Bedside Ultrasound in Pediatric Practice

July 1, 2002. Overnight shift in the pediatric emergency department. In 1 room, the fellow is attempting to place a central venous catheter in a 5-year-old boy with presumed septic shock but has been unable to locate the femoral vein with her finder needle. In the next room lies a 7-year-old trauma patient. He is tachycardic with poor perfusion and abrasions on his chest. The team calls for a portable chest radiograph and begins a secondary survey. The resident taps your shoulder. “Can I present a patient?” He describes a 15-year-old girl with lupus complaining of chest pain who is ill appearing, tachycardic, and short of breath. “I ordered labs and chest radiograph.”

July 1, 2012. Overnight shift in the pediatric emergency department. In 1 room, the fellow is attempting to place a central venous catheter in a 5-year-old boy with presumed septic shock. Using bedside ultrasound, she makes adjustments with her finder needle until she sees it enter the femoral vein. In the next room lies a 7-year-old trauma patient. He is tachycardic with poor perfusion and abrasions on his chest. The team performs an extended focused assessment with sonography for trauma examination, which reveals free fluid in Morison’s pouch and no pneumothorax. A computed tomography scan of the abdomen is prioritized, and type O negative blood is ordered. The resident taps your shoulder. “Can I present a patient?” He describes a 15-year-old girl with lupus complaining of chest pain who is ill appearing, tachycardic, and short of breath. “I did a bedside ultrasound, and she has a pericardial effusion.”

In 2002, many pediatricians, including the authors, viewed point-of-care ultrasound as a tool used primarily by “general” emergency physicians, cardiologists, and obstetricians. The relevance to our pediatric patients seemed uncertain. Ten years later, the advantages that point-of-care ultrasound offers to those caring for ill, injured, and diagnostically challenging children are difficult to ignore. Although point-of-care ultrasound is relatively new to pediatrics, it is growing rapidly in subspecialty fields such as pediatric emergency medicine, critical care, and neonatology.” The use of point-of-care ultrasound to guide invasive procedures, quickly focus the evaluation of critically ill patients, and reduce exposure to ionizing radiation are some of the factors driving the adoption of bedside ultrasound by pediatric physicians caring for the sickest and most complex pediatric patients.

Still, pediatricians who finished training more than a decade ago likely did not receive instruction in point-of-care ultrasound because the relevance to general pediatric patients had not yet been demonstrated. What does point-of-care ultrasound afford pediatrics today? We believe...
point-of-care ultrasound offers incredible opportunities to pediatricians and their patients. Mounting evidence in fields such as emergency medicine and anesthesia continues to display ways in which point-of-care ultrasound can make care safer, more efficient, and less costly by informing decision-making and reducing complications associated with procedures. Although less studied in children, this new technology is particularly well suited to aid the evaluation of pediatric patients. Physicians’ traditional bedside tools (our eyes, hands, and stethoscopes) provide limited information in the crying infant who cannot “take a deep breath” on command or the frightened toddler who screams every time she is approached for an abdominal examination. Many of the tests available to augment the history and physical examination are painful, expensive, or associated with risks of radiation or sedation. The fore-runners of point-of-care ultrasound are demonstrating increasing applications that allow us to obtain important information about our patients at the bedside, in real time, without exposing them to significant pain or risk.

A growing number of applications are especially relevant to general pediatricians. Consider how a quick scan of an erythematous, indurated, tender buttock that shows cellulitis without an abscess could prevent an unnecessary attempt at an incision and drainage. Imagine using bedside ultrasound to diagnose pneumonia in a screaming 1-year-old or to rule out an elbow fracture in a kindergartener who fell off the monkey bars, potentially sparing these children a radiograph (and sparing their parents the cost and time it would take to get one). Envision identifying with ultrasound the classic donut appearance of intussusception on a crying toddler with a difficult examination and arranging transfer to an appropriate facility for reduction. These represent a small sample of the numerous opportunities to improve pediatric care with point-of-care ultrasound that already have evidence to support them.4–7

The opportunities point-of-care ultrasound offers are hard to ignore. However, those opportunities come with great responsibility. Point-of-care ultrasound is not without its limitations, and integrating it into the field of general pediatrics is fraught with obstacles and challenges. Many of the applications relevant to pediatricians require significant training to obtain competency, and even in well-trained hands the sensitivity of some applications is too low to use bedside ultrasound as a screening exam. It is unlikely that pediatricians will be able to “rule out” certain important diagnoses such as appendicitis in the office. Still, numerous studies have shown that with focused training, novice sonographers can learn a variety of individual applications with good accuracy.4,6,7 Perhaps more difficult to answer will be questions related to quality assurance and scope of practice. Currently there are no established quality assurance processes or regulations in place for pediatrician-performed ultrasound studies. Like any test (or even any physical examination finding) errors in performance and/or interpretation put patients and physicians at risk for inaccurate diagnoses and misguided care. In addition, incidental findings could lead to workup not otherwise indicated by the presenting clinical picture. Moore raises these and other concerns in his 2011 review “Point-of-Care Ultrasonography” but assured us that despite these challenges, the use of point-of-care ultrasound across specialties will continue to grow.8

Moving forward does not require us to answer all these questions now but rather implores us to begin the conversation and explore strategies to approach the challenges at hand. We should begin to create the standards within our field, much as the emergency physicians, obstetricians, and cardiologists have done within theirs. As much as it is our responsibility to understand the limitations and challenges associated with integrating point-of-care ultrasound into pediatrics, it is also our responsibility to our patients to stay abreast of the most current advances in medicine and provide the safest, most efficient, state-of-the-art care. Point-of-care ultrasound can help us meet this goal.

Perhaps the most sensible place to begin is by developing a training strategy, one that includes pathways for both trainees and physicians-in-practice, similar to the policy established in emergency medicine.9 Curricula for point-of-care ultrasound are being developed in other specialty training programs including surgery, internal medicine, anesthesia, and pediatric subspecialties, as well as in some medical schools. We, as pediatricians, should not be left behind. We have an opportunity, and a responsibility, to educate a new generation of pediatricians who can practice beyond the limitations of our traditional bedside tools.

We will be the first to admit that at this time, the goal of an ultrasound machine in every pediatric office is overreaching. We are hopeful that in 2022, we might have a different perspective. Perhaps by then we will have developed a point-of-care ultrasound policy statement of our own that answers the difficult questions related to scope of practice, training and proficiency, credentialing, and quality management. Ideally by that time we will have also built an educational infrastructure and obtained a critical mass of ultrasound-trained pediatricians to adopt point-of-care ultrasound as an integral part of pediatric medicine. The opportunity is here. The responsibility is ours.
REFERENCES

Bedside Ultrasound in Pediatric Practice
Rebecca L. Vieira and Richard Bachur
*Pediatrics,* originally published online December 16, 2013;
DOI: 10.1542/peds.2013-0750

<table>
<thead>
<tr>
<th>Updated Information &amp; Services</th>
<th>including high resolution figures, can be found at: /content/early/2013/12/10/peds.2013-0750.citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citations</td>
<td>This article has been cited by 15 HighWire-hosted articles: /content/early/2013/12/10/peds.2013-0750.citation#related-urls</td>
</tr>
<tr>
<td>Permissions &amp; Licensing</td>
<td>Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: /site/misc/Permissions.xhtml</td>
</tr>
<tr>
<td>Reprints</td>
<td>Information about ordering reprints can be found online: /site/misc/reprints.xhtml</td>
</tr>
</tbody>
</table>

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2013 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.
Bedside Ultrasound in Pediatric Practice
Rebecca L. Vieira and Richard Bachur
*Pediatrics*; originally published online December 16, 2013;
DOI: 10.1542/peds.2013-0750

The online version of this article, along with updated information and services, is located on the World Wide Web at:
/content/early/2013/12/10/peds.2013-0750.citation