

**Workplace-Based Assessment of Residents' Performance
of Intra-Operative Pathology Consultations**

BY

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THESIS

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This thesis is dedicated to my wife, Gabriela Machado Pereira Gomes (“minha estrela”), and to our kids, Mateus e Flora. Without their love, support and understanding it would have never been accomplished.

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LIST OF ABBREVIATIONS

| | |
|---------|---|
| ACGME | Accreditation Council for Graduate Medical Education |
| CBD | Competency By Design |
| CBME | Competency Based Medical Education |
| EPA | Entrustable Professional Activity |
| EPA-IC | Entrustment-Aligned Pathology Assessment Instrument for Intraoperative Consultations |
| IRB | Institutional Review Board |
| NAS | Next Accreditation System |
| O-SCORE | Ottawa Surgical Competency Operating Room Evaluation |
| PGME | Postgraduate Medical Education |
| PGY | Postgraduate Year |
| RCPSC | Royal College of Physicians and Surgeons of Canada |
| WBA | Workplace-Based Assessment |

SUMMARY

In this study we have developed and piloted the use of a new assessment instrument to evaluate residents' performance of intraoperative consultations in an anatomical pathology residency program. Modern unified validity theory was used as a framework to guide the assessment development process and to conduct a validity investigation. Ninety assessments using the instrument were completed by 23 supervisors while observing 13 residents performing intraoperative consultations over a period of 12 months. A psychometric analysis of the tool was performed and focus groups were conducted with residents and supervisors.

The content was considered appropriate, and the assessment was feasible and acceptable to residents and supervisors. The assessment results had low reliability and numerous sources of rater bias were identified. Some of these biases seemed to be deeply embedded in the culture of pathology. The implementation of the new assessment had a positive educational impact, by making explicit the necessary steps to successfully perform intraoperative consultations, and by increasing the direct observation of learners as well as the quantity and quality of feedback given to learners by supervisors.

I. INTRODUCTION

Competency-based medical education (CBME) has prompted a paradigmatic shift in medical education in Canada and in the United States (1,2). Competence by Design (CBD) is the multi-year project of the Royal College of Physicians and Surgeons of Canada (RCPSC) for the full implementation of CBME across the medical specialties (3). In the United States, the analogous Next Accreditation System (NAS) was initiated by the Accreditation Council for Graduate Medical Education (ACGME) in 2012 for the operationalization of CBME (4).

CBME differs from traditional time-based models of learning, where a fixed time period is designated for training; in CBME, residency training is designed around targeted competencies typically toward readiness for unsupervised practice and may include entrustable professional activities (EPAs) as workplace “units of assessment” (5,6). Assessment of competencies is considered a cornerstone for CBME to achieve its promise of better and safer health care outcomes (7-11). Therefore, well-designed workplace-based assessment (WBA) tools will be required to document the competence of trainees in an authentic clinical environment (12,13).

Assessment in pathology is typically performed using end-of-rotation evaluations, which are not direct observations of a specific performance, but rather reflect sustained and long-term observations (including indirect observations) of multiple facets of learning over time. Therefore, they may not directly reflect the ability to perform the required EPAs, which is a requirement of CBME. There are a number of WBA instruments available for assessing specific clinical tasks using a variety of rating scales, including the Mini-CEX and the Objective Structured Assessment of Technical Skills (OSATS), among others (14-18). Validity studies have shown that these tools perform better when they use construct-aligned rating scales (19-21). With the operationalization of postgraduate training through EPAs (5,6,22), Crossley argued that the

construct that is being assessed is ‘entrustability’ and demonstrated that entrustment-aligned scales increase reliability and generalizability of the educational measurement of clinical encounters (20,21). Similar results were noted in the assessment of procedural skills in the operating room (23) and bronchoscopy (24), and Rekman et al. proposed that entrustability scales should be used for competency-based clinical assessment (25).

Assessment is domain specific, and a focused literature review revealed no pathology-focused assessment instrument with demonstrated validity evidence. Therefore, we developed a workplace-based assessment instrument using an entrustment-aligned rating scale to assess trainees’ performance of intraoperative pathology consultations, a prototypical anatomical pathology EPA with progressive entrustment of trainees. We used modern unified validity theory as a framework to guide the assessment development process and gather validity evidence, thereby providing inference on the use and interpretation of WBA scores targeting entrustability of intraoperative pathology consultations (26-27).

II. METHODS

The entrustment-aligned pathology assessment instrument for intraoperative consultations (EPA-IC) was developed in 2015 and introduced at Western University's Anatomical Pathology training program in 2016 (Appendix A). It was used by clinical supervisors as part of the regular formative WBA of PGY-2 to PGY-5 residents' performance of intraoperative consultations (PGY-1s do not participate on intraoperative consultations at this residency program). Data was collected between May 30, 2016, and June 06, 2017.

A. Ethics

Institutional Review Board (IRB) approval was obtained from the Ottawa Health Science Network – Research Ethics Board, the Western University Health Science Research Ethics Board, and the Office for the Protection of Research Subjects of the University of Illinois at Chicago.

B. Sources of Validity Evidence

Validity is an essential aspect of assessment; it is defined as the extent to which an assessment accurately measures what it is intended to measure. In validity theory, one gathers evidence that supports a particular interpretation of the results of an assessment tool. These sources of evidence have been grouped into five categories, as proposed by Messick: 1) content evidence is related to how the items on a tool were developed; 2) response process evidence is related to whether raters and learners understand the task and are using the tool as expected; 3) internal structure evidence is related to the psychometric properties of the assessment tool; 4) relations to other variables evidence is the degree that the results of an assessment tool are related to other

variables in expected ways; and 5) consequential evidence is related to impact the assessment tool will have, particularly on learners (26,28,29).

1. Content

A pathologist with 17 years of independent practice and special interest in medical education considered the key features of intra-operative consultations, reviewed the literature related to best-practices of intra-operative consultations (30,31), and reviewed the Ottawa Surgical Competency Operating Room Evaluation (O-SCORE) tool to identify the essential components required in a tool designed to assess resident's performance (23). The O-SCORE is succinct, and the rating anchors are linked to readiness for independent performance of the procedure rather than performance relative to year of training. Intra-operative pathology consultations share some similarities with surgical procedures: They are time sensitive and usually stressful (because the stakes are high), it requires technical skills, and it involves a multidisciplinary team with frequent interpersonal communication of sensitive information and multiple patient handovers.

The instrument was iteratively refined through: 1) Consultation with an assessment expert; 2) University of Ottawa pathologists' and residents' feedback; 3) Feedback from residents and pathologists who attended a national workshop and rated trainee's performance on video recorded simulated scenarios (approximately 60 participants); 4) Canadian pathology experts' and residents' survey feedback on the revised instrument; and 5) Consensus agreement by the authors.

The EPA-IC (Appendix A) was designed as an 11-item-instrument to assess residents' competence performing intra-operative consultations from the case preparation to the post-

procedure plan. In addition to diagnostic interpretation and technical performance, special attention was given to patient safety aspects, including tissue handover, communication and collaboration skills. It included 8 items rated on a 5-point scale, one yes/no question regarding the trainee's readiness to practice independently, and two open-ended questions asking about one specific aspect of the case performed well and one requiring improvement. The rating anchors were based on the rater's judgment of trainee's required supervision and support level, as it relates to the entrustment of the trainee while performing the intraoperative consultation, and ranged 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).

The focus groups also explored participants' experiences with the EPA-IC, its content, and the specific items that were assessed.

2. Response Process

During the academic year of 2016-2017, residents covering intraoperative consultations had their performance assessed by clinical supervisors using the EPA-IC. The new assessment instrument was presented to supervisors and residents in a 90-minute workshop. There was no frame-of-reference rater training because raters were reporting on their own behavior.

Assessment was planned to take place immediately after the first intraoperative consultation of the day, initiated by the resident, using paper forms, and with immediate face-to-face feedback by the supervisor. Residents were responsible to send EPA-IC forms to the program coordinator for documentation in their academic files. The program coordinator anonymized the forms and sent them to the research assistant who entered the data in an excel spreadsheet. Descriptive

statistics were conducted to provide information about individual items' performance, and focus groups with residents and raters were conducted to explore format familiarity, sources of biases and potential solutions to poorly performing items and biases.

For the focus groups, all residents and supervisors were invited, and those who agreed to and were available to participate in the focus groups were included. The questionnaires were designed to clarify some results of the pilot study (Appendices B&C) and explore aspects related to the use of the instrument, particularly the response process and consequences of assessment. The focus group discussions were audio recorded and the anonymized transcriptions were coded by two authors. Final codes were decided by consensus, described in a codebook, and iteratively applied to the transcripts (Appendix D). Emergent themes were recorded and iteratively interpreted by the authors.

3. Internal Structure

A psychometric analysis of the tool was performed to evaluate its internal structure. Descriptive statistics, inter-item and item-total correlations were analyzed. A generalizability study was performed to assess the reliability of the educational measurements. This model also determines how different variables contributed to the variability of the ratings, with the variance attributed to each variable expressed as a percentage of the overall variability in the ratings. Variance components were estimated using urGENOVA (Iowa City, IA). Statistical analysis was performed using SPSS.

4. Relations to Other Variables

Resident's performance was compared to their year of training, which provides known-group validity evidence as relations to other variables. We determined the average rating across the scaled-response items to create a total procedure score for each trainee per procedure. We used total procedure scores in a series of factorial ANOVAs to study the effect of PGY level and whether residents were deemed ready to perform the procedure independently.

5. Consequences

Aspects related to the acceptability of the assessment by residents and supervisors were explored in the focus groups. An inductive thematic analysis was conducted to understand the impact of the EPA-IC on workload, workflow, and resident's performance.

III. RESULTS

A total of 90 assessments were completed by 23 supervisors while observing 13 residents performing intraoperative consultations over a period of 12 months. Some items had missing data so 17 incomplete observations were excluded to keep a balanced design for analysis, leaving 73 complete observations of 12 residents (PGY2=5, PGY3=1, PGY4=4, PGY5=2; average 6.08 forms per resident; standard deviation 4.43, range = 1–17).

Sixteen participants accepted the invitation to participate in the focus groups and three groups were organized: two focus groups with supervisors (n=10; 5 male) and one focus group with residents (n=6; all male).

A. Content

Residents and supervisors commented that the EPA-IC included important components of intra-operative consultations and served as a checklist for “best-practices” and assessment. However, items 2 (case preparation) and 7 (efficiency and flow) were missing a substantial number of ratings, which raised the possibility that some of the content of the EPA-IC is not representative of residents’ performance of intra-operative consultations or cannot be assessed by the supervisors for a number of different reasons. Some supervisors commented that the tasks under “case preparation” are usually performed by a technologist, as a delegated medical act, and it is not a pathologist task. On the other hand, residents perceived value in performing those tasks for their own learning and for increasing the safety of the procedure. Regarding “efficiency and flow”, the focus group data indicated that the main issues were related to the response process (see below).

B. Response Process

A number of potential sources of rater and selection bias were identified in the focus group data analysis. Rater biases are an important component of the response process because raters might not be responding to assessment prompts as expected, and these include halo effect, buddy bias, incompetence bias and leniency bias, among others. Table I provides a summary of different types of rater bias (32). Selection biases might also inflate or deflate ratings depending on the underlying reasons.

| TABLE I. DESCRIPTION OF DIFFERENT TYPES OF RATER BIAS ^a | |
|--|--|
| Type of Rater Bias | Description |
| Halo effect | A single score in a rating scale is awarded, which is designed to reflect the overall quality of the performance. |
| Extreme response bias | The respondents may mark the extreme anchors rather than those in between, which can be due to other biases (see below). |
| Leniency-stringency bias | Some raters tend to be more lenient, while others are more stringent, which is usually related to personality traits. |
| Incompetence bias | The rater tendency to assign high ratings because of his/her lack of confidence or competence in rating the behavior. This occurs when raters are incompetent on the tasks being rated, because they do not want to penalize the person being rated for his or her own shortcomings. |
| Buddy bias | The degree of acquaintance between supervisor and trainee might increase ratings because of social aspects. |
| Back-scratching bias | A faculty member gives high ratings to residents on the assumption that the resident will be less likely to give them a low rating (fear of retribution). |

^a Adapted from Berck RA (32).

An important aspect emerging from the data was the excessive focus on “diagnostic interpretation” to the potential detriment of other aspects. This was associated with some biases, particularly the halo effect, in which different items were given less importance and scored equally together:

“I was saying because some of those are a package together, all of them except the diagnostic, they actually work together. So if you are efficient with good turnaround times, you know what you're doing and how you handle the specimen, right? ... if you're bad in one, you're going to be bad in everything, right? I think so. Except the diagnostic [interpretation], which has multiple parts in it.” – Supervisor

“Case preparation” and “efficiency and flow” were missing a number of ratings, and a number of biases identified by supervisors and residents were directly related to these items. These biases were usually related to the inability of the supervisor to assess these items, which resulted in overrating as a way not to be unfair to the learner (so-called incompetence bias):

“To be honest, it's because often they[supervisors] don't check either. I think realistically if they're not going to check their agents and they don't see it as an important thing, they're not going to ask the residents if they've done it right ...” – Resident

Interestingly, “efficiency and flow” was perceived by some supervisors as a personal trait, not as an ability that can be assessed and developed by the learner through training and coaching:

“And then for the efficiency and flow, that could be a bit personal because it might be something to do with a relative ability or disability for an individual. And if they were a little bit slow for a variety of reasons or just inefficient for a variety of reasons, maybe that just seem a bit personal to be sort of remarking, ‘Boy, you were kind of slow’.” – Supervisor

Leniency and buddy biases were overtly admitted by supervisors and perceived by residents. These biases frequently overlap and, for some supervisors, seem to be embedded in the culture of pathology. Supervisors admittedly did not follow the instructions and sometimes did not fill out the EPA-IC when the resident had a poor performance on the first intra-operative

consultation of the day. Others raised the possibility that residents might be self-selecting their better performances or performing differently when they know they are being assessed (so-called “staged performance”). These selection biases added to the inadvertently introduced selection bias of assessing residents’ performance on the first intra-operative consultation of the day, which also seem to have inflated the ratings:

“Actually the first is often not a difficult one. It’s usually a margin or something. Sometimes more difficult ones come later in the day.” – Supervisor

Additionally, some supervisors were not familiar with the format of the instrument and the rating scale, and stated that they were assessing residents in relation to their year of training (norm-referencing) rather than in relation to the entrustment that actually happened (criterion-referencing) as the rating scale proposed. On the other hand, some supervisors and residents described the entrustment-aligned rating scale as more accurate, behavior-based, and less judgmental.

We also investigated whether the tasks being performed were too easy, even for junior learners. Supervisors unanimously agreed that residents are not ready for performing intra-operative consultations independently before PGY-4 or PGY-5, and once again reinforced that “diagnostic interpretation” is the skill that is ultimately being assessed.

C. Internal Structure

Mean item ratings (item difficulty) ranged from 4.41 to 4.89, but most of the items had some “1” and “2” scores assigned. The item-total correlations (item discrimination) ranged from 0.69 to 0.78, suggesting that items were able to differentiate between high and low performing trainees, but some of the items were producing similar ratings (table II). The analysis of inter-

item correlations showed that “surgery-pathology contract/handover” and “efficiency and flow” were highly correlated (0.83).

TABLE II. DESCRIPTIVE STATISTICS FOR THE ENTRUSTMENT-BASED PATHOLOGY ASSESSMENT OF INTRA-OPERATIVE CONSULTATIONS

| Item | Rating | | Range | | Item-total |
|-----------------------------|--------|------|-------|-----|-------------|
| | Mean | SD | Min | Max | Correlation |
| Pre-procedure plan | 4.78 | 0.58 | 2 | 5 | 0.71 |
| Case preparation | 4.75 | 0.80 | 1 | 5 | 0.72 |
| Surgery-pathology handover | 4.77 | 0.68 | 1 | 5 | 0.78 |
| Technical performance | 4.58 | 0.88 | 1 | 5 | 0.72 |
| Diagnostic interpretation | 4.41 | 0.98 | 1 | 5 | 0.77 |
| Post-procedure plan | 4.71 | 0.63 | 2 | 5 | 0.78 |
| Efficiency and flow | 4.84 | 0.50 | 2 | 5 | 0.77 |
| Communication/Collaboration | 4.89 | 0.36 | 3 | 5 | 0.69 |

A total score was generated by taking the average of the 8 items. The mean score and standard deviation of the evaluations was 4.72 ± 0.55 . For the yes/no item that asked about the trainee’s readiness to safely perform the procedure independently, the distribution of scores was roughly equal: 56 (77%) of the 73 procedures or observations were marked as “yes” and 17 (23%) were marked as “no”.

Table III displays the variance components of the different factors. Residents accounted for 5% of total variance. Forms within resident accounted for the most variance (48%), which

indicates that there was variability within any resident as a function of the cases that they handled. Similar to the items analysis above, factors involving items accounted for low variability in the scores, indicating that the ratings of different items were similar, overall and within any resident. The reliability of the performance assessment (G-coefficient) using this rating scale with an average of 6.08 observations/resident was 0.41. It is also possible to derive a generalizability coefficient that corresponds to the internal consistency of the scale. The resulting coefficient is .91 and supports the observation that the item ratings are similar.

TABLE III. RESULTS OF G-STUDY: VARIANCE COMPONENTS OF THE DIFFERENT FACTORS

| facet | variance | % variance | variance associated differences |
|----------------|----------|------------|--|
| p ^a | .032 | 5 | between residents |
| f:p | .281 | 48 | between forms any given resident received |
| i | .026 | 5 | between items |
| pi | .003 | 0 | residents getting different ratings on the items |
| fi:p | .243 | 42 | due to the interaction of all 3 factors plus overall error |

^ap= resident, f=forms, i = items.

$$G (\text{overall}) = (\text{var}(p) + \text{var}(pi)/ni) / (\text{var}(p) + \text{var}(pi)/ni) + \text{var}(f:p)/nf + \text{var}(fi:p)/nfni = .41$$

$$G (\text{internal consistency}) = \text{var}(p) + \text{var}(f:p) / (\text{var}(p) + \text{var}(f:p) + \text{var}(pi)/ni + \text{var}(fi:p)/ni) = .91$$

We explored potential reasons for the high and similar ratings given to different items and learners. In order to determine whether learner's maturation could have played a role, we did

a chronological analysis of the scores of 3 PGY-2 trainees who had multiple assessments. Figure 1 shows that even PGY-2s consistently had high scores of “4” or “5” since their first assessment, except for one PGY-2 who had a steep and short developmental trajectory with increasing scores from left to right.

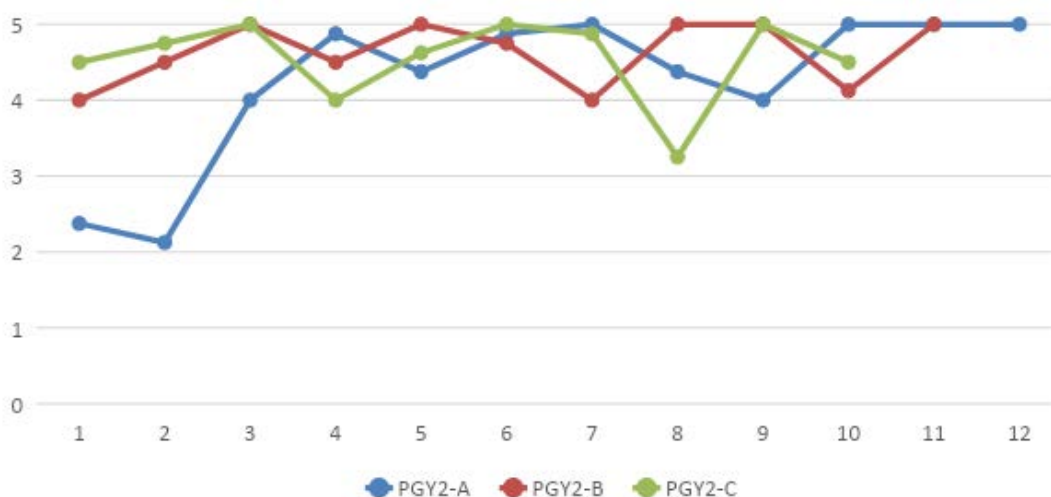


Figure 1. Overall scores of PGY2 residents' performance of intra-operative consultations in chronological order. Note the consistent high scores, except for resident A who had a steep and short developmental trajectory with increasing scores from left to right.

D. Relations to Other Variables

The mean score by year of training are summarized in Table IV. A between-subject ANOVA with PGY level as a between-subject factor showed a significant effect of PGY year [$F(3,69) = 5.627, p=.002, \text{partial eta square} = .20$]. The post hoc t-test (bonferroni) showed that ratings for PGY2 were lower than all others, PGY3 ($p=.008$) and PGY4 ($p=.04$). There was no

significant difference between scores for PGY-3, 4, and 5. However, there was only one PGY3 in the cohort, which might have skewed the data if the PGY3 was a high performer among PGY3s (and which happened to be the case as confirmed in our focus groups).

TABLE IV. OVERALL PERFORMANCE ACCORDING TO PGME YEAR OF TRAINING

| PGY ^a | Mean | SD | N |
|------------------|------|------|----|
| 2 | 4.46 | 0.70 | 35 |
| 3 | 4.96 | 0.09 | 17 |
| 4 | 4.99 | 0.04 | 9 |
| 5 | 4.90 | 0.27 | 12 |
| Total | 4.71 | 0.55 | 73 |

^a Postgraduate Year of Training.

The last question asked a global yes/no rating if the trainees could perform independently. The correlation between mean scores and whether the trainee could perform independently showed moderately high association, $r = .62, p < .001$. Table V shows the frequency of “yes” and “no” responses by PGY level. The overall pattern was that increases in PGY level leads to more “yes” responses on this item. Interestingly, the PGY2s and the PGY3 were not rated as 'ready for independent practice' even when their ratings were '5' or close to it, in agreement with the supervisors' 'gestalt' that residents are not ready before PGY4-5.

TABLE V. SAFETY TO PERFORM PROCEDURE INDEPENDENTLY ACCORDING TO POSTGRADUATE YEAR OF TRAINING

| | | Postgraduate Year | | | | Total |
|---|-----|-------------------|----|---|----|-------|
| | | 2 | 3 | 4 | 5 | |
| Resident is able to safely perform this procedure independently | No | 16 | 1 | 0 | 0 | 17 |
| | Yes | 19 | 16 | 9 | 12 | 56 |
| Total | | 35 | 17 | 9 | 12 | 73 |

E. Consequences

Residents and supervisors accepted and welcomed the implementation of the EPA-IC.

Two themes related to consequences emerged from our inductive thematic analysis.

1. Outcomes of Assessment

1.a. Practice

Residents and supervisors did not perceive any significant impact on workload. A couple of supervisors thought that there was some impact on the workflow and/or an increased cognitive load while performing intra-operative consultations, but highlighted that the benefits were worth the effort. Many residents commented on the positive impact that the implementation of the EPA-IC had on their learning and practice, including becoming more deliberate in following a stepwise approach to intra-operative consultations:

“I know I became much more systematic about the frozen sections because we’re being evaluated on different components of it so it’s not only just to screen the OR list the day before, but when you go in, you look at the room, you do all your checks for quality

and for pre-analytics to make sure the room's prepared, everything's set. It really kind of pushed residents to play a much more active role in the procedure..." – Resident

While many did not see any impact on the overall performance of intra-operative consultations, some residents and supervisors perceived an increase on the safety of the procedure as a consequence of the use of the EPA-IC as a checklist.

1.b. Instruction

The participants were unanimous to say that there were changes to the coaching process in the workplace. Residents noticed increased observation of their performance and increased quantity and quality of feedback by supervisors. Interestingly, some supervisors said that the changes were mainly to the observation while others perceived more changes to the feedback:

"And I think it helps assess other parts of the process that normally we gloss over. Like, at least one thinks it's a given that they should have looked up the history and everything, and one focuses more on the interpretation of the actual gross or frozen section slide. And this kind of incorporates all the steps and itemizes things. And so you kind of get a better perception of the different steps of the process." - Supervisor

And...

"But I do find that, although maybe you're not observing things differently, you're delivering feedback to them a lot differently. Because they're getting it broken down what they did well and what they can improve on." – Supervisor

In general, the narrative comments written for items 10 and 11 of the EPA-IC were of poor quality. The majority of comments was not specific or behavior-based, did not validate or qualify positive aspects, and did not contain actionable feedback. In the focus groups, some supervisors commented on their inability to write narrative comments, while others did not want to document poor performance or improvement suggestions that could be perceived as criticism.

2. Entrustment of Trainees

Residents and supervisors did not notice significant changes to the entrustment of trainees after implementation of the assessment. They commented on different aspects of entrustment, including factors related to the context, task, supervisor and resident, but there was no comment about the relationship between the supervisor and the resident. For instance, there were many comments on how entrustment varied according to the difficulty and complexity of intra-operative consultations, as well as how entrustment varied according to resident seniority.

The entrustment process seems to be deeply embedded in the culture of pathology and the identity of pathologists. Although residents are fully entrusted to perform some tasks of intra-operative consultations independently, diagnostic interpretation and the communication of the diagnosis to the surgeon are perceived as more challenging, and there is open reluctance to ever fully entrust a trainee to make a diagnosis on their own:

“So, we usually let the resident call the OR when it’s like straight forward. But when it becomes kind of tricky, you need some real communication, it would be the pathologist who will call. Usually when it’s like a grey zone, I don’t know what’s that, the situation needs real communication skills, usually we don’t let the resident call the OR.” – Supervisor

Sometimes, this reluctance has roots in the relational identity of pathologists. In other words, the expectations of the surgeons towards pathologists. Interestingly, it is perceived by supervisors that this reluctance to fully entrust trainees while in training could have an important negative impact on trainees and society:

“And, you know, we have two PGY5s now who passed their exams and they’re still not going out on their own, right? They have a pathologist there to backup but we still never send them, right? Next week they could start practicing in the community and calling the frozens but we don’t. And I think this tool could help, once they met the competencies and they’ve written their exam. We should be doing that before we phase them out to the world.” - Supervisor

IV. DISCUSSION

With the implementation of CBME underway in multiple jurisdictions and specialties, well-designed workplace-based assessment instruments are needed to obtain a valid assessment of trainees' performance on different EPAs. This study describes the development and the supporting validity evidence for assessing the performance of anatomical pathology trainees in the workplace while performing intraoperative consultations, a prototypical pathology EPA, using modern validity theory. We analyzed the results according to the different sources of validity and common threats to validity.

1. Content

The construct being assessed in this study is the resident's performance of intra-operative consultations. Therefore, the items in the instrument need to reflect this ability accurately and completely. The intra-operative consultation literature largely focuses on diagnostic accuracy and microscopic interpretation, and best-practices studies are restricted to expert-opinion, which were considered in the EPA-IC design (30,31). Intra-operative consultations are one of the ACGME patient care sub-competencies and the EPA-IC items reflect many competencies included in the ACGME milestones (33,34). The design of our instrument incorporated the feedback of pathology residents and supervisors, and assessment experts. The pilot study revealed one potential irrelevant item (case preparation) that is not considered a pathologist's task by supervisors.

2. Response Process

A number of rater and selection biases were identified in our study, in large part due to a 'lenient culture'. Also, some supervisors had the tendency to use the rating scale to judge performance against the level of training - as a norm-referenced Likert scale - instead of judging performance against the absolute standard of the entrustment decision that actually took place.

Physicians have historically put excessive emphasis on medical knowledge and expertise, which was in part responsible for unsafe practices that led to the development of the ACGME and RCPSC competency frameworks. In that sense, pathologists have excessively focused on diagnostic interpretation and paid less attention to other tasks that are essential to perform safe intra-operative consultations (so called soft skills, or intrinsic roles). Pathologists might attribute high ratings to these "soft skills" because they are not aware of them and do not feel confident or competent to rate them (so-called incompetence bias). Interestingly, diagnostic interpretation was the item with the lowest score and highest standard deviation, indicating that pathologists were more willing to give lower marks. This 'diagnostic supremacy' along with the other rating issues indicate that raters and learners did not understand the task well, and were not using the tool as expected or responding accurately to the assessment prompts.

In our study, we did not conduct rater training. Previous studies using entrustment-aligned rating scales suggested that they are intuitive enough for expert practitioners to use, which would preclude the need for rater training. The criterion-based standard used is the ability to perform the tasks independently, and, in theory, experienced practitioners should be able to judge it. However, it seems that supervisors were not aware of many of the tasks that they needed to observe and evaluate. In other words, the standard was not set as initially hypothesized, and rater training would have been helpful.

The issues discussed above indicate construct-irrelevant variance, or systematic error that is not related to the actual construct that is being assessed, which is one of the main sources of validity threats (table VI) (35).

TABLE VI. THREATS TO VALIDITY IN ASSESSMENT

| | |
|-------------------------------------|--|
| Construct-irrelevant variance (CIV) | The variation in scores is due to something unrelated to the construct intended to be measured. For instance, if raters are considering the resident's year of training when judging their performance, it could alter the score in a way unrelated to their ability to perform intra-operative consultations. |
| Construct underrepresentation (CU) | Only part of the construct intended to be measured is actually being measured. For instance, if the ability to communicate results to surgeons is not assessed, the score would not capture all the aspects related to the ability to perform intraoperative consultations. |

3. Internal Structure

Our results show that the residents' ratings were similar and quite high, even for junior trainees. These results are surprising, given that intra-operative consultations are regarded as a complex and stressful diagnostic task of anatomical pathologists. The restricted range in performance between residents is the main reason for the low reliability of the educational measurements. A number of possible explanations need to be considered. The number of evaluations per resident and the number of residents per group is low, which contributes to undersampling (35). Based on supervisors' opinion, it does not seem that the tasks that are being evaluated are so basic that even residents at PGY2 level are capable of performing them well.

However, it might be that the ability that actually discriminates resident's performance is not being properly measured, which would correspond to construct underrepresentation. For instance, a majority of items could be easy to learn and not have a developmental trajectory, while others might be very complex, with the easy components lifting up the global ratings. Maturation did not seem to play a role, with PGY2s getting high scores since the beginning of the academic year (and they are not exposed to intra-operative consultations during PGY1). This lack of discrimination is more likely explained by a combination of rater and selection biases, and lack of rater training, as discussed above.

The different items are highly correlated with each other, which indicate that they are measuring the same construct from a psychometric standpoint. High inter-item correlation could be secondary to the high ratings observed for all items, and potentially a consequence of the different biases previously discussed. Alternatively, it could be that items are worded in a way that they are capturing similar information or they are not capturing the discriminating aspects of trainee's performance on the different tasks. Given the fact that completely distinct tasks that require different skill sets were rated the same way, the latter explanation is less likely.

The high item correlations also suggest that the scale could be reduced to one item from a psychometric standpoint. But in doing so, the opportunity to provide specific feedback would be lost. Given that the main purpose of this assessment is formative, keeping the better performing items would make sense.

The lack of reliability is a threat to validity. Even though the main purpose of WBA is formative, the inability to discriminate good and bad performance might prevent the diagnosis of learners' needs, limit the opportunities for coaching feedback, and fail to document the

developmental growth of learner's competence. Therefore, this issue needs to be addressed in future studies.

4. Relations to Other Variables

PGY2s had lower ratings than PGY3-5 residents and were less frequently considered ready for independent practice. However, the difference in ratings was of small magnitude.

Although the supervisors' opinions suggest that residents only achieve readiness for independent practice by PGY4-5, the single PGY3 in the study had similar overall ratings to the seniors. Nevertheless, the PGY3 could happen to be an odd high-performer and which might have skewed the results and does not allow us to make any conclusion.

The fact that PGY2s and the PGY3 were not rated as 'ready for independent practice' even when their ratings were high might be because a critical item (such as diagnostic interpretation) does not mature until later, but also might suggest that faculty are actually basing their decision more heavily on trainee level rather than their observed performance.

5. Consequences

The implementation of the EPA-IC had an important impact on residents' learning. It increased direct observation and the amount of feedback, and made it more specific. The new assessment was well accepted by residents and supervisors, with a few of them reporting improvement in the practice of intra-operative consultations. Since the main purpose of WBA is to provide frequent, specific and actionable feedback to learners so that they can progress in their developmental trajectory towards readiness for independent practice, these results remain a strong argument for the validity of the EPA-IC.

No significant changes were noted in the entrustment process, which seems to be limited by cultural norms. Diagnostic accuracy is an important part of the pathologist's identity and supervisors are reluctant to fully entrust a trainee to do it independently. However, these cultural norms, particularly those that relate to the communication with surgeons, need to be addressed because they might have a negative impact on patient safety as residents transition to independent practice.

6. Limitations and Next Steps

This study has some limitations, including the low sample size, the low number of residents per group (post-graduate years), and the variation in the number of assessments per resident with many residents having a single assessment. All these aspects limit the interpretation of the psychometric analysis. Also, the study was done in a single residency program, and variations in contexts and practices could not be investigated. As suggested by our qualitative data, culture and identity play an important role in multiple aspects of assessment; therefore, results cannot be generalized to other countries or even other residency programs in Canada.

Efforts are underway to address some of the threats to validity that were identified in our pilot study. The instrument and its items need to be revised according to our initial findings, the sample size needs to be increased, frame-of-reference rater training needs to be offered, and other institutions need to be involved.

V. CONCLUSION

We conducted a pilot study using a newly developed workplace-based assessment instrument for assessing residents' performance of intra-operative pathology consultations and we presented the validity evidence that supports the use of the results of assessment. The content is appropriate, the assessment is acceptable to residents and supervisors, feasible, and it had a positive educational impact of making explicit the necessary steps to successfully perform the EPA, as well as increasing observation of and feedback to learners. The low reliability of the results is the main threat to validity and seems to be related to response process issues. Given the low stakes and formative nature of WBA, the educational impact on learners should be emphasized by faculty development activities that focus on coaching strategies, and valuing narrative comments over rates. Future studies will address the threats to validity identified. However, since some of the threats seem to be deeply embedded in the culture of medicine and pathology, one should not expect to see rapid changes and should approach WBA and CBME implementation through a quality improvement lens: with formative rather than summative purposes.

REFERENCES

1. Carraccio C, Wolfsthal SD, Englander R, Ferentz K, Martin C. Shifting paradigms: from Flexner to competencies. *Acad Med*. 2002 May;77(5):361-7.
2. Albanese MA, Mejjicano G, Mullan P, Kokotailo P, Gruppen L. Defining characteristics of educational competencies. *Med Educ*. 2008 Mar;42(3):248-55.
3. RCSPC. Competence by Design: Reshaping Canadian Medical Education – eBook, March 2014.
http://www.royalcollege.ca/portal/page/portal/rc/common/documents/educational_initiatives/rc_competency-by-design_ebook_e.pdf. Accessed October 1, 2019.
4. The Milestones Guidebook - The Accreditation Council for Graduate Medical Education
<https://www.acgme.org/Portals/0/MilestonesGuidebook.pdf?ver=2016-05-31-113245-103>
Accessed October 1, 2019.
5. ten Cate O, Scheele F. Competency-based postgraduate training: can we bridge the gap between theory and clinical practice? *Acad Med*. 2007 Jun;82(6):542-7.
6. ten Cate O, Snell L, Carraccio C. Medical competence: the interplay between individual ability and the health care environment. *Med Teach*. 2010;32(8):669-75.
7. Boateng BA, Bass LD, Blaszak RT, Farrar HC. The development of a competency-based assessment rubric to measure resident milestones. *J Grad Med Educ*. 2009 Sep;1(1):45-8.
8. Holmboe ES, Sherbino J, Long DM, Swing SR, Frank JR. The role of assessment in competency-based medical education. *Med Teach*. 2010;32(8):676-82.
9. Frenk J, Chen L, Bhutta ZA, Cohen J, Crisp N, Evans T, Fineberg H, Garcia P, Ke Y, Kelley P, Kistnasamy B, Meleis A, Naylor D, Pablos-Mendez A, Reddy S, Scrimshaw S, Sepulveda J, Serwadda D, Zurayk H. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. *Lancet*. 2010 Dec 4;376(9756):1923-58.
10. Schuwirth L, Ash J. Assessing tomorrow's learners: in competency-based education only a radically different holistic method of assessment will work. Six things we could forget. *Med Teach*. 2013 Jul;35(7):555-9.
11. Hauer KE, Vandergrift J, Hess B, Lipner RS, Holmboe ES, Hood S, Iobst W, Hamstra SJ, McDonald FS. Correlations Between Ratings on the Resident Annual Evaluation Summary and the Internal Medicine Milestones and Association with ABIM Certification Examination Scores Among US Internal Medicine Residents, 2013-2014. *JAMA*. 2016 Dec 6;316(21):2253-2262.
12. Miller GE. The assessment of clinical skills/competence/performance. *Acad Med*. 1990 Sep;65(9 Suppl):S63-7.

13. Crossley J, Jolly B. Making sense of work-based assessment: ask the right questions, in the right way, about the right things, of the right people. *Med Educ.* 2012 Jan;46(1):28-37.
14. Norcini JJ, Blank LL, Arnold GK, Kimball HR. The mini-CEX (clinical evaluation exercise): A preliminary investigation. *Ann Intern Med.* 1995;123:795–799.
15. Holmboe ES, Huot S, Chung J, Norcini J, Hawkins RE. Construct validity of the mini-clinical evaluation exercise (miniCEX). *Acad Med.* 2003;78:826–830.
16. Martin JA, Regehr G, Reznick R, et al. Objective structured assessment of technical skill (OSATS) for surgical residents. *Br J Surg.* 1997;84:273–278.
17. Vassiliou MC, Feldman LS, Andrew CG, et al. A global assessment tool for evaluation of intraoperative laparoscopic skills. *Am J Surg.* 2005;190:107–113.
18. Doyle JD, Webber EM, Sidhu RS. A universal global rating scale for the evaluation of technical skills in the operating room. *Am J Surg.* 2007;193:551–555.
19. Landy, Frank J., and James L. Farr. "Performance rating." *Psychological Bulletin* 87.1 (1980): 72.
20. Crossley J, Johnson G, Booth J, Wade W. Good questions, good answers: construct alignment improves the performance of workplace-based assessment scales. *Med Educ.* 2011 Jun;45(6):560-9.
21. Crossley J. Validity and truth in assessment. *Med Educ.* 2013 Dec;47(12):1152-4.
22. Ten Cate O, Hart D, Ankel F, Busari J, Englander R, Glasgow N, Holmboe E, Jobst W, Lovell E, Snell LS, Touchie C, Van Melle E, Wycliffe-Jones K; International Competency-Based Medical Education Collaborators. Entrustment Decision Making in Clinical Training. *Acad Med.* 2016 Feb;91(2):191-8.
23. Gofton WT, Dudek NL, Wood TJ, Balaa F, Hamstra SJ. The Ottawa Surgical Competency Operating Room Evaluation (O-SCORE): a tool to assess surgical competence. *Acad Med.* 2012 Oct;87(10):1401-7.
24. Voduc N, Dudek N, Parker CM, Sharma KB, Wood TJ. Development and Validation of a Bronchoscopy Competence Assessment Tool in a Clinical Setting. *Ann Am Thorac Soc.* 2016 Apr;13(4):495-501.
25. Rekman J, Gofton W, Dudek N, Gofton T, Hamstra SJ. Entrustability Scales: Outlining Their Usefulness for Competency-Based Clinical Assessment. *Acad Med.* 2016 Feb;91(2):186-90.
26. Messick S. Validity. In: Linn RL, editor. *Educational Measurement*, 3rd Ed. New York: American Council on Education and Macmillan; 1989.
27. Kane MT. Current concerns in validity theory. *Journal of educational Measurement.* 2001 Dec;38(4):319-42.

28. Cook DA, Beckman TJ. Current concepts in validity and reliability for psychometric instruments: Theory and application. *Am J Med.* 2006;119:166.e7–166.e16.
29. Pugh D, Hamstra SJ, Wood TJ et al. A procedural skills OSCE: assessing technical and non-technical skills of internal medicine residents. *Adv Health Sci Educ Theory Pract.* 2015 Mar;20(1):85-100.
30. Taxy JB. Frozen section and the surgical pathologist: a point of view. *Arch Pathol Lab Med* 2009;133:1135-8.
31. Lechago J. The frozen section: pathology in the trenches. *Arch Pathol Lab Med.* 2005 Dec;129(12):1529-31.
32. Berck RA. The secret to the “best” ratings from any evaluation scale. *J Fac Dev,* January 2010 (24):1, 37-39.
33. Pathology Milestones - The Accreditation Council for Graduate Medical Education <https://www.acgme.org/Portals/0/PDFs/Milestones/PathologyMilestones.pdf?ver=2019-05-29-124552-550> Accessed October 1, 2019.
34. Pathology Supplemental Guide - The Accreditation Council for Graduate Medical Education. <https://www.acgme.org/Portals/0/PDFs/Milestones/PathologySupplementalGuide.pdf?ver=2019-07-24-112409-690>. Accessed October 1, 2019.
35. Lineberry M. In: Yudkowsky R, Park YS, Downing SM, eds. *Assessment in Health Professions Education.* 2nd Ed. New York, NY: Routledge; 2020:17-32.

APPENDICES

APPENDIX A

Intra-Operative Pathology Consultation Evaluation

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

| | | | Score |
|----|---|---|--------------|
| 1 | Pre-procedure plan | <i>Assesses required clinical/radiological and prior pathological information, understands the intended surgical procedure and impact of pathological diagnosis</i> | |
| 2 | Case preparation | <i>Ensures the frozen section room is ready for use (instruments/fixatives/reagents etc)</i> | |
| 3 | Surgery-pathology contract/handover | <i>Verifies clinical indication for intraoperative consultation, understands surgical approach and determines shared goals of care</i> | |
| 4 | Technical performance | <i>Efficiently performs steps (recording gross features, appropriate representative sections, orientation of tissue, handover to technologist etc) and preserves/prepares the specimen for final assessment</i> | |
| 5 | Diagnostic interpretation | <i>Identify histological abnormalities, integrates clinical-radiological-pathological features, accounts for procedural limitations, provides a safe and accurate diagnosis in a timely fashion</i> | |
| 6 | Post-procedure plan | <i>Documents intraoperative consultation properly and handles/orients tissue appropriately for permanent pathological assessment</i> | |
| 7 | Efficiency and flow | <i>Economy of movement and flow; adequate handling of multiple specimens</i> | |
| 8 | Communication / Collaboration | <i>Professional and effective communication/collaboration with professional team (technologist, surgeon, circulating nurse, pathologist etc)</i> | |
| 9 | Resident is able to safely perform this procedure independently (circle one) <i>(NB: This is a global assessment which does not require a score of 5 on all preceding categories.)</i> | 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

APPENDIX B

Protocol Title: Development of a Workplace Direct Observation Assessment Tool of Technical Skills in Pathology (ID: 7028)

(Note: all iterative qualitative research adapts and changes to best serve the study goals and the particular needs of the participants. Therefore, some changes to the Questionnaire are inevitable during the course of the Focus Group. This template serves as a guideline only).

Semi-Structured Focus Group Questionnaire (Residents)

Thank you for agreeing to participate in our focus group today exploring your experiences with the Entrustment-aligned Pathology Assessment Tool (we will be calling it EPAT for convenience). First of all, please be sure that you have signed your consent form.

Please note that this group is being audio-recorded and will be transcribed professionally prior to analysis. Any names or identifying details that may be mentioned will be removed and only de-identified data will be shared with the study team. In order to respect your colleagues' confidentiality, please refrain from discussing this Focus Group with non-participants. Do you have any questions before we start? If not, let's begin:

1. How was the assessment of resident's performance on intra-operative consultations done on your department before the implementation of the EPAT?

Prompt: Can you describe a typical assessment before the EPAT?

2. As compared to the previous assessment system, what changed with the implementation of the EPAT?

Prompt: Did it affect your daily routine when performing intra-operative consultations? If so, can you give me an example?

APPENDIX B (continued)

3. Did this implementation affect the quality or quantity of direct observation that you receive when you're being supervised performing intra-operative consultations? How so?
4. Did this implementation affect the quality or quantity of the feedback that you receive when you perform intra-operative consultations? How so?

Prompt: Can you give me an example?

Prompt: Was face-to-face feedback more or less common than previously?

Prompt: If you did not see much impact, can you describe why you think feedback remained the same?

5. What items of the assessment tool do you think your staff find harder to assess? Why?

Prompt: Can you give me a specific example of a time when your staff did not address an item on the tool?

Prompt: Was there any item that you felt could not or should not be assessed based on your performance during an intra-operative consultation? Why?

6. Specifically, I'd like to ask you about Items 1 and 7. Item 1 is "case preparation" and Item 7 is "efficiency and flow". They were less frequently rated than the others: why do you think this might be?

Prompt: What kinds of things do you think might contribute to "skipping" items on an assessment tool?

7. The mean rating for the different residents were quite high. Why do you think that happened?

Prompt: What kinds of things do you think might contribute to giving high marks to most residents?

APPENDIX B (continued)

Prompt: Most PGY4s were assessed as ready for independent practice. Do you agree that PGY4s are usually ready to perform intra-operative consultations independently? If not, why do you think they were rated that way?

8. There is not much difference in the rating of the different items. Why do you think that happened?

Prompt: What kinds of things do you think might contribute to giving a similar mark to the different items?

9. In your opinion, what could be the impact on someone's practice with the implementation of the EPAT?

Prompt: Could you describe potential positive impacts? Negative?

10. Is there anything else you'd like to share about your experiences using this tool or any suggestion for improving the tool?

Thank you very much for taking the time to talk with us today.

APPENDIX C

Protocol Title: Development of a Workplace Direct Observation Assessment Tool of Technical Skills in Pathology (ID: 7028)

(Note: all iterative qualitative research adapts and changes to best serve the study goals and the particular needs of the participants. Therefore, some changes to the Questionnaire are inevitable during the course of the Focus Group. This template serves as a guideline only).

Semi-Structured Focus Group Questionnaire (Staff)

Thank you for agreeing to participate in our focus group today exploring your experiences with the Entrustment-aligned Pathology Assessment Tool (we will be calling it EPAT for convenience). First of all, please be sure that you have signed your consent form.

Please note that this group is being audio-recorded and will be transcribed professionally prior to analysis. Any names or identifying details that may be mentioned will be removed and only de-identified data will be shared with the study team. In order to respect your colleagues' confidentiality, please refrain from discussing this Focus Group with non-participants. Do you have any questions before we start? If not, let's begin:

1. How was the assessment of resident's performance on intra-operative consultations done on your department before the implementation of the EPAT?

Prompt: Can you describe a typical assessment before the EPAT?

2. As compared to the previous assessment system, what changed with the implementation of the EPAT?

Prompt: Did it affect your daily routine when performing intra-operative consultations? If so, can you give me an example?

APPENDIX C (continued)

3. Did this implementation affect the quality or quantity of direct observation that you do when you're supervising residents performing intra-operative consultations? How so?
4. Did this implementation affect the quality or quantity of feedback that you give to the residents?

Prompt: Can you give me an example?

Prompt: Was face-to-face feedback more or less common than previously?

Prompt: If you did not see much impact, can you describe why you think feedback remained the same?

5. What items of the assessment tools are harder to assess? Why?

Prompt: Can you give me a specific example of a time when it felt challenging to address an item on the tool?

6. Specifically, I'd like to ask you about Items 1 and 7. Item 1 is "case preparation" and Item 7 is "efficiency and flow". They were less frequently rated than the others: why do you think this might be?

Prompt: What kinds of things generally contribute to "skipping" items on an assessment tool?

7. The mean rating for the different residents were quite high. Why do you think that happened?

Prompt: What kinds of things do you think might contribute to giving high marks to most residents?

APPENDIX C (continued)

Prompt: Most PGY4s were assessed as ready for independent practice. Do you agree that PGY4s are usually ready to perform intra-operative consultations independently? If not, why do you think they were rated that way?

8. There is not much difference in the rating of the different items for a given assessment.

Why do you think that happened?

Prompt: What kinds of things do you think might contribute to giving a similar mark to the different items?

9. In your opinion, what could be the impact on someone's practice with the implementation of the EPAT?

Prompt: Could you describe potential positive impacts? Negative?

10. Is there anything else you'd like to share about your experiences using this tool or any suggestion for improving the tool?

Thank you very much for taking the time to talk with us today.

APPENDIX D

Development of an instrument for workplace-based assessment of intra-operative pathology consultations: A pilot study

Focus Groups

Facilitator: Dr. Marcio Gomes, PI; Coding: Drs. Marcio Gomes and David Driman

Qualitative Codebook (n=16 participants)

Focus Groups (n=3):

- Two with supervisors (n=10 - 5[1F:4M]/5[4F:1M])
- One with residents (n=6, 0F:6M)

Individual Participant Variables

- Gender
- Educational role
- PGY level

Identification of transcript quotes

- EPA_1 – Learners group
- EPA_2 – Supervisors group #1
- EPA_3 – Supervisors group #2

Method

Data analysis spiral (iterative analytic circles):

- Managing and organizing data
- Individual reading and emergent ideas
- Coding information: expected, surprising, conceptually interesting
- Coding discussions
- Classifying codes into themes

| Code | Code Name | Definition | Illustrative Quote |
|--------------|---------------------------------------|--|--|
| Past Assessm | Assessment of performance in the past | Refers to the assessment of trainees' performance of intra-operative consultations prior to the implementation of the EPA-IC. | <p><i>“it would have been more variable and just conversational. So with each frozen section, we would talk with the residents about how it went, you know, what they... what they did well, what they didn't do well. But it would be... it would have been less systematic for sure.” [EPA_3_L40-42]</i></p> <p><i>“Yeah, so I have nothing really to add to that. It was just ad hoc. If they did something outstanding I would comment on it but there was no real way to document it anywhere. Like it... because their frozen might not be in the specialty that they were doing it that time, it didn't really fall under their ITER (End of rotation evaluation). So I don't remember ever documenting...”[EPA_3_L57-60]</i></p> <p><i>“Well to make a long story short, there was no formal assessment. Rarely you might get feedback just saying things you could have improved but there was no assessment for this.” [EPA_1_L9-10]</i></p> |
| Imp | Generic impact | Refers to any impact of assessment on trainees, learners, practice, etc. It should only be used if it does not fit into any specific type of impact. | <p><i>“You're thinking about 50 things that you're trying to do that day. And you have to kind of pause and it's a strange pause because normally you would just have this as a conversation, you know, over the microscope or while they're working in the hood or while they're looking at the CTs on the computer. And you'd say, “Yeah, no, you're not thinking about that quite the right way.” So it's more... it had a more natural flow to it. Whereas this, you had to kind of take this kind of artificial pause” [EPA_3_L130-135]</i></p> <p><i>“So, you don't have to think one month later when you have to fill ITER, think what did this resident do in frozen section? Because you do this every day with the resident, you are at the end of the day. So, it's done there, and it's already done, you don't have to keep memories of it to give an evaluation one month later, which might not be...” [EPA_2_L76-79]</i></p> |

| Code | Code Name | Definition | Illustrative Quote |
|-------------|--------------------|--|--|
| | | | <p><i>“I think I just noticed more awareness of [them] being evaluated. Like and the only evidence of that was that the resident would hand me this. You know, so they were... they were being evaluated before this but they may or may not have known it.” [EPA_3_L206-208]</i></p> |
| Imp Trainee | Impact on trainees | Refers to the impact of assessment on trainees learning. | <p><i>“I can't speak for the seniors group, especially in PGY2, it helps you sort of identify early like, you know, especially if you have a staff who's a bit more picky with throwing these out, knowing what you have to do because sometimes there's so guidance at the beginning. You're not really sure, “Am I doing this right?” And so I think if you... if it's done correctly it can really help develop sort of how you approach frozen... how to do it well early on and sort of identify those gaps.” [EPA_1_L541-546]</i></p> <p><i>“I know I became much more systematic about the frozen sections, you know, that... because we're being evaluated on different components of it so it's not only do you just screen the OR list the day before but when you go in, you know, you look at the room, you do all your checks for quality and for pre-analytics to make sure the room's prepared, everything's set. It really kind of pushed residents to play a much more active role in the procedure, cutting their own frozen and things like that. Which, I think, may have been done somewhat in the past but it... because there was a formalized process there and then you could really... made that happen much more often and I think it really improved the learning that you got out of frozen” [EPA_1_L19-26] L2</i></p> <p><i>“I think it is a good thing that it does, even as a staff, if you maybe... you may have gone through residency and never thought about some of these aspects. And now it's like, “Oh, okay, these are actually things that I should be</i></p> |

| Code | Code Name | Definition | Illustrative Quote |
|----------|--------------------|---|--|
| | | | <p><i>thinking about.” And you would hope that, by the... if you're a staff pathologist, these are things that you would have been thinking about throughout residency. But if nobody ever explicitly taught you or told you these are the things you need to know, I think this kind of is helpful in that regard, in just triggering, “Okay, these are things that I need to look for for myself and to look for in trainees, that they understand all these components.”</i> <i>[EPA_1_L533-540] L1</i></p> <p><i>“Because often, as you were saying before, you might get a five on something but you think, “I really should have got a three or a two or a four,” whatever, right? And so I think we are almost maybe the better assessors. I think it's important to just, at least somewhere, have this kind of checklist. Because I think even as incoming PGY2, you don't necessarily know all the components that you need to think about in a frozen section. You just think, “Oh, a specimen comes, I cut it up and freeze them and look at it.” You don't think about, “Oh, we need to actually make sure that the readings have been filled in [00:50:28 inaudible] sort of the correct temperature,” and all this kind of stuff, right? So I think it's important to know that checklist but I don't know that it's as important to be evaluated on it in part because the evaluations are often falsely inflated anyways.”</i> <i>[EPA_1_L489-497] – Growth mindset</i></p> <p><i>“I think it helps with reflective practice. Even if you are a staff and nobody's assessing you, you can look at these eight items once in a while and say, “Am I, you know, am I kind of doing all the steps?” [EPA_1_L562-563]</i></p> |
| Imp Work | Impact on workload | Refers to the impact that the implementation the assessment instrument had on | <p><i>“No, no, actually it's just we're paying attention more to their performance while we're doing our work too. So it's just something we just keep in our mind that they need to be evaluated on that day. But it does</i></p> |

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| | | the workload (feasibility) | <p><i>not delay us or affecting... for, personally, it doesn't affect my work or my turnaround or stress about the case or anything.</i> [EPA_3_L102-105]</p> <p><i>"No. It's not onerous at all."</i> [EPA_2_L126]</p> <p><i>"I don't think there would be much negative impact other than it takes you 12 minutes to do this at a certain point in the day."</i> [EPA_1_L532-533]</p> |
| Imp Perform | Impact on performance | Refers to the impact that the implementation of the assessment instrument had on the overall performance of intra-operative consultations | <p><i>"And then when I watched the videos before we implemented this, and then when we started doing this, I kind of made myself go into the room at the start of the day and, and do that part. Because I realized that I hadn't been doing it myself."</i> [EPA_3_L122-125]</p> <p><i>"I think also it helped, it helped me to think about steps that you could use to evaluate a frozen section encounter, let's call it. Which probably I would not have thought about it in that kind of detail before. I would not have thought about checking all this steps before."</i> [EPA_2_L71-73]</p> <p><i>"It's confirming what we're doing is right (laughs). I think really check this, even it's for residents, for yourself too like if you're like... yeah, this is the way you're practicing, you are on the right track too and... you know, because we do... most of this is done subconsciously, you know, it's just built in. You may be doing all this at the same time and I think it also... the residents, I see that they observe us very much."</i> [EPA_3_L673-677] – role modeling and hidden curriculum</p> |
| Observ | Observation of trainees | Refers to the observation of trainees while performing intra-operative consultations. | <p><i>"And I think it, it helps assess other parts of the process that normally we gloss over. Like, at least one thinks it's a given that they should have looked up the history and everything, and one focuses more on the interpretation of the actual gross or frozen section slide. And this</i></p> |

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| | | | <p><i>kind of incorporates all the steps and itemizes things. And so you kind of get a better perception of the different steps of the process. So, I think it's helpful that way." [EPA_2_L86-90] – diagnostic supremacy</i></p> <p><i>"And I think some of the things you might almost take for granted, I think you would notice them or I hope you would notice them. But I feel as though here, I'm more certain that I'm going to notice them. So, for example, did they ensure that patient ID was correct and did they gross it?" [EPA_3_L99-103]</i></p> <p><i>"I think that maybe we can find the problems more. Like, you know, they can figure out that he has... this resident has a problem with how to deal with the tissue like [00:08:03 unclear; big] specimen or whatever. Or how to take the, you know, sections." [EPA_3_L94-96]</i></p> <p><i>"So, at that point, I was doing a lot of frozens unsupervised but I mean the pathologists were aware that this was supposed to be done. And for the first frozen section of the day and it was nice to just have... I mean they weren't always needed to be there but it's nice to have somebody to at least give you that feedback that yes, you're doing things right." [EPA_1_L39-43]</i></p> <p><i>"But I think it's hard to sometimes tease that out. Because if you're not really probing the residents where their knowledge is, as long as it looks like everything on the service is performed correctly and you get the correct diagnosis, as you mentioned, then I think there's a thought that just give fives. But did you get all the... did you understand all the nuances, all the tricks, all the pitfalls? Because I think that that's a five." [EPA_1_L365-369] – Active observation</i></p> <p><i>"I think it made me notice the good residents. I started to notice when they were coming</i></p> |

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| | | | <p><i>prepared with a history or had pulled slides which didn't happen very often, that would happen a couple of times. And I suspect maybe they weren't doing that before we started doing this because I don't remember it really happening before." [EPA_3_L142-145]</i></p> <p><i>"I think every time, because if we get a parathyroid should we weigh it, should we not? What are the indications? That sort of thing. Like if we, I go through like every time that we are doing this, I ask them to see if they understand why we are doing this. And if we don't know why they are doing it, then let's call them up and see." [EPA_2_L291-294]</i></p> |
| Feedback | Feedback | Refers to unidirectional feedback given from supervisors to residents. | <p><i>"I think it was very staff dependent. Some staff just very... would very much focus on the microscopic interpretation and not really consider the other aspects of it in evaluation. But other staff would consider all aspects of the evaluation and give you feedback on all aspects of it. But I think it was staff dependent." [EPA_1_L110-113]</i></p> <p><i>"But I do find that although maybe you're not observing things differently, but you're delivering feedback to them a lot differently. Because they're getting all these-- you know, and they have it broken down what they did well and what they can improve on." [EPA_2_L164-167]</i></p> <p><i>"I think I give more feedback then I used to give, for sure. And more specific feedback. Like, when the mark is there, and you explain why, why you didn't, why I gave you that mark was because... and at the time, because it just happened, they know exactly what you're talking about, right? [EPA_2_L175-178]</i></p> <p><i>"Like I was saying, sometimes people tend to gloss over things because we understood that they were a given, that they would look at the history or get things ready. But now, since</i></p> |

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| | | | <p><i>we're going over the form with them, then we have to specifically address each one of these steps and give feedback which is something we probably didn't give them in that detail before." [EPA_2_L179-182]</i></p> <p><i>"More details and specific. It's more specific because you carry [00:18:37 inaudible], you know, like after like, you close a case, we go through this, this one, I did it with the resident, say, "Okay, you know, this is what you... blah, blah, blah, this is good, this is not good, this was supposed to be done." So you give them feedback and it's very precise and more details with examples, very fresh examples." [EPA_3_L219-222]</i></p> <p><i>"I think it probably increased the amount of feedback a little because you've already had to have this conversation at the start of the day so you're more comfortable having the same conversation later in the day when things... if things don't go right. Whereas before, I think that can be a difficult conversation to have sometimes. But when you're forced to do it at the start of the day, the rest of the day, it's kind of easier to, to give feedback I think." [EPA_3_L247-251]</i></p> <p><i>"I think it's most of the time a good amount of feedback. And I do agree, most people do kind of look through here and kind of pick out something that you did well or if there's another area that you might need improvement, then they might pull something out of the list" [EPA_1_L118-120]</i></p> |
| Document | Documentation of encounter | Refers to the documentation of performance. Specific attention to narrative comments related to the clinical encounter and documented in | <p><i>"Because we don't know what to write at all (laughs)." [EPA_3_L741]</i></p> <p><i>"How to articulate and also that's the kind of part where you're really verbalizing what they did wrong. I think it goes back to [Name 6]'s earlier statement that you don't want to be like overly critical of them and that's the kind of</i></p> |

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| | | the assessment form. | <p><i>only point for criticism, real criticism on the form. Even though it's not supposed to be criticism, it's supposed to be like helpful. I think it often feels like criticism if we say like, "I think you should move faster.""</i> [EPA_3_L748-752] – mindset</p> <p><i>"there's not really either a good suggestion or they just write like 'not applicable' or 'keep reading' or something kind of nonspecific. I'd say that's probably the most kind of common type of suggestion that you get."</i> [EPA_1_L161-163]</p> |
| Entrustment | Entrustment of trainees | Refers to the process of entrustment of trainees; the transfer to responsibilities; the level of independence given to the trainee. It should only be used if it does not fit into any specific entrustment factor. | <p><i>"And sometimes you are comfortable with the resident helping, like taking care of the specimen and do them and there... they are in the station doing it and it gives us slides and you read the slides and so it will be like a team working. If it's a senior resident, you feel comfortable to let them take care of the specimen by themselves while we're reading the slides of another part. If a junior one, you're always on their shoulder. It just... you know, like it's just for us also to be comfortable. We don't give too much responsibility for the resident."</i> [EPA_3_L71-76]</p> <p><i>"So, we usually let the resident to call the OR when it's like straight forward, okay the partial negative. But when it's become kind of tricky, you need some real communication, it would be the pathologist who will call. Usually when it's like a grey zone, I don't know what's that, like the real, the situation needs real communication skills, usually we don't let the resident call the OR, you would rather call and speak to the surgeon yourself."</i> [EPA_2_L238-243]</p> <p><i>"I think it's just the different things. Say... if I say somebody, yes you can do it on your own, because they just did everything right. But afterward I have to check it too. So I give</i></p> |

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| | | | <p><i>them five because yeah, they are ready to do it. But would I disappear totally? No. Like I always have to do my homework, my work, I have to do my job too so I have to take... like look at the slide and make sure that the diagnosis is right and the surgeon he will try it, and everything's right because at the end of the day it's my responsibility in front of my college and my license and everything."</i> [EPA_3_L460-465]</p> <p><i>"And, you know, we have two PGY5s now who are finished their exams and they're still not going out to Vic on their own or anything like that, right? We're not... you know, they have an [00:57:44 unclear] there to backup but we still never send them, right? They're going to... next week they could start practicing in the community and calling the frozens but we don't. And I think this tool could help, you know, once they met the competencies and they've written their exam. We should be doing that during the last... before we phase them out to the world." [EPA_3_L664-669] - The threat to society of not entrusting residents before final certification. We do not fail ourselves, but we can fail society and residents.</i></p> |
| Ent Fact Context | Context | Refers to the local context of Intra-operative consultations, including cultural aspects, that affect entrustment of the trainee. | <p><i>"This is the culture, you know, at Vic, you know, like the surgeons expect you to be there..." [EPA_3_L311]</i></p> <p><i>"I suspect maybe we don't have a culture that encourages them to be confident. Like I've heard from some people... I worked with some people who trained in the US who are very... they look at the slide, make a decision, don't doubt themselves at all. And like call the surgeon with great confidence. And I think if you train in that kind of system, you probably feel ready to practice independently much sooner." [EPA_3_425-428]</i></p> |

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| Ent Fact Task | Task | Refers to characteristics of intra-operative pathology consultations that affect entrustment of the trainee. | <p><i>“if the frozen sometimes are a bit... are different as well. Like, for example, we never had like a margin so we’re never just asked, “Is it positive or is it negative.” So maybe the... it may be a little bit different in terms of the types of things that they're having to pick up on.” [EPA_3_L82-85]</i></p> <p><i>“In Neuropathology, some like even the staff, it’s difficult to, to do, right? That’d be like pituitary adenoma, a third year can do, is also very case dependent. In the inflammatory process, low grade glioma that’d be very hard...” [EPA_2_L410-412]</i></p> <p><i>"I think it's also case dependent. I'm just thinking of the times when staff tend to go on more and it's usually for like the not routine...if it's something weird, they're probably more likely to go in." [EPA_1_L58-61]</i></p> |
| Ent Fact Trainee | Trainee | Refers to characteristics of the trainee that affect the entrustment of the trainee | <p><i>“now we have two new residents who just started this month, right. So, you’d probably role model and sit with them more and... because you don’t want to rely on them and they’re screwing up the specimen so, I’m very conscientious of the fact that this Thursday for example, I have a junior resident with me, so I’ll be very conscious that day to see that everything goes through me. Because I don’t want her to screw up something. Because eventually the responsibility is mine.” [EPA_2_L633-638]</i></p> <p><i>“Yeah, so like, if we’re in rounds, I tell the resident, “As soon as you get the specimen, page me”. And I’ll leave the rounds, right. Senior residents I’d say, put it through and let me know in five minutes, and then I’ll come there.” [EPA_2_L639-641]</i></p> |
| Ent Fact Sup | Supervisor | Refers to characteristics of the supervisor that | <p><i>“But I think maybe sometimes I maybe didn’t give them enough freedom or like was too interfering. Maybe spoke too much when we</i></p> |

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| | | affect the entrustment of the trainee. It also includes variation in standards of practice between supervisors because the individual standard is the reference standard for evaluation. | <p><i>were looking at the microscope. And then I would find myself saying at the end, "What would you have done if I wasn't here?" And I kind of... sometimes I didn't get a good sense of whether they could have done it fine without me and I was just interfering or whether they really needed the support."</i> [EPA_3_L278-282]</p> <p><i>"But if it was somebody who took 30 seconds because they had really good dexterity and another person took 60 seconds, I know that they're twice as slow but on my scale they were still kind of in the okay range."</i> [EPA_3_L293-295]</p> <p><i>"I think we're a group, maybe with some exceptions, of more cautious people, perhaps. And I suspect we pass that on to our residents that they don't become competent until later."</i> [EPA_3_L429-431]</p> <p><i>"At the beginning to the end of PGY3, having two years' experience doing things that it... certain staff will be like, "Well, just let me know when the slides are ready and then we'll look at them." So I think it is staff dependent but... especially early on, starting as a PGY2, I had lots of direct observation and I mean staff also recognized, at that point, that you're new so you're more likely to need assistance with things so."</i> [EPA_1_L53-57]</p> |
| Independ | Independent practice | Refers to the readiness of trainees to practice independently. | <p><i>"F2: I don't think not before four or five. M1: Four, sometimes PGY5. F2: Four, it depends on the resident also F4: Pass their exam (laughs). F2: Yeah, some residents five, I think. Maybe a little my own paranoia about making a mistake. But some of them I think maybe don't have the diagnostic confidence to do it until very late. M1: I guess PGY4 or 5, yeah. The good ones or the exceptional ones as early as halfway through PGY4. The others that are less</i></p> |

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| | | | <p><i>confident or just don't... you know, taking longer to develop an eye for certain things, then maybe midway through PGY5, yeah. Somewhere in that range." [EPA_3_L415-424] – Contradiction between ratings and perception of readiness for independent practice. The exam (liability?), resident's confidence as issues (resident's or supervisor's confidence?</i></p> <p><i>"And I think it is too, you kind of... you need to have enough experience that you know when you've reached your limits. Because even pathologists, you'll sometimes consult another pathologist on a frozen section case. They won't give an answer without showing a slide to somebody else first. So I think... I think once you've got... maybe got to the point where you... you know what you know and you know what you don't know is probably when you are probably ready to... to do frozen section and... because you don't want to be just flippantly saying, "Well I think it's this," when you could be totally wrong. But, as a more junior person, you... you might not know... you might think it's something but you might not know all the differentials that would be included in, in that. So you might not think of something else that it could be." [EPA_1_L304-312]</i></p> |
| Response | Response process | Refers to all aspects related to the process of responding to assessment prompts and the quality control of data with the exception of rating issues (specified below). It should only be used if it is not related to rating issues. | <p><i>"I just have a question. It just came up to me. I think you mentioned this. Because we do this in the... in frozen section room, you sign it, you do it with the resident. How do you know it... you got it? You know what I mean?" [EPA_3_L728-730]</i></p> <p><i>"Yeah, yeah. So at the other hospital but the... it... it of course still brings it from the OR so we just sit in the frozen section and a porter brings it. And so part of the procedure is you make sure that it matches the OR and the patient's specimen labels. But it's something we're not really probably evaluated on that</i></p> |

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| | | | <p><i>much. I don't think I've got any feedback on. I think it's just a protocol thing of how it's done." [EPA_1_L233-237]</i></p> <p><i>"F4: There may be one other reason. We choose the one... the resident that did it very well and we assess these on that point, you know. And the one who did very bad, we exclude it from the assessments. I think we did that.</i></p> <p><i>F: I thought it was supposed to be the first one of the day.</i></p> <p><i>F: Just the first one, yeah.</i></p> <p><i>F4: That's okay but for me, I did that.</i></p> <p><i>F: I kind of glob- I kind of do the days." [EPA_3_L568-564]</i></p> |
| Rating | Rating issues | Refers to any aspect related to the rating of trainee's performance. It should only be used if it does not fit into any specific rating aspect. | <p><i>"I think it's just the different things. Say... if I say somebody, yes you can do it on your own, because they just did everything right. But afterward I have to check it too. So I give them five because yeah, they are ready to do it. But would I disappear totally? No." [EPA_3_L460-462]</i></p> <p><i>"But if it was somebody who took 30 seconds because they had really good dexterity and another person took 60 seconds, I know that they're twice as slow but on my scale they were still kind of in the okay range." [EPA_3_L293-295] – Standard setting</i></p> <p><i>"But I think it's hard to sometimes tease that out. Because if you're not really probing the residents where their knowledge is, as long as it looks like everything on the service is performed correctly and you get the correct diagnosis, as you mentioned, then I think there's a thought that just give fives. But did you get all the... did you understand all the nuances, all the tricks, all the pitfalls? Because I think that that's a five." [EPA_1_L365-369] – Also included in observation</i></p> |

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| | | | <p><i>“But I think if we set the expectation with the resident, “In your first years, this is expectation and this is the range. Second year, this is the expect...” and so on. So if they get two, this is their best. They achieved the best of what was expected from them, right?”</i> [EPA_3_L633-635]</p> <p><i>“Yeah but I think we’re... you know, the gut reaction would be to consider it a score. Like as two out of five, “I got 40 percent.” Whereas I mean like we just need to see these as descriptors. And actually I think the way... it's funny that our in-house exams, they say by the end of PGY2 you should get 25 percent. This is kind of laid out at the beginning of the year and with that expectation, I mean seeing a really low score was not disheartening on the in-house exams at the beginning. But if those expectations aren't necessarily laid out for frozen section, I mean if we told our PGY2s, “You should be getting ones at the beginning and twos,” I mean that’s what you're aiming... if that’s what you're aiming for, just a description, it's not an assessment of your... like of failing. A two accurately describes early frozen section so I mean... I mean if it was laid out like that I think the gut reaction would be totally different.”</i> [EPA_1_L396-405]</p> |
| Rating Item | Item characteristics | Refers to specific items in the rating scale (other than the ones specified below). | <p><i>“The surgery pathology contract handovers sometime is difficult, just the way our setup is here. We have a porter that brings that brings the specimen that drops it off and doesn't know anything about the case. So it's... it's a bit different than, you know, verifying with the nurse the question or the surgeon.”</i> [EPA_1_L228-230]</p> <p><i>“I... so, as a PGY2, the hardest one and it was like maybe a third of the time at least was number nine; resident able to safely perform this procedure independently. And the reason being, there will be times where like literally</i></p> |

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| | | | <p><i>they only come in to look under the scope, they ask what you think and if they agree, then they leave the room like go in the hall... So literally they're like, "I don't need to be there but this is a five year program so I feel weird saying you can do this independently even though I wasn't there." [EPA_1_L185-190]</i></p> <p><i>"The surgery pathology contract handovers sometime is difficult, just the way our setup is here. We have a porter that brings that brings the specimen that drops it off and doesn't know anything about the case. So it's... it's a bit different than, you know, verifying with the nurse the question or the surgeon. We don't..." [EPA_3_L178-182]</i></p> |
| Rating item - Prep | Case Preparation | Refers to the item "case preparation" in the practice and assessment of intra-operative consultations. | <p><i>"With the case preparation, the details being ensures the frozen section room is ready for use. I might have noticed if the resident was really not attending to that but I think they and I would leave that to the technologist primarily" [EPA_3_L332-334]</i></p> <p><i>"Yeah, it's more technical also and our techs are really good. They're not going to be dependent on the residents, I feel." [EPA_2_L219-220]</i></p> |
| Rating Item - E&F | Efficiency and flow | Refers to the item "efficiency and flow" in the practice and assessment of intra-operative consultations. | <p><i>"I found like the... some things that were difficult to put on to a scale were things like efficiency and flow because everyone's a little bit different. And, again, this isn't emergency medicine, we're not paid to be fast, we're paid to be absolute accurate. So I'm not really wanting to cramp somebody's style to save 30 seconds, if you know what I mean." [EPA_3_L272-275]</i></p> <p><i>"And then for the efficiency and flow, that could be a bit personal because it might be something to do with a relative ability or disability for an individual. And if they were a little bit slow for a variety of reasons or just inefficient for a variety of reasons, maybe</i></p> |

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| | | | <p><i>that... does that just seem a bit personal to be sort of remarking, "Boy, you were kind of slow." [EPA_3_L355-358] – Fixed mindset, also will lead to leniency bias</i></p> <p><i>"Well, because we often don't have more than one frozen going at the same time. Especially early in the morning, we tend not to have in the morning, it tends to build up more during the day. So, when you have to talk about handling multiple specimens, sometimes it just doesn't apply, in that particular frozen that we are evaluating" [EPA_2_L350-353]</i></p> |
| Rating Item - Dx | Diagnostic interpretation | Refers to the item "diagnostic interpretation" in the practice and assessment of intra-operative consultations. | <p><i>"We can do everything and take five, five, five, five if the same, except diagnosis is wrong, for example, and not the correct diagnosis. So here, here is a problem, you know, I can't trust him because he did the technical work very good but the diagnosis was not right so..." [EPA_3_L478-480] – Diagnostic supremacy</i></p> <p><i>"And then the final one is just the diagnostic and this is like even the pathologist sometimes, we talk about this differential with the surgeon. And, you know, like I mean so just to be fair to them. If they can pick up the histology, they can pick up the abnormalities. And so I'm just trying to put it... even not a specific one [00:50:05 inaudible] diagnosis, just what could be. I think this is good for them. I wanted to raise this point." [EPA_3_L596-600]</i></p> |
| Rating Scale | Scale characteristics | Refers to the entrustment-aligned rating scale. | <p><i>"See I think this makes it easier because it's more... if it says a two, I have to talk them through it. They know if you talked them through it. They can't say, "No, you didn't have to talk me through it," if you experience that you did talk them. So, for me, this is kind of less judgemental, I think. It's still hard to give them a low score." [EPA_3_L614-617]</i></p> <p><i>"And I think, yeah, it was kind of seen as a score based on your level. So you... like you</i></p> |

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| | | | <p><i>were at an appropriate level for a PGY2 or a PGY3, therefore you got a four or a five. Whereas, you know, probably more of the time, you know, a three might be appropriate because you... you intermittently might need a bit of help, right? But very rarely I think do people do that. I think it's kind of almost like a 'meets expectations' equals a score five."</i> <i>EPA_1_L350-354]</i></p> <p><i>"I don't think I'd be surprised because it's just a description of what happened, right? If the pathologist needs to come in there and do it because I wasn't able to then I would know that beforehand and I would fully expect to get a one. Right? And so I just wouldn't be blindsided, I wouldn't be shocked..."</i> <i>[EPA_1_L411-414]</i></p> <p><i>"I recall one [in which the scale does not apply], but I don't know if that applies, but I had a situation where one of the residents were, I just said, "Just stop. Let me just take over because we're not going to get anywhere", but I mean I didn't say it in those words, but I said, "Stop, just get up because we need to get this thing done properly". So, there I can't assess because ... there's an assessment but it's, I don't know, I don't think it's an example of what you're trying to..."</i> <i>[EPA_2_L271-275]</i></p> <p><i>"And, it's a culture shift, from evaluating ... from how we were accustomed to evaluating to with absolute standard evaluations. A culture shift, and people still like to compare, 'this is a very good PGY2 resident,' you know, like in your mind you think that and then therefore you translate that to giving them an easy rating I think. And I think I was guilty of it too when I did the evaluations." [EPA_2_L514-517]</i></p> |
| Rating Bias | Rating bias | Refers to sources and types of | <i>"And I do think part of... and it might even be the culture of medicine is that, you know,</i> |

| Code | Code Name | Definition | Illustrative Quote |
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| | | potential bias in general or to specific sources or types other than the ones specified below. | <p><i>giving people low scores when they actually deserve it, isn't really something that's, that's done because it's kind of like, "Okay, yeah, you're doing fine for your level." Whereas some people kind of take the opposite viewpoint where it's like, "Well, if you're a medical student then you can't possibly like 'meet expectations' kind of thing so I have to give you a low score on something just because."</i>" EPA_1_L377-382]</p> |
| Rating Bias - Rater | Rater biases | Refers to sources and types of potential rater bias. | <p><i>"M1: It's a credit to our humanity I guess, civility. Yeah I think I understand now what [Name 5] was saying. It's... there's going to be reluctance, relative reluctance to point out things that are not great."</i> [EPA_3_L759-760] – Buddy bias culture</p> <p><i>"F1: I think we're all generally very nice people and you want... because you're having to then spend the, you know, the... the afternoon having them all sign off on this. You want to say, "Well, you know, it was okay, you're going to get three or four." You know, we don't want to say, "Two, I had to talk them through." But of course we're talking them through..."</i> [EPA_3_L550-553] – Buddy bias culture</p> <p><i>"To be honest, it's because often they don't check either. So I don't think they... like I think realistically if they're not going to check their agents and they don't see it as an important thing, they're not going to ask the residents if they've done it right so..."</i> [EPA_1_L245-247] – Incompetence bias</p> <p><i>"So, we usually let the resident to call the OR when it's like straight forward, okay the partial negative. But when it's become kind of tricky, you need some real communication, it would be the pathologist who will call. Usually when it's like a grey zone, I don't know what's that, like the real, the situation needs real communication skills, usually we</i></p> |

| Code | Code Name | Definition | Illustrative Quote |
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| | | | <p><i>don't let the resident call the OR, you would rather call and speak to the surgeon yourself.”</i> [EPA_2_L303-304] – Incompetence bias. Zone of perceived safety: even though it's not safe, the lack of consequences make it feel safe. No coaching, high rating, no change in practice, no learning.</p> <p><i>“So I think it's important to know that checklist but I don't know that it's as important to be evaluated on it in part because the evaluations are often falsely inflated anyways.”</i> [EPA_1_L495-497] – Leniency bias</p> <p><i>“M3: Like some of us are ... don't mind. F: Some of us are tough. M3: But, but I understand we usually tend to be very... F: Kind. M3: Kind, yes. F: It's a culture to be kind and over rate”</i> [EPA_2_L563-568] – Buddy bias</p> <p><i>“F2: I think... so one reason might be the good residents tend to be good at everything. They tend to be efficient and good communicators and conscientious, etc., etc. They might fall down on the diagnostic but if they're good at everything else, usually they're good at everything and the same with the less strong residents. I think as well, if we have a resident that we perceive to be good, we probably give them more leeway on the scoring. And, you know, maybe are more likely to push them up to a four or a five on an individual item even if they didn't do so well on that one item, I would guess.”</i> [EPA_3_L578-580] – Halo effect</p> <p><i>“F3: I was saying because some of those, they actually... it's a package together, you know, like... like all of them except the diagnostic, they actually work together. So if you are efficient with good turnaround times and you know what you're doing, how you handle the</i></p> |

| Code | Code Name | Definition | Illustrative Quote |
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| | | | <p><i>specimen, right? So in order to reach the seven, you really have to go through all this to have this easy flow, right? So they are all actually... if you're bad in one, you're going to be bad in everything, right? I think so. Except the diagnostic and the diagnostic, there is multiple parts in it.” [EPA_3_L587-592] – Halo effect and diagnostic supremacy</i></p> <p><i>“It’s the same thing with the ITERs, when you take Meets, Meets, Meets, Meets, Meets, Meets all the way down. I think.” [EPA_2_L545-546] – halo effect</i></p> <p><i>“If there is a senior resident with me and honestly, and there are a few residents here, senior residents particularly, we don't really even need to be there. Like without naming anybody. So, in that case, I’m just going to put a five here, which is what you’re asking right? It’s five or four, whatever same for everything.” [EPA_2_L547-550] – halo effect</i></p> |
| Rating Bias - Select | Selection biases | Refers to sources and types of potential selection bias. | <p><i>“so one possible reason is we've had a couple of really exceptional residents lately. So literally in terms of sampling, that may have biased it a bit.” [EPA_3_L496-497]</i></p> <p><i>“There may be one other reason. We choose the one... the resident that did it very well and we assess these on that point, you know. And the one who did very bad, we exclude it from the assessments.” [EPA_3_L558-560]</i></p> <p><i>“To be honest, I did that. If it's very bad, the first one, I leave it to the second one just to see if improved or whatever and if there's difference I fill the best one. Yeah, I did that.” [EPA_3_L566-567]</i></p> <p><i>“Actually and the first is often not a difficult one. It’s usually a margin or something. Sometimes more difficult ones come later in the day.” [EPA_2_L328-329]</i></p> |

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| | | | <p><i>"I think there might be a bias in, in, in the evaluation, in a sense. Exactly what [Name 1] points out is. Usually the first frozen of the day, 99% of the time is going to be something very easy" [EPA_2_L424-425]</i></p> <p><i>"No, I just want to say, I think whenever is it, knows their being evaluated... I think, is it that we have to let them know, this is the frozen you're going to be evaluated on? Because I think when they know they're going to be evaluated they actually do perform a little differently." [EPA_2_L483-485] – staged performance</i></p> |
| Culture | Culture | Refers to any cultural aspect that influences the practices or the changes to practices, including identity issues. | <p><i>"And just this is a way it is in pathology, like we don't give them responsibility to sign out the cases by themselves. Like we always have to check it. You have your name on the report. You feel it's your responsibility at the end of the day." [EPA_3_L437-439]</i></p> <p><i>"I like getting specific feedback and if there is something that I do need to improve on, I would rather be told rather than somebody just kind of let you continue on and think you are doing something properly. I mean obviously I don't think I'd happy to get a one or a two. But if I deserve a one or a two then I think that is appropriate. And I do think part of... and it might even be the culture of medicine is that, you know, giving people low scores when they actually deserve it, isn't really something that's, that's done because it's kind of like, "Okay, yeah, you're doing fine for your level." Whereas some people kind of take the opposite viewpoint where it's like, "Well, if you're a medical student then you can't possibly like 'meet expectations' kind of thing so I have to give you a low score on something just because." [EPA_1_L374-382] – mindset</i></p> <p><i>"I just think it would... it would be a... sometimes I view it as not a very necessarily valuable tool because I... sometimes that I</i></p> |

| Code | Code Name | Definition | Illustrative Quote |
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| | | | <p><i>think my scores don't actually reflect my level that I should be at. Like I think oh, maybe I should be at a three or a four and I was getting fives. So sometimes you don't... you kind of just do it as a routine of doing it. But I think if there is a culture change that you're actually getting, in theory, valuable feedback, I think it would become more of a... like a... I think that actually holds more value." [EPA_1_L634-639] – mindset</i></p> <p><i>"No, I just want to say, I think whenever is it, knows their being evaluated... I think, is it that we have to let them know, this is the frozen you're going to be evaluated on? Because I think when they know they're going to be evaluated they actually do perform a little differently." [EPA_2_L483-485] – mindset, staged performance</i></p> <p><i>"M3: Like some of us are ... don't mind. F: Some of us are tough. M3: But, but I understand we usually tend to be very... F: Kind. M3: Kind, yes. F: It's a culture to be kind and over rate" [EPA_2_L563-568]</i></p> <p><i>"You see when we have many frozen sections and a busy day, it depends like, especially at the Vic and it's busy and many parcels are frozen, you just want to get through them (laughs)." [EPA_3_L69-71] – Identity as imagination; we're pathologists, not teachers; we're making diagnosis, not teaching residents.</i></p> <p><i>"I found like the... some things that were difficult to put on to a scale were things like efficiency and flow because everyone's a little bit different. And, again, this isn't emergency medicine, we're not paid to be fast, we're paid to be absolute accurate. So I'm not really wanting to cramp somebody's style to save 30</i></p> |

| Code | Code Name | Definition | Illustrative Quote |
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| | | | <p><i>seconds, if you know what I mean. So I found that a bit hard. So I... efficiency and flow, I had a pretty big range as to what was acceptable” [EPA_3_L272-276] – Identity, diagnostic supremacy, efficiency as a personal trait, fixed mindset</i></p> <p><i>“Just maybe because of, you know, interpersonal awkwardness with making a comment about a person’s general abilities. You know, I think it’s okay to say to a person, “Well, I’m not sure if you’ve interpreted that tumor quite right. I see it this way.” But if you say to a person, “Gee, you’re kind of slow,” it’s such a broad sort of... you know, it’s one of those things that you had in kindergarten. So it’s kind of a chord (laughter) ... I think there’s a natural reluctance for most of us to get at a personal attribute. A diagnostic sort of shortcoming, that’s okay, that’s, you know, that’s what we’re doing.” [EPA_3_L360-366] – Identity, diagnostic supremacy, efficiency as a personal trait, fixed mindset</i></p> <p><i>“F3: This is the culture, you know, at Vic, you know, like the surgeons expect you to be there... F1: Yeah. F3: ...and answer the questions, not the resident. F4: They don’t believe in residents.” [EPA_3_L311-314] – Culture and identity. Relational identity and hierarchy RE: surgeons – Pathologists working for surgeons, not for patients.</i></p> <p><i>“F2: But I don’t think we have that kind of culture here. I think we’re a group, maybe with some exceptions, of more cautious people, perhaps. And I suspect we pass that on to our residents that they don’t become competent until later. I’m not sure, that’s kind of a broad... a broad indictment (laughs) but that’s the sense I have.</i></p> |

| Code | Code Name | Definition | Illustrative Quote |
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| | | | <p><i>F4: I think all of us doing the same thing, you know. For me, for example, I don't trust the resident. It's not because he doesn't know what's going on but because I'm afraid that they're going to miss something, you know, because this is a critical diagnosis and we need to be right. So yeah. And I don't know, I feel like I don't trust them too much.</i></p> <p><i>F3: And just this is a way it is in pathology, like we don't give them responsibility to sign out the cases by themselves. Like we always have to check it. You have your name on the report. You feel it's your responsibility at the end of the day.</i></p> <p><i>F4: So you don't... we don't give them a chance to be independent completely. And I think all of us do that. Can you give the frozen section to the resident and doctors have done everything and you signed the case without looking at the case or whatever? We can't, I don't think." [EPA_3_L429-442] – Identity, caution as part of pathologist identity; The diagnostic supremacy, medical error as an unacceptable outcome, inability to transfer the responsibility of personal liability and accountability, self-identification as the absolute standard ?relational autonomy.</i></p> <p><i>We're different. Our diagnosis is final. Is it? Is it how we're seen in postmodern medicine? Isn't it the consequent management as a shared team decision the most important?</i></p> <p><i>"And, it's a culture shift, from evaluating ... from how we were accustomed to evaluating to with absolute standard evaluations. A culture shift, and people still like to compare, 'this is a very good PGY2 resident,' you know, like in your mind you think that and then therefore you translate that to giving them an easy rating I think. And I think I was guilty of it too when I did the evaluations." [EPA_2_L514-517]</i></p> |
| Suggestions | Suggestions by participants | Refers to suggestions of | <p><i>"Yeah, one thing is when are you going to establish this, like permanent establish of this?"</i></p> |

| Code | Code Name | Definition | Illustrative Quote |
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| | | participants for improving the assessment instrument. | <i>Can you put it online so it's going to be... like we can have access when you do the evaluation for the resident, we can look at this online or this is not...?" [EPA_3_L711-713]</i> |

| Themes | Codes Categorized | Codes |
|--|--|---|
| Past assessment - Introduction to results, not a theme | Past assessment | Assessment of performance in the past |
| Performance Assessment and Response Process | Response process Rating issues – items and biases Selection biases | Response process Rating issues Item characteristics Case Preparation Efficiency and flow Diagnostic interpretation Scale characteristics Rating bias Rater biases Selection biases |
| Outcomes of assessment - Practices | Impact on practices | Generic impact Impact on trainees Impact on workload Impact on performance |
| Outcomes of assessment - Instruction | Observation and Feedback Documentation | Observation of trainees Feedback to trainees Narrative documentation |
| Entrustment of trainees | Entrustment process Entrustment factors Readiness for independent practice | Entrustment of trainees Context Task Trainee Supervisor Independent practice |
| Culture and identity | Culture | Culture |

VITA

NAME Marcio Mendes Gomes

EDUCATION

- 2016 - 2020 Masters in Health Professions Education, Department of Medical Education, University of Illinois at Chicago, Illinois, USA (finished all requirements, pending homologation).
- 1999 - 2003 PhD in Sciences, Department of Pathology, University of Sao Paulo School of Medicine, Sao Paulo, Brazil
Thesis: Relevance of the epithelial cell/epithelial basement membrane unity lesion in idiopathic interstitial pneumonias early architectural remodeling
- 1996 - 1999 Anatomical Pathology Residency: Hospital das Clínicas, Department of Pathology, University of Sao Paulo School of Medicine, Sao Paulo, Brazil
- 1989 - 1995 Doctor of Medicine, University of São Paulo School of Medicine, São Paulo, Brazil

PROFESSIONAL ACTIVITIES

- 2013 – present Associate Professor
Department of Pathology and Laboratory Medicine
University of Ottawa, Ottawa, Ontario, Canada
- 2008 – 2013 Assistant Professor
Department of Pathology and Laboratory Medicine
University of Ottawa, Ottawa, Ontario, Canada
- 2005 – 2008 Assistant Professor,
Département de pathologie
Université de Sherbrooke, Sherbrooke, Québec, Canada
- 2003 – 2005 Staff pathologist
Departamento de patologia
Hospital das Clinicas da Faculdade de Medicina da Universidade de Sao Paulo (HC-FMUSP), Sao Paulo, Brazil
- 2000 – 2002 Assistant Professor
Departamento de patologia
Faculdade de Ciencias Medicas da Santa Casa, Sao Paulo, Brazil

Hospital Appointments

- 2008 – present Staff Pathologist, Thoracic Pathology Lead

Division of Anatomical Pathology
The Ottawa Hospital, Ottawa, Ontario, Canada

- 2005 – 2008 Staff Pathologist
Centre Hospitalier Universitaire de Sherbrooke (CHUS), Sherbrooke, Québec, Canada
- 2003 – 2005 Staff Pathologist
Hospital das Clinicas da Faculdade de Medicina da Universidade de Sao Paulo (HC-FMUSP), Sao Paulo, Brazil
- 2002 – 2003 Staff Pathologist
SARAH Network of Hospitals of the Locomotor System, Brasilia, Brazil
- 2000 – 2002 Staff Pathologist
Santa Casa de Misericordia de Sao Paulo, Sao Paulo, Brazil
- 1999 – 2001 Staff Pathologist
Diagnostika – Patologia Cirurgica e Citologia, private laboratory specialized in gastrointestinal pathology, from March 1999 to January 2001, Sao Paulo, Brazil

Other Professional Appointments

- 2019 – present Regional Associate Director for Latin America
Royal College International
Royal College of Physicians and Surgeons of Canada.
- 2017 – present Clinician Educator
Specialties Unit
Royal College of Physicians and Surgeons of Canada.

EDUCATION HONORS AND AWARDS

- 2019 Visiting Professor, Discipline of Laboratory Medicine
Eastern Health and Memorial University
Saint John's, Newfoundland, Canada, December 16-17, 2019.
- 2019 Visiting Professor, Services de pathologie et pneumologie, Centre Hospitalier Universitaire de Lyon, Université Lyon Est, Lyon, France, January 28 to February 22, 2019.
- 2018 Visiting Professor and Education Consultant, Universidad de Los Andes, Bogota, Colombia, February, 2018.

Educational Design of a two day conference for the university faculty:
"Postgraduate Medical Education: State of the Art"; Educational Consultant
for Universidad de los Andes Leadership regarding CBME implementation.

- 2017 Clinician Educator, Specialties Unit, Royal College of Physicians and Surgeons of Canada.
First physician in diagnostic medicine to become a clinician educator of the Royal College of Physicians and Surgeons of Canada.
- 2017 Leadership in Education Award
Canadian Association of Pathologists
- 2017 Royal College Robert Maudsley Fellowship for Studies in Medical Education
Education Research Development Committee
Royal College of Physicians and Surgeons of Canada
- 2015 University of Ottawa Teaching Skills Attainment Award with Distinction,
University of Ottawa, Ottawa, Ontario, Canada
- 2015 Visiting Professor, University of Goettingen, Goettingen, Germany, May, 2015.
- 2014 - present CanMEDS Educator, Royal College International
Royal College of Physicians and Surgeons of Canada
- 2014 PARO Clinical Teaching Award, Professional Association of Residents of Ontario, Ontario, Canada
- 2013 Distinguished Teacher of the University of Ottawa, member of the inaugural graduating class of 2013, University of Ottawa, Ottawa, Ontario, Canada
- 2013 Visiting Professor, University of Nagasaki, Nagasaki, Japan, December, 2014.
- 2011 University of Ottawa Teaching Skills Attainment Award with Merit,
University of Ottawa, Ottawa, Ontario, Canada
- 2011 Dr. M. Orizaga Award for Excellence in Resident Teaching,
Department of Pathology and Laboratory Medicine, University of Ottawa, Ottawa, Ontario, Canada
- 2011 Visiting Professor, Royal Brompton Hospital, London, UK, November 2011.
- 2010 Award of Excellence and Innovation in Postgraduate Medical Education, University of Ottawa, Ottawa, Ontario, Canada

2009 University of Ottawa Teaching Skills Attainment Award, University of Ottawa, Ottawa, Ontario, Canada

RESEARCH HONORS AND AWARDS

- 2021 1st Ranking in the Stream 3 Cancer Pathology Translational Research Grant (CPTRG) competition, Ontario Molecular Pathology Research Network (OMPRN), Ontario Institute for Cancer Research (OICR), Ontario. Distinguishing aerogenous metastasis from multiple primary adenocarcinomas: a multidisciplinary proof-of-concept study. Marcio Gomes, Matthew Tsang, Bryan Lo (principal investigator).
- 2016 2nd Best paper by a Senior Resident or Fellow, Annual Research Day of the Department of Pathology and Laboratory Medicine, University of Ottawa, June 02, 2016. Lung Adenocarcinoma with Aerogenous Spread: Description of Histological Features and the Radiological Pathological Correlation. Nina Chang, J Inacio, C Lai, A Gupta, CA Souza, HS Sekhon, MM Gomes.
- 2012 Certificate of Merit Award - Education Exhibit at the 98th Scientific Assembly and Annual Meeting of the Radiological Society of North America. J R Inacio, C A Souza, S S Hare, M M Gomes, H S Sekhon, J Seely, N. Muller. Spectrum of Primary Pulmonary Lymphoproliferative Disorders: Imaging and Pathology Correlation. Educational Exhibit, Radiological Society of North America 2012 (RSNA), November 20-25, 2012, Chicago, Illinois, USA.
- 2011 Top Poster Award on the International Conference on Residency Education of the Royal College of Physicians and Surgeons of Canada, Quebec City, Canada, September 2011. Gomes M, Souza C, Bar J, Sekhon H. Interdisciplinary site-specific didactic meetings: Addressing competency-based education and program-based clinical services.
- 2011 Award of Best Poster by a Senior Resident, Annual Research Day of the Department of Pathology and Laboratory Medicine, University of Ottawa, April 2011. T. Jayasinghe, M.M. Gomes and H.S. Sekhon. Changing trends of fine needle aspirate diagnosis of lung neoplasm in the face of customized patient management approach. Are we going to step up?
- 2010 Certificate of Merit Award - Education Exhibit at the 96th Scientific Assembly and Annual Meeting of the Radiological Society of North America. SS Hare, MBBS, FRCR, MA, Ottawa, ON; A Gupta, MD; MM Gomes, MD, PhD, ; HS Sekhon, MD, PhD, ; JM Seely, MD; CA Souza, MD. Bronchioloalveolar Carcinoma (BAC) Unmasked: The Many Guises of Adenocarcinoma with a BAC Pattern of Growth. RSNA, Chicago, USA, 2010.

- 2009 Donald W. Penner Award Winner for best abstract (poster) - Edgecombe AD, Nguyen BN, Gomes MM, Cote J, Mai KT. Comparative Immunohistochemical Study of Serous and Mucinous Cystic Neoplasms of the Pancreas: Similar Stroma Phenotype Suggesting a Possible Histopathogenic Relationship. Canadian Association of Pathologists Meeting, Nova Scotia, Canada, July 2009.

CLINICAL AWARDS

- 2018 Thoracic Oncology Collaborative Practice Award (Inaugural)
Thoracic Oncology Program
The Ottawa Hospital, Ottawa, Ontario, Canada
- 2016 Quality Award, The Ottawa Hospital Cancer Program
Regional diagnostic process redesign: Application of a systems approach to lung cancer care transformation
Cancer Quality Council of Ontario, Toronto, ON, Canada

PUBLICATIONS

1. Gomes CM, de Bessa J, Nunes RV, Prezotti J, Bruschini H, Gomes MM. Impact of a 1-day urodynamic course on knowledge, perceptions, and attitudes of urology residents. *Neurourol Urodyn.* 2021;40:443–450. **Senior Author - Participated in study design, data analysis, writing, reviewing and editing the manuscript.*
2. Parneet K. Cheema, Marcio Gomes, Shantanu Banerji, Philippe Joubert, Natasha B. Leighl, Brandon S. Sheffield, Tracy Stockley, Diana Ionescu. Consensus Recommendations for Optimizing Biomarker Testing to Identify and Treat Advanced EGFR-Mutated Non-Small Cell Lung Cancer. *Curr Oncol*, 2020 Dec;27(6)321–329. **Participated in study design, data analysis, writing, reviewing and editing the manuscript.*
3. Ghofran Ageely; Carolina Souza, Kaissa De Boer, Nha Voduc, Saly Zahra, Marcio Gomes. The Impact of Multidisciplinary Discussion in The Diagnosis and Management of Fibrotic Interstitial Lung Diseases. *Canadian Respiratory Journal*, vol. 2020, Article ID 9026171, 6 pages, 2020. <https://doi.org/10.1155/2020/9026171> **Senior Author - Participated in study design, data analysis, writing, reviewing and editing the manuscript.*
4. Aleksandar Radonjic, Smita Pakhale, Shawn D. Aaron, Karen Earlam, Ena Gaudet, Marcio M. Gomes, Ashish Gupta, Melanie Chin. Organizing Pneumonia Secondary to Exophiala dermatitidis in Cystic Fibrosis: A Case Report. *J Cyst Fibros.* 2020;S1569-1993(19)30990-7. **Participated in preparing the pathology portion and reviewing of the manuscript.*
5. Melanie Chin, Aaron Leblanc, Carolina Souza, Marcio M. Gomes, Catherine Ivory, Ines Midzic, Sunita Mulpuru. A Severe Pleural Complication Associated with Granulomatosis

- with Polyangiitis. *Respir Med Case Rep.* 2019 Sep 15;28:100933. **Participated in preparing the pathology portion and also reviewing of the manuscript.*
6. Matthew J. Cecchini, Leslie Anderson, Elena Diana Salagean, Marcio M. Gomes. Social Media Eh? A Canadian Perspective on Social Media use in Pathology. *Can J Pathol.* 2018 Vol. 10 Issue 1, p37-52. **Senior author - Participated in designing the project, providing supervision to the residents, writing and reviewing the manuscript.*
 7. Gupta A, Souza CA, Sekhon HS, Gomes MM, Hare SS, Agarwal PP, Kanne JP, Seely JM. Solitary fibrous tumour of pleura: CT differentiation of benign and malignant types. *Clin Radiol.* 2017 Sep;72(9):796.e9-796.e17. **Participated in reviewing the pathology cases, writing and reviewing the manuscript.*
 8. Sisodia S, Boushey R, Lee G, Marginean C, Gomes MM, Bhattacharya G, Dennis K. Perianal Pagetoid Intraepithelial Carcinoma. *Case Rep Gastroenterol* 2017;11:109–113. **Participated in reviewing of the literature for diagnosis and of the manuscript for publication.*
 9. Shoki A, Gomes MM, Gupta A, Kify O, Pakhale S, Mulpuru S. An important cause of non-resolving pneumonia. *Respir Med Case Rep.* 2016 Jul 5;19:40-2. **Participated in writing and providing images for the pathology portion and also reviewing of the manuscript.*
 10. Paliga A., Strickland S., Gomes MM. Hospital autopsy: A major medical education gap. *Canadian Journal of Pathology.* 2016 Vol. 8 Issue 1, p24-33. **Participated in study design, reviewing and editing the manuscript, providing supervision to the residents.*
 11. Wasserman JK, Purgina B, Sekhon H, Gomes MM, Lai C. The Gross Appearance of a NUT Midline Carcinoma. *Int J Surg Pathol.* 2016 Feb;24(1):85-8. **Participated in reviewing and editing the manuscript, providing supervision to the resident.*
 12. Earlam K, Souza CA, Glikstein R, Gomes MM, Pakhalé S. Pulmonary Langerhans Cell Histiocytosis and Diabetes Insipidus in a Young Smoker. *Can Respir J.* 2016;2016:3740902. **Participated in writing and providing images for the pathology portion of the manuscript.*
 13. Gomes MM. Competency-Based Medical Education in Pathology. *Can J Path.* 2015 Autumn;7(3):06-10. **Single author.*
 14. Gaikwad A, Souza CA, Inacio JR, Gupta A, Sekhon HS, Seely JM, Dennie C, Gomes MM. Aerogenous metastases: a potential game changer in the diagnosis and management of primary lung adenocarcinoma. *AJR Am J Roentgenol.* 2014 Dec;203(6):W570-82. **Participated in literature review, writing and reviewing the manuscript, and providing images for the pathology portion – *Senior Author*
 15. Wheatley-Price P, Jonker H, Jonker D, Shamji F, Gomes MM. Thymic epithelial neoplasms: a 12-year canadian regional cancer program experience. *Clin Lung Cancer.* 2014

- May;15(3):231-6. **Senior author. Participated in reviewing pathology reports and reviewing the manuscript.*
16. Peña E, Souza CA, Escuissato DL, Gomes MM, Allan D, Tay J, Dennie CJ. Non-infectious Pulmonary Complications after Hematopoietic Stem Cell Transplantation: Practical Approach to Imaging Diagnosis. *RadioGraphics*. 2014 May-Jun;34(3):663-83. **Participated in writing, reviewing and providing images for the pathology portion of the manuscript.*
 17. Kos Z, Burns BF, Gomes MM, Sekhon HS. A rare case of anaplastic variant of diffuse large B-cell lymphoma presenting as a lung primary. *Int J Surg Pathol*. 2014 Apr;22(2):167-71. *Participated in writing and reviewing the manuscript.*
 18. Anand Gaikwad, Ashish Gupta, Sam Hare, Marcio Gomes, Harman Sekhon, Carolina Souza, Joao Inacio, Shilpa Lad, Jean Seely. Primary Adenocarcinoma of Lung: A Pictorial Review of Recent Updates. *Eur J Radiol*. 2012 Dec;81(12):4146-55. **Participated in writing, reviewing and providing images for the pathology portion of the manuscript.*
 19. Sulpher J.A., S.P. Owen, K. Tobros, F.A. Shepherd, E. Sabri, M. Gomes, H. Sekhon, G. Liu, C.M. Canil and P. Wheatley-Price. Factors influencing a specific pathologic diagnosis of non-small cell lung carcinoma. *Clin Lung Cancer*. 2013 May;14(3):238-44. **Participated in study design and responsible for reviewing the pathology portion of the manuscript.*
 20. Hare SS (fellow), Souza CA, Bain G, Seely JM, Gomes MM, Quigley M. The Radiological Spectrum of Pulmonary Lymphoproliferative Disease. *Br J Radiol*. 2012 July;85:848–864 **Participated in study design, supervision of resident and was responsible for the pathology portion of the manuscript, images and final edits.*
 21. Xiaomei Yao, Marcio M. Gomes, Ming S. Tsao, Christopher J. Allen, William Geddie, Harman Sekhon, MD. Fine-needle aspiration biopsy versus core-needle biopsy in diagnosing lung cancer: a systematic review. *Curr Oncol*. 2012 Feb;19(1):e16-e27 – **Corresponding and Senior Author.*
 22. Lee L, Gomes MM, Ford JC. Pathology recruitment in Canada: does medical school education in pathology influence student career choice? *Can J Pathol*. 2012 Spring;4(1):11-17 - **Participated in data collection, discussion of findings and manuscript review.*
 23. Edgecombe A (resident), Peterson RA, Shamji FM, Commons S, Sekhon H, Gomes MM. Myopericytoma: a pleural-based spindle cell neoplasm off the beaten path. *Int J Surg Pathol*. 2011 Apr;19(2):247-51 - **Senior and Corresponding Author. Supervision of resident's project.*
 24. Nguyen BN, Edgecombe A, Gomes M, Soucy G, Marginean CE, Mai KT. Comparative Immunohistochemical Study of the Stroma of Serous and Mucinous Cystic Neoplasms: Possible Histopathogenetic Relationship of the 2 Entities. *Pancreas*. 2011 Jan;40(1):37-41 – **Participated in data collection, discussion of findings and manuscript review.*

25. Ford JC, Gomes MM. Pathology Education in Canada: Results of a National Survey. *Can J Path.* 2010 Fall;2(3):23-27 - **Participated in data collection, review of literature, abstract composition, discussion of findings, manuscript review and final edits.*
26. Shaun J. Kilty, Dakheelallah Almutari, Melanie Duval, Michelle A. Groleau, Joseph De Nanassy, Marcio M. Gomes. Manuka Honey: Histological Effect on Respiratory Mucosa. *Am J Rhinol Allergy.* 2010 Mar;24(2):e63-6 – **Senior Author.*
27. Arab WA, Echavé V, Sirois M, Bénéard F, Gomes MM. Primary myxoid sarcoma of the pleura. *Can J Surg.* 2009 Aug;52(4):E93-E94. **Senior Author.*
28. Arab WA, Echavé V, Sirois M, Gomes MM. Incidental carcinoma in bullous emphysema. *Can J Surg.* 2009 Jun;52(3):E56-7. **Senior Author.*
29. Flood TA (resident), Sekhon HS, Seely JM, Shamji FM, Gomes MM. Spontaneous pneumothorax and lung carcinoma: should one consider synchronous malignant pleural mesothelioma? *J Thorac Oncol.* 2009 Jun;4(6):770-2. **Senior and Corresponding Author. Supervision of resident's project.*
30. Morin, C.; Sirois, M.; Echavé, V.; Gomes, M.M.; Rousseau, E. Effects of ω -hydroxylase product on distal human pulmonary arteries. *Am J Physiol Heart Circ Physiol.* 2008 Mar;294(3):H1435-43 **Responsible for dissecting and harvesting pathology samples and reviewing the manuscript.*
31. Aires V, Morin C, Sirois M, Echave V, Gomes MM, Rizcallah E, Rousseau E. Modulation du tonus des bronchioles humaines par l'acide 20-Hydroxy- éicosatétraénoïque et par les diacylglycérols. *Revue des Maladies Respiratoires* 11/2008; 25(9):1202. **Responsible for dissecting and harvesting pathology samples and reviewing the manuscript.*
32. Morin, C.; Sirois, M.; Echave, V.; Gomes, M. M.; Rousseau, E. 14,15-EET displays anti-inflammatory effects in TNF α -stimulated human bronchi: putative role of CPI-17. *Am. J. Respir. Cell. Mol. Biol.* 2008; 38(2):192-201 **Responsible for dissecting and harvesting pathology samples and reviewing the manuscript.*
33. Morin, C.; Sirois, M.; Echavé, V.; Gomes, M.M.; Rousseau, E. Functional effects of 20-HETE on human bronchi: hyperpolarization and relaxation due to BKCa channel activation. *Am. J. Physiol.; Lung Cell Mol. Physiol.* 2007 Oct; 293(4):L1037- L1044 **Responsible for dissecting and harvesting pathology samples and reviewing the manuscript..*
34. Morin, C.; Sirois, M.; Echavé, V.; Gomes, M.M.; Rousseau, E. Relaxing effects of 5-oxo-ETE on human bronchi involve BKCa channel activation. *Prostaglandins and other Lipid Mediators* 2007; 83(4):311-319 **Responsible for dissecting and harvesting pathology samples and reviewing the manuscript..*
35. Morin, C.; Sirois, M.; Echavé, V.; Gomes, M.M.; Rousseau, E. Epoxyeicosatrienoic acid relaxing effects involve BKCa channel activation and CPI-17 dephosphorylation in human

bronchi. *Am. J. Respir. Cell. Mol. Biol.* 2007 May; 36(5) :633-641 **Responsible for dissecting and harvesting pathology samples and reviewing the manuscript.*

36. Cardoso MP, Bourguignon DC, Gomes MM, Saldiva PH, Pereira CR, Troster EJ. Comparison between clinical diagnoses and autopsy findings in a pediatric intensive care unit in Sao Paulo, Brazil. *Pediatr Crit Care Med.* 2006 Sep;7(5):423-7 **Responsible for pathological data collection, writing and reviewing the manuscript.*
37. Kotb R, Turcotte E, McFadden N, Gomes M, Sawan B, Schmutz G. Late clinically silent perforation of intestinal non-Hodgkin's lymphoma. *Clin Lymphoma Myeloma.* 2006 May;6(6):484-7. *Participated in writing and reviewing the manuscript.*
38. Rozin, G.F. (medical student); Gomes, M.M.; Parra, E.R., Capelozzi, V.L.. Collagen and Elastic System in the Remodelling Process of Major Types of Idiopathic Interstitial Pneumonias (IIP). *Histopathology* 2005; 46(4)413-21. * *Supervision of medical student's research project (part of my PhD thesis), writing of manuscript.*
39. Claudia Regina Gomes Cardim Mendes de Oliveira, Olavo Pires de Camargo, Alberto Tesconi Croci, Miraim Nacagami Sotto, Marcio Mendes Gomes, Leda Saba. Fibrohistiocitoma maligno em criança, após tumor de Wilms: relato de caso. [Malignant Fibrohistiocytoma in a Child after a Wilm's Tumor: Case Report] *Revista Brasileira de Ortopedia.* May 2000. **Participated in the review and analysis of case.*

BOOK CHAPTERS

1. Marcio Gomes, Farid Shamji, Scott Laurie and Carole Dennie. How to design and foster multidisciplinary thoracic oncology cancer conferences. *Thoracic Surgery Clinics, Lung Cancer* 2021, Part 1 (in print).
2. Carolina Souza, Marcio Gomes. Aerogenous Metastasis in Lung Cancer. *Thoracic Surgery Clinics, Lung Cancer* 2021, Part 2 (in print).
3. Marcio Gomes. Educational Design: The 5 steps. *Royal College of Physicians and Surgeons of Canada Program Director Handbook* (in print).
4. Harman Sekhon, Carolina Souza and Marcio Gomes. Advances in Cytopathology for Lung Cancer: The Impact and Challenges of New Technologies. *Thorac Surg Clin.* 2013 May;23(2):163-78. **Corresponding and Senior Author.*

ABSTRACTS

1. Marcio Gomes, Stephanie Sutherland. It takes a village: Team characteristics as an essential presage factor of effective interprofessional education interventions. *Association of Medical Education Europe (AMEE) 2020: The Virtual Experience.* September 7-9, 2020.

2. Marcio Gomes, Denyse Richardson, Jerry Maniate, Samantha Halman, Linda Snell. Applying the 3-P Model to Plan and Evaluate your Interprofessional Education Activity. 2020 Canadian Conference on Medical Education, CMEJ 2020; 11(2):e11.
3. Gomes CM, Gomes MM et al. Impact of a one-day urodynamic course on knowledge, perceptions and attitudes of urology residents. 2020 Annual Meeting of the American Urological Association, Washington, DC, USA, May 15-18, 2020 (platform presentation).
4. Stewart DJ, Maziak D, Gomes MM et al. The cost of delaying therapy for advanced non-small cell lung cancer (NSCLC): a population kinetics assessment. American Association for Cancer Research Annual Meeting, San Diego, CA, USA, April 24-29, 2020 (submitted)
5. Busca A, Souza C, Gupta A, John S, Paliga A, Gomes MM. When Is Inflammation Just Inflammation? Pulmonary Nodules with an Initial Core Needle Biopsy Showing Non-Specific Inflammation: Radiological-Pathological Features and Correlation with Final Diagnosis. 109th Annual Meeting of the United States-Canadian Association of Pathologists, Los Angeles, California, USA, March 3, 2020.
6. Gomes MM, Driman D, Bhanji F, Dudek N. Design of a Workplace-Based Assessment Instrument for Assessing Pathology Trainee's Performance of Intra-Operative Consultations. 109th Annual Meeting of the United States-Canadian Association of Pathologists, Los Angeles, California, USA, March 2, 2020.
7. Marcio M. Gomes, David Driman, Timothy J. Wood, Nancy Dudek. Development of an instrument for workplace-based assessment of pathology entrustable professional activities: A pilot study. 1st CBME Program Evaluation Summit, International Conference on Residency Education (ICRE) Pre-Conference Activity, Ottawa, ON, Canada, September 23, 2019.
8. Marcio Gomes, Carolina Souza, Chantal Bornais, Denyse Richardson, Stephanie Sutherland. Presage, Process and Product: Analysis of an Interprofessional Education Intervention. Association of Medical Education Europe (AMEE), Vienna, Austria, August 28, 2019, abstract reference 62.
9. Ageely G, Souza C, de Boer K, Voduc N, M Gomes. Impact of Multidisciplinary Discussion in the Final Diagnosis and Management of Interstitial Lung Diseases. Society of Thoracic Radiology Annual Meeting, Savannah, Georgia, USA, March 24-27, 2019.
10. Keyhanian K, Lo B, Gomes MM, Sekhon H. High Levels of Neuroendocrine Differentiation Distinguishes Pulmonary Basaloid Variant of Squamous Cell Carcinoma: Immunohistochemical and Molecular Evidence. United States & Canadian Academy of Pathology's 108th Annual Meeting, Abstract number #1647, Maryland, USA, March 16-21, 2019.
11. M Gomes, D Huntsman, J Spaans, T Asmis, R Miller, P Kaurah, H Sekhon, S Banerji, M Duciaume, N Andrews Wright and G Goss. Histological and Genomic Characterization of

Lung Cancers in the Inuit Population of the Eastern Canadian Arctic. 4th Canadian Cancer Research Conference, Vancouver, BC, Canada, Nov 5-7, 2017, Abstract 12672.

12. Gilpin C, Gomes MM, Pollett A, Tomiak, E. An Unusual IHC result: Is Late Onset Biallelic Mismatch Repair Deficiency (BMMRD) the explanation? Collaborative Group of the Americas on Inherited Colorectal Cancer (CGAICC) 2017 meeting, Orlando, Florida, USA, October 20-21, 2017.
13. Joao R. Inacio, Nina Chang, Carolina Souza, Chi K Lai, Harman S Sekhon, Carole Dennie, Marcio Gomes. Aerogenous Spread of Lung Adenocarcinomas: Pathologic and Radiologic Features in Multiple Lung Cancers. 4th World Congress of Thoracic Imaging, Boston, MA, USA, June 18-21, 2017
14. Nina Chang, J Inacio, C Lai, A Gupta, CA Souza, HS Sekhon, MM Gomes. Aerogenous Intrapulmonary Metastasis of Lung Adenocarcinomas: Pathologic and Radiologic Features and Correlation. United States & Canadian Academy of Pathology's 106th Annual Meeting, San Antonio, TX, USA, March 4-10, 2017
15. Nina Chang, J Inacio, C Lai, A Gupta, CA Souza, HS Sekhon, MM Gomes. Lung Adenocarcinoma with Aerogenous Spread: Description of Histological Features and Radiological Pathological Correlation. Annual Research Day, Department of Pathology and Laboratory Medicine, University of Ottawa, Ottawa, ON, Canada, June 02, 2016.
16. João R Inácio, Nina Chang, Carolina Souza, Marcio Gomes, Carole Dennie. RUL Adenocarcinoma and Intrapulmonary Aerogenous Metastases. Case of the Day – Society of Thoracic Radiology Annual Meeting, USA, 2016.
17. Chang N, Inacio J, Lai C, Gupta A, Souza CA, Sekhon HS, Gomes MM. Lung Adenocarcinomas with Aerogenous Spread: Description of Histological Features and Radiological-Pathological Correlation. Pulmonary Pathology Society Biennial Meeting, San Francisco, CA, USA, June 02-05, 2015.
18. Jordan Sim, Nina Chang, Marcio Gomes, Chi Lai, Harman Sekhon. Predicting the Histologic Subtype of Lung Adenocarcinoma Using Cytology Specimens. Annual Research Day, Department of Pathology and Laboratory Medicine, University of Ottawa, May 15, 2015.
19. Nina Chang, Jordan Sim, Marcio Gomes, Chi Lai, Harman Sekhon. Predicting the Histologic Subtype of Lung Adenocarcinoma Using Cytology Specimens. United States and Canadian Academy of Pathology 102^{sd} Annual Meeting, Boston, MA, USA, March 21-27, 2015.
20. Petkiewicz S, Sekhon H, Lai C, Wheatley-Price P, Gomes M. Morphology Outperforms Immunohistochemistry on Subtyping of NSCLC in Biopsies. United States and Canadian Academy of Pathology 101st Annual Meeting, San Diego, CA, USA, March 01-07, 2014.

21. Paliga A, Strickland S and Gomes M. Improving the Autopsy Service through a Pathology Resident-Led Educational Initiative for Clinical Residents. United States and Canadian Academy of Pathology 101st Annual Meeting, San Diego, CA, USA, March 01-07, 2014.
22. Petkiewicz S, Sekhon H, Gomes M. Histology: A Reliable Tool to Classify NSCLC. Poster presentation, Pulmonary Pathology Society Biennial Meeting, Grenoble, France, June 26-28, 2013.
23. Aleksandra Paliga, Sarah Strickland and Marcio Gomes. Resident-led Autopsy Teaching and Autopsy Quality Improvement at The Ottawa Hospital. AIME Medical Education Day, April 5th, 2013, Ottawa, Ontario.
24. J Inacio, C Souza, J Seely, A Gupta, H Sekhon, M Gomes, C Dennie. Focal Ground Glass Lesions detected on Computed Tomography: Approach to Diagnosis and Management. Scientific exhibit, American Roentgen Ray Society 113th Annual Meeting, April 14-19, 2013, Washington, D.C., USA.
25. Gaikwad A, Inacio J, Gupta A, Souza C, Gomes M, Sekhon H, Dennie C. Primary Mucinous Adenocarcinoma of Lung: Analysis of Imaging Features on CT Scan and Significance of Aerogenous Spread. Scientific exhibit, American Roentgen Ray Society 113th Annual Meeting, April 14-19, 2013, Washington, D.C., USA.
26. A Gaikwad, J Inacio, C Souza, J Seely, A Gupta, H Sekhon, M Gomes, C Dennie. Aerogenous metastases: An under recognized game-changer in management of lung cancer. Educational exhibit, American Roentgen Ray Society 113th Annual Meeting, April 14-19, 2013, Washington, D.C., USA.
27. Diffuse Alveolar Damage Is Not a Prominent Feature of Non-Lung-Transplant-Related Pleuroparenchymal Fibroelastosis. Jeffrey J. Tanguay, Efrat Ofek, Shaf Keshavjee, Thomas K. Waddell, Marcio M. Gomes, David M. Hwang. United States and Canadian Academy of Pathology 100th Annual Meeting, March 02-06, 2013, Baltimore, Maryland, USA.
28. J R Inacio, C A Souza, S S Hare, M M Gomes, H S Sekhon, J Seely, N. Muller. Spectrum of Primary Pulmonary Lymphoproliferative Disorders: Imaging and Pathology Correlation. Educational Exhibit, Radiological Society of North America 2012 (RSNA, November 20-25, 2012, Chicago, Illinois, USA.
29. N. Malik, S. Lad, A. Gupta, M. Gomes, H. Sekhon, K. Amjadi, J. Seely. The Lumpy Bumpy Pleura: Radiology-Pathology Correlation of Pleural Biopsies. Educational Exhibit, Radiological Society of North America 2012 (RSNA), November 20-25, 2012, Chicago, Illinois, USA.
30. Kos Z., B. Burns, M. Gomes, H. Sekhon. A rare case of primary pulmonary anaplastic variant of diffuse large B-cell lymphoma. Canadian Association of Pathologist (CAP-ACP) Annual Meeting (Calgary, AB, Canada), 2012.

31. Gomes MM; Marginean EC; Ayroud YA. CanMEDS-based Daily Assessment of Clinical Encounters in Pathology. 2012 Canadian Conference on Medical Education, Banff, Alberta, Canada, April 17th, 2012 (poster presentation).
32. AL Dias, S. Hameed, A Gupta, ATC Goncalves, MM Gomes and SS Hare. The spectrum of radiological manifestations of pulmonary Aspergillus infection. Society of Thoracic Radiology Annual Meeting, March 11-14, 2012, Huntington Beach, CA, USA.
33. Anand Gaikwad, Ashish Gupta, Sam Hare, Marcio Gomes, Harman Sekhon, Carolina Souza, Joao Inacio, Shilpa Lad, Jean Seely. BAC Is Dead! Acclimatization to the New Terminologies and the Radiological Recommendations. Society of Thoracic Radiology Annual Meeting, March 11-14, 2012, Huntington Beach, CA, USA.
34. E Peña, C Souza, D Escuissato, C Dennie, J Tay, M Gomes, D Allan, J Ahuja. Non infectious Pulmonary complications after hematopoietic stem cell transplant. Educational Exhibit, Radiological Society of North America (RSNA), Nov/2011, Chicago, Illinois, USA.
35. Gomes M, Souza C, Bar J, Sekhon H. Interdisciplinary site-specific didactic meetings: Addressing competency-based education and program-based clinical services. International Conference on Residency Education 2011, Royal College of Physicians and Surgeons of Canada (Best Poster Award), Quebec, Canada. Open Medicine. September 21, 2011. Vol. 5(3), pp.S10, abstract 159.
36. Gomes MM; Marginean EC; Ayroud YA. CanMEDS-based Daily Assessment of Clinical Encounters in Pathology. International Conference on Residency Education 2011, Royal College of Physicians and Surgeons of Canada – oral presentation, Quebec, Canada. Open Medicine. September 21, 2011. Vol. 5(3)
37. H. Sekhon, M. Gomes, C. Souza, K. Amjadi, S. Sundaresan and S. Laurie. Are Cytology Samples Optimal For EGFR Mutation Analysis For Medical Oncology Clinics and Do They Measure Up? 23rd European Congress of Pathology, European Society of Pathology Annual Meeting (Helsinki, Finland). Arch Virchow. 2011 (August); 459 (suppl): S134.
38. Hare S, Souza C, Gupta A, Sekhon H, Seely J, Gomes M. Radiopathological correlation in lung adenocarcinoma. Poster presentation, Pulmonary Pathology Society Biennial Meeting, New York, NY, USA, August 2011.
39. Gomes M, Souza C, Bar J, Sekhon H. Interdisciplinary Thoracic Pathology Meetings: Addressing Competency-Based Education. Poster presentation, Pulmonary Pathology Society Biennial Meeting, New York, NY, USA, August 2011.
40. Petkiewicz S, Sekhon H, Gomes M. Peripheral Myoepithelial Carcinoma of the Lung. Poster presentation, Pulmonary Pathology Society Biennial Meeting, New York, NY, USA, August 2011.

41. Petkiewicz S, Souza C, Sekhon H, Gomes M. Lung Metastases Presenting as Ground Glass Nodules. Oral presentation, Pulmonary Pathology Society Biennial Meeting, New York, NY, USA, August 2011.
42. H.S. Sekhon, R. Padmore, B. F. Burns, M. Gomes, C. Souza and S. Sundaresan. Anterior Mediastinal Mass: an atypical clinical and radiological presentation of a rare case of Erdheim Chester Disease. Poster presentation, Pulmonary Pathology Society Biennial Meeting, New York, NY, USA, August 2011.
43. T. Jayasinghe, M.M. Gomes and H.S. Sekhon. Changing trends of fine needle aspirate diagnosis of lung neoplasm in the face of customized patient management approach. Poster presentation, Pulmonary Pathology Society Biennial Meeting, New York, NY, USA, August 2011.
44. Siadat, F., Gomes, M., Marginean, E., Ayroud, Y., Mai, K. and Nguyen, B. Mucin profiles in goblet cell carcinoid of the appendix. Canadian Laboratory Medicine Congress, Vancouver, British Columbia, Canada, June 4-8, 2011 (poster presentation).
45. H.S. Sekhon, R. Padmore, B. F. Burns, M. Gomes, C. Souza and S. Sundaresan. Anterior Mediastinal Mass: an atypical clinical and radiological presentation of a rare case of Erdheim Chester Disease. Canadian Laboratory Medicine Congress, Vancouver, British Columbia, Canada, June 4-8, 2011 (poster presentation).
46. Gomes MM; Marginean EC; Ayroud YA. CanMEDS-based Daily Assessment of Clinical Encounters in Pathology. 2011 Canadian Conference on Medical Education, Toronto, ON, Canada, May 7-11, 2011 (oral presentation).
47. Siadat F, Nguyen B, Gomes M, Marginean EC. The Diagnostic Utility of Hepatocyte Antigen, GPC3, and IMP3 in Distinguishing Between Hepatocellular Carcinoma and Benign Hepatic Lesions. United States and Canadian Academy of Pathology 100th Annual Meeting (San Antonio, Texas, USA). *Modern Pathology*. 2011; 24(suppl):pp 168A.
48. T. Jayasinghe, M.M. Gomes and H.S. Sekhon. Changing trends of fine needle aspirate diagnosis of lung neoplasm in the face of customized patient management approach. Are we going to step up? United States and Canadian Academy of Pathology 100th Annual Meeting (San Antonio, Texas, USA). *Modern Pathology*. 2011; 24(suppl):pp 94A.
49. DT Barnes, MBCHB; SS Hare, MBBS, FRCR, MA; A Gupta, MD; HS Sekhon, MD; MM Gomes, MD; C A Souza, MD. Novel Target Therapy for Lung Cancer and the Role of the Percutaneous Imaging-guided Biopsy: What the Radiologist Needs to Know. RSNA, Chicago, USA, 2010.
50. SS Hare, MBBS, FRCR, MA, Ottawa, ON; A Gupta, MD; MM Gomes, MD, PhD, ; HS Sekhon, MD, PhD, ; JM Seely, MD; CA Souza, MD. Bronchioloalveolar Carcinoma (BAC) Unmasked: The Many Guises of Adenocarcinoma with a BAC Pattern of Growth. RSNA, Chicago, USA, 2010.

51. SS Hare, MBBS, FRCR, MA; A Gupta, MD; AT Goncalves, MD; DT Barnes, MBCHB; MM Gomes, MD; CA Souza, MD. Reorganizing Disorganized Concepts Regards Organizing Pneumonia (OP). RSNA, Chicago, USA, 2010.
52. Allison Edgecombe, MD, Rebecca Peterson, MD, Farid M. Shamji, MD, A. Susan Commons, MD, Harman Sekhon, MD, PhD, Marcio M. Gomes, MD, PhD. Pulmonary Myopericytoma: A Pleural Based Spindle Cell Neoplasm Off The Beaten Path. Canadian Association of Pathology, July 2010.
53. Jun Fukuoka, Ryoko Egashira, Hiroyuki Taniguchi, Marcio M. Gomes et al. Agreement of Pathological Diagnosis in Fibrosing Interstitial Pneumonia. ATS International Conference in New Orleans, Louisiana, USA, May 2010.
54. Shaun J. Kilty, Dakheelallah AlMutari, Melanie Duval, Michelle A. Groleau, Joseph De Nanassy, Marcio M. Gomes. Manuka Honey: Histological Effect on Respiratory Mucosa. 55th Annual Meeting of the American Rhinologic Society, San Diego, CA, USA on October 3rd, 2009.
55. Edgecombe AD, Nguyen BN, Gomes MM, Cote J, Mai KT. Comparative Immunohistochemical Study of Serous and Mucinous Cystic Neoplasms of the Pancreas: Similar Stroma Phenotype Suggesting a Possible Histopathogenic Relationship. Canadian Association of Pathologists Meeting, Nova Scotia, Canada, July 2009.
56. Gomes MM, Md Amin S, Sekhon H. Are We Ready To Diagnose Bronchioloalveolar Adenocarcinoma as an In Situ Lesion? 6th Biennial Meeting of the Pulmonary Pathology Society, Portland, USA, June 2009.
57. Marinescu M, Gomes MM, Sekhon HS. Primary melanoma of the lung, University of Ottawa Department of Pathology Research Day, Ottawa, Canada, May 2009.
58. Flood TA, Sekhon HS, Seely JM, Shamji FM, Gomes MM. Spontaneous pneumothorax and lung carcinoma: should one consider synchronous malignant pleural mesothelioma?. University of Ottawa Department of Pathology Research Day, Ottawa, Canada, May 2009.
59. A.M.Cantin and M.M.Gomes. Effect of 1H-purine nasal instillation on bleomycin lung injury in mice. American Thoracic Society Meeting, San Francisco, USA, May 2007.
60. Morin, C., Sirois, M., Echavé, V., Gomes, M.M. et E. Rousseau. Sensibilité des bronchioles humaines aux eicosanoïdes bronchodilatateurs: EET et 20-HETE. Congrès l'APPQ-RSR, Québec, Qc., 1-2 Décembre 2006.
61. Rousseau, E., Morin, C., Sirois, M., Echavé, V. et Gomes, M.M. Functional effects of 20-HETE on human bronchi: hyperpolarization and relaxation due to BKCa channel activation. NorthEast Smooth Muscle Society, Worcester, MA., USA, 18-19 October 2006.

62. Morin, C., Sirois, M., Echavé, V., Gomes, M.M. et E. Rousseau. BroncHUS: mode d'action des eicosanoïdes bronchodilatateurs dans un modèle de bronchioles humaines en culture organoïde. CRCQ, Lac à l'Eau Claire, Qc., 21-23 Septembre 2006.
63. Gomes, M.M.; Rozin, G.F.; Parra, E.R.; de Carvalho, C.R.; Kairalla, R.; Saldiva, P.H.N.; Capelozzi, V.L.. The injury extension to the epithelial cell/epithelial basement membrane unity (EC-EBM) as the major pathogenetic determinant of lung architectural remodelling in IIP: A paradigmatic change. European Respiratory Society Annual Congress, Glasgow, Scotland, September 2004.
64. Capelozzi, V.L.; Baptista, A.L.; Gomes, M.M.; Parra, E.R.; Ab'Sáber, A.M.; De Carvalho, C.R.R.; Kairalla, R.A.. Type II Pneumocytes in Architectural Remodelling of Usual Interstitial Pneumonias. European Respiratory Society Annual Congress, Glasgow, Scotland, September 2004.
65. Capelozzi, V.L.; Rozin, G.F.; Gomes, M.M.; Parra, E.R.; Ab'Sáber, A.M.; De Carvalho, C.R.R... Architectural Remodelling in Idiopathic Interstitial Pneumonias: fibrosis or fibroelastosis? European Respiratory Society Annual Congress, Glasgow, Scotland, September 2004.
66. Baptista, A. L.; Gomes, M.M.; Parra, E.R.; Ab'Sáber, A.M.; de Carvalho, C.R.R.; Kairalla, R.; Capelozzi, V.. Type II Pneumocytes in Architectural Remodelling of Usual Interstitial Pneumonias. *Am J Respir Crit Care Med* 2004; 169(7):A112 – American Thoracic Society Meeting, Orlando, USA, May 2004.
67. Rozin, G.; Gomes, M.M.; Parra, E.R.; Ab'Sáber, A.M.; Carvalho, C. R. de; Kairalla, R.; Capelozzi, V.. Collagen and Elastic System in the Architectural Remodelling of Idiopathic Interstitial Pneumonias. *Am J Respir Crit Care Med* 2004; 169(7):A779 – American Thoracic Society Meeting, Orlando, USA, May 2004.
68. Parra, E.R.; Gomes, M.M.; Ab'Sáber, A.M.; Rozin, G.; Kairalla, R.; Saldiva, P.H.N.; Carvalho, C.; Capelozzi, V.. Diffuse interstitial lung diseases: prevalence in a series of 305 patients with open lung biopsy from a University Hospital. *Am J Respir Crit Care Med* 2003; 167:A990 – American Thoracic Society Meeting, Seattle USA, May 2003.
69. Parra, E.R.; Gomes, M.M.; Ab'Sáber, A.M.; Rozin, G.; Kairalla, R.; Saldiva, P.H.N.; Carvalho, C.; Capelozzi, V.. New ATS/ERS 2001 Classification Revisited in IIP: Impact on Specific Entities. *Am J Respir Crit Care Med* 2003; 167:A990 – American Thoracic Society Meeting, Seattle USA, May 2003.
70. Parra, E.R.; Ab'Sáber, A.M.; Gomes, M.M.; Rozin, G.; Kairalla, R.; Saldiva, P.H.N.; Carvalho, C.; Capelozzi, V.L.. [ATS/ERS 2001 Classification Revisited in IIP: Impact on Specific Entities]. *Jornal Brasileiro de Patologia* 39 (1):149, Abstract 15-07, 2003. XXIV Brazilian Congress of Pathology, Florianópolis, Brazil, April 2003.
71. Parra, E.R.; Ab'Sáber, A.M.; Gomes, M.M.; Rozin, G.; Kairalla, R.;

- Saldiva, P.H.N.; Carvalho, C.; Capelozzi, V.L.. [Diffuse Interstitial Lung Diseases: Prevalence in a Series of 305 Wedge Lung Biopsies]. *Jornal Brasileiro de Patologia* 39(1):46, Abstract 15-10, 2003. XXIV Brazilian Congress of Pathology, Florianópolis, Brazil, April 2003.
72. Monteiro, A.; Gomes, M.M.; Silveira, E.B.; Lima, M.I.; Kalil, R.K.. [Macrofagic Myofasciitis in a Child with Neonatal Hypotonia], Poster presentation. *Jornal Brasileiro de Patologia* 39(1) Resumo 2003. XXIV Brazilian Congress of Pathology, Florianópolis, Brazil, April 2003.
73. Gomes, M.M.; Rozin, G.; Parra, E.R.; Kairalla, R.; Saldiva, P.H.N.; Capelozzi, V.. Prevalence of non-infectious DILD among 444 patients with open lung biopsy. *Histopathology*, 41(suppl.1), 2002 - XXIV International Congress of the International Academy of Pathology – Amsterdam, Netherlands, October 2002.
74. Gomes, M.M.; Rozin, G.; Parra, E.R.; Kairalla, R.; Saldiva, P.H.N.; Capelozzi, V.. ATS/ERS 2001 Classification: Impact on the Frequency of Idiopathic Interstitial Pneumonias. *Histopathology*, 41(suppl.1), 2002 - XXIV International Congress of the International Academy of Pathology – Amsterdam, Netherlands, Oct 2002, platform presentation.
75. Gomes, M.M.; Ishida, L.H.; Alves, H.R.N.; Rodrigues, L.; Capelozzi, V.; Ferreira, M.C.. Degenerative changes on perforator vessels of microsurgical cutaneous flaps. *Histopathology*, 41(suppl.1), 2002 - XXIV International Congress of the International Academy of Pathology – Amsterdam, Netherlands, October 2002, platform presentation.
76. Gomes, M.M.; Ishida, L.H.; Munhoz, A.M.; Kim, A.D.Y.; Miranda, R.E.; Rodrigues, L.; Dolhnikoff, M.; Ferreira, M.C.. Breast reconstruction recipient vessels: internal thoracic and thoracodorsal vessels histological comparative study. *Histopathology*, 41(suppl.1), 2002 – In: XXIV International Congress of the International Academy of Pathology – Amsterdam, Netherlands, October 2002, platform presentation.
77. Ishida, L.H.; Gomes, M.M.; et al. Qualitative and histomorphometric study of the anterolateral thigh perforator vessels. - “VI International course on perforator flaps” – Taoyuan - Taiwan, Oct 2002, platform presentation.
78. Ishida, L.H.; Gomes, M.M.; et al. Qualitative and histomorphometric study of the recipient vessels in microsurgical breast reconstruction. - “VI International course on perforator flaps” – Taoyuan - Taiwan, October 2002, platform presentation.
79. Lancellotti, C.L.P.; Gomes, M.M.; Iasi, M., Iasi, M.S.F.; Favero, S.S.G.; Cordovani, N.T.B.; Santos, R.G.; Soler, W.V.. [Small Bowel Transplantation: Outcome and Clinical-Pathological Correlation], Poster presentation – XXIII Brazilian Congress of Pathology, Salvador, Brazil, April 2001.

80. Stirbulov, R.; Ferrazi, M.A.T.; Honda, A.; Gibbons, A.P.; Fonseca, M.S.M.; Martins, V.C.; Palombo, M.; Gomes, M.M.. [Primary Pulmonary Lymphoma], Poster presentation – IX Sao Paulo Congress of Respiriology, São Paulo, Brazil, 2001.
81. Stirbulov, R.; Ferrazi, M.A.T.; Honda, A.; Gibbons, A.P.; Fonseca, M.S.M.; Martins, V.C.; Palombo, M.; Gomes, M.M.. [Anthracotic Nodules: Case Report], Poster presentation – IX Sao Paulo Congress of Respiriology, São Paulo, Brazil, 2001.
82. Stirbulov, R.; Ferrazi, M.A.T.; Honda, A.; Gibbons, A.P.; Fonseca, M.S.M.; Martins, V.C.; Palombo, M.; Gomes, M.M.. “Plueral Metastasis of Prostatic Adenocarcinoma”, Poster presentation – IX Sao Paulo Congress of Respiriology, São Paulo, Brazil, 2001.
83. Genta, P.R.; Prezotti, S.O.A.; Tedde, M.L.; Jacomelli, M.; Gomes, M.M.; Pedreira Jr, W.L.; Takagaki, T.Y.. [Endobronchial Adenoid Cystic Carcinoma: Endoscopic Resection by Snare Polypectomy Electrocautery], Poster presentation – VIII Sao Paulo Congress of Respiriology, São Paulo, Brazil, 1999.
84. Co-author, case report [Primary Pulmonary Nodular Amyloidosis], Poster presentation – VIII Sao Paulo Congress of Respiriology, São Paulo, Brazil, 1999.
85. Co-author, case report [Desmoplastic Mesothelioma], Poster presentation – VIII Sao Paulo Congress of Respiriology, São Paulo, Brazil, 1999.
86. Vicentini, F.C.; Fonseca, M.H.; Araújo, P.H.X.N.; Bernardo, W.; Fernandes, P.M.P.; Gomes, M.M.. [Primary Thymic Sarcoma Associated with a Multilocular Thymic Cyst] – XVII University Medical Congress of the University of Sao Paulo School of Medicine, São Paulo, August 1998.
87. Co-author, [Persistent *Candida krusei* Candidemia] – XXXI Brazilian Congress of Clinical Pathology, Belo Horizonte, September 1997.
88. Rossi, F.S.; Proença, R.S.M.; Teixeira, M.R.P.; Gomes, M.M.; Baggio, V.L.; Miura, I.K.; Ramos, J.L.; Leone, C.R.. [Budd-Chiari Syndrome in a Neonate Secondary to Fungal Endocarditis] – XV Brazilian Congress of Maternal-Fetal Medicine, Belo Horizonte, Brazil, November 1996.

TEACHING

Undergraduate

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|-------------|--|
| 2015 – 2019 | e-Portfolio Longitudinal Coach, Graduating Class of 2019, francophone stream, University of Ottawa, Ottawa, ON, Canada |
| 2012 - 2014 | Case-Based Learning Tutor, 1 st year Medical School, Unit I, Francophone stream, University of Ottawa, Ottawa, ON, Canada |

- 2011 - 2013 Case-Based Learning Tutor, 1st year Medical School, Unit II, Francophone stream, University of Ottawa, Ottawa, ON, Canada
- 2011 - 2015 e-Portfolio Longitudinal Coach, Graduating Class of 2015, francophone stream, University of Ottawa, Ottawa, ON, Canada
- 2011 OSCE examiner, 1st Year Medical Students, Francophone stream, University of Ottawa, Ottawa, ON, Canada
- 2008 - present Lectures and Labs, 1st year Medical School, Foundations Unit, Anglophone and Francophone streams, University of Ottawa, Ottawa, ON, Canada
- 2008 - present Lectures and Labs, 1st year Medical School, Unit I, Anglophone and Francophone streams, University of Ottawa, Ottawa, ON, Canada
- 2008 - 2019 Lectures and Labs, 2nd year Medical School, Unit II, Anglophone and Francophone streams, University of Ottawa, Ottawa, ON, Canada
- 2008 - present Supervision of Pathology Elective Rotations, 1st, 2nd, 3rd and 4th year Medical Students, University of Ottawa, Ottawa, ON, Canada
- 2007 – 2008 Apprentissage Par Problème, Tuteur, Pneumologie, 1st year Medical School, Université de Sherbrooke, Sherbrooke, Quebec, Canada
- 2000 – 2001 Lectures and Labs, 4th year Medical School, Santa Casa School of Medical Sciences, Sao Paulo, Brazil
- 1997 – 2001 Lectures and Labs, 3rd year Medical School, University of Sao Paulo, Sao Paulo, Brazil
- Postgraduate
- 2009 – 2018 Coordinator and Moderator, Interdisciplinary Thoracic Pathology Meetings (Thoracic Surgery, Medical Oncology, Radiation Oncology, Radiology, Nuclear Medicine, Respiriology and Pathology) – University of Ottawa, Ottawa, ON, Canada
- 2009 – 2014 Supervisor and Moderator, Thoracic Rounds (Thoracic Surgery, Radiology, Respiriology and Pathology) – University of Ottawa, Ottawa, ON, Canada
- 2008 – present “Unknown Rounds”, The Ottawa Hospital – Pathology Residency Program, University of Ottawa, Ottawa, ON, Canada
- 2008 - present Supervisor of Thoracic Pathology Rotation, The Ottawa Hospital – Pathology Residency Program, University of Ottawa, Ottawa, ON, Canada

- 2008 - 2015 Supervisor of Thoracic Pathology Rotation, The Ottawa Hospital – Medical Oncology, Respirology and Thoracic Surgery Fellows, University of Ottawa, Ottawa, ON, Canada
- 2008 - present Gastrointestinal Pathology Rotation, The Ottawa Hospital – Pathology Residency Program, University of Ottawa, Ottawa, ON, Canada
- 2008 - 2013 Gastrointestinal Pathology Rotation, The Ottawa Hospital – Gastroenterology Residency Program, University of Ottawa, Ottawa, ON, Canada
- 2008 - present Surgical Pathology Rotation, The Ottawa Hospital – Pathology Residency Program, University of Ottawa, Ottawa, ON, Canada
- 2008 - present Surgical Pathology Rotation, The Ottawa Hospital – Radiation Oncology, Radiology, General Surgery, Medical Genetics Residency Programs, University of Ottawa, Ottawa, ON, Canada
- 2008 - present Thoracic Pathology review sessions and practical exams for Anatomical Pathology Residents (preparation for Royal College specialty exam)
- 2008 - 2019 Gastrointestinal Pathology review sessions and practical exams for Anatomical Pathology Residents (preparation for Royal College specialty exam)
- 2008 - present Supervision Pathology Residents on-call, The Ottawa Hospital – Pathology Residency Program, University of Ottawa, Ottawa, ON, Canada
- 2008 – 2009 Multihead Microscope Teaching Sessions, The Ottawa Hospital – Pathology Residency Program, University of Ottawa, Ottawa, ON, Canada
- 2005 – 2008 Supervision of medical residents (pathology, gastroenterology and general surgery), “Centre Hospitalier Universitaire de Sherbrooke”, Sherbrooke, Québec, Canada
- 2003 – 2005 Supervisor of Thoracic Pathology Rotation, Hospital das Clínicas, Pathology Residency Program, University of Sao Paulo School of Medicine, Sao Paulo, Brasil
- 2003 – 2005 Supervisor of Surgical Pathology Rotation, Hospital das Clínicas, Pathology Residency Program, University of Sao Paulo School of Medicine, Sao Paulo, Brasil
- 2000 – 2001 Supervisor of Thoracic Pathology Rotation, Pathology Residency Program, Santa Casa School of Medical Sciences, Sao Paulo, Brasil

2000 – 2001 Supervisor of Surgical Pathology Rotation, Pathology Residency Program,
Santa Casa School of Medical Sciences, Sao Paulo, Brasil

Graduate

2009 – 2012 Teacher, Graduate Program: The Pathological Basis of Disease, Course
Coordinator: Adolfo J. de Bold, University of Ottawa, Ottawa, ON, Canada