



Point-of-Care Echocardiography in Non-Cardiology Hands: Training Thresholds, Governance and the Missed Finding

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Abstract

Point-of-care cardiac ultrasound (POCUS) has moved from the intensive care unit into routine use by emergency physicians, intensivists, and generalists, and the American Society of Echocardiography's 2024 nomenclature statement now separates basic cardiac POCUS/FoCUS from advanced POCUS, critical care echocardiography, and ultrasound-assisted physical examination -- while deliberately declining to attach any of these to a single regulatory body. Reported training thresholds vary widely: FoCUS certification is typically framed around 20 to 50 supervised scans against 75 to 250 for comprehensive transthoracic echocardiography (TTE) certification, while the British Society of Echocardiography's Level 1 route requires 75 personally performed, mentor-verified studies within 12 months. Diagnostic accuracy tracks this training gradient unevenly: in a tertiary medical intensive care unit, intensivist-performed critical care echocardiography (CCE) matched comprehensive TTE closely for its core targets -- left ventricular systolic dysfunction (sensitivity 0.87, specificity 0.94) and pericardial effusion (0.87, 0.99) -- but was markedly less reliable for valve regurgitation, where 60% to 70% of CCE examinations were simply nondiagnostic for mitral, tricuspid, or aortic insufficiency against only 20% to 30% of TTE examinations. A meta-analysis of handheld-device use found a comparable experience gradient (68% to 83% sensitivity for non-experienced operators versus 85% to 89% for experienced operators assessing left ventricular abnormalities), and training-programme reports from resource-limited settings describe pass rates as low as four of eight trainees. Governance frameworks -- the 2010 ACEP/ASE consensus statement and BSE Level 1 accreditation among them -- converge on the same practical answer: bound the scope of what basic POCUS is used to rule out, require escalation and cardiology overread for anything outside that scope, and treat a nondiagnostic view as an actionable result rather than a reassuring one.

Keywords: Point-of-care ultrasound; Focused cardiac ultrasound; Diagnostic accuracy; Clinician training; Credentialing

Introduction

A handheld or cart-based ultrasound probe at the bedside has become as ordinary a part of an emergency department or intensive care assessment as a stethoscope, and the clinicians

holding that probe are now, more often than not, not cardiologists. The American Society of Echocardiography's 2024 nomenclature statement tried to give this practice a stable vocabulary, separating basic cardiac point-of-care ultrasound (POCUS), also called focused cardiac ultrasound (FoCUS),

from advanced cardiac POCUS, critical care echocardiography (CCE), and ultrasound-assisted physical examination (UAPE) -- but it did so while explicitly declining to attach cardiac POCUS practice to any single regulatory body, leaving scope and credentialing to individual specialties and institutions [1].

That combination -- a genuinely useful bedside tool, widely adopted, without a single governing standard for who may use it or how much training that requires -- is the honest tension this review sets out to describe. Focused cardiac ultrasound performed by non-cardiology operators reliably answers the questions it was designed to answer: is there a large pericardial effusion, is the left ventricle grossly failing, is the inferior vena cava distended. The same operators, using the same machine on the same patient, are measurably less reliable at the questions comprehensive echocardiography was designed to answer -- valve disease chief among them -- and the evidence reviewed here suggests that gap does not close cleanly with a fixed number of practice scans.

This review reads the training-threshold literature that defines how many supervised scans and hours of instruction are typically required before a non-cardiology operator is considered competent, the diagnostic-accuracy studies that compare non-cardiology-performed cardiac POCUS against comprehensive echocardiography read by a cardiologist, and the governance frameworks -- an American consensus statement on scope of practice and a British personal-accreditation scheme among them -- that attempt to keep the resulting practice safe.

Material and Methods

This is a narrative review drawing on the 2024 American Society of Echocardiography (ASE) cardiac POCUS nomenclature statement, the 2010 joint consensus statement of the ASE and the American College of Emergency Physicians on focused cardiac ultrasound in the emergent setting, a systematic review of focused cardiac ultrasound training programs, a novice-examiner diagnostic-accuracy study, a tertiary intensive care unit diagnostic-accuracy study of critical care echocardiography against comprehensive transthoracic echocardiography (TTE), a meta-analysis of handheld-device accuracy stratified by operator experience, an editorial documenting training variability in resource-limited settings, a primary-care point-of-care ultrasound evaluation in heart failure, and the British Society of Echocardiography's (BSE) Level 1 personal accreditation documentation, identified through the sources cited here and citation tracking between them, without a pre-registered protocol or systematic search string. All scan numbers, training hours, sensitivities, specificities, agreement statistics, and percentages reported here are taken directly from the cited sources; none has been invented, estimated, or extrapolated.

Results

How many scans does competency require, and against what definition of competency?

Reported thresholds vary by roughly an order of magnitude depending on which certification is being described. A systematic review of training programs found that FoCUS certification is typically framed around 20 to 50 supervised scans, against 75 to 250 scans for comprehensive TTE certification [3]. Figure 1 sets these ranges alongside two further benchmarks discussed below.

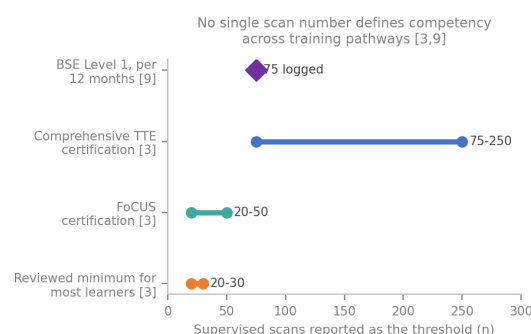


Figure 1: Supervised-scan thresholds reported across four training pathways: no single number defines competency [3,9].

Within FoCUS itself, the same systematic review found that the number of scans needed depends on both the pathology being assessed and how strict a definition of agreement is used: substantial inter-rater agreement (kappa greater than 0.6) for left ventricular systolic dysfunction was reached with 4 to 10 scans plus 2 hours each of didactic and hands-on training, while near-perfect agreement (kappa greater than 0.8) required 6 hours each of didactic and hands-on training; pericardial effusion identification reached substantial agreement only with 25 scans plus 3 hours each of didactic and hands-on practice [3]. Figure 2 plots this training-intensity relationship. The review's own headline recommendation -- 2 to 3 hours of didactic learning, 2 to 3 hours of hands-on training, and 20 to 30 scans -- is explicitly qualified as "likely adequate for most learners," not all of them [3].

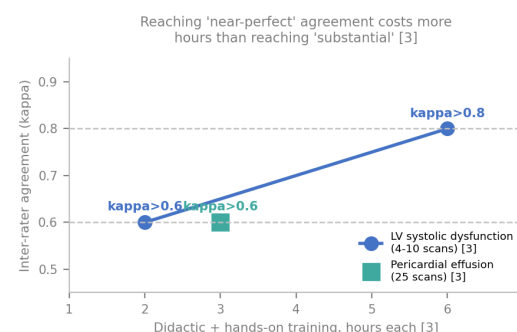


Figure 2: More training hours track higher inter-rater agreement, but the relationship is pathology-dependent [3].

Two further benchmarks show what "adequate" looks like once it is scrutinised. A novice examiner -- three years into clinical training, with a single one-day workshop and roughly 50 prior cardiac ultrasound examinations including only 10

supervised -- achieved 95.6% agreement with a specialist across six pathologies in 102 patients (612 individual assessments), with sensitivity 0.91 and specificity 0.97 [4]. That is a reassuring result, but it sits well above the reviewed 20-to-30-scan floor, not at it. The BSE's own Level 1 accreditation route, by contrast, requires 75 personally performed and reported studies within the preceding 12 months, with defined case-mix minimums (at least 5 cases each of left and right ventricular dysfunction, at least 3 cases of each major valve category), a designated mentor who verifies competency online, a live or simulator scanning assessment requiring full view acquisition within 20 minutes at an 83% pass mark, and a separate image-interpretation examination requiring a 100% pass mark [9] -- several times the scan count the pooled training literature calls sufficient.

Diagnostic accuracy: strong where it counts most, weaker exactly where non-cardiology operators are least likely to know it

In a tertiary medical intensive care unit, intensivist-performed critical care echocardiography (CCE) was compared directly against comprehensive TTE interpreted by a cardiologist. For the findings FoCUS was designed to catch, agreement was strong: left ventricular systolic dysfunction sensitivity 0.87, specificity 0.94; right ventricular systolic dysfunction sensitivity 0.85, specificity 0.94; pericardial effusion sensitivity 0.87, specificity 0.99 [5]. Figure 3 sets these results out alongside two pathology domains that fared worse.

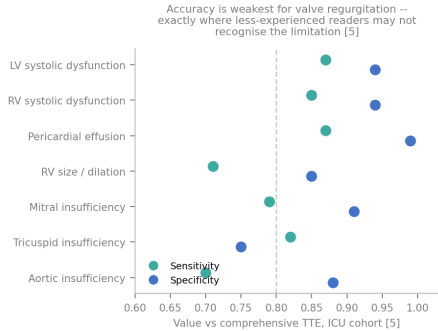


Figure 3: Sensitivity and specificity of critical care echocardiography against comprehensive TTE, by pathology, in a tertiary medical ICU [5].

Right ventricular size assessment fell to sensitivity 0.71 and specificity 0.85, and valvular regurgitation was the weakest domain overall: mitral insufficiency sensitivity 0.79/specificity 0.91, tricuspid insufficiency 0.82/0.75, aortic insufficiency 0.70/0.88 [5]. The more striking number sits beneath those figures rather than in them: 60% to 70% of CCE examinations were rated nondiagnostic for mitral, tricuspid, or aortic insufficiency, against only 20% to 30% of comprehensive TTE examinations [5]. Figure 4 sets this nondiagnostic gap out directly, because a scan that cannot assess a valve is a different failure mode from a scan that assesses it wrongly -- and a nondiagnostic result quietly filed as "no significant finding" is exactly the missed-finding pathway this review is concerned

with.

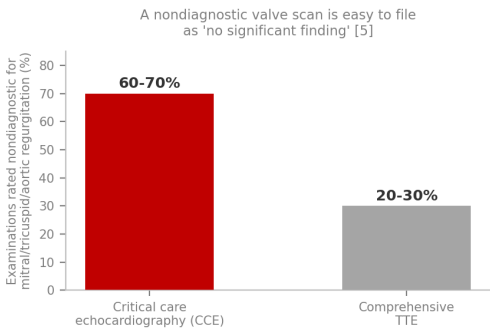


Figure 4: Examinations rated nondiagnostic for valve regurgitation: critical care echocardiography versus comprehensive TTE [5].

Pathology	CCE sensitivity	CCE spe cificity	Notes
LV systolic dysfunction [5]	0.87	0.94	Core FoCUS target
Pericardial effusion [5]	0.87	0.99	Core FoCUS target
RV size/dilation [5]	0.71	0.85	Outside core FoCUS scope
Mitral insufficiency [5]	0.79	0.91	60-70% nondiagnostic
Tricuspid insufficiency [5]	0.82	0.75	60-70% nondiagnostic
Aortic insufficiency [5]	0.70	0.88	60-70% nondiagnostic

Table 1: Diagnostic accuracy of intensivist-performed critical care echocardiography against comprehensive TTE, tertiary medical ICU [5].

A meta-analysis of handheld cardiac ultrasound devices for left ventricular structure and function found the same experience gradient in a different population. Experienced operators achieved pooled sensitivity/specificity of 88%/96% for reduced ejection fraction, 85%/95% for wall-motion abnormality, 89%/98% for left ventricular dilatation, and 85%/91% for left ventricular hypertrophy, with a statistically significant difference between experienced and inexperienced operators for ejection fraction, dilatation, and wall-motion abnormality detection [6]. A related editorial summarising this and adjacent evidence reported non-experienced operators detecting left ventricular abnormalities at 68% to 83% sensitivity and 87% to 95% specificity, against 85% to 89% sensitivity and 91% to 98% specificity for experienced operators [7].

The pattern across both cohorts -- ICU intensivists and handheld-device users alike -- is the same: accuracy is highest for the B-mode findings the ASE nomenclature places in the basic FoCUS tier, and falls once Doppler interrogation or fine structural discrimination is required, which is precisely the boundary the nomenclature draws between basic and advanced cardiac POCUS [1,5,6]. Experience does not close that boundary; it narrows the accuracy gap within each tier without erasing the difference between tiers.

What intensive training buys, and what a governance gap leaves exposed

A primary-care physician who completed a 30-hour structured course, observed 250 echocardiographic examinations, and independently performed 50 supervised examinations before using POCUS in routine clinic visits reached 83% overall concordance with conventional echocardiography, detected asymptomatic structural heart failure (stage B) in 44.9% of assessed patients against 19.4% by conventional clinical assessment, and identified 58 cases of left ventricular hypertrophy against only 10 flagged by electrocardiography -- while requesting fewer formal echocardiograms and making fewer specialist referrals than colleagues without the same training [8]. Table 2 places this training-intensive example alongside the pooled experience-gradient data discussed above.

Training-programme reports from resource-limited settings show how far short of these results a structured programme can still fall: one training programme found more than two-thirds of trainee-acquired images rated poor quality at the end of training, and another found only 4 of 8 trainees passed competency testing at all, while a third achieved 83% sensitivity and 85% specificity with non-expert users [7]. None of these programmes lacked structure; what varied was whether the structure reliably produced the competency it targeted.

Operator / setting	Training received	Reported accuracy
Novice examiner, ED-adjacent [4]	3yr prior clinical training, 1-day workshop, ~50 exams (10 supervised)	95.6% agreement; sens 0.91, spec 0.97
Primary care physician [8]	30h course, 250 observed, 50 independently performed	83% concordance; Stage B HF 44.9% vs 19.4%
Pooled experienced operators [6,7]	Formal echocardiography training/certification	Sens 85-89%, spec 91-98% (LV findings)
Pooled non-experienced operators [7]	Below formal certification threshold	Sens 68-83%, spec 87-95% (LV findings)

Table 2: Training intensity and reported diagnostic performance across four operator groups [4,6,7,8].

Set against the scan-number ranges in Figure 1, the pattern is coherent even where the underlying constructs differ: the closer a training pathway sat to the reviewed 20-to-30-scan floor without additional supervision or mentor sign-off, the more its reported results varied between cohorts, while the two examples that exceeded that floor several-fold -- the novice examiner's roughly 50 examinations and the primary-care physician's 300 -- both landed at the accurate end of the range [3,4,8]. That is not proof that more scans alone explain the

difference, since supervision quality, case mix, and mentor feedback varied alongside scan count in every source cited here, but it is consistent with the reviewed floor being closer to a minimum than to a target.

Governance: what the frameworks say a non-cardiology operator should and should not conclude

The ASE's 2024 nomenclature separates basic cardiac POCUS/FoCUS (B-mode only: chamber size and function, pericardial fluid, inferior vena cava) from advanced cardiac POCUS (adding colour and spectral Doppler, M-mode, quantitative interpretation), critical care echocardiography (advanced POCUS with haemodynamic quantification in the critical care setting), and ultrasound-assisted physical examination (augmenting, rather than replacing, the physical exam) [1]. Figure 5 sets this classification out as a ladder of rising scope and training intensity -- but the statement explicitly "uncoupled POCUS practice from any overarching regulatory body," leaving the decision of who may practise at which level to individual specialties and institutions rather than to a single credentialing authority [1].

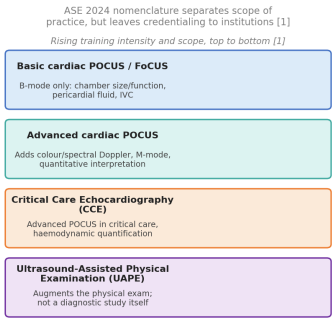


Figure 5: The ASE 2024 nomenclature separates cardiac POCUS into a scope-of-practice ladder, but leaves credentialing to institutions [1].

The 2010 joint consensus statement of the ASE and the American College of Emergency Physicians is more concrete about where that scope ends. It defines FoCUS as appropriate for detecting pericardial effusion, gross systolic dysfunction, chamber size, and inferior-vena-cava-based volume status, and for guiding pericardiocentesis or confirming pacemaker lead placement -- while explicitly stating that segmental wall-motion abnormality, valve quantification, diastolic function assessment, endocarditis, and left ventricular thrombus each require comprehensive echocardiography, and recommending quality-assurance measures including overread by echocardiography-credentialed physicians, annual programme review, and structured image archiving and reporting [2]. Figure 6 sets out the escalation logic this scope division implies for a single finding encountered by a non-cardiology operator, and Table 3 places the three governance frameworks reviewed here side by side.

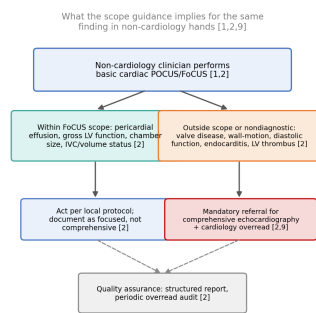


Figure 6: The escalation pathway implied by ACEP/ASE scope guidance and BSE Level 1 practice for a finding outside basic FoCUS scope [1,2,9].

Framework	Defines scope	Escalation trigger	Ongoing QA
ASE 2024 nomenclature [1]	Yes, 4-tier ladder	Not specified	Not specified; credentialing left to institutions
ACEP/ASE 2010 consensus [2]	Yes, explicit in clude/exclude list	Valve, wall-motion, diastolic, endocarditis, LV thrombus findings	Overread, annual review, structured reporting
BSE Level 1 accreditation [9]	Yes, by case-mix logbook minimums	Anything beyond the minimum TTE dataset	Mentor sign-off, re-accreditation cycle

Table 3: Scope, escalation triggers, and ongoing quality-assurance requirements across three cardiac POCUS governance frameworks [1,2,9].

Discussion

Read together, these findings describe a technology whose accuracy is not uniform across its own indication list. Non-cardiology-performed cardiac POCUS is genuinely reliable for the two findings most tied to an immediate management change -- gross left ventricular dysfunction and pericardial effusion -- with sensitivities and specificities in the high-0.80s to high-0.90s in a real ICU cohort reading against comprehensive echocardiography [5]. The same operators, using the same machine, are least accurate exactly where formal echocardiography's structured protocol and Doppler interrogation matter most: valve disease [5,6]. The nondiagnostic-rate gap is the more important number of the two, because a wrongly read valve is a recognisable error waiting to be caught on review, while a nondiagnostic valve view folded silently into "no significant finding" may never be flagged as anything at all [5].

The training-threshold literature does not resolve this cleanly with a single number. FoCUS certification is framed around 20 to 50 scans against 75 to 250 for comprehensive TTE certification, the reviewed floor for "most learners" is 20 to 30 scans, and the BSE's own personal accreditation route requires 75 logged studies with case-mix minimums, mentor verification, and a two-part practical and interpretive

examination -- several times the reviewed floor [3,9]. The ASE's own 2024 statement, meanwhile, declines to mandate any of these numbers as a credentialing requirement, leaving that judgment to institutions [1]. That combination -- real accuracy where it counts, real limitation where it does not, and no single agreed threshold connecting training to either -- is the honest complication a cardiologist supervising or being asked to overread these studies should expect to find.

The ASE's own scope ladder is a useful reminder that not every use of a probe at the bedside claims the same authority. Ultrasound-assisted physical examination, the lightest tier in the 2024 nomenclature, is framed explicitly as augmenting a clinical impression -- a quick look at gross ventricular size or an obviously large effusion alongside auscultation and a jugular venous assessment -- rather than as a diagnostic study standing on its own [1]. The accuracy and nondiagnostic-rate numbers reviewed here apply to studies that were performed, interpreted, and acted on as if they were a diagnostic FoCUS or CCE examination, not to a probe used as an extension of the physical exam; conflating the two, in either direction, is itself a governance failure the ASE ladder was built to prevent [1].

The training-programme reports from resource-limited settings sharpen the point: a structured programme does not guarantee competency by itself, since one programme passed only half its trainees and another produced predominantly poor-quality images despite formal instruction [7]. Where training was unusually intensive -- a 30-hour course plus 300 supervised or independent examinations in the primary-care example -- the resulting accuracy and clinical yield were substantially better than the reviewed minimum threshold would predict, including nearly a five-fold improvement in detecting asymptomatic structural heart failure and more than five times as many hypertrophy diagnoses as electrocardiography alone [8]. The practical lesson is less about the exact scan count and more about what the ACEP/ASE and BSE frameworks both build in structurally: a defined boundary of what basic POCUS is trusted to rule out, a mandatory escalation pathway for anything outside that boundary or left indeterminate, and ongoing overread rather than a one-time certification [2,9].

For a cardiologist asked to overread or supervise these studies, the practical question is less "was the operator trained" than "trained to detect what." A non-cardiology colleague who has logged the BSE's 75 annual studies, or who has cleared a FoCUS certification built around 20 to 50 scans, has good reason to trust their own reading of pericardial effusion and gross ventricular function, and equally good reason to distrust a normal-looking valve view on the same study, precisely because the training and accuracy literature reviewed here draws that same line in the same place [3,5,9]. Building that distinction into local protocols -- rather than treating every focused study as equivalent to a comprehensive one once a

clinician is described as "POCUS-trained" -- is the single change the evidence reviewed here most directly supports.

Study limitations

This is a narrative review, not a systematic review with a pre-registered protocol, and it draws on a limited set of training and accuracy studies rather than an exhaustive search of the cardiac POCUS literature. The intensive care unit diagnostic-accuracy data reviewed here come from a single tertiary centre and may not generalise to emergency department, ward, or primary-care populations, where case mix, pretest probability, and available follow-up imaging all differ [5]. The training-threshold numbers are drawn from studies that define "competency" differently -- inter-rater kappa in one review, pass/fail examination performance in BSE accreditation, sensitivity/specificity against a reference standard in the accuracy studies -- so the scan-number comparisons in Figure 1 describe genuinely different constructs placed on the same axis for comparison, not a single equivalence-tested measure [3,9]. None of the studies reviewed here reports patient-level outcomes -- missed diagnoses leading to delayed treatment, or unnecessary downstream testing from false-positive findings -- so the case made is one of diagnostic accuracy and nondiagnostic rate, not a directly measured harm from missed valve disease. The three governance frameworks compared in Table 3 are not parallel instruments -- an international specialty nomenclature statement, a US multispecialty consensus statement, and a UK personal-accreditation scheme -- and the comparison is illustrative of how each addresses scope and escalation, not a formal equivalence analysis between regulatory systems in different health systems [1,2,9].

A further point worth stating plainly for practice: the reviewed evidence base for non-cardiology cardiac POCUS is strongest for exactly the findings clinicians are least likely to miss on physical examination alone -- a large pericardial effusion or a grossly failing left ventricle usually comes with other clinical clues -- while it is weakest for valve disease, which can be clinically silent until decompensation. This means the accuracy gap documented here is not evenly distributed across clinical risk: the pathology non-cardiology POCUS is least equipped to detect is also the pathology least likely to otherwise announce itself before a formal echocardiogram would have caught it. A clinician reading only the headline sensitivity and specificity numbers for left ventricular function and pericardial effusion, without separately registering the nondiagnostic-rate figures for valve disease, would reasonably but mistakenly conclude that a normal-looking focused scan rules out clinically important cardiac pathology in general, when the evidence reviewed here supports that conclusion only for the specific findings FoCUS was designed to detect [2,5].

Conclusion

Cardiac point-of-care ultrasound in non-cardiology hands has a genuine, well-documented evidence base of strong accuracy for the life-threatening findings it was designed to catch -- pericardial effusion and gross ventricular dysfunction chief among them -- and an equally genuine, well-documented evidence base of reduced accuracy and elevated nondiagnostic rates for pathology, particularly valve disease, that it was never designed to rule out reliably. No single scan-number threshold in the literature reviewed here reconciles this gap, and the ASE's own 2024 statement declines to impose one. The practical safeguard described consistently across the governance frameworks reviewed is not a training number at all but a structure: a clearly bounded scope of practice, mandatory escalation and cardiology overread for anything outside or indeterminate within that scope, and a habit of treating a nondiagnostic view as a result requiring action rather than one requiring none.

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