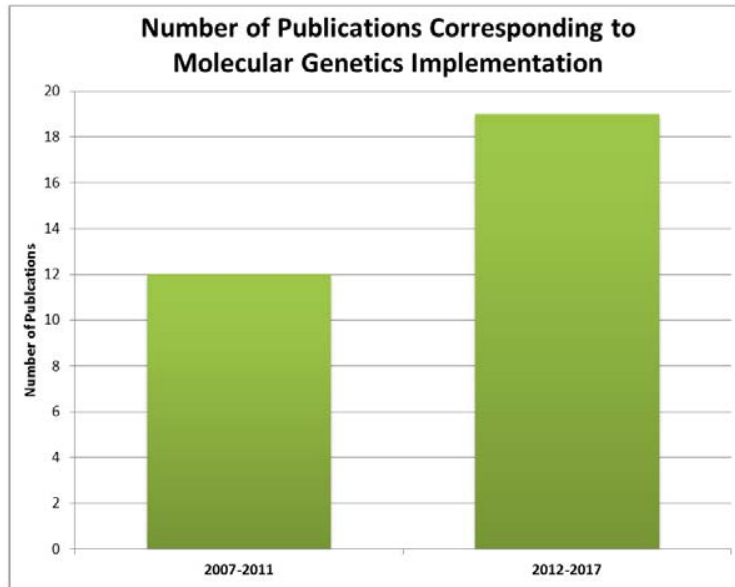
Figure 1 - 559

Figure 1: Study of Medical and Molecular Association During Residency Training (SMMART):
A Systematic Approach for Resident Molecular Pathology Training

Figure 2 - 559

Conclusions: Our experience demonstrates that SMMART program promotes molecular pathology training for resident education. The increased MP exposure has produced resident involvement on a national and international level through various published works.

560 Implementation of a Novel 3rd Year Medical Student Required Surgical Pathology Clinical Experience

Sonya Wegman[1], Debra Zynger[2]
[1]The Ohio State University Medical Center, Galloway, OH, [2]The Ohio State University Medical Center, Columbus, OH

Disclosures: Sonya Wegman: None; Debra Zynger: None

Background: Few medical schools have required experiences in pathology during the 3rd and 4th clinical years and there are currently no published examples of required clerkships in surgical pathology. Medical schools cite a scarcity of available time and resources during the clinical years as a reason for the lack of exposure to pathology. We aimed to create and implement a required 3rd year surgical pathology clinical experience with the goal of introducing students to the role of surgical pathology in patient care.

Design: A required surgical pathology clinical experience was initiated that consisted of a 1 hour introductory lecture; 1 hour in the gross room, histology and immunohistochemistry laboratories; and 1 hour of one-on-one case sign-out preceptorship with a subspecialty surgical

pathologist. Concepts that were covered included specimen processing, frozen sectioning, completing specimen requisitions, interpreting synoptic reports and pTNM staging. Students evaluated the session with the surgical pathologist (1, poor/unhelpful; 2, marginal; 3, neutral; 4, good; 5, excellent/useful) and provided narrative feedback. Ten multiple choice questions (included as part of a Perioperative Services exam) and attendance were incorporated into the students' Perioperative Services rotation grade (honors, letter of commendation, satisfactory, or unsatisfactory).

Results: From 2014-2018, 757 medical students participated in the required 3rd year surgical pathology clerkship experience. 30 subspecialty pathologists served as preceptors for the surgical pathology sign out session with an average of 9 sessions per preceptor per year. Evaluation data was collected from 2015-2018 from 316 students with a mean preceptor rating of 4.8/5 (range 4-5). Students scored an average of 81% on the surgical pathology portion of the administered exam (range 21-99% for each question). The surgical pathology clerkship experience accounted for 17% of the student's Perioperative Services rotation grade and was included in the Medical Student Performance Evaluation for application to residency, alongside all other 3rd year rotation grades.

Conclusions: We successfully implemented a novel required 3rd year medical student surgical pathology clinical experience which introduced all medical students to key concepts in surgical pathology without excessive use of time or resources. Students demonstrated understanding of key concepts and rated the sign out experience with the surgical pathology preceptor highly.

561 System Changes in Resident Education: An Evolution in the Resident Call Role Over Two Decades

Kaitlyn Wieditz[1], Patricija Zot[1], Steven Smith[2], Marie Do[1]
[1]Virginia Commonwealth University Health System, Richmond, VA, [2]Virginia Commonwealth University School of Medicine, Richmond, VA

Disclosures: Kaitlyn Wieditz: None; Patricija Zot: None; Steven Smith: None; Marie Do: None

Background: Pathologists are not only leaders in the laboratory; they also serve as consultants for the clinical teams in the hospital. An important aspect of pathology residency training is on-call responsibility, through which the residents develop communication skills and gain both confidence and experience in dealing with a wide variety of questions. At our institution, on-call records are monitored weekly to evaluate the progress of trainees and to provide prompt feedback. The objective of this study is to identify the types of calls received, to determine how these calls have changed over time, and to assess the educational value of continuing to collect these data.

Design: A retrospective review of resident on-call records over a one-year period (2018) was performed and compared to two previous reviews performed at our institution in 1997-1998 and 2005-2006. Calls included were received "after hours" between 5pm and 8am on weekdays and all day and night on weekends and holidays. The calls were classified according to type of originator and laboratory service involved (Table 1).

Results: Comparing the on-call data led to identification of several consistent patterns as well as a few interesting differences. A total of 19, 33 and 32 call weeks were available to analyze during 1997-1998, 2005-2006 and 2018 respectively. The average number of calls per week increased from 9 to 20 between 2005-2006 and 2018.   In addition, lab technologists initiated calls most frequently across all time periods, followed by clinicians and nurses (Figure 2). Within the category of Blood Bank, the percentage of consultations for apheresis increased from 1.6% to 9.3% to 22.1% respectively.

	Year	1997-98	2005-2006	2018
Blood Bank		**87**	**150**	**394**
	Apheresis	5	29	90
	Transfusion Reaction	23	43	121
	Release of Product	12	34	64
	Supply Issue	8	24	48
	Mislabeled Specimen	4	4	2
	Other	35	16	69
Hematology		**41**	**52**	**100**
	Critical Value	1	24	11
	Smear Review	21	18	59
	Test Approval	7	4	19
	Mislabeled Specimen	9	2	0
	Other	3	4	11
Chemistry		**71**	**73**	**77**
	Critical Value	5	14	14
	Test Approval	42	34	53
	Mislabeled Specimen	12	4	7
	Other	12	21	3
Micro/Immuno		**37**	**31**	**45**
	Critical Value	2	2	9
	Test Approval	5	12	10
	Mislabeled Specimen	29	12	7
	Other	1	5	19
Other		**36**	**7**	**6**
Total		**272**	**313**	**622**

Figure 1 - 561

Figure 2 - 561

Distribution of Calls Recieved by Laboratory Service Involved

Distribution of Calls Recieved by Originator
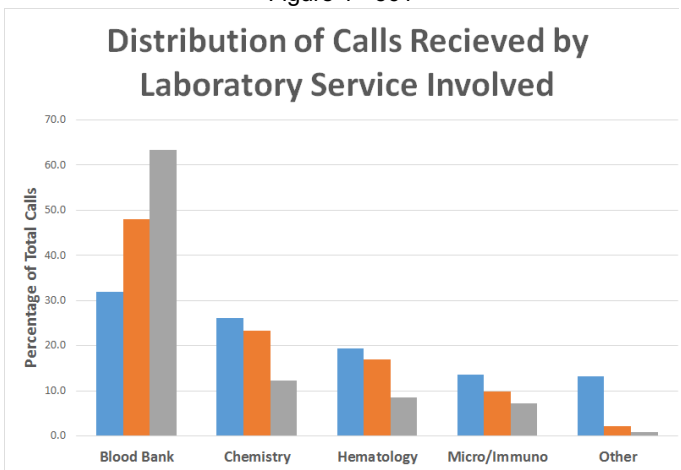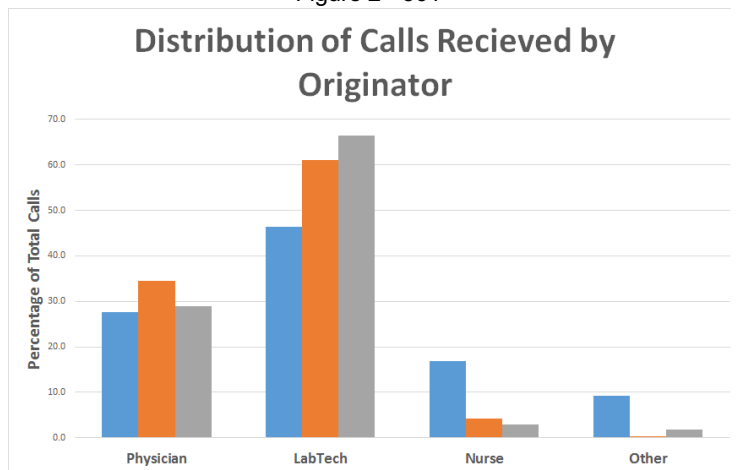
Conclusions: The ever-changing patterns in types of calls received reflect the changes in the role of a resident clinical pathologist within the hospital system. The increase in call volume demonstrates the important role that Pathologists play in leading laboratory activities and assisting our clinical colleagues. The rise in calls received regarding the Blood Bank may reflect growth in the bone marrow transplant service and sole regional Level 1 trauma center status. Evaluating changes in the call patterns provides a valuable tool in the education of pathology residents by demonstrating that the demands placed on pathologists may change over time as the needs and characteristics of the hospital shift.

562 Reaching the Millennial Applicant: Impact of Social Media Presence on Residency Recruitment

Michael Williams[1], Karen Kelly[1]
[1]SUNY Upstate Medical University, Syracuse, NY

Disclosures: Michael Williams: None; Karen Kelly: None

Background: The digital age and its associated generation of tech-savvy applicants has significantly changed the landscape for residency recruitment. Applicants utilize a myriad of electronic resources to compare and contrast programs and a residency program's social medial presence is increasingly becoming a prominent influencer in decisions. Enhancement of a residency program's web presence could positively impact recruitment efforts.

Design: Applicants who interviewed for pathology residency training at a university-based northeast program during the 2016-2017, 2017-2018 and 2018-2019 cycles were sent a post-match survey at the conclusion of recruitment season using SurveyMonkey. Surveys sought applicants' perspectives with respect to their engagement with the program's social media presence and how those experiences impacted their application and rank list decisions. Data from ERAS regarding the number of applications to the program over the same time period was obtained to further assess the effect of implementing social media tools.

Results: The number of applications for the program increased 23.7% from 472 in 2016-2017 to 584 in 2017-2018 when the social media tools (Instagram, Twitter and Facebook) for the program went live. This upward application trend from pre-social media times held steady for 2018-2019. Of the 148 applicants that interviewed at the program from 2016-2019, 58 responded (39.2%). 70.7% (41/58) of respondents stated that they used the program's social media presence to gather information during the application process; 60.3% (35/58) of respondents reported having personal social media accounts that interacted with the program's social media accounts (e.g., liking posts/photos/tweets, re-tweeting tweets, commenting on photos/posts/tweets and/or viewing videos); 65.5% (38/58) of respondents said that the program's social media presence did impact their applying to the program, how they formed their rank list, or both.

Applicants' Information Tool Preferences	
	Number of Yes Responses (%)
Instagram	35/58 (60.34%)
Twitter	28/58 (48.28%)
Facebook	8/58 (13.79%)
Doximity	39/58 (67.24%)
Student Doctor Network	27/58 (46.55%)
Word of Mouth	23/58 (39.66%)
Faculty at Institution	1/58 (1.72%)
Residents at Institution	8/58 (13.79%)
Online Databases (e.g., FREIDA)	23/58 (39.66%)
Program Coordinator at Institution	25/58 (43.10%)
Program Director at Institution	4/58 (6.90%)

Conclusions: The social medial presence of a pathology residency program does affect recruitment of applicants. By implementing social media tools, programs can augment their recruitment efforts and attract millennial applicants who frequent social media sites and place value on them in the selection process.

563 Integration of Formative Assessment Practices to Optimize Assessment of Competence and Hematopathology Milestone Progression

Adam Wood[1], Carrie Bowler[2], Lisa Hartzheim[1], Jennifer Embers[1], James Hoyer[1], Kaaren Reichard[1], Rebecca King[1]
[1]Mayo Clinic, Rochester, MN, [2]Mayo Clinic Rochester, Rochester, MN

Disclosures: Adam Wood: None; Carrie Bowler: None; Lisa Hartzheim: None; Jennifer Embers: None; James Hoyer: None; Kaaren Reichard: None; Rebecca King: None

Background: Assessment practices in GME training have evolved toward competency-based education. Incorporation of formative assessment (FA) into traditionally summative assessment (SA) practices allows for continuous feedback and trainee improvement. In addition, the Entrustable Professional Activities model has received attention in GME as a mechanism to provide objective assessment of trainee competency for a given task. With the implementation of Hematopathology Milestones (HPM), our program sought to design competency-based FA that would allow for ongoing fellow evaluation and for direct mapping to HPM to provide a comprehensive and efficient analysis of overall fellow progress.

Design: Our prior Likert-based numerical rating scale was first transitioned to a rubric-based Dreyfus model of skill acquisition and assessment. Criteria were established to reflect development of specific skills, achievements, and graduated responsibility (Figure 1). Next, we identified the methods used to assess the curricular activities. We broke down each HPM narrative and determined where in our

fellowship curriculum it was addressed and by what assessment method. We utilized MedHub (Minneapolis, MN) to map assessments to the HPM and create a visual dashboard that tracks trainee progress over time.

Results: The project resulted in the creation of rotation-specific FAs. Comparing the HPM to our fellowship curriculum identified curricular and assessment gaps from which we enhanced our evaluation tools. Items assessed in each rotation cover all 6 HPM core competencies and are mapped to HPM sub-competencies allowing for creation of a visual dashboard which automatically compiles data on a trainee's performance over time via MedHub (Figure 2). The visual dashboard has provided our Clinical Competency Committee (CCC) with an objective starting point for semi-annual fellow evaluation and HPM reporting to ACGME.

Comparison of Hematopathology Fellow Evaluations Pre– and Post–Milestones		
	Pre 2014 Likert Scale	**2015 – Present Dreyfus Model**
Objective evaluation	No	Yes
Expectations transparent to trainee and evaluator	No	Yes
Allows for consistency between evaluators	No	Yes
Evaluation considers Milestones	No	Yes
Linked to Milestones	No	Yes
Formative Assessment	No	Yes
Summative Assessment	Yes	Yes

Figure 1 - 563

Transition from Likert scale (1991–2015) to Dreyfus model (2015–Present)

Figure 2 - 563

MK-4 Hematology knowledge: demonstrates attitudes, knowledge, and practices that incorporate evidence-based medicine and promote lifelong learning.					
Has not achieved	**Novice**	**Advanced beginner**	**Competent**	**Proficient**	**Practicing Pathologist**
	MK4-1a Demonstrates knowledge of major hematopathology-related non-neoplastic and neoplastic conditions faced by general practice pathologists **100%** (39/39)	**MK4-2a** Demonstrates general knowledge of more specialized and rare hematopathology-related non-neoplastic and neoplastic conditions, but may not always consider them in diagnosing cases **94.9%** (37/39)	**MK4-3a** Demonstrates more extensive knowledge of most hematopathology-related non-neoplastic and neoplastic conditions **69.8%** (44/63)	**MK4-4a** Demonstrates competence in knowledge in hematopathology-related non-neoplastic and neoplastic conditions & competence to practice hematopathology independently **12.0%** (6/50)	**MK4-5a** Demonstrates proficiency in knowledge of hematopathology-related non-neoplastic and neoplastic conditions **0.0%** (0/50)
	MK4-1b Demonstrates general knowledge of normal histology of peripheral blood, lymph node, bone marrow, spleen & other lymphoid tissues **100%** (68/68)	**MK4-2b** Demonstrates competence in knowledge of normal histology of peripheral blood, lymph node, bone marrow, spleen & other lymphoid tissues **94.1%** (64/68)	**MK4-3b** Understands implications of most diagnoses **55.8%** (24/43)	**MK4-4b** Effectively consults medical literature and colleagues when face with knowledge gap **14.6%** (7/48)	**MK4-5b** Actively keeps abreast of progress in hematopathology **0.0%** (0/26)
	MK4-1c Demonstrates basic knowledge of coagulation **100%** (5/5)	**MK4-2c** Demonstrates competence in knowledge of normal coagulation **100%** (5/5)	**MK4-3c** Consults medical literature and colleagues when faced with knowledge gap **65.0%** (39/60)	Knows own limitations **22.2%** (4/18)	
			MK4-3d May not always realize the limitations of his/her disease-based knowledge **55.6%** (10/18)		

Conclusions: We have successfully implemented faculty-of-fellow assessments that integrate objective, FA into previous subjective, SA (Table 1). Our innovative assessment tool inherently and objectively documents and displays trainee progress ensuring that they achieve competency in required knowledge and skills. An additional benefit with this system is transparency in the assessment process for both fellows and faculty. Finally, up-front curriculum assessment and mapping of assessments to HPM competencies has significantly improved our CCC's ability to efficiently and effectively assess trainee progress over time.

564 A Mobile Platform-Based Structured Sign Out Tool to Improve Resident Teaching on Anatomic Pathology Rotations

Yihe Yang[1], Tawfiqul Bhuiya[2], Seema Khutti[3], Taisia Vitkovski[4], Michael Esposito[5]
[1]Northwell Health Hofstra Northwell School of Medicine, Lake Success, NY, [2]Long Island Jewish Medical Center, Albertson, NY, [3]Donald and Barbara Zucker School of Medicine at Hofstra/Northwell, Greenvale, NY, [4]Lake Success, NY, [5]Northwell Health, New Hyde Park, NY

Disclosures: Yihe Yang: None; Tawfiqul Bhuiya: None; Seema Khutti: None; Taisia Vitkovski: None; Michael Esposito: None

Background: Resident teaching is often negatively impacted as a result of increasingly demanding AP service work. Lack of standardized teaching and assessment amongst faculty also negatively effects resident learning. We have developed a structured sign out tool (SST) for anatomic pathology which utilizes a mobile-based platform that incorporates assessment of resident diagnostic skills, question-based analysis of medical knowledge and timely feedback of resident performance.

Design: This SST was piloted with the breast and thoracic rotations to assess its efficacy in improving resident learning and ensure that teaching and assessment were standardized and more objective. We developed a spreadsheet that tracks real-time resident diagnostic accuracy utilizing a binary scoring system during sign out (Table 1). The cloud-based spreadsheet was accessible on a tablet that was brought to the sign out session by the resident. Major and minor disagreements compared to attending diagnoses were tracked in real time allowing faculty to evaluate diagnostic skills. Practical questions were developed and distributed to each faculty on service. 2-3 questions were asked per sign out period to assess fund of knowledge. The data was used as a basis for constructive feedback utilizing the SFED (Self-awareness, Feedback, Encouragement, Direction) model at the end of each sign out session.

Results: The pilot study involved 2 residents and 1 fellow on the breast and thoracic service. Both residents and faculty reported increased satisfaction with resident teaching at sign out. There was increased satisfaction with objective measures of resident diagnostic skills. Faculty appreciated having standardized questions with answers to aid in resident teaching and assessment of medical knowledge. These assessments served as a basis for quality feedback that promoted resident self-awareness of positive attributes and deficiencies that could be improved. The monitoring of this process by program leadership ensured that assessment and feedback were standardized throughout the program. Long term effects such as in-service exam scores and board pass rates cannot be evaluated in this pilot study.

Table 1: Mobile-device-based structured evaluation tool (SET)

Scoring Instructions: 1. Major disagreement is any false positive or false negative and or any diagnosis that results in a therapeutic difference, e.g., benign vs malignant, missed positive margin, etc. If agree with attending = 1, if disagree =0.   2. Minor disagreement is any error that does not effect patient management, e.g., missed LVI. If no disagreement in other histologic features = 1, if disagreement in one or more histologic features = 0. This is not scored for all cases, more appropriate for large specimens. 3. Management implication is scored 1 if no therapeutic consequent, 0 if therapeutic consequence. 4. Feedback: Score 1 if given; 0 if not. 5. Structured Questions: Score 1 if asked; 0 if not.

Subspecialty: Breast		Rotation:		Resident:		

Did you receive introduction at the beginning of rotation: Y/N

Date	Attending	Accession#	Major Agreement (0/1)	Minor Agreement (0/1)	Management implication (0/1)	Feedback (SFED) (0/1)	Structured Questions (0/1)
Correct percentage (%)			=AVERAGE(D5:D20)	=AVERAGE(E5:E20)	=AVERAGE(F5:F20)	=AVERAGE(G5:G20)	=AVERAGE(H5:H20)

Conclusions: The SST is an effective method for measuring diagnostic skill and medical knowledge. It promotes standardized teaching, timely feedback and resident self-awareness of areas that need improvement. Residents and faculty reported positive experience with this method (SST).