

AAIM Perspectives

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The State of Internal Medicine Point-of-Care Ultrasound (POCUS) Fellowships in the United States and Canada



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INTRODUCTION

Point-of-care ultrasound (POCUS) is defined as a “goal-directed ultrasound examination performed by a healthcare provider to answer a specific question or guide performance of an invasive procedure at the bedside.”¹ POCUS improves procedural safety and success, demonstrates excellent sensitivity and specificity for diagnosing numerous conditions (eg, pleural effusion and ascites), improves patient satisfaction, and can decrease the use of ionizing radiation.²⁻⁷

Emergency medicine residencies adopted POCUS into practice decades before internal medicine.⁸ As a result, there are well-established curricula within emergency medicine residencies, and the American Board of Emergency Medicine now offers a focused practice designation in advanced emergency medicine ultrasonography. There are over 100 accredited emergency medicine POCUS fellowships within the United States with well-defined objectives and requirements for their fellows.⁹

A recent survey of internal medicine program directors found that an increasing number of residency

programs have incorporated diagnostic and procedural POCUS education into residency training (61% in 2020 compared with 25% in 2013) over the past 10 years.¹⁰ This increase parallels the increase in POCUS education in undergraduate medical education. A 2019 survey of US medical schools showed that 72.6% have an ultrasound curriculum.¹¹ The majority of internal medicine program directors reported that POCUS training is a medium or high priority for their program in terms of resident recruitment (82%), patient care (90%), and resident preparation for clinical practice (93%). The authors also identified perceived barriers to implementing POCUS education, most notably a shortage of trained faculty and local POCUS champions.¹⁰ Both the Alliance for Academic Internal Medicine and the American College of Physicians have formally acknowledged the important role of POCUS in internal medicine, and support the integration of POCUS into graduate medical education (GME).^{12,13} In response to the scarcity of POCUS-trained faculty and champions, there are now POCUS continuing medical education training programs offered by general medicine, hospital medicine, and critical care medicine societies.¹⁴⁻¹⁶

In parallel with a growth in POCUS residency training and continuing medical education, there has been a growing interest in the development of internal medicine POCUS fellowships. Barron et al¹⁷ described the creation of a “primary care ultrasound fellowship” geared toward teaching graduates of internal medicine, combined

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internal medicine and pediatrics, pediatrics, and family medicine residency programs.¹⁷ Since their program started in 2011, several other institutions have created similar fellowships with varying objectives and educational strategies. There is scant literature cataloging the current state of internal medicine POCUS fellowships. The objective of our study was to conduct a survey of internal medicine POCUS fellowship directors throughout the United States and Canada about the current state of education and training within their programs.

MATERIALS AND METHODS

We conducted an online survey of internal medicine POCUS fellowship programs in the United States and Canada between February 2022 and June 2022. Programs were identified via online Web searches (search terms: “point-of-care ultrasound” or “POCUS” fellowships + “internal medicine”), a national internal medicine GME listserv, and social media. For the latter, we used Twitter, which has a strong POCUS community. We also employed targeted snowball sampling.¹⁸ We identified 11 internal medicine POCUS fellowship programs and their program directors.

The online survey consisted of 30 questions and was divided into fellowship design, fellowship requirements, and information about POCUS use at the institution. Questions about general fellowship design were constructed based on the structure of the primary care ultrasound fellowship described by Barron et al.¹⁷ We utilized prior literature on the state of emergency medicine POCUS fellowships to create questions about diagnostic and procedural applications.^{17,19-21} For this purpose, we also referenced the Society of Hospital Medicine position statement on core POCUS applications for hospitalists.²²

Barriers to POCUS education have been well described in prior literature and guided the design of questions on this topic.¹⁰ We asked program directors to rank 6 barriers to creating or continuing their POCUS fellowships from most to least significant to evaluate the perceived impact of these barriers.

Demographic information collected included the length of the program, number of fellows per class, the residency programs that fellows have completed, and faculty responsible for POCUS education. We also

assessed the clinical responsibilities of fellows by identifying the number of required clinical shifts per month, with a clinical shift defined as an 8- to 12-hour hospitalist shift or 1 day in clinic.

Survey creation and methodology were overseen by the director of education scholarship at the University of North Carolina School of Medicine Academy of Educators (UNC AOE). Prior to administration, the questions were reviewed and edited for clarity by the UNC AOE associate chair for faculty development and the UNC director of internal medicine POCUS education. The final survey (see [Supplementary material, available online](#)) was administered through Research Electronic Data Capture® (REDCap, Vanderbilt University, Nashville, Tenn).

The survey landing page served as the informed consent page and the study was deemed exempt by our institution’s institutional review board (#IRB 21-2849). The survey was sent via an initial e-mail followed by 2 reminder e-mails 2 weeks apart. Each survey was

assigned a random identifier that was used to track successful completion of the survey. If we had not received a response after 1 month of attempting to contact a program director, we contacted any co-directors or associate program directors identified using the program’s website. De-identified data were entered into Microsoft Excel (Microsoft Corporation, Redmond, Wash) and summarized descriptively.

PERSPECTIVES VIEWPOINTS

- Point-of-care ultrasound (POCUS) is increasingly identified as an adjunct to internal medicine patient care.
- The depth and breadth of internal medicine residency POCUS education is hindered by a shortage of trained faculty.
- One path to address these deficits is through the creation of internal medicine POCUS fellowships.
- Our survey of the nascent state of internal medicine POCUS fellowships may be useful to residency and fellowship programs in structuring and supporting the creation of their own fellowship.

RESULTS

Program Characteristics

Nine internal medicine POCUS programs completed the survey (response rate 82%) including 7 US programs and 2 Canadian programs. Program characteristics are described in [Table 1](#). Most programs reported having 2 fellows at one time, with internal medicine being the most common residency program completed prior to starting the fellowship. Most fellowships last 12 months but range from 6 to 12 months. Clinical duties required from fellows range from 6 shifts per month to more than 15. The most frequently reported requirement was 6 to 8 shifts per month.

Post-fellowship career positions that programs reported their fellows had pursued ([Figure 1](#)) included: faculty in an academic setting, leadership or instructor in POCUS curricula within medical school or resident education, leadership in a POCUS fellowship program, pursuit of a specialty fellowship (eg, critical care,

Table 1 Characteristics of IM POCUS Fellowship Programs (n = 9)

Program Characteristic	n (%)
Program structure	
Primarily an EM POCUS fellowship that accepts trainees from other disciplines	1 (11)*
Created primarily for internal medicine: Residency programs fellows have completed prior to starting program:	8 (89)
Internal Medicine	9 (100)
Family Medicine	3 (33)
Emergency Medicine	2 (22)
Pediatrics	1 (11)
Combined Med Peds	4 (44)
Anesthesia	0 (0)
Surgery	0 (0)
Other	0 (0)
Number of fellows per year (2021-2022)	
1	0 (0)
2	7 (78)
3	1 (11)
4	1 (11)
5 or more	0 (0)
Geographic location	
Northeastern US	3 (33)
Southern US	2 (22)
Midwestern US	1 (11)
Western US	1 (11)
Canada	2 (22)
Length of fellowship	
6-12 mo	2 (22)
12 mo	7 (78)
No. of clinical shifts fellows have per month	
5 or fewer	0 (0)
6-8	5 (56)
9-11	2 (22)
12-14	1 (11)
15 or more	1 (11)
Number of faculty members in primary department who have completed national certification in POCUS	
0	3 (33)
1	0 (0)
2	1 (11)
3	0 (0)
4 or more	3 (33)
Not sure	2 (22)

EM = emergency medicine; IM = internal medicine; POCUS = point-of-care ultrasound.

*One program started primarily as an EM POCUS fellowship, but currently accepts different specialties within individualized tracks (eg, an IM POCUS fellowship track).

from 4 to more than 10, with 4 to 7 being the most frequently reported. Programs reported that anywhere from 0 to more than 4 faculty core members had completed a national certification program in POCUS (Table 1). In addition to core faculty, fellows receive training from faculty, fellows, and ultrasound technicians across a range of specialties (Figure 2).

Fifty-six percent of programs reported full-time equivalent (FTE) support for faculty, up to a maximum of 25% with a median of 16% to 20%. Most of this support is for the program director, although 2 programs reported FTE support for associate program directors (16%-20% total) and one program reported support (up to 5% total) for other faculty members.

Educational Strategies

All surveyed programs use involvement in resident or medical student education, lectures, and image review conferences to train fellows (Figure 3). Additional strategies include supervised scanning shifts, training within a different department, participation in journal clubs, and procedural simulation. Less frequently used strategies include training at another institution or through a program from a national society such as the Society of Hospital Medicine, American College of Physicians, and the American College of Chest Physicians. Twenty-two percent of programs reported providing funding to fellows for completion of POCUS certification through one of these organizations.

All program curricula include diagnostic POCUS in focused cardiac, vascular, abdominal, musculoskeletal, lung, and superficial and soft tissue ultrasound. Aorta (89%), gallbladder (89%), and ocular examinations (89%) are also frequently used, followed by obstetrics-gynecology (67%). One program reported education in the use of transcranial Doppler, transvaginal ultrasound, and transesophageal echocardiograms.

Eight programs (89%) reported teaching ultrasound-guided procedures to their fellows. The most-taught procedure is peripheral vascular access (100%) followed by central venous access (88%), joint aspiration/injection (88%), paracentesis (88%), thoracentesis (88%), and lumbar puncture (75%). Incision and drainage and nerve blocks are less frequently taught (38% and 25%, respectively). One program reported teaching drainage of peritonsillar abscesses.

Evaluating Competencies

Programs use a range of strategies to evaluate fellow competencies, with all programs employing direct observation at the bedside (Figure 4). Other strategies include portfolio development (89%) and skills assessment (67%). Less common methods include national POCUS certification (22%) and knowledge assessment via written examination (22%). For programs that require portfolio development, the number of scans per

sports medicine, nephrology, cardiology), community physician, or a combination of those positions.

POCUS Faculty

The number of core faculty members participating in education of internal medicine POCUS fellows ranged

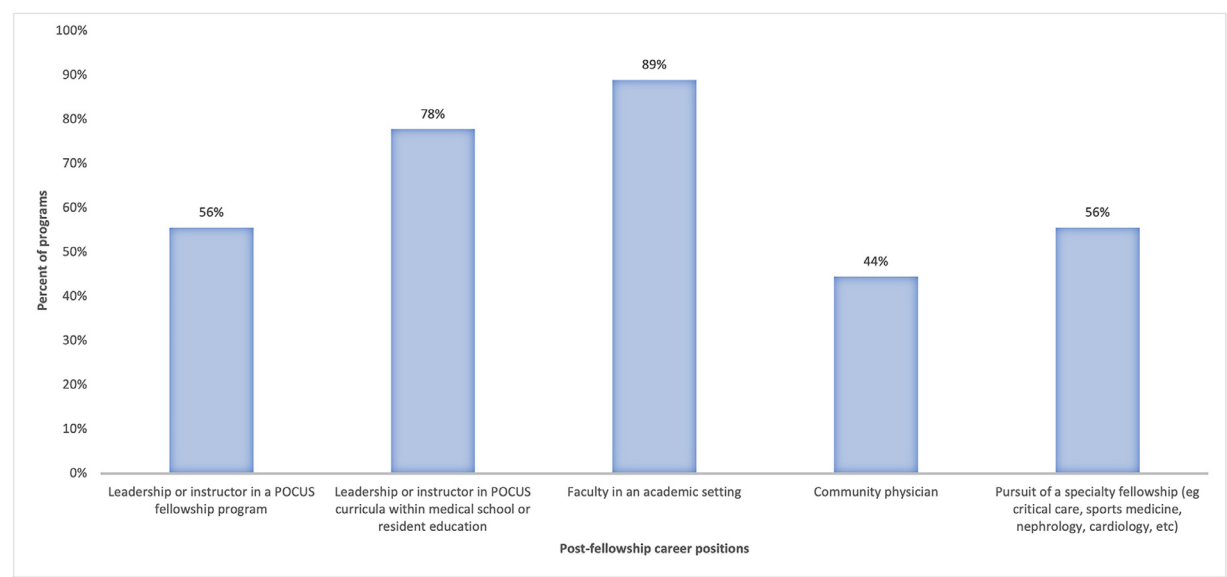


Figure 1 Post-fellowship career positions that graduates have pursued. Percentages represent proportion of programs that reported having had at least one graduate pursue a particular position.

organ system required is shown in Table 2. Overall, programs require the highest numbers of cardiac, abdominal, and lung examinations.

Research and Teaching Requirements

Only 56% of programs reported having a mandatory research requirement for their fellows. Of these 5 programs, the most common requirement is a presentation (poster or oral presentation) at the regional or national level (60%), followed by submission of an IRB

application or manuscript (both 40%) and application for grant funding (20%).

All programs reported that their fellows are involved in resident education. Eighty-nine percent of programs also reported that their fellows are involved in faculty, advanced practice provider (APP), and other fellow education and 78% in medical student or APP student education. Fellows are required to create scholarly materials including recorded lectures or modules (100%), development of POCUS curricula (67%), creation of instructional videos for ultrasound-guided pro-

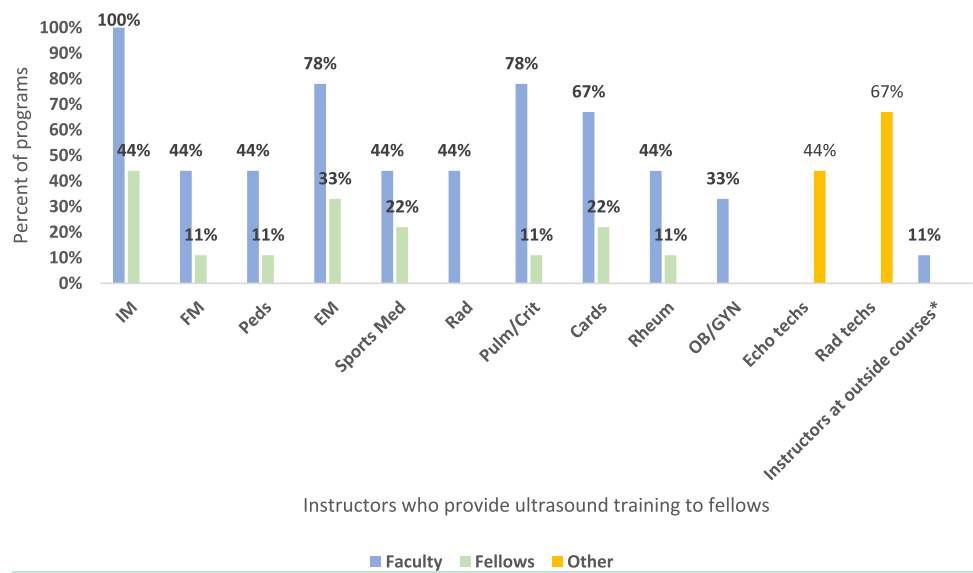


Figure 2 Instructors who provide ultrasound training to IM POCUS fellows. One program indicated that cardiac anesthesia faculty also teaches. *Including the Society of Hospital Medicine, the American College of Chest Physicians, American College of Physicians, etc. FM = Family Medicine; IM = Internal Medicine; OB/GYN = obstetrics/gynecology; POCUS = point-of-care ultrasound.

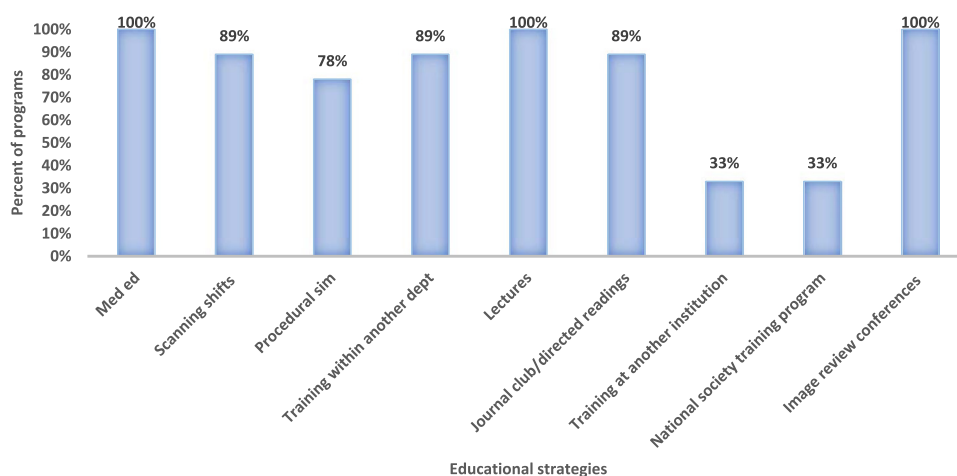


Figure 3 Educational strategies utilized to train point-of-care ultrasound fellows.

cedures (33%), and creation of assessment instruments, such as knowledge or skills tests (33%).

Barriers to Creating Internal Medicine POCUS Fellowships

Barriers to creating or continuing POCUS fellowships from most to least significant are shown in Table 3. Lack of time for faculty and educators and lack of support were the most frequently cited barriers, whereas lack of equipment was overall ranked as the least significant barrier. All programs reported that their fellows have access to both hand-held and cart-based ultrasound machines. Other barriers reported by respondents included inability to bill for ultrasound in internal medicine except for procedures, funding for the fellowship position, scheduling around clinical work, and lack of a digital archiving system.

Additional Information about POCUS at Institutions

Eighty-nine percent of respondents reported having a process in place for training faculty members in

POCUS; however, only 33% of programs have a process for credentialing non-emergency medicine faculty to obtain privileges in bedside ultrasound for diagnostic or billing purposes. Sixty-seven percent of institutions have a quality assurance process for bedside ultrasounds, and 100% reported having a system for archiving bedside ultrasound studies after they are performed. Respondents reported that ultrasound examinations are rarely (25% to 50% of the time) documented in the medical record.

DISCUSSION

In this study surveying the nascent state of internal medicine POCUS fellowships throughout the United States and Canada, we identified only a small number of established programs, with many similarities and some notable differences. Across fellowship programs there is a strong consensus on the diagnostic ultrasound examinations that are emphasized. Cardiac, abdominal, and lung ultrasound examinations are given the most weight—likely reflecting both the emphasis placed on these studies in internal medicine practice and the relative difficulty of the examinations, necessitating more scans to achieve competency. Procedural ultrasound is also an important part of the fellowship curriculum, with 6 procedures (peripheral and central vascular access, joint aspiration, paracentesis, thoracentesis, and lumbar punctures) most taught and utilized.

POCUS education from fellows was universal across the programs we surveyed, with programs reporting that their fellows teach residents, medical and APP students, other fellows, and faculty members. Fellows also assist in the development of educational materials. Research was not highly emphasized.

There is variability in the clinical responsibilities and in the number of core internal medicine faculty members who teach the fellows. While most POCUS educators in these programs are general internal

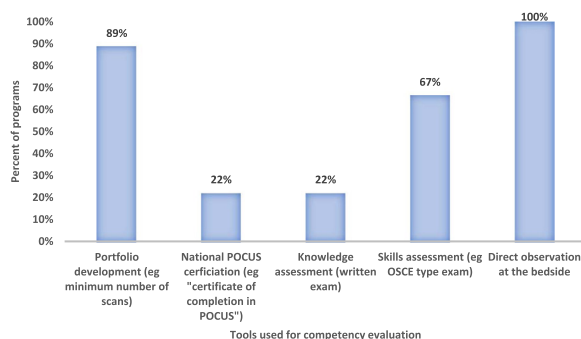


Figure 4 Tools used by programs for evaluating fellow competencies. OSCE = objective structured clinical examination; POCUS = point-of-care ultrasound.

Table 2 Minimum Number of Scans Required Per Organ System Among IM POCUS Programs Requiring an Ultrasound Portfolio

Program	Cardiac	DVT	Aorta	Abdominal*	Gallbladder	MSK	Ocular	Lung	Superficial and Soft Tissue	OB/GYN
1	>40	21-40	21-40	>40	21-40	21-40	0-20	>40	0-20	0-20
2	>40	21-40	0-20	>40	0-20	0-20	0-20	>40	>40	N/R
3	21-40	21-40	21-40	21-40	21-40	0-20	0-20	21-40	21-40	21-40
4	>40	21-40	0-20	0-20	0-20	0-20	0-20	21-40	0-20	0-20
5	21-40	21-40	21-40	21-40	21-40	21-40	0-20	21-40	21-40	0-20
6	0-20	0-20	0-20	21-40	0-20	>40	0-20	0-20	0-20	0-20
7	>40	N/R	21-40	>40	21-40	21-40	0-20	>40	>40	21-40
8	>40	N/R	N/R	>40	N/R	N/R	N/R	>40	>40	N/R
9	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R

*Including bladder, kidneys, liver, spleen.

DVT = deep vein thrombosis; IM = internal medicine; MSK = musculoskeletal; N/R = not required; OB/GYN = obstetrics/gynecology; POCUS = point-of-care ultrasound.

medicine physicians, programs reported a range of other individuals such as echocardiography and radiology technicians who assist in education. This range may reflect the barriers reported by programs, namely a lack of trained internal medicine faculty and POCUS “champions,” as well as lack of financial support for faculty time. Outsourcing some of the teaching burden seems to be a common solution. POCUS fellowship programs require faculty time in organizing education, supervising fellows, providing quality assurance and safety measures, and evaluating competency. FTE support for POCUS faculty in internal medicine residency programs has been linked to higher satisfaction in their POCUS curriculum.¹⁰ We hope normative data on FTE support will allow current and future programs to advocate for more FTE support.

This survey highlights that while all internal medicine POCUS fellowships require their fellows to teach residents, there is a wide range in clinical responsibilities. Attention must be paid to balancing fellow clinical and teaching responsibilities.

This survey also calls attention to further challenges facing the growth of internal medicine POCUS education in general. Likely due to the development of less costly hand-held and cart-based ultrasound machines, lack of equipment was the lowest-ranked barrier.

Table 3 Barriers Faced by Program Leadership in the Creation of a POCUS Fellowship, Ranked from Most to Least Significant

1	Lack of time for ultrasound faculty to participate in education due to other clinical responsibilities
2	Lack of support from department or hospital (monetary or otherwise)
3	Lack of consensus guidelines for IM POCUS fellowship curriculum
4	Lack of ultrasound-trained faculty
5	Lack of teaching or sim space
6	Lack of equipment

IM = Internal Medicine; POCUS = point-of-care ultrasound.

Unfortunately, there are more complicated challenges, including the lack of guidelines for residency and fellowship POCUS curricula. More broadly, there are few institutions with established processes for credentialing, archiving, documenting, billing, and providing quality assurance. In short, while internal medicine professional societies have endorsed POCUS, there is little guidance in operationalizing this practice and training learners to mastery.

Our study should be interpreted in light of several limitations. We are unaware of any central repository of non-emergency-medicine-based POCUS fellowships. As a result, we relied on internet searches and targeted snowball sampling to identify programs, and it is possible we may have omitted existing programs, particularly smaller or less established ones. Additionally, while our survey questions were based on items from similar prior studies, there may have been differences in the interpretation of survey items across participants. We tried to control for this by extensive review of the survey by experts in survey design and medical education and by requesting objective data wherever possible. Finally, there are differences in medical education and accreditation requirements between the United States and Canada.

CONCLUSION

The major domains emphasized by programs include achieving mastery of diagnostic and procedural POCUS and providing peer POCUS education to other trainees and faculty. Programmatic planning should attempt to address the barriers identified in this study, particularly the lack of devoted and funded time for faculty to participate in ultrasound education. The fellowship programs we surveyed have graduated leaders in POCUS education within medical schools and residencies as well as in POCUS fellowship programs. As demand for POCUS throughout every level of medical education continues to grow, it is important to increase

the availability of fellowship positions to train leaders in ultrasound education.

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SUPPLEMENTARY DATA

Supplementary material associated with this article can be found in the online version at <https://doi.org/10.1016/j.amjmed.2023.04.011>.