

## Point-of-Care Ultrasound Training in Nephrology: A Leap Forward, Not Merely a Check Mark



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**P**oint-of-care ultrasonography (POCUS) is rapidly evolving as a component of physical examination in modern medicine. To establish a successful nephrology-oriented POCUS program, the following elements are essential.

First, it is important for the nephrology faculty and division leadership to grasp the significance of integrating POCUS training into fellowship curriculum. It has been shown that POCUS improves diagnostic accuracy, reduces time to diagnosis, has a positive impact on physician-patient interactions, reduces health care cost burden, and the findings carry prognostic significance.<sup>1-3</sup> In contrast to prevailing perceptions, POCUS performed by nephrologists goes beyond kidney ultrasound and encompasses an extensive array of sonographic applications such as lung ultrasound, focused cardiac ultrasound, and systemic venous Doppler as a part of comprehensive volume status assessment.<sup>4</sup> Most medical schools in the United States have already incorporated basic POCUS training into their curricula, and internal medicine residencies are making efforts to catch up.<sup>5,6</sup> This raises expectations among nephrology fellowship applicants about the specialty-specific POCUS applications they are going to learn during their fellowship. Furthermore, having fellows with previous POCUS training who use it during rounds creates confusion in the clinical decision-making process if the supervising physicians are not familiar with the findings. Therefore, it is imperative that nephrologists entrusted with teaching responsibilities have proficiency in POCUS, at least image interpretation and clinical integration, if not acquisition. As opposed to procedures such as kidney biopsy that can be delegated to interventionalists, physical examination is an integral component of bedside assessment that clinicians are expected to perform. Ultrasonography is just another physical examination tool that can be deployed at the point of care like the stethoscope and has consistently demonstrated diagnostic superiority over conventional methods.<sup>1,2</sup> Recognizing these facts prompts divisional faculty members to actively engage with the POCUS program and motivate fellows to incorporate routine scanning, thereby laying a strong foundation for an effective program.

Establishing any novel academic program from scratch is a challenging task and the POCUS curriculum is no exception. Expert faculty with a passion for teaching are the key to building a successful POCUS program. Despite growing interest in POCUS, faculty expertise and the range of sonographic applications taught in nephrology fellowship programs remain sparse at this time.<sup>7</sup> Nephrology fellowship programs that do not have POCUS-trained

faculty tend to rely on experts from other specialties such as emergency medicine and critical care to teach fellows through short workshops or elective rotations. Although this is a reasonable initial strategy and fills the void to some extent, it is not a viable long-term option. Though image acquisition remains relatively uniform, the focused clinical questions asked, and clinical integration of the POCUS findings are unique to individual specialties. For example, ensuring adequate decongestion in a patient with cardiorenal syndrome before discharge by assessing sonographic markers is more relevant to nephrology compared with emergency medicine in which the focus is on acute life-threatening diagnoses. Similarly, quantifying extravascular lung water and right atrial pressure in the outpatient setting (eg, cardiorenal clinic and dialysis unit) is unique to nephrology. Therefore, nephrology faculty will be able to provide a better perspective on the practical use of POCUS in specialty-specific clinical scenarios. In addition, faculty from other specialties often cannot dedicate time for longitudinal supervision of nephrology fellows, which eventually curbs fellows' enthusiasm for learning or, even worse, makes them overestimate their skills, potentially leading to patient harm. Hence, fellowship programs must allocate resources to train their core POCUS faculty through institutional pathways in which available or structured certification programs<sup>8,9</sup> are provided with an eventual goal of training the rest of the faculty.

Faculty must be provided with dedicated time and support for the administration of POCUS curriculum commensurate with the size of the fellowship program and its configuration; failure to do so leads to burnout, which ultimately results in suboptimal training of the fellows. The amount of work that goes into developing and maintaining a POCUS program is often underrecognized. For example, the duties of a POCUS director include development and curation of educational material, providing direct and indirect supervision, maintaining equipment, ensuring proper documentation, guiding scholarly activity, performing quality assessment, and training other faculty in the division.<sup>4</sup> Furthermore, faculty must attain minimum competency in POCUS themselves before starting a formal training program, which consumes substantial time. This contrasts with setting up a subspecialty clinic such as glomerulonephritis clinic because nephrologists are expected to possess minimum competency in treating glomerulonephritis by the time they graduate from fellowship and can quickly hone their skills afterward. In addition, although faculty members interested in research may secure extramural funding to






support their time once they have achieved competence, compelling them to generate papers and obtain funding right from the outset could potentially result in subpar research conducted with potentially erroneous inferences.

The availability of ultrasound equipment is another key element that impacts the quality of POCUS education. Fellowship programs must consider several factors when procuring ultrasound equipment, not just the cost. In general, low-cost handheld devices have lower image resolution. Although it may not affect applications such as lung (involves interpretation of artifacts) and internal jugular vein (superficial structure) ultrasound, low image quality particularly compromises cardiac imaging. Moreover, novice POCUS users may not be able to grasp sonographic anatomy when using such devices. Cost cutting also hinders procuring options such as spectral Doppler, a vital component of advanced hemodynamic assessment. Having these options is important for the faculty to grow their skills and eventually expand the curriculum. Notably, a study that evaluated 4 commonly used handheld ultrasound devices in the United States found that none of these devices were considered to possess all the desired attributes according to expert users.<sup>10</sup> As mentioned, future nephrology fellows will already be exposed to basic sonographic applications, such as lung and inferior vena cava, during their medical school or residency and expect training in Doppler applications. As such, POCUS programs must be equipped to cater to their needs and expectations. In addition, the size of the ultrasound monitor is something that is often overlooked. Larger screen size (as opposed to cellphone or a tablet-based display) enables better appreciation of the images or pathology at the bedside when there are multiple

learners. In contrast, portability is important when the equipment must be carried to places such as outpatient dialysis units and offsite clinics. We recommend that programs consider purchasing both cart-based and handheld devices to provide optimal training experience. POCUS scans can be billed for as we described in detail elsewhere,<sup>11,12</sup> which helps to offset the equipment costs over time. Indeed, studies have demonstrated that the establishment of a well-structured billing process for POCUS scans can generate net profit.<sup>13</sup> The burden of purchasing ultrasound devices should never fall on individual faculty or trainees.

An established workflow with image archiving is critical for establishing a successful POCUS program. It facilitates providing timely feedback for the trainees, billing, and seeking expert opinion when in doubt. If the images are archived and are retrievable from the patient's chart, the need for multiple specialists to perform repeat exams to answer the same focused clinical question is obviated. It also facilitates quality assurance, which is vital for the maintenance and improvement of a POCUS program. Archiving is technically not difficult and can be accomplished with the help of the institutional information technology department. Fig 1 lists the key limiting factors and their impact on the quality of the POCUS program.

Robust POCUS training programs are necessary to unlock its full potential and explore its use in areas that pose diagnostic challenges, such as hepatorenal dysfunction. Building such programs involves not only motivated faculty but also administrative support, long-term vision and interdisciplinary collaboration. Creating me too or check mark curricula just to fill fellowship spots without a proper

Limiting factor	Impact on the POCUS program
 Trained faculty	<ul style="list-style-type: none"> <li>Inadequate supervision of the trainees</li> <li>Ineffective or improper clinical integration of POCUS findings</li> </ul>
 Protected time	<ul style="list-style-type: none"> <li>Faculty burnout</li> <li>Suboptimal training and supervision (e.g., faculty are not available when a fellow is on POCUS elective or needs help with performing and interpreting the scans)</li> </ul>
 Equipment	<ul style="list-style-type: none"> <li>No dedicated equipment for nephrology use: delays in patient care; limited hands-on experience for trainees</li> <li>Equipment with poor image quality and insufficient options (e.g., no spectral Doppler): Clinically significant findings may be missed; limits teaching advanced skills such as hemodynamic assessment.</li> </ul>
 Image archiving	<ul style="list-style-type: none"> <li>Delay or gaps in providing feedback to trainees</li> <li>Cannot obtain immediate expert opinion on abnormal findings; patient might have to undergo a repeat scan</li> <li>Hampers billing for the studies</li> </ul>
 Quality improvement program	<ul style="list-style-type: none"> <li>False sense of confidence among POCUS users</li> <li>Faculty do not feel the need for improving their skills</li> <li>Potential patient harm due to misinterpretation of images or improper clinical integration</li> </ul>

**Figure 1.** Key limiting factors and their impact on the quality of the point-of-care ultrasound program at the institutional level.

structure will potentially deteriorate the already dwindling interest in nephrology. Moreover, inadequate training and consequent false sense of confidence could lead to patient harm. Nephrology professional associations should collaborate to formulate guidelines for standardized POCUS curricula, methods of assessing and documenting competency, and pathways for reimbursement. These interorganizational committees should be comprised experts with suitable qualifications and a demonstrated history of excellence in teaching POCUS. Beyond fellowship education, practicing physicians are eagerly anticipating longitudinal POCUS training programs with the endorsement of professional societies, leading to certification. This demand was clearly highlighted through feedback received from participants who attended the recent POCUS workshops hosted by the American Society of Nephrology and the National Kidney Foundation led by the authors. It is high time we as a specialty acknowledge the necessity of embracing this skill, which is arguably a breakthrough in bedside clinical assessment after the invention of the stethoscope more than 2 hundred years ago.

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