



## PERSPECTIVE

# CONSIDERATIONS WHEN ACQUIRING POINT-OF-CARE ULTRASOUND (POCUS) EQUIPMENT: ADVICE FOR GENERAL INTERNISTS

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## Why Is This Topic Important?

First, while it is true that we are entering the brave new world of affordable, personal ultrasound machines, there is a wide range of equipment cost and functionality. The general internist should be familiar with their options before settling on one device or company. Second, one's ultrasound equipment needs may change considerably over time, particularly if one is planning to integrate POCUS into a clinic, hospitalist group, residency, or student training program. Knowing how to scale an equipment purchase over time can help jumpstart a stalled program or avoid the need for rapid equipment replacement and unnecessary costs. Third, many factors now and on the horizon will make learning and integrating POCUS easier than ever before. Still, many doctors aren't "techies" and potentially unanticipated equipment considerations can ensnare and frustrate the busy clinician/educator. Ensuring your POCUS equipment will fit your practice and goals prior to purchase will save you time, money, and heartache.

## How Do I Know What Type of Ultrasound Equipment I Need?

Three main factors are important in this decision: transducer type, screen size, and portability.

Transducers (commonly referred to as *probes*) determine the POCUS applications for which one can use an ultrasound machine. If interested only in "core" IMPOCUS applications (namely cardiac, pulmonary, and abdominal scanning), you should invest in a low-frequency sector probe (also referred to as a *phased array* probe). This ensures cardiac imaging is optimal but will also support most lung and abdominal imaging as well. If interested in "extended" IMPOCUS applications (namely, scanning superficial structures of the extremities and head/neck) or if the equipment will be used for real-time procedural guidance, you will need a high-frequency

linear probe. In fact, 95% of IMPOCUS scanning in my practice (mixed inpatient/outpatient) can be accomplished with the combination of sector and linear probes. Low-frequency convex probes (also referred to as *curvilinear* probes) provide the widest field of view which improves abdominal and pelvic imaging and allows for soft-tissue and musculoskeletal scanning in larger patients.

Cart-based ultrasounds (CBU) with high resolution and large screens are important when guiding invasive procedures with real-time needle visualization. They are also helpful for meaningful hands-on instruction of more than two learners at a time. However, their reduced portability can result in lower use. Distance between physician and POCUS equipment can be a significant barrier when on the other side of the clinic or a different hospital floor. Highly portable, pocket-sized ultrasounds (PSU) enhance availability and improve utilization by the general internist for most practice workflows. If portability is key or CBUs aren't yet attainable, PSUs can be augmented to increase functional screen size in some settings. Remember that increased portability also increases the probability machines are misplaced or become "lost," particularly as the number of shared users goes up. Having accountability policies and some technological solutions prior to widespread dissemination is key to protect your investment.

## Which Types of Technical Specifications Should I Know About?

*Screen casting.*

All devices that utilize smartphones and tablets should allow this capability when paired with inexpensive casting hardware. This can be a great enhancer for teaching, as a pocket-sized screen can become large enough to support group teaching when transmitted to a projector or large

*continued on page 2*

**PERSPECTIVE** (continued from page 1)

TV. This usually doesn't improve resolution, however.

*Functional scan time/battery life.*

Unlike CBUs, PSUs can't scan while charging. While clinical use is characterized by short, intermittent scanning periods, educational use often requires scanning for an hour or more. Some PSUs have significant overheating issues and/or short battery life during continuous scanning. In some cases, this can be mitigated by having extra batteries.

*Image archiving and uploading capabilities.*

This is where the Information Technology (IT) issues will crop up around any device that is used in the clinical spaces, particularly if personal phones/tablets are being used. While most new devices allow for image uploading for online archiving, it is essential to recognize that on some devices, images and videos are actually stored in the cloud, not locally on the device. The default setup where the physician does not actually "own" the images he captures and must pay a fee to maintain access to them may rightfully raise concerns. Special arrangements between a device company and medical institution may be able to be worked out, but may be less likely with a small clinic or individual user.

**Which Types of Non-Technical Specifications Are Most Important to Think About?**

For CBUs, ensure you consider the size of the footprint of the cart, and whether it can easily get into the clinical spaces (e.g., around exam tables or hospital beds). While the biggest screen may be a desirable feature, it will be useless if it can't reach the bedside of your patients.

For PSUs, consider what environments you will be scanning in and whether the device is easily cleaned. There are numerous advantages to smartphone ultrasound devices, but there are many circumstances (e.g.,

contact precautions) when having a stand-alone machine is preferable.

If unsure whether the equipment is right for your practice, remember that most companies will arrange for demonstrations at your site or offer a risk-free trial period. POCUS courses often provide a "no pressure" opportunity to try a variety of equipment as well. **MY ADVICE: DON'T BUY AN ULTRASOUND DEVICE UNLESS YOU HAVE TRIED IT FIRST.**

**How Much Does Ultrasound Equipment Cost?**

Single-probe PSUs can be obtained for approximately \$1,200-13,000, with at least two companies offering single-probe PSUs for <\$5,000. PSUs with both high and low-frequency capabilities range between \$2,400-18,000, with at least 3 companies making a device for <\$5,000—CBUs range in the \$20,000s through the \$70,000s.

The following are additional considerations about costs that may not be advertised:

- **Many companies offer significant medical education discounts (up to 50% off list price) which are worth inquiring about.**
- **Some features of CBUs that are included in the initial quote may not be necessary for the practice of a general internist and can often be removed to decrease cost.**
- **Some devices require annual subscription fees which, depending on the number of users, can add unexpected costs.**
- **Be sure to include the cost of the compatible smartphones and/or tablets in your budgeting unless you already have what you need. Depending on your practice, budgeting for gel and cleaning wipes may also be necessary.**

**How Do I Pay for Ultrasound Equipment?**

First, it is important to determine who should pay for ultrasound

equipment, and, in most cases, it should be the department, office, or hospital, not the employed physician. While this is almost always the case with CBUs due to their higher cost, it is likely the best route for PSUs as well. This helps ensure you stay compliant with institutional policies on medical imaging devices (if present) and facilitate integration with image archival and quality assurance systems (if desired). Furthermore, if the intention is to recoup purchasing costs by billing, who purchased the equipment can significantly affect reimbursement. A potential pitfall for the generalist buying their own ultrasound device is to spend thousands of dollars only to be told by IT or biomed that they cannot use it in clinical spaces.

For equipment under \$5,000, departments often have operational funds with much less red tape than capital funding. With the rapid development of portable ultrasound technology, in some situations leasing equipment may make more sense than purchasing, particularly when first starting out. Asking about under-advertised payment plans, including lease-to-own options, may provide the fiscal flexibility needed to get a program off the ground.

If you decide to buy your own personal device, you may want to see if using continuing medical education (CME) funds is an option. If electronic stethoscopes, laptops or tablets are covered at your institution, a PSU may be too. A coordinated purchase by altruistic IMPOCUS faculty champions can make a small pool of machines available to a program. Again, spaced-out payment arrangements with a device company can potentially give you more buying power. Note this route should only be to support educational efforts. Using tax-exempt CME funds to generate revenue from billing can be seen as a form of tax evasion, so check with your billing and compli-

continued on page 3

**PERSPECTIVE** *(continued from page 2)*

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ance officers prior to going down this road. Finally, while many pilot grants preclude the purchase of medical equipment, some allow it. If starting an IMPOCUS curriculum, consider making it part of a research project and apply for grant funding to get equipment. While reviewers

who “get it” can be rare, their numbers may grow with increasing visibility of IMPOCUS. Many positive changes are already here!

*Note:* this perspective piece was based on material prepared for a presentation at the APDIM National Meeting in April 2019. This topic

and several others will be covered in more detail at the SGIM National Conference Pre-Course on Internal Medicine POCUS (IMPOCUS) in May 2020. To share your own experience and learn from the perspective of many others, join us at the SGIM IMPOCUS Pre-course in 2020! **SGIM**