Demographic Characteristics and Diagnostic Performance of Pathologists Who Enjoy Interpreting Melanocytic Skin Lesions

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A thesis submitted in partial fulfillment of the requirements for the degree of

Master of Science

University of Washington

2017

Committee:

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Program Authorized to Offer Degree:

Epidemiology

University of Washington

Abstract

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Background: Diagnostic errors among pathologists when interpreting melanocytic skin lesions (MSL) is an ongoing concern for patient safety and quality of care. The number of skin biopsies has increased annually over the past decade, subsequently applying a higher demand on pathologists' work performance. Given that physician job satisfaction can plausibly impact upon patient care, we aimed to estimate the association between enjoyment of MSL interpretation and diagnostic performance in pathologists, and to characterize the attributes of pathologists who do vs. do not enjoy interpreting MSL.

Materials and Methods: A cross-sectional survey was conducted among pathologists from 10 U.S. states who interpret MSL. Characteristics of pathologists' demographics, training, experience, and perceptions of MSL interpretation were gathered and the associations with self-report of enjoyment when interpreting MSL were estimated by Mantel-Haenszel chi-square tests,

or Spearman's correlation tests for ordinal variables. Pathologists subsequently reviewed a set of 48 MSL cases, and their interpretations were compared to a reference standard diagnosis to determine diagnostic accuracy. A multivariable logistic regression model was fit to determine if the characteristics associated with enjoyment were also independently associated with diagnostic accuracy. The unadjusted and adjusted associations between enjoyment and diagnostic accuracy were evaluated by generalized estimating equations (GEE) models.

Results: Of 207 pathologists who enrolled in the study, 187 completed a baseline survey followed by histological interpretations (90%). Seventy percent agreed at least slightly that interpreting MSL is enjoyable. Pathologists who enjoyed interpreting MSL were more likely to interpret an average of ≥50 benign MSL cases per month (p=<0.001), report that their colleagues consider them an expert in MSL pathology (p=<0.001), found MSL cases more challenging to interpret (<0.001), were more nervous about MSL compared to other types of pathology (0.002), and had a higher degree of confidence in their MSL assessment (p=<0.001). In multivariable analyses, expertise and number of benign MSL interpreted per month remained statistically significantly associated with diagnostic accuracy; however, the adjusted GEE model showed no association between enjoyment and diagnostic performance.

Conclusions: Most pathologists agreed that interpretation of MSL is enjoyable. The number of benign MSL cases interpreted per month, and perceived expertise and confidence in MSL interpretation were highly associated with enjoyment. Due to the annual increase in skin biopsies and a greater demand for pathologists to enter the workforce, it is reassuring to know that there is no association between enjoyment and diagnostic accuracy.

INTRODUCTION

Physician job satisfaction or enjoyment in daily clinical activities are likely to have an impact on the physician. Job satisfaction among physicians has been studied within the dermatology, pathology and dermatopathology fields,[1–4] and a strong correlation of job satisfaction with the perceived ability to deliver optimal patient care was identified among dermatologists.[2] Pathologist frustration with clinician-pathologist communication is likely to also play a role in diagnostic performance; a 2012 study of over 500 American Society of Dermatopathology (ASDP) dermatopathologists showed that there was a significant amount of dissatisfaction with the quality of clinical information in the requisition form that they are given to make a definitive diagnosis.[5] There are also additional challenges and demands that pathologists currently face with the implementation and increasing use of electronic medical records.[6] Since 2014 patients have been able to receive direct access to their laboratory reports, and the resulting risk of patient misinterpretation of reports and subsequent demand on pathologists to respond to direct patient inquiries or requests is substantial.[7]

The incidence of melanoma is rising faster than any other cancer,[8] in part due to an annual increase in skin biopsies since 2002.[9] Melanocytic lesions can be challenging to interpret. Previous studies have noted substantial and frequent diagnostic errors in interpreting skin biopsies.[10–13] Diagnostic errors cause harm to patients by preventing or delaying appropriate treatment, providing unnecessary or harmful treatment, or resulting in psychological or financial repercussions.[14] Because of the clinical implications that diagnostic errors have on patient safety and quality of care, it is important to further evaluate the potential sources of these errors.

No known literature exists that evaluates the association between job satisfaction and diagnostic performance among pathologists when interpreting melanocytic skin lesions (MSL).

In this study, we characterize the pathologist attributes that are correlated with job satisfaction and evaluate whether level of satisfaction is associated with diagnostic performance when interpreting MSL using data from the Melanoma Pathology Study (M-Path).

MATERIALS AND METHODS

Study population

During July 2013 – March 2015 we invited pathologists to participate in our study who interpreted skin tissue and practiced in one of the following states: CA, CT, IA, KY, LA, NJ, UT, NM, and WA. Pathologists were considered eligible if they interpreted some MSL as part of their usual caseload, had been interpreting for at least one year before the start of the study and planned to continue interpreting MSL for the next two years. We excluded residents and fellows. We identified eligible pathologists through telephone calls to pathology laboratories, membership lists from professional organizations, and Internet searches. The Institutional Review Boards at the University of Washington, Dartmouth College, Oregon Health and Science University, Rhode Island Hospital and Fred Hutchinson Cancer Research Center approved all of the study activities.

Pathologist baseline survey

The pathologist baseline survey assessed participant demographics, training and experience, and perceptions about MSL. Pathologists reported how challenging they find MSL to interpret on a 6-point Likert scale that included 'very easy' (1), 'easy' (2), 'somewhat easy' (3), 'somewhat challenging' (4), 'challenging' (5) and 'very challenging' (6). Responses were dichotomized into two categories for analysis, easy to somewhat challenging (includes 2-4), and challenging to very challenging (includes 5-6). There were no responses for 'very easy'. Participants' general confidence in their assessments of MSL was reported by a 6-point Likert scale ranging from 1 ('extremely confident') to 6 ('not at all confident'). Responses were categorized into three groups for analysis, high confidence (includes 1-2), moderate confidence

(includes 3) and low confidence (includes 4-5). There were no responses for the 'not at all confident' category. Additionally, participants reported their level of agreement using a 6-point Likert scale from 1 ('strongly disagree') to 6 ('strongly agree') when asked to rate statements regarding their nervousness from interpreting MSL compared to other types of pathology, concern about patient safety and potential harm that may result from their assessment of MSL, and enjoyment when interpreting MSL. For the analysis, we collapsed the Likert responses to the statement, "interpreting melanocytic skin lesions is enjoyable", into the following four comparison groups: 1) disagree (includes 'strongly disagree' and 'disagree'), 2) slightly disagree, 3) slightly agree and 4) agree (includes 'strongly agree' and 'agree'). A full copy of the survey is available at: http://depts.washington.edu/epidem/faculty/elmore-joann.

Participant and reference diagnoses

Once the baseline survey was complete, participants were randomly assigned to independently interpret one of five sets of 48 skin pathology cases in glass-slide format using an online Melanocytic Pathology Assessment Tool and Hierarchy for Diagnosis (MPATH-Dx) histology form.[15] The 240 cases included in these review sets were identified by stratification on patient age and medical chart documentation of the original diagnosis. Additional information on the development and allocation of the cases is reported elsewhere. [15–17] All 240 cases, with one glass slide per case, were previously reviewed independently by each consensus panel member and then again together as a group to reach a consensus reference diagnosis for each case.[16] The same 240 glass slides were then allocated to sets and randomly assigned to participating pathologists. Each set consisted of cases that, based on consensus panel review, ranged from benign MSL to invasive melanoma, with an equal distribution of the different histological

subtypes. Pathologists' diagnoses for each case were mapped to one of five MPATH-Dx© classes.[15]

Statistical analysis

Associations between pathologist characteristics and enjoyment of interpreting MSL were tested for statistical significance using Mantel-Haenszel Chi-squared test statistics for binary covariates and tests for significance of Spearman's rank correlation coefficients for ordinal covariates, with an alpha level of 0.003 for each individual test after a Bonferroni correction for multiple comparisons. Diagnostic performance was defined as the overall discordance and concordance proportions when comparing participant case interpretations to the reference standard diagnosis. Discordance for each case was defined as a participant diagnosis that was classified into a different MPATH-Dx© class compared to the reference standard diagnosis. Concordance for each case was defined as a participant diagnosis that was classified into the same MPATH-Dx© class as the reference standard diagnosis. Average discordance and concordance proportions for pathologists by category of enjoyment when interpreting melanocytic skin lesions were calculated. The statistical significance of the comparison was determined by use of logistic regression models with discordance vs. concordance rate as the binary outcome and enjoyment as the predictor of interest. Models were fit with generalized estimating equations (GEE) using an independence working correlation matrix, due to our assumption that case interpretations between participants are independent from each other, and we identified pathologists as the independent units of analysis. Associations of potential confounding variables with diagnostic accuracy were estimated by a multivariable logistic

regression model. The final GEE model included an adjustment for pathologist characteristics that were associated with both enjoyment and diagnostic accuracy. Two sided p-values were based on Wald statistics. All statistical analyses were performed with STATA version 14 (StataCorp. 2015. *Stata Statistical Software: Release 14*. College Station, TX: StataCorp LP).

RESULTS

Pathologists' characteristics and enjoyment of interpreting MSL

Of 301 eligible pathologists, 207 (68.8%) completed the baseline survey and 187 of those 207 (90%) completed their 48 glass slide interpretations (**figure 1**). There were no statistically significant differences among the 207 eligible pathologists who agreed to participate and the 94 who were eligible but declined to participate with respect to mean age, time spent in direct medical care, or practice in a community of ≥250,000 people (data not shown). The 187 pathologists who completed the slide review were no different than the 20 who did not complete when it came to the baseline characteristics, including enjoyment of interpreting MSL (**Appendix 1**). However, to make valid comparisons between the associations of enjoyment with characteristics from the baseline survey and data on their subsequent diagnostic accuracy, main analyses were conducted among the 187 pathologists who completed their diagnostic interpretations on the cases and the remaining 20 were thus excluded.

Among the 187 participating pathologists, when asked about whether or not they agreed with the statement "Interpreting melanocytic skin lesions is enjoyable," most respondents said that they either slightly agreed or agreed (127/187; 68%) (**Figure 2**). Most were 50 years or older (53%), male (61%), not affiliated with an academic medical center (72%), had ≥10 years of experience interpreting melanocytic skin lesions (60%), had a ≥10% usual caseload of melanocytic skin lesion cases (58%), and interpreted an average ≥5 melanoma cases per month (56%) (**Table 1**). Among the aforementioned attributes, only affiliation with an academic medical center and having ≥10 years of experience interpreting MSL were associated with agreement that interpreting MSL is enjoyable.

After imposing a Bonferroni adjustment to account for multiple comparisons, pathologists who reported enjoying interpreting MSL were more likely than those who did not enjoy to interpret an average of ≥50 benign MSL cases per month (p=<0.001), to report that their colleagues consider them an expert in MSL pathology (p=<0.001), and to find MSL easier to interpret (p=<0.001); they were also less nervous about interpreting MSL (p=0.002), and had a higher degree of confidence in their assessment of MSL (p=<0.001). Self-reported level of enjoyment when interpreting MSL was not associated with the following: pathologists age at time of the survey, their gender, their % caseload of MSL cases, their number of cases of melanoma (melanoma in situ and invasive melanoma) interpreted per month, how many second opinions they requested per month, whether or not they had ever been involved in a prior malpractice lawsuit, or whether they were concerned about patient harm as a result of their assessment of MSL (**Table 1**).

We further evaluated the five pathologist characteristics that were statistically significantly associated with level of enjoyment in the baseline survey by performing multivariable logistic regression modeling of the association of these variables and their concordance with the reference standard diagnosis on the subsequent test cases (**Table 2**). Interpreting an average of ≥50, compared to <50, benign MSL cases per month (OR=1.33; 95% CI (1.19, 1.47)) and self-report of being considered an expert by colleagues (OR=1.28; 95% CI (1.16, 1.41)) remained statistically significantly associated with concordance with the reference standard diagnosis (both p=<0.001).

Agreement with the reference standard diagnosis

As reported enjoyment of interpreting MSL increased, the accuracy of interpretations on the test cases as assessed by concordance with the consensus reference standard also increased (**Table 3a**). There was an unadjusted statistically significant association between enjoyment and agreement with the reference standard diagnosis (p=0.002). After adjustment for pathologists' self-report of whether their colleagues consider them to be an expert and their average number of benign MSL interpreted per month, there was no association between enjoyment of interpreting MSL and agreement with the reference standard diagnosis (p=0.341) (**Table 3b**).

DISCUSSION

Most pathologists in the study indicated that they strongly agreed or agreed that interpreting melanocytic skin lesions is an enjoyable part of their clinical practice. Pathologists reporting enjoyment in their interpretation of MSL were older, male, affiliated with an academic medical center and had more years of experience with interpreting MSL cases compared to the pathologists who did not enjoy interpreting these lesions. Additionally, pathologists who enjoy interpreting MSL more often indicated that their colleagues consider them to be an expert, they interpreted more benign MSL cases per month, and were more confident in their interpretations, when compared to pathologists who did not enjoy interpreting MSL. Self-report of considered to be an expert by colleagues and number of benign MSL interpreted per month were identified as confounders of the association between enjoyment of MSL interpretation and diagnostic accuracy. After adjustment for these confounders, there were no differences in accuracy with the reference standard diagnosis according to enjoyment of interpreting MSL.

No study is without limitations. We gathered data on enjoyment from a single self-reported question. Gathering more comprehensive information (e.g. income, mental health history, primary practice setting, work/life balance, etc.) and using it to develop a validated measurement of enjoyment may have resulted in a different distribution among the participants, which could have led to a more sensitive estimate of the exposure. We were also not able to confirm the accuracy of the reference standard diagnosis due to the excision of the MSL tissue at time of patient biopsy. However, the reference panel consisted of three internationally recognized dermatopathologists who participated in a rigorous review process of all 240 cases. Additionally, the cross-sectional design of the study doesn't allow us to draw causal inferences, and residual or unmeasured confounding remains a possibility. It is difficult to determine the

temporality of the associations between expertise and number of benign cases interpreted per month with enjoyment of interpreting melanocytic skin lesions; these factors may also lie on the causal pathway and therefore act as mediators of the association between enjoyment and diagnostic accuracy. However, as the first study to identify characteristics that are correlated with enjoyment of interpreting MSL and to estimate the association between enjoyment and diagnostic accuracy among pathologists who interpret MSL, this study provides context for future research to potentially replicate and expand upon our findings.

It is reassuring to know that, after adjustment, enjoyment of interpreting MSL is not correlated with diagnostic accuracy, given the increase in skin biopsies and subsequent increasing demand on the workload of pathologists who interpret skin cases. There is also evidence of a workforce shortage for pathology in the United States, leading to deficiencies in pathologists' abilities to provide effective health care to patients.[18] Therefore, it is important that those pathologists who are entering the workforce are satisfied with their choice of specialty and continue to work in the field. Our result of a high frequency of enjoyment among pathologists who interpret skin cases is consistent with other studies.[1,2]

Although there was no association between enjoyment and diagnostic accuracy after adjustment for whether pathologists considered themselves to be an expert by colleagues and their average number of benign cases of MSL interpreted per month, it is important to know that these factors have an impact. A similar study on enjoyment of breast pathology interpretation also found no association with diagnostic performance but did similarly identify expertise and number of cases interpreted per week as statistically significantly associated with enjoyment.[19] Additionally, radiologists who reported higher confidence or less uncertainty in their mammographic assessments had higher positive predictive values for detecting cancer and lower

recall rates.[20–22] It is likely that these indicators of caseload and perceived expertise have an impact on pathologists' job satisfaction due to the resulting increase in skill and confidence. The clinical experience level and training of dermatologists or dermatopathologists has also been shown to have an impact on diagnostic accuracy of malignant melanomas.[12,23] Fellowship or board certification training in dermatopathology among pathologists is associated with greater diagnostic accuracy, particularly when providing second opinions, which can have major implications for patient treatment.[12]

To conclude, most pathologists in this study reported enjoying their work related to interpreting MSL. Pathologists who reported that their colleagues considered them an expert, interpreted a greater number of benign MSL per month, and had confidence in their interpretations were more likely to find their clinical practice enjoyable, and these factors may also have implications for diagnostic accuracy and patient care. Although we found no association between enjoyment and diagnostic accuracy, it is important to know that job satisfaction among skin pathologists who interpret MSL does not appear to be a significant driver of diagnostic errors. More research on the underlying contributors to skin pathologists' job satisfaction, including their workload, compensation or work environment, could provide a better understanding of how satisfaction influences patient outcomes.

ACKNOWLEDGEMENTS

This study was supported by the National Cancer Institute, National Institutes of Health (R01CA151306). The AMA master file is the source for some of the data used in comparing characteristics of participants and non-participants. The author would like to thank her thesis committee chair Dr. Joann Elmore, and committee member Dr. Amanda Phipps for their guidance on the development of the manuscript.

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Figure 1. Recruitment Flowchart of Invited M-Path Study Pathologists

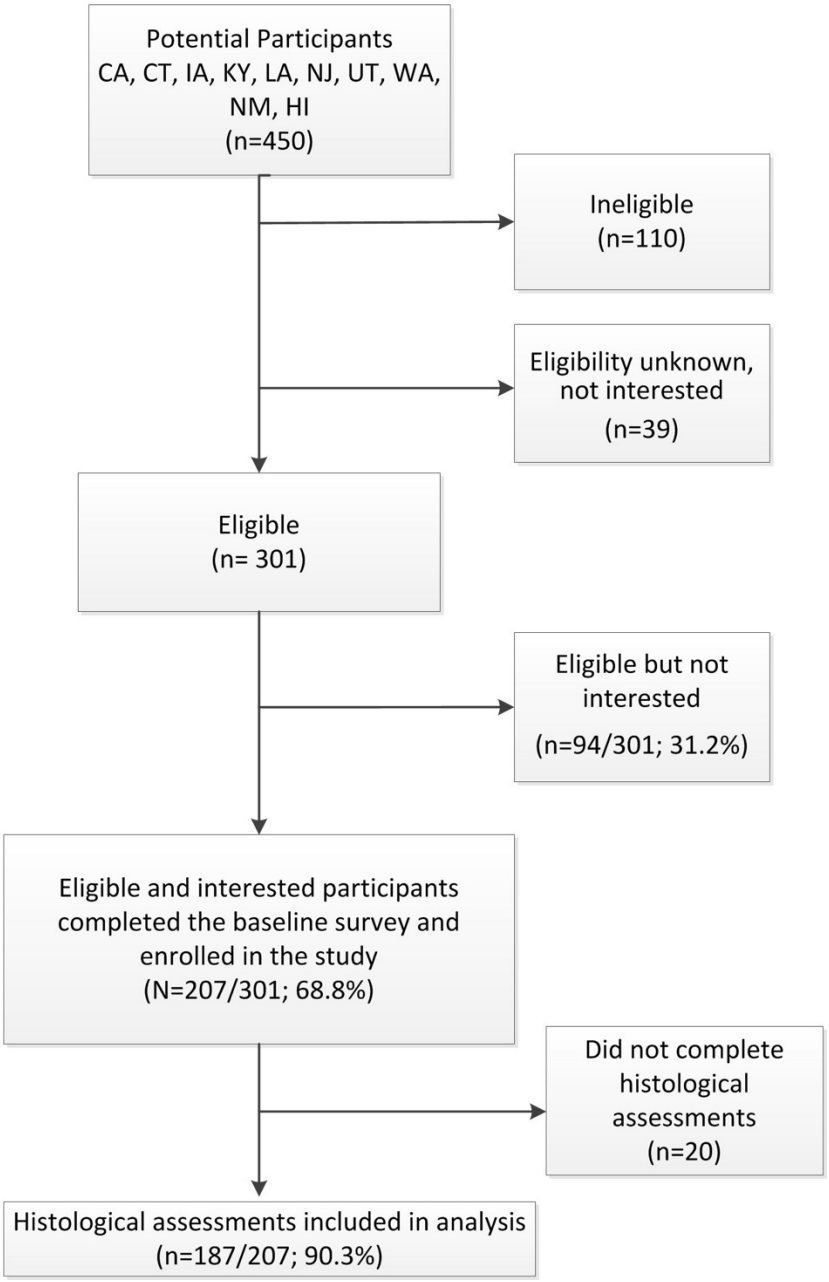

Figure 2. Responses of pathologists (N=187) to the survey question, "interpreting melanocytic skin lesions is enjoyable".

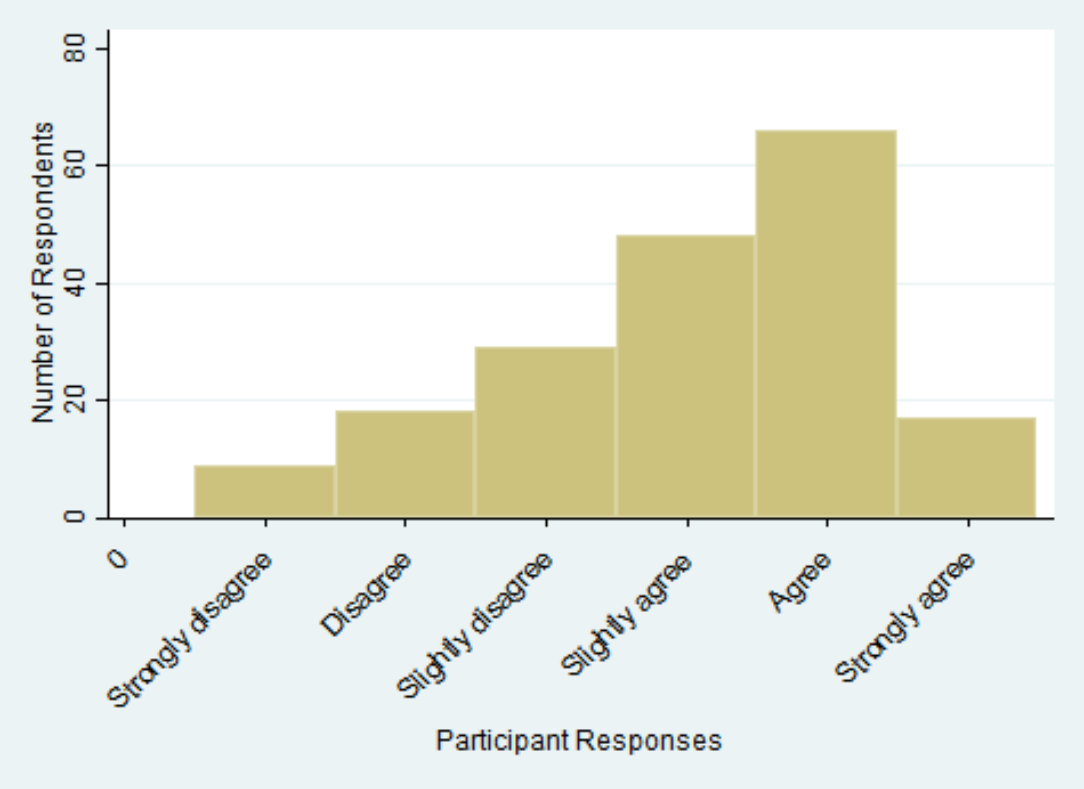

Table 1. Characteristics of pathologists responding to the baseline survey (N = 187), by self-reported enjoyment of interpreting melanocytic skin lesion pathology.

Pathologist Characteristics	Total (N)	Interpreting melanocytic skin lesions is enjoyable, N (%)				P-value[a]
		Strongly disagree/ Disagree	Slightly disagree	Slightly agree	Agree / Strongly agree	
Total	187	27 (13)	29 (17)	48 (25)	83 (45)	
Demographics						
Age at survey (yrs.)						
<50	87	15 (17)	16 (18)	21 (24)	35 (40)	0.138
≥50	100	12 (12)	13 (13)	27 (27)	48 (48)	
Gender						
Male	114	17 (15)	12 (11)	25 (22)	60 (53)	0.054
Female	73	10 (14)	17 (23)	23 (32)	23 (32)	
Training and experience						
Affiliation with academic medical center						
No	134	21 (16)	24 (18)	38 (28)	51 (38)	0.025
Yes, adjunct/affiliated or primary appointment	53	6 (11)	5 (9)	10 (19)	32 (60)	
Board certified and/or fellowship trained in Dermatopathology						
No	113	19 (17)	23 (20)	28 (25)	43 (38)	0.013
Yes	74	8 (11)	6 (8)	20 (27)	40 (54)	
Years interpreting melanocytic skin lesions						
<5	29	6 (21)	6 (21)	7 (24)	10 (34)	
5 - 9	45	10 (22)	8 (18)	14 (31)	13 (29)	0.007
10 -19	57	6 (11)	11 (19)	10 (18)	30 (53)	
≥20	56	5 (9)	4 (7)	17 (30)	30 (54)	
Percent of caseload interpreting melanocytic skin lesions						
<10%	79	15 (19)	11 (14)	20 (25)	33 (42)	0.276
≥10%	108	12 (11)	18 (17)	28 (26)	50 (46)	
Average number of melanoma cases (melanoma						

in situ and invasive melanoma) interpreted per month						
<5	82	12 (15)	20 (24)	19 (23)	31 (38)	0.078
≥5	105	15 (14)	9 (9)	29 (28)	52 (50)	
Average number of benign melanocytic skin lesions interpreted per month						
<50	86	17 (20)	24 (28)	18 (21)	27 (31)	<0.001[c]
≥50	101	10 (10)	5 (5)	30 (30)	56 (55)	
In a typical month, for how many melanocytic skin lesion cases do you request a second opinion?						
<4	96	12 (13)	15 (16)	27 (28)	42 (44)	
4-7	40	8 (20)	7 (18)	9 (23)	16 (40)	0.122
≥ 8	51	7 (14)	7 (14)	12 (24)	25 (49)	
Have you ever been named in a medical malpractice suit?						
No, never been sued	126	20 (16)	16 (13)	33 (26)	57 (45)	0.886
Yes, suit(s) related to melanocytic skin lesions or related to other pathology or medical cases [b]	61	7 (11)	13 (21)	15 (24)	26 (43)	
Perceptions about melanocytic skin lesions						
Considered an expert in melanocytic skin lesions by colleagues						
No	108	21 (19)	24 (22)	26 (24)	37 (34)	<0.001[c]
Yes	79	6 (8)	5 (6)	22 (28)	46 (58)	
How challenging do you find melanocytic skin lesions to interpret? [d]						
Easy to somewhat challenging	82	5 (6)	10 (12)	22 (27)	45 (55)	<0.001[c]
Challenging to very challenging	105	22 (21)	19 (18)	26 (25)	38 (36)	
Melanocytic lesions make me more nervous than other types of pathology						
Disagree	58	2 (3)	7 (12)	17 (29)	32 (55)	0.002[c]
Agree	129	25 (19)	22 (17)	31 (24)	51 (40)	
How confident are you in your assessments of melanocytic skin lesions?[e]						

High confidence	123	13 (11)	8 (7)	31 (25)	71 (58)	
moderate confidence	38	9 (24)	15 (39)	8 (21)	6 (16)	<0.001[c]
Low confidence	26	5 (19)	6 (23)	9 (35)	6 (23)	
Concerned about potential harm to patients that may result from my assessment of melanocytic skin lesions						
Disagree	47	7 (15)	6 (13)	10 (21)	24 (51)	0.535
Agree	140	20 (14)	23 (16)	38 (27)	59 (42)	

[a] P-value from the Mantel-Haenszel test for trend for dichotomous covariates, and Spearman's correlation coefficient for ordinal covariates
[b] Includes any suit filed and either dropped, settled out of court, or gone to trial
[c] p-value is statistically significant at the alpha-level of 0.003 after Bonferroni correction for multiple comparisons
[d] no responses in the "very easy" category
[e] no responses in the "not at all confident" category

Table 2. Multivariable logistic regression model of accuracy with respect to an expert consensus reference standard diagnosis by pathologist characteristics independently associated with pathologists' reported enjoyment of interpreting melanocytic skin lesions.

Pathologist Characteristics	**Concordance with the reference standard diagnosis[a]**	
	OR (95% CI)[b]	P-value
Average number of benign melanocytic skin lesions interpreted per month		
<50	1.0	<0.001
≥50	1.33 (1.19, 1.47)	
Considered an expert in melanocytic skin lesions by colleagues		
No	1.0	<0.001
Yes	1.28 (1.16, 1.41)	
How challenging do you find melanocytic skin lesions to interpret? [d]		
Easy to somewhat challenging	1.0	0.798
Challenging to very challenging	1.01 (0.92, 1.11)	
Melanocytic lesions make me more nervous than other types of pathology		
Disagree	1.0	0.772
Agree	0.99 (0.89, 1.09)	
How confident are you in your assessments of melanocytic skin lesions?[c]		
High confidence	1.0	0.106
moderate confidence	0.91 (0.80, 1.04)	
Low confidence	1.06 (0.91, 1.18)	
Interpreting melanocytic skin lesions is enjoyable		
Strongly disagree/disagree	1.0	
Slightly disagree	1.02 (0.87, 1.19)	
Slightly agree	0.95 (0.82, 1.09)	0.225
Strongly agree/agree	1.06 (0.93, 1.22)	

a. Outcome of accuracy is defined as participant concordance with the reference diagnosis
b. OR= odds ratio; CI= confidence interval
c. no responses in the "not at all confident" category
d. no responses in the "very easy" category

Table 3a. Unadjusted association between enjoyment of melanocytic skin lesion pathology and agreement with the reference standard diagnosis using GEE.

	Interpreting melanocytic skin lesions is enjoyable				
Agreement with reference standard diagnosis	**Strongly disagree/Disagree (n=27)**	**Slightly disagree (n=29)**	**Slightly agree (n=48)**	**Agree/Strongly agree (n= 83)**	**P-value[a]**
Discordance proportion [b,c]	0.51 (0.46-0.56)	0.53 (0.48-0.57)	0.49 (0.46-0.52)	0.45 (0.43-0.47)	0.002
Concordance proportion [b]	0.49 (0.44-0.54)	0.47 (0.43-0.52)	0.51 (0.48-0.54)	0.55 (0.53-0.57)	

a. Analyses based on a collapsed 6-point Likert scale.
b. Least squares means (LS Means) expressed as mean proportion and 95% CI.
c. Reference category

Table 3b. Adjusted association between enjoyment of melanocytic skin lesion pathology and agreement with the reference standard diagnosis using GEE.

	Interpreting melanocytic skin lesions is enjoyable				
Agreement with reference standard diagnosis[a]	**Strongly disagree/Disagree (n=27)**	**Slightly disagree (n=29)**	**Slightly agree (n=48)**	**Agree/Strongly agree (n= 83)**	**P-value[b]**
Discordance proportion [c,d]	0.48 (0.44-0.53)	0.48 (0.44-0.52)	0.49 (0.47-0.52)	0.47 (0.45-0.49)	0.341
Concordance proportion [c]	0.52 (0.47-0.56)	0.52 (0.48-0.56)	0.51 (0.48-0.53)	0.53 (0.51-0.55)	

a. Adjusted for considered an expert by colleagues, and average number of benign MSL interpreted per month
b. Analyses based on a collapsed 6-point Likert scale.
c. Least squares means (LS Means) expressed as mean proportion and 95% CI.
d. Reference category

Appendix Table 1. Comparison of baseline pathologist characteristics between pathologists who did complete (N=187) and who did not complete the study (N=20).

Pathologist Characteristics		**Completed the study, N (%)**	
	Total (N)	**No**	**Yes**
Total	207	20	187
Predictor of interest			
Interpreting melanocytic skin lesions is enjoyable			
Strongly disagree/ disagree	27	0 (0)	27 (100)
Slightly disagree	36	7 (19)	29 (81)
Slightly agree	51	3 (6)	48 (94)
Agree/ Strongly agree	93	10 (11)	83 (89)
Demographics			
Age at survey (yrs.)			
<50	95	8 (8)	87 (92)
≥50	112	12 (11)	100 (89)
Gender			
Male	123	9 (7)	114 (93)
Female	84	11 (13)	73 (87)
Training and experience			
Affiliation with academic medical center			
No	148	14 (9)	134 (91)
Yes, adjunct/affiliated or primary appointment	59	6 (10)	53 (90)
Years interpreting melanocytic skin lesions			
<5	33	4 (12)	29 (88)
5 - 9	47	2 (4)	45 (96)
10 -19	63	6 (10)	57 (90)
≥20	64	8 (13)	56 (88)
Percent of caseload interpreting melanocytic skin lesions			
<10%	90	11 (12)	79 (88)
10 - ≥25%	117	9 (8)	108 (92)
Average number of melanoma cases (melanoma in situ and invasive melanoma) interpreted per month			
<5	91	9 (10)	82 (90)
≥5	116	11 (9)	105 (91)
Average number of benign melanocytic skin lesions interpreted per month			
<50	99	13 (13)	86 (87)
≥50	108	7 (6)	101 (94)
In a typical month, for how many melanocytic skin lesion cases do you request a second opinion?			
<4	109	13 (12)	96 (88)
4-7	44	4 (9)	40 (91)

≥ 8	54	3 (6)	51 (94)
Board certified and/or fellowship trained in dermatopathology			
No	126	13 (10)	113 (90)
Yes	81	7 (7)	74 (91)
Have you ever been named in a medical malpractice suit?			
No, never been sued	139	13 (9)	126 (91)
Yes, suit(s) related to melanocytic skin lesions or related to other pathology or medical cases	68	7 (10)	61 (90)
Perceptions about melanocytic skin lesions			
Considered an expert in melanocytic skin lesions by colleagues			
No	119	11 (9)	108 (91)
Yes	88	9 (10)	79 (90)
How challenging do you find melanocytic skin lesions to interpret?			
Easy to somewhat challenging	93	11 (12)	82 (88)
Challenging to very challenging	114	9 (8)	105 (92)
Melanocytic lesions make me more nervous than other types of pathology			
Disagree	61	3 (5)	58 (95)
Agree	146	17 (12)	129 (88)
How confident are you in your assessments of melanocytic skin lesions?			
High confidence	132	9 (7)	123 (93)
moderate confidence	46	8 (17)	38 (83)
Low confidence	29	3 (10)	26 (90)
Concerned about potential harm to patients that may result from my assessment of melanocytic skin lesions			
Disagree	52	5 (10)	47 (90)
Agree	155	15 (10)	140 (90)