

ORIGINAL ARTICLE

Curricular Impact of Resource Investments in Point-of-Care Ultrasound Education Among Family Medicine Residency Programs: A CERA Study

Natalie Nguyen, DO^a; J. Nicoll Capizzano, MD^b; Nicholas LeFevre, MD, MSAM^c; Ryan Paulus, DO^d; Varshaben M. Songara, MD^e; Puja Dalal, MD^f; Hiten Patel, MD, MPH^g; Johnny Tenegra, MD^h; Ryan Trantham, MDⁱ; Dongru Chen^b; Amy Runyon^b; Joel J. Heidelbaugh, MD^b; Diane M. Harper, MD, MPH^b

AUTHOR AFFILIATIONS:

^aKaiser Permanente Los Angeles Medical Center, Los Angeles, CA

^bDepartment of Family Medicine, University of Michigan, Ann Arbor, MI

^cDepartment of Family Medicine, University of Missouri–Columbia, Columbia, MO

^dDepartment of Family Medicine, University of North Carolina, Chapel Hill, NC

^eHarnett Health System (Cape Fear Valley Health), Dunn, NC

^fFamily Medicine Residency Program, Novant Health, Cornelius, NC

^gDepartment of Family and Community Medicine, The Ohio State University, Columbus, OH

^hSouthern Illinois University Decatur Family Medicine Residency Program, Decatur, IL

ⁱWaco Family Medicine Residency Program, Waco, TX

CORRESPONDING AUTHOR:

Ryan Paulus, Department of Family Medicine, University of North Carolina, Chapel Hill, NC, ryan_paulus@med.unc.edu

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ABSTRACT

Background and Objectives: The Accreditation Council for Graduate Medical Education added POCUS (point-of-care ultrasound) education to family medicine program requirements in 2023. This study examined the association between institutional resources dedicated to POCUS education and outcomes of POCUS curricula.

Methods: A Council of Academic Family Medicine Educational Research Alliance (CERA) survey was administered to US family medicine residency program directors (PDs) from April to May 2025. The survey assessed POCUS faculty resources, protected time, ultrasound equipment, curriculum scope, resident assessment, PD satisfaction, and resident engagement. Associations were evaluated using χ^2 tests and multinomial multivariable logistic regression.

Results: Of 726 eligible residency programs, 321 (44.2%) responded. Overall, 89% of programs offered POCUS education, although only 18.3% of PDs were satisfied with their curriculum. Programs with two or more POCUS faculty were significantly more likely to provide comprehensive curricula incorporating bedside scanning, image review, and competency assessment. Protected time for the POCUS champion was independently associated with higher PD satisfaction, with programs providing more than 2 hours per week demonstrating 9.3-fold greater odds of satisfaction than those with no protected time (OR 9.32, 95% CI 2.92–29.76). Access to four or more ultrasound machines was also independently associated with greater PD satisfaction (OR 3.37, 95% CI 1.54–7.36).

Conclusions: Although POCUS education is widely implemented in family medicine residencies, institutional resources remain highly variable. Dedicated POCUS leadership, protected faculty time, adequate faculty, and sufficient ultrasound equipment were associated with more comprehensive curricula and greater PD satisfaction, providing targets for resource allocation as national POCUS competency standards are implemented.

INTRODUCTION

Point-of-care ultrasound (POCUS) has become an increasingly valuable diagnostic tool in outpatient medicine.^{1–3} Studies have reported several benefits, including changes in clinical management, reduced resource utilization, increased diagnostic confidence, and improved patient satisfaction.^{4–7} Recognizing these substantial benefits, the major organizations responsible for

family medicine training, certification, and education have reached consensus on the importance of POCUS. The Accreditation Council for Graduate Medical Education reinforced its role in residency education in 2023 by introducing a dedicated POCUS program requirement stating, “Residents should have experience in using point-of-care ultrasound in clinical care.”⁸ Likewise, the American Board of Family Medicine

(ABFM) has announced that POCUS competency will become a requirement for board eligibility.⁹ This institutional commitment has been mirrored by family medicine residency programs nationwide, where POCUS curricula have expanded dramatically from just 2.2% of programs in 2014–53% in 2019.^{10,11} Together, these developments demonstrate broad agreement among accrediting bodies, certifying organizations, and residency programs that POCUS is an essential component of contemporary family medicine training and practice.

Despite growing recognition of POCUS as an essential component of family medicine, significant barriers continue to limit its implementation in residency training. Common challenges include limited faculty expertise, insufficient protected time for POCUS educators, inadequate access to ultrasound equipment, and financial constraints.^{10–16} High-quality POCUS education requires dedicated faculty leadership, faculty development, supervised clinical scanning, image review, assessments, and access to ultrasound technology.^{17–19} As expectations for POCUS competency continue to rise, many residency programs struggle to secure the resources needed to develop and sustain comprehensive POCUS curricula.^{14,15}

The objective of this Council of Academic Family Medicine Educational Research Alliance (CERA) survey was to examine the relationship between institutional resources dedicated to POCUS education and the implementation of POCUS curricula in US family medicine residency programs. By identifying the resources associated with more robust curricula, this study aimed to inform and reshape the understanding of the institutional support necessary to build and sustain successful POCUS programs.

METHODS

The survey was part of a larger omnibus study of US department of family medicine program directors (PDs) conducted from April 22, 2025, to May 23, 2025, with recurrent standardized demographic questions. The methodology of the CERA residency PD survey has been described previously in detail.²⁰ The American Academy of Family Physicians Institutional Review Board approved the CERA survey. The CERA steering committee evaluated questions for consistency with the overall subproject aim, readability, and existing evidence of reliability and validity. Pretesting to evaluate for clarity, readability, and feasibility of response was conducted with family medicine educators who were not included in the sampling frame.

The survey content was collaboratively developed by a multi-institutional cohort of POCUS leaders across the United States who are all members of the Society of Teachers of Family Medicine POCUS Task Force, a group working with support from the ABFM Foundation to define national curricular standards for POCUS. Questions were created in light of recurring challenges reported with POCUS program implementation warranting further investigation.^{10–17} These topics were iteratively reviewed and refined by the study

committee in collaboration with an assigned CERA mentor (J.H.) to ensure their relevance, clarity, and methodological rigor. The questions assessed the resources programs allocate toward POCUS, including the number of POCUS faculty, the full-time equivalents (FTEs) dedicated to POCUS education at-large (across all faculty), the training level of the family medicine residency POCUS faculty champion or lead, FTE dedicated to the POCUS champion or lead for POCUS education, money spent on additional third-party ultrasound education, and the number of ultrasound machines at the program. Of note, given the variable definition of POCUS champion or lead in the community, we excluded providing a definition and allowed interpretation by the PD. Curricular impacts surveyed were the degree of longitudinal POCUS curriculum offered, the degree of evaluation of POCUS assessments, the satisfaction of the PD regarding their POCUS education, and the percentage of residents who seek additional POCUS education outside of the core family medicine residency curriculum.

The survey was distributed to 799 residency PDs. After excluding 73 who did not meet eligibility criteria (programs had to have at least three complete residency classes), the final sample consisted of 726 directors. Of these, 321 completed surveys, yielding a response rate of 44.2%.

All data were summarized with descriptive frequencies, means, and standard deviation. We calculated the inferential comparisons with *t* tests and analysis of variance statistics. We analyzed the ordinal or categorical responses with χ^2 or Fisher exact as appropriate. We did not calculate *a priori* power analysis, meaning that all nonsignificant differences cannot be verified as truly nonsignificant. We ran two multinomial logistic regression models, adjusting for all variables significant in univariate analyses. The first predicted bivariate PD satisfaction (satisfied vs dissatisfied), the second predicted neutral versus dissatisfied as the bivariate outcome.

RESULTS

A total of 321 PDs completed some parts of the survey and 312 completed both demographic descriptors and PD satisfaction with their current POCUS curriculum. Appendix 1 contains the complete survey and a summary of participant responses. Of all respondents, 88.5% offer at least some POCUS education in their residency program (Table 1). Of the responding PDs, 58.3% were from community-based, university-affiliated programs; 25.4% from community-based or military programs; and 16.3% from university-based programs. Overall, 41.7% had less than 19 residents, 43.3% had 19 to 31 residents, and 15.1% had 32 or more residents in the program as of July 2022. Nearly half (43.4%) of the PDs had been in their current role for less than 3 years, and 17.3% for more than 10 years. PD gender was 58.3%/41.7% female/male, with the majority White (76.5%) and not underrepresented in medicine (87.1%). The demographics summary is presented in Table 1.

TABLE 1. Respondent Characteristics by Satisfaction With POCUS Education in the Family Medicine Residency Program

	How satisfied are you with the point-of-care ultrasound education at your family medicine residency program?			Total
	Very dissatisfied/ dissatisfied n (%)	Satisfied/ extremely satisfied n (%)	Neutral n (%)	n (%)
Residency program				
University-based	22 (44.0)	16 (36.4)	12 (27.3)	50 (16.3)
Community/university	97 (54.2)	30 (16.8)	52 (29.1)	179 (58.3)
Community/military ^d	37 (47.4)	11 (14.1)	30 (38.5)	78 (25.4)
Total	156 (50.8)	57 (18.6)	94 (30.6)	307
Location of residency				
East region ^a	52 (48.1)	20 (18.5)	36 (33.3)	108 (34.6)
Middle region ^b	69 (52.7)	25 (19.1)	37 (28.2)	131 (42.0)
West region ^c	38 (52.1)	12 (16.4)	23 (31.5)	73 (23.4)
Total	159 (51.0)	57 (18.3)	96 (30.7)	312
Size of the residency programs' community				
Less than 75K	53 (60.2)	13 (14.8)	22 (25.0)	88 (28.4)
75,000–499,999	66 (49.3)	27 (10.1)	41 (30.6)	134 (43.2)
500,000+	39 (44.3)	16 (18.2)	33 (37.5)	88 (28.4)
Total	158 (51.0)	56 (18.1)	96 (30.9)	310
Total number of residents in the program in July 2022				
<19	73 (56.1)	17 (13.1)	40 (30.8)	130 (41.7)
19–31	68 (50.4)	25 (18.5)	42 (31.1)	135 (43.3)
>31	18 (38.3)	15 (31.9)	14 (29.8)	47 (15.1)
Total	159 (51.0)	57 (18.3)	96 (30.8)	312
Medical certification				
MD	126 (51.6)	46 (18.9)	72 (29.5)	244 (78.7)
DO	32 (48.5)	11 (16.7)	23 (34.8)	66 (21.3)
Total	158 (51.0)	57 (18.4)	95 (30.6)	310
Time in current program director role				
0–3 years	79 (58.5)	26 (19.3)	30 (22.2)	135 (43.3)
3.5–9 years	58 (45.0)	22 (17.1)	43 (33.3)	123 (39.4)
10 + years	22 (40.7)	9 (16.7)	23 (42.6)	54 (17.3)
Total	159 (51.0)	57 (18.2)	96 (30.8)	312
Program director gender				
Female/woman	96 (53.3)	28 (15.6)	56 (31.1)	180 (58.3)
Male/man	62 (48.1)	29 (22.5)	38 (29.5)	129 (41.7)
Total	158 (51.1)	57 (18.4)	94 (30.4)	309
Program director race/ethnicity				
White	114 (50.0)	45 (19.7)	69 (30.3)	228 (76.5)
Nonwhite ^e	38 (54.3)	12 (17.1)	20 (28.6)	70 (23.5)
Total	152 (51.0)	57 (19.1)	89 (29.9)	298
Underrepresented in medicine				
No	135 (50.0)	52 (19.3)	83 (30.7)	270 (87.1)
Yes	22 (55.0)	5 (12.5)	13 (32.5)	40 (12.9)
Total	157 (50.6)	57 (18.4)	96 (31.0)	310
Number of ultrasound machines				
0–3	108 (60.0)	15 (8.3)	58 (32.0)	181 (58.0)
4+	51 (38.9)	42 (32.1)	38 (29.0)	131 (42.0)

(Continued)

TABLE 1. Respondent Characteristics by Satisfaction With POCUS Education in the Family Medicine Residency Program (Continued)

	How satisfied are you with the point-of-care ultrasound education at your family medicine residency program?			Total
	Very dissatisfied/ dissatisfied n (%)	Satisfied/ extremely satisfied n (%)	Neutral n (%)	n (%)
Total	159 (51.0)	57 (18.3)	96 (30.8)	312

Note: Grey box statistical significances, Bonferroni corrected for multiple comparisons with *P* values at least <.01.

^aNew England, Mid-Atlantic, South Atlantic: NH, MA, VT, RI, CT, NY, PA, NJ, PR, FL, GA, SC, NC, VA, DC, WV, DE, MD

^bEast South Central, East North Central, West South Central, West North Central: KY, TN, MS, AL, WI, MI, OH, IN, IL, OK, AR, LA, TX, ND, MN, SD, IA, NE, KS, MO

^cMountain, Pacific: MT, ID, WY, NV, UT, AZ, CO, NM, WA, OR, CA, AK, HI

^dCombined community-based residencies and military residencies

^eNonwhite includes American Indian/Alaska Native/Indigenous (n=1), Asian (n=25), Black/African American (n=14), Hispanic/Latinx/of Spanish origin (n=15), Middle Eastern North African (n=2), multirace (n=13), not disclosed (n=13).

Abbreviation: POCUS, point-of-care ultrasound

POCUS Faculty Resources

This study surveyed the following regarding the POCUS champion and faculty of family medicine residency programs (Table 2): the number of POCUS faculty, total protected time for all POCUS faculty, protected time for the POCUS champion or lead, and the educational training of the POCUS champion or lead. No formal definitions were provided for the roles of POCUS champion/lead or POCUS faculty. Rather, the survey allowed PDs to determine, based on their own program structure and perceptions, which faculty members fulfilled the role of a POCUS champion/lead versus any POCUS faculty.

Overall, 19.5% of programs had no POCUS faculty, and 22.8% of programs did not have a designated POCUS champion or lead. Of those programs with no POCUS champion or lead, 57.1% also lacked POCUS faculty, while the remainder all reported having at least one POCUS faculty member despite not identifying a designated POCUS champion or lead (Appendix 2A).

Protected time allocated to the POCUS champion/lead varied significantly by residency program type. Allocation of 4 or more hours per week of protected time for the POCUS champion/lead was significantly more common in university-based programs (30.0%) than in community-based university-affiliated programs (11.5%, *P*<0.01) and community-based military programs (9.0%, *P*<0.01). However, community-based university-affiliated programs were more likely to provide 2 hours per week of protected time for the POCUS champion/lead than to provide no protected time (52.3% vs 36.2%, *P*<0.01). Protected time allocated to POCUS faculty did not differ significantly across residency program types, with 40.1% of POCUS faculty receiving no protected time. The number of POCUS faculty compared to program-protected time is presented in Appendix 2B. Of the programs with only one POCUS faculty, a statistically greater portion of the programs had some protected time (>0.05 FTE) compared to those with none (61.5% vs 38.5%, *P*<0.01).

Among POCUS champions/leads, the most common training pathway was independent study (29.0%), followed by third-party educational programs (23.3%), residency training

(11.5%), hospital-based fellowship programs (7.0%), and institution-sponsored fellowships (4.8%).

POCUS Equipment and Educational Resources

Table 3 describes residency program characteristics by ultrasound machine availability and annual financial investment in POCUS education. Overall, most programs (55.0%) had access to one to two ultrasound machines, and 57.9% reported some annual POCUS-related expenditures. Among programs that allocated funding for POCUS education, 34.4% (62/180) spent up to \$2,500 annually, 37.8% (68/180) spent up to \$5,000 annually, and 27.8% (50/180) spent more than \$5,000 annually.

Programs with only one POCUS faculty member (33.9% of all programs) were significantly more likely to have access to only one or two ultrasound machines than to have access to more than two machines (63.2% vs 34.9%, *P*<0.01). Likewise, among programs with one POCUS faculty member, nearly half (47.2%) reported no annual financial expenditure on POCUS education, with the remainder fairly evenly distributed across levels of spending.

POCUS Curriculum Components

The survey assessed the scope of residency POCUS curricula as no curriculum, third-party online education only, or an in-house curriculum. In-house curricula were categorized by increasing comprehensiveness, progressing from didactics and hands-on workshops to the addition of bedside scanning, image review, and assessments. Table 4 examines the associations between POCUS faculty resources and curriculum scope, resident evaluation methods, and resident interest in POCUS education beyond the core residency curriculum.

Overall, 16.7% (52/312) of residency programs fully outsourced their POCUS curriculum to a third-party educational provider. Among programs offering didactics, hands-on workshops, and bedside scanning (38.0%), 93.3% had at least one POCUS faculty member. The addition of bedside scanning was associated with a significantly higher proportion of programs having two or more POCUS faculty compared with programs offering only didactics and

TABLE 2. POCUS Education Modalities by Residency Program

	Number of family medicine residency FACULTY teaching POCUS for multiple organ systems faculty teaching POCUS for multiple organ systems				Amount of protected time for all family medicine residency faculty for POCUS education ^a			Amount of protected time for the family medicine residency program POCUS champion/lead				Educational qualifications for POCUS champion/lead			
	0	1	2+	Total	0	0.1 FTE+	Total	Zero	2 hrs/wk (0.05 FTE)	4 hrs/wk (0.1 FTE)	Total	Completed a third-party POCUS training program ^c	Part of in person residency, fellowship, or specific institutional POCUS program	Total	
Residency program sponsor															
University-based	7 (14.0)	15 (30.0)	28 (56.0)	50	24 (48.0)	26 (52.0)	50	19 (38.0)	16 (32.0)	15 (30.0)	50	14 (21.9)	38 (59.4)	64	
Community/university	32 (17.9)	61 (34.1)	86 (48.0)	179	85 (48.0)	92 (52.0)	177	63 (36.2)	91 (52.3)	20 (11.5)	174	40 (16.7)	139 (57.9)	240	
Community/military ^d	21 (26.6)	27 (58.2)	31 (39.2)	79	46 (58.2)	33 (41.8)	79	37 (47.4)	34 (43.6)	7 (9.0)	78	18 (19.8)	57 (65.6)	91	
Total	60 (19.5)	103 (33.4)	145 (48.1)	308	155 (50.7)	151 (49.3)	306	119 (39.4)	141 (46.7)	42 (10.0)	302	72 (18.2)	234 (59.2)	395	
Location of residency															
East region ^d	19 (17.6)	37 (34.3)	52 (48.1)	108	54 (50.5)	53 (49.5)	107	44 (41.1)	44 (41.1)	19 (17.8)	107	34 (23.8)	85 (59.4)	143	
Middle region ^e	32 (24.2)	46 (34.8)	54 (40.9)	132	70 (53.4)	61 (46.6)	131	56 (43.1)	61 (46.9)	13 (10.0)	130	37 (23.4)	95 (60.1)	158	
West region ^f	9 (12.3)	23 (31.5)	41 (56.2)	73	35 (47.9)	38 (52.1)	73	23 (32.9)	37 (52.9)	10 (14.3)	70	20 (20.0)	57 (57.0)	100	
Total	60 (19.2)	106 (33.9)	147 (47.0)	313	159 (51.1)	152 (48.9)	311	123 (40.1)	142 (46.3)	42 (13.7)	307	54 (22.2)	142 (58.4)	243	
Size of the residency programs' community															
Less than 75K	25 (28.1)	32 (36.0)	32 (36.0)	89	47 (53.4)	41 (46.6)	88	37 (42.5)	43 (49.4)	7 (9.0)	87	26 (24.1)	64 (59.3)	108	
75,000–499,999	20 (14.9)	46 (34.3)	68 (50.7)	134	67 (50.0)	67 (50.0)	134	52 (39.7)	58 (44.3)	21 (16.0)	131	39 (22.5)	102 (59.0)	173	
500,000+	15 (17.0)	27 (30.7)	46 (52.3)	88	43 (49.4)	44 (50.6)	87	32 (36.8)	41 (47.1)	14 (16.1)	87	26 (22.2)	69 (59.0)	117	

(Continued)

TABLE 2. POCUS Education Modalities by Residency Program (Continued)

	Number of family medicine residency FACULTY teaching POCUS for multiple organ systems faculty teaching POCUS for multiple organ systems				Amount of protected time for all family medicine residency faculty for POCUS education ^a				Amount of protected time for the family medicine residency program POCUS champion/lead				Educational qualifications for POCUS champion/lead			
	0	1	2+	Total	0	0.1 FTE+	Total	n (%)	Zero	2 hrs/wk (0.05 FTE)	4 hrs/wk (0.1 FTE)	Total	Independent study ^b	Completed a third-party POCUS training program ^c	Part of in person residency, fellowship, or specific institutional POCUS program	Total
Total	60 (19.3)	105 (33.8)	146 (46.9)	311	157 (50.8)	152 (49.2)	309		121 (39.7)	142 (46.6)	42 (13.8)	305	91 (22.9)	72 (18.1)	235 (59.0)	398
Total number of residents, July 2022																
<19	29 (22.1)	62 (47.3)	40 (30.5)	131	68 (52.7)	61 (47.3)	129		57 (44.2)	61 (47.3)	11 (8.5)	129	34 (21.3)	32 (20.0)	94 (58.8)	160
19–31	27 (20.0)	33 (24.4)	75 (55.6)	135	70 (51.9)	65 (48.1)	135		48 (36.1)	69 (51.9)	16 (12.0)	133	40 (22.5)	34 (19.1)	104 (58.4)	178
>31	4 (8.5)	11 (23.4)	32 (68.1)	47	21 (44.7)	26 (55.3)	47		18 (40.0)	12 (26.7)	15 (33.3)	45	17 (27.0)	7 (11.1)	39 (61.9)	63
Total	60 (19.2)	106 (33.9)	147 (47.0)	313	159 (51.1)	152 (48.9)	311		123 (40.1)	142 (46.3)	42 (13.7)	307	91 (22.7)	73 (18.2)	237 (59.1)	401
Medical certificate																
MD	43 (17.6)	81 (33.2)	120 (49.2)	244	123 (50.8)	119 (49.2)	242		93 (38.9)	112 (46.9)	34 (14.2)	239	71 (22.0)	64 (19.8)	188 (58.2)	323
DO	16 (23.9)	25 (37.3)	26 (38.8)	67	35 (52.2)	32 (47.8)	67		28 (42.4)	30 (45.5)	8 (12.1)	66	20 (25.6)	9 (11.5)	49 (62.8)	78
Total	59 (19.0)	106 (34.1)	146 (46.9)	311	158 (51.1)	151 (48.9)	309		121 (39.7)	142 (46.6)	42 (13.8)	305	91 (22.7)	73 (18.2)	237 (59.1)	401
Time in current program director role																
0–3 years	24 (17.8)	43 (31.9)	68 (50.4)	135	78 (57.8)	57 (42.2)	135		57 (43.2)	59 (44.7)	16 (12.1)	132	50 (27.8)	24 (13.3)	106 (58.9)	180
3.5–9 years	25 (20.2)	40 (32.3)	59 (47.6)	124	60 (48.8)	63 (51.2)	123		48 (39.7)	58 (47.9)	15 (12.4)	121	27 (16.7)	42 (25.9)	93 (57.4)	162
10 + years	11 (20.4)	23 (42.6)	20 (37.0)	54	21 (39.6)	32 (60.4)	53		18 (33.3)	25 (46.3)	11 (20.4)	54	14 (23.7)	7 (11.9)	38 (64.4)	59

(Continued)

TABLE 2. POCUS Education Modalities by Residency Program (Continued)

Number of family medicine residency FACULTY teaching POCUS for multiple organ systems faculty teaching POCUS for multiple organ systems				Amount of protected time for all family medicine residency faculty for POCUS education ^a				Amount of protected time for the family medicine residency program POCUS champion/lead				Educational qualifications for POCUS champion/lead			
n (%)				n (%)				n (%)				n (%)			
0	1	2+	Total	0	0.1 FTE+	Total	Zero	2 hrs/wk (0.05 FTE)	4 hrs/wk (0.1 FTE) +	Total	Independent study ^b	Completed a third-party POCUS training program ^c	Part of in person residency, fellowship, or specific institutional POCUS program	Total	
Program director gender															
Total	60 (19.2)	106 (33.9)	147 (47.0)	313	159 (51.1)	152 (48.9)	311	123 (40.1)	14.2 (46.3)	42 (13.7)	91 (22.7)	73 (18.2)	237 (59.1)	401	
Program director gender															
Female/ woman	32 (17.8)	63 (35.0)	85 (47.2)	180	94 (52.5)	85 (47.5)	179	66 (37.9)	82 (47.1)	26 (14.9)	54 (21.9)	50 (20.2)	143 (57.9)	247	
Male/man	28 (21.5)	42 (32.3)	60 (46.2)	130	65 (50.4)	64 (49.6)	129	57 (43.8)	57 (43.8)	16 (12.3)	36 (24.2)	22 (14.8)	91 (61.1)	149	
Total	60 (19.4)	105 (33.9)	145 (46.8)	310	159 (51.6)	149 (48.4)	308	123 (40.5)	139 (45.7)	42 (13.8)	90 (22.7)	72 (18.2)	234 (59.1)	396	
Program director race/ethnicity ^β															
White	43 (18.8)	78 (34.1)	108 (47.2)	229	121 (53.3)	106 (46.7)	227	88 (39.5)	103 (46.2)	32 (14.3)	68 (23.0)	55 (18.6)	173 (58.4)	296	
Nonwhite	16 (22.9)	23 (32.9)	31 (44.3)	70	34 (48.6)	36 (51.4)	70	29 (41.4)	32 (45.7)	9 (12.9)	19 (22.1)	15 (17.4)	52 (60.5)	86	
Total	59 (19.7)	101 (33.8)	139 (46.5)	299	155 (52.5)	142 (47.8)	297	117 (39.9)	135 (46.1)	41 (14.0)	87 (22.8)	70 (18.3)	225 (58.9)	382	
Underrepresented in medicine															
No	49 (18.1)	91 (33.6)	131 (48.3)	271	137 (50.9)	132 (49.1)	269	100 (37.7)	126 (47.5)	39 (14.7)	80 (22.5)	65 (18.3)	210 (59.2)	355	
Yes	11 (27.5)	13 (32.5)	16 (40.0)	40	21 (52.5)	19 (47.5)	40	22 (55.0)	15 (37.5)	3 (7.5)	10 (23.8)	7 (16.7)	25 (59.5)	42	

(Continued)

TABLE 2. POCUS Education Modalities by Residency Program (Continued)

Number of family medicine residency FACULTY teaching POCUS for multiple organ systems teaching POCUS for multiple organ systems				Amount of protected time for all family medicine residency faculty for POCUS education ^a				Amount of protected time for the family medicine residency program POCUS champion/lead				Educational qualifications for POCUS champion/lead			
n (%)				n (%)				n (%)				n (%)			
0	1	2+	Total	0	0.1 FTE+	Total	Zero	2 hrs/wk (0.05 FTE)	4 hrs/wk (0.1 FTE)	Total	Independent study ^b	Completed a third-party POCUS training program ^c	Part of in person residency, fellowship, or specific institutional POCUS program	Total	
60 (19.3)	104 (33.4)	147 (47.3)	311	158 (51.1)	151 (48.9)	309	122 (40.0)	141 (46.2)	42 (13.8)	305	90 (22.7)	72 (18.1)	235 (59.2)	397	

Note: Grey box statistical significances, Bonferroni corrected for multiple comparisons, with P values at least <.05.

^aIncluding the POCUS champion or lead

^bIncluding short-term workshops, online content, etc

^cSuch as Gulf Coast Ultrasound, Global Ultrasound Institute, Ultrasound Leadership Academy, STFM certificate program, etc

^dNew England, Mid-Atlantic, South Atlantic: NH, MA, VT, RI, CT, NY, PA, NJ, PR, FL, GA, SC, NC, VA, DC, WV, DE, and MD

^eEast South Central, East North Central, West South Central, West North Central: KY, TN, MS, AL, WI, MI, OH, IN, IL, OK, AR, LA, TX, ND, MN, SD, IA, NE, KS, and MO

^fMountain, Pacific: MT, ID, WY, NV, UT, AZ, CO, NM, WA, OR, CA, AK, and HI.

^gRace/ethnicity had to be aggregated to White vs nonwhite due to cell size.

Abbreviations: FTE, full-time equivalent; POCUS, point-of-care ultrasound; STFM, Society of Teachers of Family Medicine

TABLE 3. Environmental Facilitators for POCUS Training: Machines and Cost

Number of ultrasound machines (cart-based or handhelds) available for family medicine residents in ambulatory and general inpatient settings ^a						Financial requirements (cost, maintenance, rental) per year for POCUS education for the residency ^b					
n (%)						n (%)					
0	1-2	3-4	5 + machines	Total	No 3rd-party educational tool	\$1-\$2,500	\$2,501-\$5,000	\$5,001-\$10,000+	Total		
Number of family medicine residency faculty who teach POCUS for multiple organ systems											
0	6 (10.0)	42 (70.0)	11 (18.3)	1 (1.7)	60	37 (62.7)	13 (22.0)	8 (13.6)	1 (1.7)	59	
One	2 (1.9)	67 (63.2)	25 (23.6)	12 (11.3)	106	50 (47.2)	19 (17.9)	20 (18.9)	17 (16.0)	106	
More than one	2 (1.4)	63 (42.9)	35 (23.8)	47 (32.0)	147	44 (30.1)	30 (20.5)	40 (27.4)	32 (21.9)	146	
Total	10 (3.2)	172 (55.0)	71 (22.7)	60 (19.2)	313	131 (42.1)	62 (19.9)	68 (21.9)	50 (16.1)	311	
FTE											
None	8 (6.5)	82 (66.7)	23 (18.7)	10 (8.1)	123	70 (54.3)	47 (36.4)	10 (7.8)	2 (1.6)	129	
2 hours/week-0.05 FTE	2 (1.4)	74 (52.1)	34 (23.9)	32 (22.5)	142	27 (43.5)	34 (54.8)	1 (1.6)	0	62	
Four hours+ /week-0.10 FTE	0	14 (33.3)	11 (26.2)	17 (40.5)	42	25 (21.9)	61 (53.5)	23 (20.2)	5 (4.4)	114	
Total	123 (10.1)	142 (46.3)	34 (11.1)	8 (2.6)	307	122 (40.0)	142 (46.6)	34 (11.1)	7 (2.3)	305	
Residency program											
University-based	1 (2.0)	21 (42.0)	15 (30.0)	13 (26.0)	50	20 (41.7)	9 (18.8)	11 (22.9)	8 (16.7)	48	
Community/university	5 (2.8)	103 (57.5)	35 (19.6)	36 (20.1)	179	74 (41.3)	34 (19.0)	41 (22.9)	30 (16.7)	179	
Community/military ^c	4 (5.1)	46 (58.2)	19 (24.1)	10 (12.7)	79	34 (43.0)	19 (24.1)	16 (20.3)	10 (12.7)	79	
Total	10 (3.2)	170 (55.2)	69 (22.4)	59 (19.2)	308	128 (41.8)	62 (20.3)	68 (22.2)	48 (15.7)	306	
Size of the residency programs' community											
Less than 75 k	4 (4.5)	51 (57.3)	18 (20.2)	16 (18.0)	89	38 (42.7)	19 (21.3)	15 (16.9)	17 (19.1)	89	
75k-499,999	2 (1.5)	70 (52.2)	36 (26.9)	26 (19.4)	134	51 (38.6)	24 (18.2)	34 (25.8)	23 (17.4)	132	
500k+	4 (4.5)	50 (56.8)	16 (18.2)	18 (20.5)	88	41 (46.6)	18 (20.5)	19 (21.6)	10 (11.4)	88	
Total	10(3.2)	171 (55.0)	70 (22.5)	60 (19.3)	311	130 (42.1)	61 (19.7)	68 (22.0)	50 (16.2)	309	
Total number of residents in the program in July 2022											
<19	8 (6.1)	79 (60.3)	24 (18.3)	20 (15.3)	131	58 (44.3)	27 (20.6)	24 (18.3)	22 (16.8)	131	
19-31	1 (0.7)	80 (59.3)	31 (23.0)	23 (17.0)	135	54 (40.3)	29 (21.6)	33 (24.6)	18 (13.4)	134	
>31	1 (2.1)	13 (27.7)	16 (34.0)	17 (36.2)	47	19 (41.3)	6 (13.0)	11 (23.9)	10 (21.7)	46	
Total	10 (3.2)	172 (55.0)	71 (22.7)	60 (19.2)	313	131 (42.1)	62 (19.9)	68 (21.9)	50 (16.1)	311	
Time in current program director role											
0-3 years	6 (4.4)	74 (54.8)	29 (21.5)	26 (19.3)	135	60 (44.8)	27 (20.1)	28 (20.9)	19 (14.2)	134	
3.5-9 years	2 (1.6)	67 (54.0)	31 (25.0)	24 (19.4)	124	47 (38.2)	25 (20.3)	30 (24.4)	21 (17.1)	123	
10 + years	2 (3.7)	31 (57.4)	11 (20.4)	10 (18.5)	54	24 (44.4)	10 (18.5)	10 (18.5)	10 (18.5)	54	
(Continued)											

(Continued)

TABLE 3. Environmental Facilitators for POCUS Training: Machines and Cost (Continued)

Number of ultrasound machines (cart-based or handhelds) available for family medicine residents in ambulatory and general inpatient settings ^a					Financial requirements (cost, maintenance, rental) per year for POCUS education for the residency ^b				
n (%)					n (%)				
0	1–2	3–4	5 + machines	Total	No 3rd-party educational tool	\$1–\$2,500	\$2,501–\$5,000	\$5,001–\$10,000+	Total
10 (3.2)	172 (55.0)	71 (22.7)	60 (19.2)	313	131 (42.1)	62 (19.9)	68 (21.9)	50 (16.1)	311

Note: Grey box statistical significances, Bonferroni corrected for multiple comparisons, with *P* values at least <.05.
^aExcluding ICU, CCU, and OB/GYN inpatient services
^bFrom an outside third party (ie, SonoSim, Global Ultrasound Institute, Gulf Coast Ultrasound, Butterfly Network, Core Ultrasound), including machine maintenance and subscriptions
^cCombined community-based residencies and military residencies
Abbreviations: CCU, critical care unit; FTE, full-time equivalent; ICU, intensive care unit; OB/GYN, obstetrics and gynecology; POCUS, point-of-care ultrasound

TABLE 4. POCUS Education and Evaluation by Faculty Resources

	Number of family medicine residency faculty who teach POCUS for multiple organ systems n (%)				Amount of protected time for all family medicine residency faculty for POCUS education n (%)				Amount of protected time for the family medicine residency program, POCUS champion, or lead n (%)			
	None	One	Two+	Total	None	0.1 + FTE	Total	None	0.05 FTE	0.1 + FTE	Total	
POCUS curriculum in the family medicine residency program												
Online third-party curriculum	30 (57.7)	15 (28.8)	7 (13.5)	52	41 (78.8)	11 (21.2)	52	41 (78.8)	8 (15.4)	3 (5.8)	52	
Didactics and hands-on workshops	19 (23.5)	31 (38.3)	31 (38.3)	81	49 (61.3)	31 (38.8)	80	46 (57.5)	30 (37.5)	4 (5.0)	80	
Didactics, hands-on workshops, bedside scanning	8 (6.7)	41 (34.5)	70 (58.8)	119	58 (49.2)	60 (50.8)	118	31 (27.0)	72 (62.6)	12 (10.4)	115	
Didactics, hands-on workshops, bedside scanning, image review, and assessments	2 (3.3)	19 (31.7)	39 (65.0)	60	11 (18.3)	49 (81.7)	60	4 (6.8)	32 (54.2)	23 (39.0)	59	
Total	59 (18.9)	106 (34.0)	147 (47.1)	312	159 (51.3)	151 (48.7)	310	122 (39.9)	142 (46.4)	42 (13.7)	306	
Residents' evaluation												
Not evaluated	39 (32.8)	38 (31.9)	42 (35.3)	119	78 (65.5)	41 (34.5)	119	70 (60.3)	35 (30.2)	11 (9.5)	116	
One-on-one evaluation only	19 (11.7)	58 (35.6)	86 (52.8)	163	70 (43.5)	91 (56.5)	161	46 (28.8)	94 (58.8)	20 (12.5)	160	
Comprehensive one-on-one evaluation ^a	2 (6.5)	10 (32.3)	19 (61.3)	31	11 (35.5)	20 (64.5)	31	7 (22.6)	13 (41.9)	11 (35.5)	31	
Total	60 (19.2)	106 (33.9)	147 (47.0)	313	159 (51.1)	152 (48.9)	311	123 (40.1)	142 (46.3)	42 (13.7)	307	
Percentage of residents seeking additional POCUS training ^b												
0%–10%	53 (21.5)	87 (35.2)	107 (43.3)	247	134 (54.7)	111 (45.3)	245	107 (44.4)	104 (43.2)	30 (12.4)	241	
20%	4 (9.1)	11 (25.0)	29 (65.9)	44	15 (34.1)	29 (65.9)	44	10 (22.7)	26 (59.1)	8 (18.2)	44	
More than 30%	3 (14.3)	7 (33.3)	11 (52.4)	21	10 (47.6)	11 (52.4)	21	6 (28.6)	11 (52.4)	4 (19.0)	21	
Total	60 (19.2)	105 (33.7)	147 (47.1)	312	159 (51.3)	151 (48.7)	310	123 (40.2)	141 (46.1)	42 (13.7)	306	

Note: Grey box statistical significances, Bonferroni corrected for multiple comparisons, with *P* values at least < .05.

^aComprehensive one-on-one evaluation included the options of OSCE only, a combination of one-on-one evaluation, OSCE, and written test, OR one-on-one evaluation, OSCE, written test, plus additional evaluation.

^bSeeking training outside the core family medicine residency curriculum means POCUS rotation, POCUS elective, POCUS track or area of concentration, teaching POCUS to learners, POCUS scholarly work, etc

Abbreviations: FTE, full-time equivalent; OSCE, objective structured clinical examination; POCUS, point-of-care ultrasound

hands-on workshops (58.8% vs 38.3%, $P < 0.01$). As curricula expanded from bedside scanning to include image review and assessment, the proportion of programs with two or more POCUS faculty increased further (38.3% bedside scanning, 58.8% image review, and 65.0% assessment).

Offering POCUS assessment varied by both the number of POCUS faculty and the protected time allocated to them. Even with at least one POCUS faculty member, 67.2% of programs that did provide assessment had limited protected time, with only 34.5% allocating 0.1 or more FTE for POCUS education. Likewise, among programs relying on third-party POCUS curricula, 83.5% had one POCUS faculty member but also did not provide POCUS assessment (Appendix 2C).

Program Director Satisfaction and Resident Engagement

Overall, 57 (18.3%) of PDs reported being satisfied with their residency POCUS curriculum, 96 (30.8%) were neutral, and 159 (51.0%) were dissatisfied. We used a multinomial multivariable logistic regression model to examine factors associated with PD satisfaction with the residency POCUS curriculum.

PD satisfaction differed by residency program type. Compared with community-based/military and university-based programs, PDs from community-based university-affiliated programs were significantly more likely to report dissatisfaction than satisfaction with their current POCUS curriculum (54.2% vs 16.8%, $P < 0.0001$; and 47.4% vs 14.1%, $P < 0.0001$, respectively). In university-based programs, satisfaction and dissatisfaction were reported in similar proportions.

Greater PD satisfaction was associated with protected time for the POCUS champion/lead and access to a higher number of ultrasound machines (Table 5). Comparing PD satisfaction with dissatisfaction, programs providing at least 0.05 FTE of protected time for the POCUS champion/lead were associated with 2.8-fold greater odds of PD satisfaction than programs with no protected time (OR 2.78, 95% CI 1.04–7.37; $P = 0.04$). Programs providing more than 2 hours per week of protected time had 9.3-fold greater odds of PD satisfaction (OR 9.32, 95% CI 2.92–29.76; $P = 0.0002$). The only other independent predictor of PD satisfaction was access to four or more ultrasound machines, which was associated with 3.4-fold greater odds of satisfaction compared with programs having fewer than four machines (OR 3.37, 95% CI 1.54–7.36; $P = 0.0023$).

The number of POCUS faculty and protected time allocated to the POCUS curriculum were independently associated with PDs reporting neutral rather than dissatisfied perceptions of their POCUS curriculum. Compared with programs having no POCUS faculty, programs with one POCUS faculty member had 2.54-fold greater odds of neutral satisfaction (aOR 2.54, 95% CI 1.02–6.33; $P = 0.0459$), while programs with two or more POCUS faculty had 4.92-fold greater odds of neutral satisfaction (aOR 4.92, 95% CI 1.93–12.56; $P = 0.0009$). In addition, allocating 2 hours per week of protected time for

the POCUS lead was associated with 2.36-fold greater odds of neutral satisfaction compared with dissatisfaction (aOR 2.36, 95% CI 1.21–4.60; $P = 0.0121$).

We assessed resident engagement by the percentage of residents who pursued POCUS training beyond the core family medicine residency curriculum, such as POCUS rotations, electives, tracks, teaching opportunities, or scholarly activities. We observed no significant association between protected time for POCUS faculty and the proportion of residents pursuing additional POCUS training beyond the core residency curriculum. Among programs in which more than 30% of residents sought additional training, 52.4% provided 0.1 or more FTE of protected faculty time compared with 47.6% that provided none ($P > 0.05$).

DISCUSSION

This study both updates previous POCUS curricular prevalence surveys and represents the first national-level assessment of resources supporting POCUS education in US family medicine residency programs. Representing an increase compared with prior national surveys, POCUS education is now offered by nearly 90% of US family medicine residency programs, reflecting the growing integration of POCUS into residency education. Despite this progress, most PDs reported dissatisfaction with their current POCUS curriculum. Our findings suggest that this dissatisfaction is driven less by whether a curriculum exists and more by the resources available to support it.

Several institutional resources were consistently associated with more comprehensive curricula and greater PD satisfaction, including the presence of a dedicated POCUS champion, the number of POCUS faculty, protected faculty time, and access to ultrasound equipment. Nearly one-quarter of programs lacked a designated POCUS champion, more than 10% had neither a champion nor POCUS faculty, and 40% of POCUS faculty received no protected time. Although community-based university-affiliated programs were more likely to provide some protected time for POCUS champions, this alone did not translate into higher PD satisfaction, suggesting that protected time must be paired with sufficient faculty, equipment, and institutional support.

An important finding of this study is the distinction between a POCUS champion/lead and POCUS faculty. Although the survey intentionally allowed PDs to define these roles within their own institutional context, the results suggest that these roles represent different educational functions. Protected time for the POCUS champion, not just the presence of POCUS faculty, was more strongly associated with comprehensive curricula and PD satisfaction. The term “POCUS champion” has crept into educational culture, and we believe that it is defined as dedicated educational leadership responsible for curriculum development, implementation, and program oversight versus general POCUS faculty who provide educational components without an overall program structure.

TABLE 5. Satisfaction With Point-of-Care Ultrasound Education

Outcomes	Parameter	Adjusted odds ratio	95% Wald CI	P value
Satisfied vs dissatisfied	Type of residency program you direct (ref: university-based)			
	Community-based, university-affiliated	0.62	0.240–1.602	.3234
	Community-based, nonaffiliated and military	0.91	0.288–2.900	.8784
	Number of residents in the program (ref: <19)			
	19–31	1.22	0.521–2.861	.6468
	>31	1.35	0.428–4.299	.6052
	Time in PD role (ref: 0–3 years)			
	More than 3 years	1.16	0.551–2.426	.7012
	Protected time for POCUS lead (ref: No POCUS champion/lead)			
	2 hours/week	2.78	1.045–7.368	.0405
Neutral vs dissatisfied	>2 hours/week	9.32	2.919–29.756	.0002
	Number of ultrasound machines (ref: 0–3)			
	4–5+	3.37	1.543–7.359	.0023
	Type of residency program you direct (ref: university-based)			
	Community-based, university-affiliated	1.05	0.445–2.489	.9083
	Community-based, nonaffiliated and military	2.11	0.805–5.527	.1289
	Number of residents in the program (ref: <19)			
	19–31	0.88	0.473–1.652	.7001
	>31	1.25	0.481–3.264	.6449
	Time in PD role (ref: 0–3 years)			
	More than 3 years	2.22	1.241–3.981	.0072
	Number of total faculty (ref: 0)			
	1	2.54	1.017–6.328	.0459
	2+	4.92	1.929–12.557	.0009
	Protected time for POCUS lead (ref: No POCUS champion/lead)			
	2 hours/week	2.36	1.206–4.599	.0121
	>2 hours/week	2.68	0.946–7.561	.0634
	Number of ultrasound machines (ref: 0–3)			
	4–5+	0.849	0.456–1.579	.605

Note: Multinomial logistic regression compares satisfied vs dissatisfied vs neutral responses, adjusting for all the significant univariate comparisons. Bold indicates a significant adjusted odds ratio.

Abbreviations: CI, confidence interval; PD, program director; POCUS, point-of-care ultrasound

Our findings also highlight opportunities to strengthen competency assessment. Programs with more POCUS faculty and greater protected time were more likely to incorporate resident evaluation, whereas many programs with limited faculty resources either did not assess competency or relied on minimal evaluation methods. Because competency assessment is essential to competency-based medical education, expanding faculty capacity may be necessary to ensure that residents achieve meaningful POCUS proficiency.

As curricula became more comprehensive (from didactics and workshops to bedside scanning, image review, and competency assessment), the need for faculty resources increased substantially. While a single POCUS faculty member appeared sufficient to support introductory didactic and hands-on instruction, programs offering longitudinal bedside scanning and structured assessment typically required two or

more faculty members. The robust associations of protected time for the faculty champion or lead with satisfaction and curricular outcomes suggest that 0.1 FTE may represent a practical minimum to effectively support teaching, image review, quality assurance, faculty development, and oversight of ultrasound technology. Resident enthusiasm for POCUS was encouraging, with many residents pursuing additional educational opportunities beyond the core curriculum. However, greater participation in these extracurricular activities was observed primarily in programs providing at least 0.1 FTE of protected faculty time. As national competency expectations continue to evolve and residency curricula become more comprehensive, the need for supplemental extracurricular training may diminish.

Our findings demonstrate that ultrasound equipment remains an important component of successful POCUS

implementation. Access to four or more ultrasound machines was independently associated with greater PD satisfaction, supporting the importance of investing in ultrasound technology alongside faculty development. As handheld ultrasound devices become increasingly affordable and incorporate features such as asynchronous image review, expanding access to these technologies may reduce important barriers to resident education while facilitating curricular components, including image review and quality assurance, that remain underdeveloped in many programs.

This study had important limitations. The 44.2% response rate and reliance on PD responses may have introduced response and reporting bias. Additionally, PD satisfaction is a subjective measure that may not fully reflect curriculum quality or resident competency. Future studies should evaluate objective educational outcomes, such as resident POCUS competency, to better define the relationships among faculty resources, protected time, curricular design, and educational effectiveness. The CERA survey format also limited the study to 10 specific questions, preventing a more comprehensive assessment of factors such as faculty training, resident competency, and institutional barriers to POCUS implementation. However, given the extent of the CERA survey, the question limitation likely reduced survey fatigue and helped boost survey response rate.^{21,22}

CONCLUSIONS

Overall, family medicine residency programs demonstrate substantial variability in POCUS educational resources and curriculum implementation. This study emphasized the important contributions of protected faculty time and technology investments in creating successful POCUS curricula. As the ABFM introduces national POCUS competency requirements,⁹ standardized educational expectations may help promote more consistent resource allocation and ensure that residents achieve competency by graduation. This study also provided one of the first descriptions of financial investment in third-party POCUS education among family medicine residency programs. More than 40% of programs relying on outsourced curricula had already developed internal POCUS faculty, suggesting that many programs may be transitioning toward internally led education. Future studies should determine whether continued faculty development reduces reliance on third-party educational resources while improving educational quality and long-term program sustainability. Future family medicine POCUS curricular studies should work toward longer-term outcome measurement—including measured and sustained resident competency, greater real clinical utilization, enhanced patient satisfaction, and better clinical outcomes in family medicine.

CONFLICTING AND COMPETING INTERESTS

Dr Patel consults with GE Healthcare's point-of-care ultrasound team, giving input and feedback on device development and functionality specific to family medicine. Dr Patel does not have

stock or equity interest in GE Healthcare. Dr Patel does not have any relevant conflicts of interest from this work in relation to this article.

PRIOR PRESENTATION

An overview of this content was presented at the Society of Clinical Ultrasound Fellowships Annual meeting, October 7–9, 2025, St. Louis, MO.

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