Butterfly™
The New Image of Health

TeleGuidance™ for Point-of-Care Ultrasound

A Case for Widespread Adoption

A Case Study by:
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This paper presents true-to-life clinical examples of the helpful role Teleguidance can have in expanding POCUS accessibility to remote communities at the frontline of care, as well as the supportive role of POCUS education remotely and at-scale.

Example 1: Dr. Smith

Dr. Smith works in a small critical-access emergency department and evaluates a 66-year-old man with several days of progressive difficulty breathing, a patient in whom she suspects COVID-19. She has recently learned how to use a point of care ultrasound (POCUS) ultrasound system to evaluate the lungs. Dr. Smith also knows that each time she uses a POCUS system at the bedside in personal protective equipment (PPE), she saves a radiology technician from exposure to that patient, and conserves valuable and limited supplies of PPE. Dr. Smith has not yet been credentialed to perform POCUS independently and is not fully confident in her skills. As she records images of the patient's lungs and heart, she reviews the images online with an on-call supervising expert. Together, they determine that this patient is likely suffering from new onset of congestive heart failure, with no evidence of COVID-19 or pneumonia. Dr. Smith treats the patient with appropriate medications and safely discharges him home to follow up with a cardiologist.

Point-of-care ultrasound is a core component of Emergency Medicine (EM) clinical practice[1], and its use is rapidly increasing among clinicians within a broad range of other specialties. POCUS has been associated with decreased time to diagnosis, decreased time to clinical disposition, decreased downstream testing, and increased patient/provider satisfaction. For critical patients, early use has been associated with management changes and lives saved.[4,5] Moreover, especially in resource-limited settings, POCUS systems are an affordable adjunct that supports clinicians in framing a diagnosis for their patients.

POCUS training has been designated by the American Board of Emergency Medicine (ABEM) as a core milestone of EM residency competence since 2012.[6] However, many advanced practice providers (e.g. physician assistants, nurse practitioners) and clinicians from non-EM specialties lack readily available access to a POCUS curriculum as part of their formal training. Even providers who did receive residency training in POCUS may not have current access to POCUS nor be facile at all applications, including "newer" applications now more commonly used in emergency medicine such as POCUS-guided regional anesthesia or lung ultrasound.[7,8,9]

Traditional in-person POCUS courses are one solution to providing clinicians with an opportunity to learn basic POCUS skills or to develop additional clinical-application skills. There is also a variety of resources available through ultrasound organizations and social media.

Example 2: Dr. Rock

Dr. Rock has recently become credentialed in POCUS through a training course which includes remote, online mentoring. He evaluates a 53-year-old patient who had a brief episode of chest pain. The patient has a normal exam, normal electrocardiogram, and normal cardiac biomarkers. By standard clinical decision instrument, e.g. HEART Score or EDACS, he would be discharged. Dr. Rock performs a bedside ECHO and diagnoses an aortic dissection, with a mortality rate of 1% per hour[3]. Instead of being discharged home the patient is transferred to a tertiary care hospital for emergency surgery.

The challenge in POCUS education is to support longitudinal development and maintenance of skills to allow the technology to be a true clinical adjunct as opposed to a novelty. The educational goal is for a provider to be both facile enough and confident enough in their POCUS skills to interpret the images they've acquired and incorporate these findings into independent clinical decision-making. Optimal training, especially in an active clinical environment, includes direct, hands-on instruction, and timely quality assurance/quality improvement (QA/QI) of images obtained.

Regular hands-on training and image review is more feasible at tertiary care medical centers with EM residency programs, EM POCUS fellowships, and ultrasound faculty (at least during periods when faculty are available for training/image review sessions). At smaller practice sites with fewer resources, especially those geographically remote from training centers, regular hands-on supervision and timely image review is challenging.Additionally, the 24/7 nature of emergency clinician practice and the scarcity of POCUS-guided procedure supervision make development of competency in clinical ultrasound even more difficult. Programs that lack trained providers qualified for education or image review will find it almost impossible to develop and maintain a self-sustaining and successful POCUS program.

Example 3: Alex

Alex is a Physician Assistant at a small community-emergency department. He is caring for a construction worker who has fallen and sustained 4 rib fractures. The patient is stable enough to be sent home but might have to be admitted solely because he is experiencing too much pain to get into his car. Alex has become credentialed in ultrasound procedural guidance and knows that an ultrasound-guided nerve block could make his patient more comfortable. However, he has never performed this specific procedure. Through his handheld ultrasound device and iOS tablet, he connects with a remote ultrasound expert who guides him in real time as he performs the nerve block. Thirty minutes later the patient reports that he is now almost completely pain-free and is able to safely travel home.

Cutting-edge POCUS software and available remote mentors provide a novel solution to support POCUS implementation at regional emergency departments or clinics. Technological advances enable the necessary ability to supervise scanning and review images in real time. POCUS images are easily transmitted electronically for distant image review. Many hospital systems already use remote radiology services to support 24/7 image interpretation for clinical providers, and telemedicine is now generally available to provide specialty support to remote medical providers. Telemedicine is used for diagnosis, monitoring, and mentoring for a variety of clinical applications.

Handheld ultrasound systems that utilize smartphones and tablets afford the ability to provide real-time remote bedside scanning supervision through an audio and video connection that includes synchronized ultrasound imaging transmission. One system, the Butterfly iQ, supports "TeleGuidance," in which a POCUS specialist can directly supervise scanning performed by a provider at a remote site in real time. The supervising mentor can offer real-time feedback on image acquisition technique and/or assist directly with interpretation of the images obtained. The mentor can use tools to adjust system settings remotely (e.g. gain, depth, preset, mode), suggest different scanning positions using augmented reality, and record images and cine clips, as if present at the bedside. In addition, Butterfly Enterprise software facilitates asynchronous image QA/QI across distant sites and educational dialogue between learners and mentors. As mentors are able to train local providers to be facile in POCUS, they can gradually assume local responsibility for some component of longitudinal mentorship and image review.

Example 4: Dr. Jones

Dr. Jones is fellowship-trained in POCUS and is part of a regional call group supporting other providers at remote sites seven days a week. During her 12-hour shift, she performs image review, real-time POCUS guidance, and QA/QI of images that were collected the night before or are collected during her shift. She's had a productive day, reviewing 10 images for direct patient management, supervising 4 cases by TeleGuidance, and doing QA/QI on 74 scans performed over the past 24 hours in a 7-hospital health network.

Successful telemedicine programs require a pool of specialists to be "on call" remotely, often for multiple sites. Therefore, in addition to the costs of technical equipment discussed above and information technology support, a successful program requires adequate staffing. The costs associated with the development of regional POCUS programs may be offset by clinical benefits (quicker critical diagnoses, reduced time to crucial interventions, reduced need for transport) and economic benefits as the current payer model provides additional revenue opportunities associated with POCUS. When bedside ultrasound is used for clinical management, both professional and technical charges are supported. Professional charges alone would likely not be sufficient to support a regional POCUS program with on-call staffing for TeleGuidance/Image Review. However, sufficient revenue would be generated through inter-facility sharing of a percentage of the technical charge attributed to the remote facility.

The development of an integrated regional POCUS system requires an initial capital investment in equipment, including acquisition of POCUS systems capable of direct-scanning supervision and cloud-based image QA. It will also include ongoing staffing support for on-call POCUS specialists, and, ideally, a program manager to facilitate scheduling, appropriate coding, reimbursement appeals, IT support, and payroll. Such a program can be self-sustaining through the following reimbursement strategies[3]:

- Any POCUS study performed by a non-credentialed provider and reviewed remotely by a credentialed provider during the course of patient management becomes a billable study, generating a professional and facilities charge.
- Any study performed by a non-credentialed provider and supervised in real time via TeleGuidance becomes a billable study and generates a professional and facilities charge. In addition, when credentialed providers are remotely supervised for a more advanced POCUS application or for more advanced procedural guidance, those cases also become billable.
- Providers on TeleGuidance shifts would actively QA/QI POCUS images at multiple remote facilities with a fee generated for each study reviewed.

Summary

In summary, establishing and supporting point-of-care ultrasound programs in regional emergency departments, outpatient clinics, and other resource-limited settings bolsters the standard of care in emergency medicine and encourages improved patient care metrics. Traditional educational modalities such as on-site courses or social media tutorials are insufficient to provide longitudinal training and support at geographically distant sites. With the advent of telemedicine and new ultrasound technology, training and maintenance of skills can be supported using a pool of on-call POCUS specialists for image review and direct supervision. While one could argue that the cost of this type of program could be justified solely by the clinical benefits of appropriate POCUS utilization, this system also has the ability to generate revenue and become self-sustaining. Once established, the system is easily scaled to support developing and sustaining POCUS programs across multiple specialties and institutions.

References

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