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The DOI for this manuscript is doi: 10.5858/arpa.2020-0408-CP

The final published version of this manuscript will replace the Early Online Release version at the above DOI once it is available.

Breast Fine-Needle Aspiration Practice in 2019

Results of a College of American Pathologists National Survey

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• ***Context.***—**The College of American Pathologists surveys provide national benchmarks of pathology practice for laboratories.**

Objective.—**To investigate breast fine-needle aspiration (FNA) biopsy practice in domestic and international laboratories in 2019.**

Design.—**We analyzed data from the College of American Pathologists Breast FNA Practice Supplemental Questionnaire that was distributed to laboratories participating in the 2019 College of American Pathologists Non-Gynecologic Cytopathology Education Program.**

Results.—**Sixty-one percent (499 of 816) of respondent laboratories routinely evaluated breast FNAs. Cystic lesions were the most common indication, and radiologists primarily performed FNAs in most settings. Forty-five percent (220 of 491) of laboratories performed ancillary studies on breast FNA samples, but 33.8% (70 of 207) did not report fixation time for breast biomarker studies. Only 54.5% (271 of 497) of laboratories had a standardized reporting system and only 16.8% (82 of 488) were aware of the International Academy of Cytology Yokohama Breast FNA Biopsy Cytology Reporting System. There were significant differences among different types of institutions in several aspects of breast FNA practice, including frequency of concurrent FNA and core needle biopsy for the same lesion, primary personnel who performed the FNA, etc. Significant differences existed between domestic and international laboratories in slide preparation, ancillary studies, fixation time reporting, standardized/descriptive diagnosis, and International Academy of Cytology Yokohama Reporting System awareness.**

Conclusions.—**This is the first survey from the College of American Pathologists Cytopathology Committee to investigate breast FNA practices. The data reveal significant differences in breast FNA practice among different types of institutions and between domestic and international laboratories, and provide a baseline for future breast FNA studies in a variety of practice settings.**

(*Arch Pathol Lab Med.* doi: 10.5858/arpa.2020-0408-CP)

Breast fine-needle aspiration (FNA) biopsy is performed with variable frequency among different countries and institutions.[1–9] In 1996, a National Cancer Institute–sponsored conference with a group of breast practitioners put forward a uniform approach to breast FNA and acknowledged the reliability of the triple test, which includes the incorporation of findings on physical examination, breast imaging, and cytologic evaluation in diagnosing breast lesions.[10] Breast FNAs have been declining in frequency and have been gradually replaced by core needle biopsy (CNB). This decline is likely a result of the breast FNA's limitations in diagnostic accuracy, such as inability to reliably distinguish invasive from in situ carcinoma, and additional requirements for breast biomarker analysis such as fixative and fixation time, especially in developed countries.[11–17] However, in many international locations, breast FNAs are still commonly performed. Breast FNAs are performed as a complement to breast CNBs to triage a broad spectrum of breast lesions from benign cystic lesions to breast carcinomas, which can then be identified by the more invasive and costly CNB.[9,18–21]

In 1996, at a time when breast FNAs were routinely performed in the United States, the National Cancer Institute–sponsored conference recommended a standardized approach for the reporting of breast FNAs. Breast FNAs were classified into 1 of 5 categories: (1) benign, (2) atypical/indeterminate, (3) suspicious/probably malignant, (4) malignant, and (5) unsatisfactory.[10] In order to establish the best practice guidelines for breast FNA, emphasize the importance of the FNA technique and the skillful preparation of direct smears, and produce a comprehensive and standardized approach, a committee from the International Academy of Cytology (IAC) developed another reporting

Accepted for publication October 5, 2020.

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The authors have no relevant financial interest in the products or companies described in this article.

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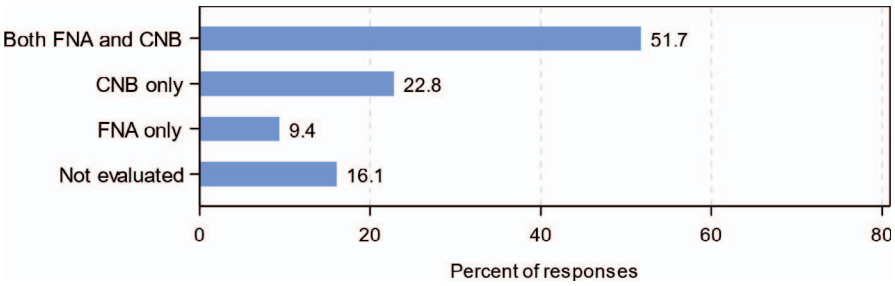

Figure 1. *Distribution of laboratories based on breast specimens evaluated. Abbreviations: CNB, core needle biopsy; FNA, fine-needle aspiration.*

system, the IAC Standardized Reporting of Breast Fine-Needle Aspiration Biopsy Cytopathology (IAC Yokohama Reporting System) in 2019.[22,23] The IAC Yokohama Reporting System proposed a standardized report with a 5-tier system to classify breast FNAs, including (1) insufficient or inadequate, (2) benign, (3) atypical, (4) suspicious for malignancy, and (5) malignant. The IAC Yokohama Reporting System also established clear terminology for defined reporting categories, each of which has a risk of malignancy and is linked to management options.[22]

Additionally, and with proper validation for cytologic preparations, ancillary studies can be performed on breast FNA material for primary diagnosis of breast lesions and prognostic/predictive biomarkers of breast carcinomas: estrogen receptor (ER), progesterone receptor (PR), and HER2.[24] However, these prognostic/predictive biomarkers should be performed on a CNB or excision specimen when it is available or expected.[24] When cytologic material is used for these biomarkers because of lack of a CNB or surgical specimen, formalin-fixed, paraffin-embedded cell block sections are preferred, with the protocol and evaluation compliant with the most recent American Society of Clinical Oncology/College of American Pathologists (CAP) guidelines for ER, PR, and HER2.[25,26]

In 2007, a roundtable discussion was held to survey cytopathology advisory board members and representatives of affiliated societies on the current role of breast FNA cytology in clinical management.[27] The majority of participants were from European countries. The survey revealed that most participating countries had adopted the triple-test approach, with breast FNA as the first-line test in both screening and symptomatic populations, except in patients with microcalcifications. When the triple test is concordant, final treatment may proceed on the basis of FNA without CNB. The survey also demonstrated that the majority of European countries used similar reporting systems for breast FNAs, in keeping with the European Guidelines for Quality Assurance in Breast Cancer Screening and Diagnosis.

The CAP has used survey questionnaires administered to cytopathology laboratories to investigate practice changes and emerging trends in many cytologic areas and to establish national metrics for diagnostic categories and other parameters. Participation in these survey supplementary questionnaires is voluntary. The purpose of the 2019 CAP Breast FNA Practice Supplemental Questionnaire was to evaluate current breast FNA practices and trends, to identify the differences in breast FNA practice between domestic (US) and international laboratories, and to provide baseline data for future breast FNA studies in a variety of practice settings.

METHODS

In 2019, the breast FNA supplemental questionnaire was mailed to 2139 laboratories enrolled in the 2019 CAP Non-Gynecologic Cytopathology Education Program. Among 816 laboratory respondents, 499 laboratories that routinely evaluated breast FNA specimens were included in the final analysis. In the supplemental questionnaire, laboratories were asked whether they evaluated breast FNA specimens, who primarily performed breast FNAs, indications for breast FNAs, cytologic preparations for breast FNAs, frequency of ancillary studies on breast FNA specimens, how breast FNAs were reported, and volume changes for breast FNAs. The respondents were asked to answer all questions based on actual clinical practice in 2019; however, not every laboratory responded to every question.

The survey results were screened to remove duplicate surveys from the same laboratory and to exclude surveys where only 1 or 2 pages of the survey were submitted. Multivariate logistic regression models were used to test for practice characteristic differences by institution location and type. Institution location was defined as a 2-level factor for domestic (US) and international laboratories. Institution type was defined as a 5-level factor based on a reclassification of the institution type question that included 10 types. The 5 types were hospital (nonacademic and non–Veterans Administration/Department of Defense), clinic or regional/local independent laboratory, university hospital/academic medical center, national/corporate laboratory, or Veterans Administration/Department of Defense hospital. A significance level of .05 was used for the statistical testing. Analyses were performed with SAS 9.4 and R 3.6.2.

RESULTS

Among 816 laboratory survey respondents, 499 laboratories (61.2%) routinely evaluated breast FNA specimens, with 422 (51.7%) evaluating both breast CNB and breast FNA specimens and 77 (9.4%) evaluating breast FNA specimens only. One hundred eighty-six laboratories (22.8%) evaluated only breast CNB specimens, and 131 (16.1%) had no breast specimens at all (Figure 1).

Not all 499 laboratories that routinely evaluated breast FNA specimens answered all surveyed questions. Seventeen laboratories did not specify their institution type. The other 482 laboratories that responded to the survey included 205 voluntary/nonprofit hospitals (42.5%), 71 proprietary hospitals (14.7%), 54 city/county/state hospitals (11.2%), 51 regional/local independent laboratories (10.6%), 40 university hospitals/academic medical centers (8.3%), 36 national/corporate laboratories (7.5%), 11 clinic/group/doctor-office laboratories (2.3%), 10 Army/Air Force/Navy hospitals (2.1%), 3 Veterans Administration hospitals (0.6%), and 1 public health/nonhospital facility (0.2%) (Figure 2).

There were 390 domestic (US) laboratories (78.2%), 93 international laboratories (18.6%), and 16 laboratories with missing location information (3.2%). The detailed information of international laboratories is illustrated in Figure 3.

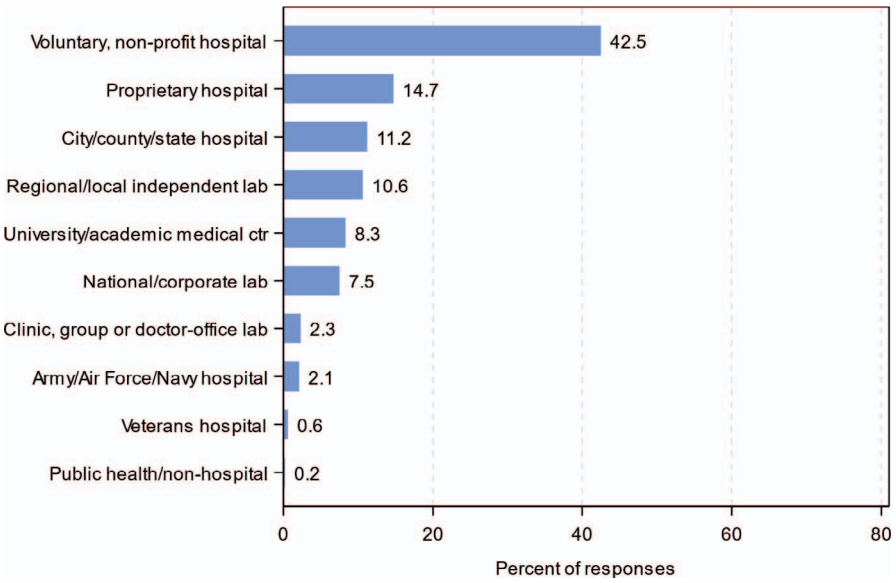

Figure 2. *Demographics of laboratories based on institution types.*

Summary of Survey Results

The most common indications for breast FNA for 468 laboratories were cystic lesions (76.9%; 360), followed by solid lesions by palpation (67.1%; 314) and solid lesions by imaging (59.0%; 276). Laboratory respondents indicated that radiologists, surgeons, and pathologists all performed breast FNA procedures. Radiologists primarily performed FNAs in the majority of surveyed laboratories (69.0%; 330 of 478), followed by surgeons (22.4%; 107). Pathologists primarily performed breast FNAs in a minority of laboratories (20 of 478; 4.2%), mostly in clinic or regional/local independent laboratories and national/corporate laboratories. None of the surveyed university hospitals/academic medical centers had pathologists who primarily performed breast FNAs. The majority of surveyed laboratories used both non–image-guided and image-guided modalities to perform breast FNAs, whereas only a very few laboratories (2.7%; 13 of 485) used a non–image-guided modality alone. Although cases with concurrent breast CNB and FNA specimens were encountered in most surveyed laboratories (332 of 408; 81.4%), more than half of laboratories (195 of 332; 58.7%) reported this combination to occur only very infrequently (≤10%) (Table 1).

Slide preparation methods for breast FNA included direct smear, cell block, liquid-based cytology, and cytospin, with direct smear as the most frequent primary method (45.6%; 219 of 480) followed by liquid-based cytology (36.9%; 177). The majority of surveyed laboratories (297 of 489; 60.7%) did not perform adequacy assessment (Table 1).

Less than half of laboratories (44.8%; 220 of 491) performed ancillary studies on breast FNA specimens. More than half of laboratories (56.0%; 121 of 216) collected breast FNA material in formalin for ancillary studies. In the majority of 201 laboratories, the ancillary studies performed on breast FNA specimens included ER (84.1%; 169), PR

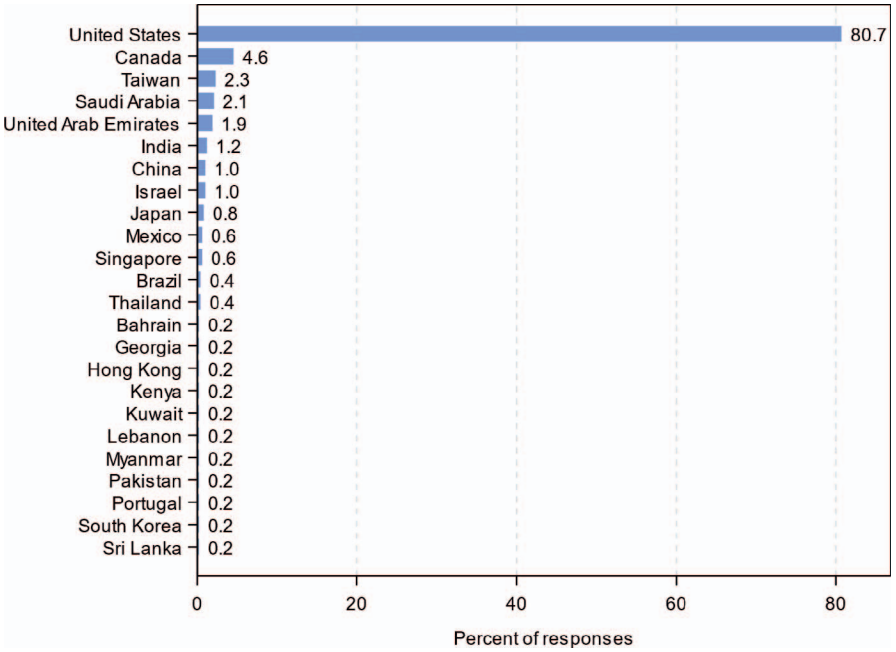

Figure 3. *Distribution of laboratories based on institution locations.*

Table 1. Summary of Survey Results of Breast Fine-Needle Aspiration (FNA) Practices From All Surveyed Laboratories (Domestic and International)

Practice Categories	Specific Answers	No.	%
Indication (multiple responses allowed)	Cystic lesion by imaging	360	76.9
	Palpable mass	314	67.1
	Solid lesion by imaging	276	59.0
	Other	61	13.0
	Total	468	
Primary performer	Radiologist	330	69.0
	Surgeon	107	22.4
	Pathologist	20	4.2
	Other	21	4.4
	Total	478	
Modalities	Both image-guided and non–image-guided	223	46.0
	Image-guided only	154	31.8
	Non–image-guided only	13	2.7
	Unsure	95	19.6
	Total	485	
Frequency of concurrent FNA and CNB for same patient	Never	76	18.6
	≤10%	195	47.8
	11%–50%	66	16.2
	>50%	71	17.4
	Total	408	
Primary slide preparation method	Direct smear	219	45.6
	Liquid-based	177	36.9
	Cytospin	42	8.8
	Cell block	30	6.3
	Unsure	12	2.5
	Total	480	
Adequacy assessment	Yes	192	39.3
	No	297	60.7
	Total	489	
Ancillary studies on breast FNA	Yes	220	44.8
	No	271	55.2
	Total	491	
Collection medium (multiple responses allowed)	Formalin	121	56.0
	Ethanol	72	33.3
	RPMI/balanced salt solution	66	30.6
	Methanol	55	25.5
	Total	216	
Fixation method	Formalin	99	47.1
	Alcohol followed by formalin	61	29.0
	Alcohol	50	23.8
	Total	210	
Prognostic/predictive markers (multiple responses allowed)	ER IHC	169	84.1
	PR IHC	166	82.6
	HER2 IHC	147	73.1
	IHC (other than biomarkers)	146	72.6
	HER2 FISH	83	41.3
	Total	201	
Fixation time reporting	Yes	137	66.2
	No	70	33.8
	Total	207	

Abbreviations: CNB, core needle biopsy; ER, estrogen receptor; FISH, fluorescence in situ hybridization; IHC, immunohistochemistry; PR, progesterone receptor.

(82.6%; 166), and HER2 immunochemistry (73.1%; 147) and other immunohistochemical stains (72.6%; 146). However, 41.3% (83) of 201 laboratories also performed HER2 FISH on breast FNA specimens. Although approximately two-thirds of 207 laboratories performing breast biomarker studies reported fixation time, up to 33.8% (70) did not report fixation time (Table 1).

Slightly more than half of 497 laboratories (54.5%; 271) had a standardized reporting system for breast FNAs in their practice. The vast majority of these laboratories used the

Table 2. Summary of Survey Results of Breast Fine-Needle Aspiration (FNA) Reporting From All Surveyed Laboratories (Domestic and International)

Reporting Categories	Specific Answers	No.	%
Standardized reporting system	Yes	271	54.5
	No	226	45.5
	Total	497	
Descriptive diagnosis for breast FNAs	Yes	472	95.9
	No	20	4.1
	Total	492	
IAC Yokohama Breast FNAB Cytology Reporting System awareness	Yes	82	16.8
	No	406	83.2
	Total	488	
IAC Yokohama Breast FNAB Cytology Reporting System adoption status	Adopted all recommendations	7	8.5
	Adopted some but not all recommendations	9	11.0
	Plan to adopt all or some recommendations in 2019	21	25.6
	Do not plan to adopt any of the recommendations	9	11.0
	Undecided	36	43.9
	Total	82	

Abbreviations: FNAB, fine-needle aspiration biopsy; IAC, International Academy of Cytology.

following reporting categories: unsatisfactory, negative for malignancy, atypical, suspicious for malignancy, and malignant. Additionally, almost all laboratories (472 of 492) also reported breast FNAs with a descriptive diagnosis, such as benign ductal epithelial cells, malignant cells, etc. Surprisingly, only 16.8% of respondent laboratories (82 of 488) were aware of the IAC Yokohama Reporting System, and only 7 laboratories adopted all recommendations of the reporting system (Table 2).

During 2019, there was no change in the volume of breast FNAs during the past 3 years in 40.5% (200) of 494 surveyed laboratories, volume decreased in 31.8% (157) of laboratories, volume increased in 7.9% (39), and 19.8% (98) did not know if any volume changes had occurred. In 2019, the volume of breast CNBs increased in 53.8% (222) of 413 surveyed laboratories, showed no change in 20.3% (84), and decreased in 6.8% (28). In regard to breast CNB, 19.1% (79) of laboratories indicated that they did not know if any volume changes had occurred (Figure 4).

Comparison of Breast FNA Practice Among Different Institution Types

Survey results were analyzed by institution type to identify any significant differences in breast FNA practice. University hospitals/academic medical centers more frequently evaluated breast FNA specimens only (40%; 16 of 40) than clinic or regional/local independent laboratories (15.9%; 10 of 63) and other hospitals (10.9%; 36 of 330) ($P < .001$). Although radiologists primarily performed breast FNA biopsies most frequently among all surveyed institutions, pathologists primarily performed breast FNAs significantly more often in small clinics or regional/local independent laboratories than in hospitals or academic medical centers ($P < .001$). Up to 36% (9 of 25) of university hospitals/academic medical centers did not perform concurrent breast FNAs and CNBs for the same patient, significantly more frequently than clinic or regional/local independent laboratories (19.6%; 10 of 51) and other hospitals (16%; 46 of 287) ($P < .001$) (Table 3).

Comparison of Breast FNA Practices Between Domestic and International Laboratories

We also compared breast FNA practices between domestic (US) and international laboratories, and the following significant differences were identified:

1. Direct smears were more commonly used in international laboratories (68.8%; 64 of 93) than in domestic laboratories (41.1%; 148 of 360) ($P < .001$).
2. Significantly more domestic than international laboratories performed ancillary studies on breast FNA specimens (46.8% [180 of 385] versus 34.4% [31 of 90], $P = .01$).
3. Up to 65.5% of international laboratories (19 of 29) did not report fixation time for ancillary studies, significantly more frequently than domestic laboratories (27.8%; 47 of 169) ($P < .001$).
4. Significantly more international than domestic laboratories had a standardized reporting system for breast FNA (66.3% [61 of 92] versus 50.9% [198 of 398], $P = .02$), and approximately 10.9% of international laboratories (10 of 92) did not use descriptive diagnoses at all, significantly more frequently than domestic laboratories (2.6% [10 of 384], $P = .001$).
5. Significantly more international than domestic laboratories were aware of the IAC Yokohama Reporting System (27.2% [25 of 92] versus 13.7% [52 of 380], $P = .002$) (Table 4).

DISCUSSION

Breast FNA cytologic diagnosis has been established as an important significant component of the triple test (physical examination, imaging findings, and cytologic diagnosis) in diagnosing breast lesions.[10] During the last 2 decades, breast FNA has been declining and has gradually been replaced by CNB because of its limitations, such as the inability to differentiate invasive carcinoma from in situ carcinoma and additional requirements for ancillary prognostic/predictive biomarkers.[11–17] This trend was noted in a survey from 52 laboratories by the Papanicolaou Society of Cytopathology

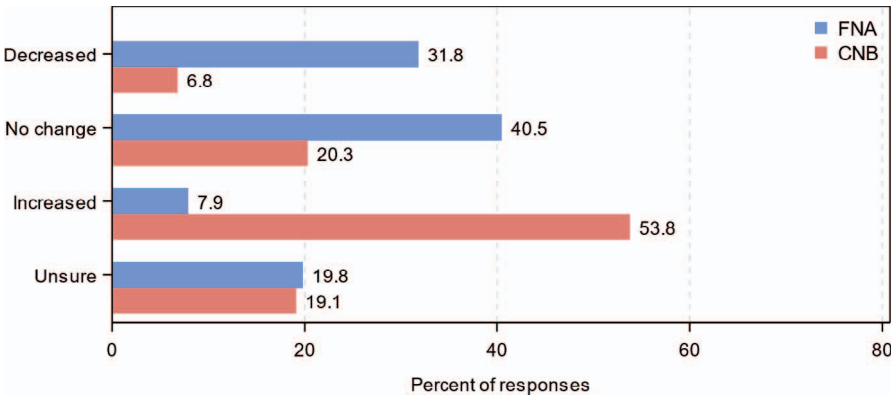

Figure 4. *Distribution of laboratories based on their breast specimen volume changes within the past 3 years. Abbreviations: CNB, core needle biopsy; FNA, fine-needle aspiration.*

in 2000, showing that 91% of surveyed laboratories had seen an increase in the use of CNB, 41% had seen a decline in FNA of palpable lesions, and 38% had seen a decline in FNA of nonpalpable lesions.[28] However, breast FNAs are still actively undertaken in some, especially international, institutions.[9,18–21,29,30] Consistent with these reports, our results revealed that up to 61.2% of 816 responding laboratories (with the majority of responding institutions in the United States) routinely evaluated breast FNA specimens.

The switch to core biopsy has exploded during the last 2 decades. This trend was noted in a survey by the Papanicolaou Society of Cytopathology in 2000, which included 52 laboratories and showed that 91% had seen an increase in the use of core biopsy for the diagnosis of mammary lesions during the 1990s. During the same time frame, 41% of laboratories noted a decline in FNA of palpable lesions and 38% noted a decline in FNA of nonpalpable lesions.

Breast FNA is often used to evaluate breast masses of low clinical suspicion for breast cancer.[31] Consistent with this practice pattern, our survey results demonstrate the most common indication for breast FNA was benign-appearing cystic lesions. However, most laboratories (81.4%) encountered concurrent breast CNBs and breast FNAs, suggesting they were being used as complementary sampling tests for malignant breast lesions.[9,18–21] Because of advances in imaging technology in diagnosing breast lesions, it is no surprise to find that radiologists were the most common primary personnel to perform breast FNA; image-guided techniques were far more common than non–image-guided techniques to perform breast FNA in our survey.

Although ancillary studies can be performed on breast FNA material for the primary diagnosis of breast lesions and prognostic/predictive biomarkers in breast carcinoma,[24] it is very challenging to interpret diagnostic IHC in breast pathology such as CK5, myoepithelial markers, and others. Because prognostic/predictive biomarker (ER, PR, and HER2) status is critical for currently available targeted treatments, the American Society of Clinical Oncology/CAP guidelines recommend that breast cancer prognostic/predictive biomarker testing should be performed on a CNB or excision specimen when it is available or expected.[25,26] Based on our survey data, less than half of laboratories (44.8%) performed ancillary studies on breast FNA specimens, suggesting this may be related to the difficulty and challenges of performing and interpreting these tests.

The National Cancer Institute–sponsored conference recommended a standardized approach for reporting breast FNAs 2 decades ago.[10] In addition, the International Academy of Cytology published the IAC Yokohama Reporting System in 2019 to help standardize breast FNA reporting with a comprehensive approach.[22] However, very surprisingly, our survey revealed that only slightly more than half of laboratories (54.5%) had a standardized reporting system for breast FNAs, and only 16.8% of survey respondents (82 of 488) were aware of the IAC Yokohama Reporting System.

The most important finding from the current study is the significant difference between domestic and international laboratories in several aspects of breast FNA practice, including cytologic preparation methods, ancillary studies, fixation time reporting for breast biomarker studies, and a reporting system for breast FNAs. Compared with domestic laboratories, international laboratories more frequently used direct smears for breast FNA (68.8% versus 41.1%), implemented a standardized reporting system (66.3% versus 50.9%), and were aware of the IAC Yokohama Reporting System (27.2% versus 13.7%). Furthermore, only 7 laboratories adopted all recommendations of the IAC Yokohama Reporting System, and most of them were international laboratories. Domestic laboratories, in contrast, more frequently performed ancillary studies on breast FNA specimens (46.8% versus 34.4%) than international laboratories. The most significant difference between domestic and international laboratories was fixation time reporting for breast cancer biomarkers. Although 65.5% of international laboratories did not report fixation time, only 27.8% of domestic laboratories did not.

In the current study, less than half of laboratories (816 of 2139; 38%) responded to the breast FNA supplemental questionnaire survey; however, this response rate is consistent with previous CAP supplemental questionnaire surveys during the past 2 years for these programs, where the rates were between 35% and 40%. The margin of error for this survey was 3%. It is possible that some of the nonrespondent laboratories do not perform and/or evaluate breast FNAs. This may skew our survey results, and future studies are warranted.

The survey results demonstrate some significant differences in breast FNA practice among different institution types. University hospitals/academic medical centers more frequently evaluated only breast FNA specimens and less frequently encountered concurrent breast FNAs and CNBs than other types of institutions. None of the surveyed university hospitals/academic medical centers had pathologists primarily perform breast FNA, suggesting a more subspecialized environment in these large institutions.

Table 3. Summary of Breast Fine-Needle Aspiration (FNA) Practices That Were Statistically Different Among Different Institution Types (Domestic and International)

		Hospital		Clinic or Regional/Local Independent Laboratory		University Hospital/Academic Medical Center		National/Corporate Laboratory		Veterans Administration/DOD			
Practice Category	**Answer**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**Total**	***P* Value**
Breast FNA practice	FNA + CNB	294	89.1	53	84.1	24	60.0	25	69.4	9	69.2	405	<.001
	FNA only	36	10.9	10	15.9	16	40.0	11	30.6	4	30.8	77	
	Total	330		63		40		36		13		482	
Primary FNA performer	Radiologist	239	74.0	33	55	28	73.7	8	28.6	9	75.0	317	<.001
	Surgeon	70	21.7	15	25.0	9	23.7	6	21.4	3	25.0	103	
	Pathologist	8	2.5	8	13.3	0	0.0	4	14.3	0	0.0	20	
	Other	6	1.9	4	6.7	1	2.6	10	35.7	0	0.0	21	
	Total	323		60		38		28		12		461	
Frequency of concurrent FNA and CNB	≤10%	140	48.8	26	51.0	7	28.0	6	31.6	6	66.7	185	<.001
	11%–50%	46	16.0	10	19.6	6	24.0	3	15.8	0	0.0	65	
	>50%	55	19.2	5	9.8	3	12.0	1	5.3	2	22.2	66	
	Never	46	16	10	19.6	9	36	9	47.4	1	11.1	75	
	Total	287		51		25		19		9		391	
Ancillary studies	Yes	150	46.0	27	44.3	22	55.0	7	20.6	8	61.5	214	.02
	No	176	54.0	34	55.7	18	45.0	27	79.4	5	38.5	260	
	Total	326		61		40		34		13		474	

Abbreviations: CNB, core needle biopsy; DOD, Department of Defense.

Table 4. Summary of Specific Breast Fine-Needle Aspiration (FNA) Practices That Were Statistically Different Between Domestic and International Laboratories

		Domestic		International			
Practice Category	Answer	No.	%	No.	%	Total	*P* Value
Primary slide preparation methods	Direct smear	148	41.1	64	68.8	212	<.001
	Liquid-based	146	40.6	24	25.8	170	
	Cytospin	39	10.8	3	3.2	42	
	Cell block	27	7.5	2	2.2	29	
	Total	360		93		453	
Ancillary studies	Yes	180	46.8	31	34.4	211	.01
	No	205	53.2	59	65.6	264	
	Total	385		90		475	
Fixation time reporting	Yes	122	72.2	10	34.5	132	<.001
	No	47	27.8	19	65.5	66	
	Total	169		29		198	
Standardized reporting system	Yes	198	50.9	61	66.3	259	.02
	No	191	49.1	31	33.7	222	
	Total	389		92		481	
Descriptive diagnosis for breast FNAs	Yes	374	97.4	82	89.1	456	.001
	No	10	2.6	10	10.9	20	
	Total	384		92		476	
IAC Yokohama Breast FNAB Cytology Reporting System awareness	Yes	52	13.7	25	27.2	77	.002
	No	328	86.3	67	72.8	395	
	Total	380		92		472	

Abbreviations: FNAB, fine-needle aspiration biopsy; IAC, International Academy of Cytology.

CONCLUSIONS

This is the first survey study from the CAP to investigate the practice of breast FNA among participating domestic and international laboratories. Our data illustrate significantly varied breast FNA practice among different institution types and between domestic and international institutions. These results summarize current breast FNA practice and provide a baseline for future studies in actual practice settings.

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