Focused Transthoracic Cardiac Ultrasound: A Survey of Training Practices

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Objective: **The role of focused assessment by transthoracic echocardiography or focused cardiac ultrasound (FoCUS) in the perioperative setting is uncertain and evolving. To the authors' knowledge, there are no studies that evaluate the current teaching practices regarding FoCUS in US anesthesiology residencies. The authors surveyed residents and residency program directors to examine the frequency, type, and variability of instruction regarding training of FoCUS.**

Design: **A survey study.**

Setting: **Anesthesiology residency programs in the United States.**

Participants: **All 133 Accreditation Council for Graduate Medical Education anesthesiology program directors and their residents were invited to participate in an anonymous electronic survey.**

Measurements and Main Results: **In all, 292 respondents replied to the survey, and 245 were included in the analysis. Overall response rate was 30% for program directors. The majority of the respondents were trainees (83.7%). FoCUS training was reported to be present by 36% of respondents. Respondents from institutions in which >10% of attending physicians used FoCUS were nearly 3 times as likely as those in which fewer attending physicians used FoCUS to report presence of FoCUS training program. The most common training mode is lectures with simulation (34%), followed by bedside training (31%). The most frequently reported responsible training parties were anesthesiologists (75%), followed by cardiologists (14%). Although FoCUS training is relatively rare, most respondents (187 of 205 residents and 26 of 40 program directors) said that FoCUS should be the standard in training for anesthesia residents.**

Conclusions: **Despite the increasing availability and use of ultrasound in clinical practice, FoCUS-related use and training remain uncommon in anesthesiology. Trainees in anesthesiology are not receiving adequate instruction in FoCUS despite their desire to acquire this skill.**

KEY WORDS: anesthesiology residency, education, ultrasound, FoCUS, transthoracic echocardiography

THE USE OF ULTRASOUND is becoming ubiquitous. Ultrasound-guided vascular access and ultrasound-guided regional anesthesia have become standard practice. The role of focused assessment by transthoracic echocardiography, or focused cardiac ultrasound (FoCUS), in the perioperative setting is evolving. FoCUS refers to a limited, clinician-performed sonographic evaluation of the heart used with the aim of obtaining specific information to aid in critical and time-sensitive decision making.[1] A FoCUS examination is intended to serve as a goal-directed assessment that supplements the information obtained from the standard history and physical examination. FoCUS is desirable in the acute care setting because it is noninvasive, can be performed easily at the bedside, and can be repeated as needed to monitor or assess the efficacy of an intervention. By design, FoCUS encourages specificity over sensitivity, and any question that is unclear should prompt expert consultation.[2]

The authors surveyed anesthesia residents and residency program directors in the United States to estimate the frequency with which FoCUS-specific training was conducted, the type of instruction given, variability regarding training methods, and general attitudes about FoCUS. The authors wanted to ascertain whether trainees and educators believed FoCUS was of clinical benefit and to better understand current beliefs regarding its training during residency.

To the authors' knowledge, there are no studies examining current FoCUS teaching practices in the United States (residency program directors and trainees). Accordingly, a survey was distributed to this population with the aims of assessing teaching practices, identifying variation, and determining targets of future educational initiatives.

METHODS

Institutional review board approval was obtained from the Human Research Protection Program at Baystate Medical Center. Given the fact that the survey was anonymous and voluntary, the requirement for individual consent was deemed unnecessary by the review board because participation in the survey implied consent.

A simple electronic survey via e-mail link was sent to all 133 Accreditation Council for Graduate Medical Education (ACGME)-accredited anesthesiology program directors who were asked to participate and to distribute the survey to all residents in their program (Appendix A: Survey). The survey consisted of 22 questions, 8 of which were demographic in nature. Of the 14 remaining questions, 6 required a single response from a list. Two required numerical values to be input (total number of anesthesiologists and number of current residents). Two questions were posed in a simple yes/no format and 3 fields consisted of free text options to expand on "other" responses. The final question was an open response with free text, allowing the participant to provide additional comments regarding training in focused transthoracic cardiac ultrasound.

Demographic data were differentiated between role (program director *v* resident) and practice setting (university/teaching hospital *v* public/military hospital). Respondents were asked to identify hospital location and location of medical school, with an additional field for free text to specify medical

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Table 1. Baseline Characteristics of Residents and Program Directors

	Overall (N = 245)	Residents (n = 205)	Program Directors (n = 40)	p Value
FoCUS training present at institution (%)	89 (36)	78 (31)	11 (28)	0.28
Sex (%)				
Female	84 (34)	76 (37)	8 (20)	
Male	160 (65)	129 (63)	31 (78)	0.07
Anesthesiologists on staff (mean/SD)	54/28	53/29	54/26	0.84
Number of residents (mean/SD)	44/21	44/21	45/22	0.73
Percentage of attending anesthesiologists adept at FoCUS (%)				
Missing/I don't know	55 (22)	54 (26)	5 (12)	
0%-10%	151 (62)	117 (57)	34 (85)	
11%+	39 (16)	34 (17)	5 (13)	0.001
Hospital location (%)				
Northeast	96 (39)	82 (40)	14 (35)	
Midwest	52 (21)	39 (19)	13 (33)	
West	43 (18)	40 (20)	3 (8)	
Southwest	18 (7)	15 (7)	3 (8)	
Southeast	36 (15)	29 (14)	7 (18)	0.18

school if outside of the United States. Residency training level (postgraduate year [PGY]1-PGY 5) and years of practice since completion of training for program directors also were surveyed.

Study data were collected and managed using Research Electronic Data Capture (REDCap) tools provided by Baystate Medical Center at Tufts Clinical and Translational Sciences Institute. REDCap is a secure, web-based application designed to support data capture for research studies.[3] The survey had no items that could identify respondents individually. The instrument was designed with assistance from the Department of HealthCare Quality at Baystate Health Systems (Springfield, MA). The survey was developed in compliance with previously published guidelines for survey composition in anesthesia.[4,5]

Statistical Analyses

Categorical responses were calculated as n (%). Group comparisons were performed using Fisher's exact test (categorical) or unpaired *t*-tests (means). Multivariate logistic regression was used to identify independent correlates of key outcomes (presence of FoCUS training program, yes *v* no; belief that transthoracic echocardiogram should be the standard in training, yes *v* no). Two-sided p values ≤ 0.05 were considered statistically significant. Multivariate models included all variables associated at $p \leq 0.2$ in bivariate analyses. Overall model fit was assessed using the Hosmer-Lemeshow Goodness-of-Fit test. Stata 13.1 (Union Station, TX) was used for all analyses.

RESULTS

Overall, 292 respondents completely the survey; 16.1% (n = 47) were excluded because they did not answer the main question regarding presence of training, leaving 245 for analysis. The demographics are presented in Table 1. Overall response rate was 30% for program directors (40 of 133); response rate could not be determined for trainees because the exact number of surveys distributed by the programs' directors and coordinators was unknown.

Of the surveys that were completed, the majority were from trainees (83.7%). There were 18 PGY1, 47 PGY2, 63 PGY3, 72 PGY4, and 5 PGY5 residents who completed the survey.

FoCUS training was reported by 38% (78 of 205) of residents and 27.5% (11 of 40) of program directors, for an overall proportion of 36.3% (95% confidence interval [CI], 30.5%-42.6%). The number of residents in the program and the proportion of full-time anesthesiologists who used FoCUS (Fig. 1) was associated positively with the presence of a FoCUS-related training program, whereas geographic location was not.

In a multivariate logistic regression model including number of residents and full-time anesthesiologists, only the latter maintained a significant association with presence of training: Respondents from institutions in which $>10\%$ of attending physicians used FoCUS were 2.5 times (95% CI, 1.2-5.2) as likely as those in which $\leq 10\%$ used FoCUS to report presence of training programs.

Characteristics of training programs are shown in Table 2. The most common training modes were lectures with simulation (34%), followed by bedside training (31%). The most frequently reported responsible training parties were anesthesiologists (75%), followed by cardiologists (14%).

Of those residents who had training at their hospital, 16% (n = 12) expected to be "not-at-all" proficient after training.

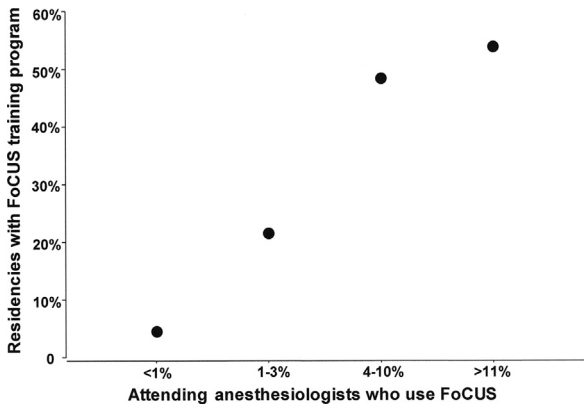

Fig 1. Likelihood that a residency program offered focused cardiac ultrasound (FoCUS) training. The larger number of faculty having capabilities in the use of FoCUS correlated with the likelihood that the program will have specified residency training.