Point-of-Care Ultrasonography by Pediatric Emergency Medicine Physicians

Point-of-care ultrasonography is increasingly being used to facilitate accurate and timely diagnoses and to guide procedures. It is important for pediatric emergency medicine (PEM) physicians caring for patients in the emergency department to receive adequate and continued point-of-care ultrasonography training for those indications used in their practice setting. Emergency departments should have credentialing and quality assurance programs. PEM fellowships should provide appropriate training to physician trainees. Hospitals should provide privileges to physicians who demonstrate competency in point-of-care ultrasonography. Ongoing research will provide the necessary measures to define the optimal training and competency assessment standards. Requirements for credentialing and hospital privileges will vary and will be specific to individual departments and hospitals. As more physicians are trained and more research is completed, there should be one national standard for credentialing and privileging in point-of-care ultrasonography for PEM physicians.

INTRODUCTION

Point-of-care ultrasonography is a focused ultrasonography performed and interpreted at the patient’s bedside by a health care provider in conjunction with his or her clinical examination. Point-of-care ultrasonography can expedite clinical decision-making, direct follow-up diagnostic imaging, aid in procedural guidance, and improve patient satisfaction.1-6 Point-of-care ultrasonography is designed to answer specific yes or no questions in real time. The point-of-care ultrasonography examination has important qualities as an imaging modality. There is no need to transport a patient outside of the emergency department (ED), examinations can be performed at all hours, examinations may be repeated, and there is no ionizing radiation exposure. Moreover, it may help direct further evaluation so as to avoid unnecessary and costly testing.
Clinician-performed ultrasonography has been used and accepted since the 1960s, when obstetricians and cardiologists first adopted the technology. The use of ultrasonography by those specialists is endorsed by various professional radiology organizations. At present, nonphysician providers, such as nurses and prehospital care workers, are also using point-of-care ultrasonography as a part of their practice.

MINIMIZING RADIATION EXPOSURE

One of the appealing aspects of ultrasonography is its inherent safety. It relies on sound waves and not x-rays to generate images. In many instances, computed tomography (CT) imaging or radiography are the optimal diagnostic modalities in the evaluation of the pediatric patient; however, there is an increasingly large body of literature emphasizing and delineating the risks of ionizing radiation, particularly from CT. Pediatric patients are particularly sensitive to ionizing radiation, given the larger organ-specific dosing they receive with each study, the increased susceptibility of these organs to radiation-induced cancer, and the increased life span over which children may develop radiation-induced cancers. In response to this risk, several national campaigns have been initiated to reduce the use of unnecessary CT imaging in pediatric patients. These include efforts by the Society for Pediatric Radiology, the National Council on Radiation Protection and Measurements, the Food and Drug Administration, and the National Cancer Institute. In summary, when imaging is indicated, practitioners should attempt to optimize the use of nonradiating diagnostic modalities, such as ultrasonography.

INDICATIONS FOR POINT-OF-CARE ULTRASONOGRAPHY

PEM physicians can use point-of-care ultrasonography as a diagnostic or procedural adjunct in the evaluation of patients in the ED. Diagnostic applications are those that assist in diagnosis and inform medical decision-making. Procedural applications may be “ultrasonography-assisted” or “static” or “ultrasonography-guided,” also referred to as “dynamic.” Static ultrasonography is defined as using ultrasonography before the procedure, identifying anatomic structures, and determining the ideal circumstances for the procedure to be performed. The procedure itself is performed without the use of ultrasonography. In contrast, in dynamic ultrasonography, the ultrasonography and procedure are performed simultaneously.

Clinical applications will be practice-specific and based on the patient population, incidence of disease, and the availability of resources, such as 24-hour attending radiologist coverage, availability of ultrasonography technicians, and distance/transfer times to facilities that can provide ultrasonography imaging. ED leaders should determine which point-of-care ultrasonography examinations will be most useful to their practice environments.

Physicians would then apply for institutional privileges in those specific areas. There will be a natural transition period for physicians who did not receive point-of-care ultrasonography education as part of their graduate medical training. Therefore, the indications for which clinicians use point-of-care ultrasonography will evolve over time as the education is disseminated throughout the PEM community.

Finally, clinicians should be aware that point-of-care ultrasonography is better used as a “rule in” and not a “rule out” diagnostic modality. The absence of an abnormal finding should not indicate a normal examination. For example, nonvisualization of an intussusception with high clinical concern must prompt further evaluation. Likewise, when findings other than those sought to “rule in” a diagnosis are encountered, a more complete imaging evaluation is warranted.

POINT-OF-CARE ULTRASONOGRAPHY TRAINING, CREDENTIALING, AND PRIVILEGING

Before implementing a program in the ED, departmental leaders should identify a core group of individuals with expertise in point-of-care ultrasonography. This group is responsible for educating faculty and trainees as well as managing administrative tasks, such as outlining credentialing pathways and performing quality assurance image reviews. Standardized and universally accepted criteria for what designates a point-of-care expert are likely to evolve over time as advanced training programs are established. In departments or divisions without point-of-care ultrasonography–trained individuals, departmental leadership should consider sending an individual or group of individuals with interest to receive additional training in point-of-care ultrasonography. Alternatively, an expert from another department (eg, general emergency medicine, radiology) may assume these responsibilities and work collaboratively with ED leaders.

Point-of-care ultrasonography training varies depending on the practitioner’s previous education and practice environment. Until now, most PEM physicians have received little or no point-of-care ultrasonography instruction as part of their training. It is important that PEM fellowship programs provide adequate training, including measurements of competency for trainees. Point-of-care ultrasonography education is now an American Board of Pediatrics requirement for PEM fellowship programs. Consensus education guidelines and a model curriculum were recently published.
2 training pathways for physicians: a “training-based” pathway for current trainees and a “practice-based” pathway for faculty without previous experience. The details of such pathways are outlined in the accompanying technical report.38

Before performing a point-of-care ultrasonography examination for medical decision-making, PEM physicians must demonstrate application-specific competency. During this “training” phase, the point-of-care ultrasonography expert should review all ultrasonography examinations in a timely manner. Practitioners can receive relevant feedback regarding their examinations. In addition, novice practitioners should be supervised at the bedside to ensure that the examinations are being performed correctly. Examination reviews and bedside supervision may be performed by a department or division “expert” or by another physician already credentialed to perform ultrasonography for that indication. These educational scans should not be used for medical decision-making or billing purposes, and this should be clearly communicated to patients and their families.

Given that a point-of-care ultrasonography examination is intended to be a focused examination, training requirements necessarily differ from those set forth by other specialty organizations, such as the American College of Radiology and others. A similar distinction was made in the 2002 training guidelines adopted by the American Society of Echocardiography, which outlined basic training requirements for anesthesiologists performing perioperative echocardiography, which differed from the more rigorous training needed for more consultative echocardiography performed by cardiologists.39 Competency and subsequent credentialing within a division or department may be achieved after performing a specified number, or range, of accurately performed and interpreted point-of-care ultrasonography examinations. With the lack of robust data supporting a specified number of examinations per indication, some guidelines suggest 25 to 50 examinations needed to achieve competency.40 However, physicians should not interpret this recommendation as a “one-size-fits-all” approach, because examinations vary in difficulty and therefore may require more experience to establish competency. In addition, the number of examinations performed may not always best define competency. Because point-of-care ultrasonography incorporates both cognitive and psychomotor components, individual physicians may gain competency at varying rates that may be independent of a predetermined numerical goal and better assessed through simulation, observed structured clinical examinations, or direct observation during clinical shifts. Hospital privileging committees should provide an opportunity for privileging in specific pediatric point-of-care ultrasonography examinations. Written requirements for privileging should be delineated. Building on the recommendations set forth by the American College of Emergency Physicians, when a physician applies for appointment or reappointment to the medical staff and for clinical privileges, the process should include assessment of current competency by the point-of-care ultrasonography director.40 Because point-of-care ultrasonography is a relatively new technology for PEM physicians, some specialists and hospital privileging committees may not be familiar with the precedent already set forth for point-of-care ultrasonography and the benefits to patient care. Therefore, PEM physicians should educate those who are unfamiliar with its use, citing the established literature attesting to emergency physicians’ ability to accurately perform and interpret point-of-care ultrasonography examinations.5,41–104

In addition, PEM physicians should consider collaboration with radiologists and expert sonographers when implementing point-of-care ultrasonography into their ED.

POINT-OF-CARE ULTRASONOGRAPHY DOCUMENTATION

Once PEM physicians are credentialed to perform point-of-care ultrasonography for a particular application, they can integrate the point-of-care ultrasonography examination into patient care. Details of the point-of-care ultrasonography examination must be documented at the time of performance in the medical record. Specifically, documentation should include the indication for the examination, structures/organs identified, and the interpretation.105 If the study is inadequate, this finding should also be noted. Images should be archived, ideally electronically, and entered as part of the electronic health record for ease of retrieval and review.

RECOMMENDATIONS

1. PEM physicians should be familiar with the definition and application of point-of-care ultrasonography and the utility for patients in the ED.
2. Pediatric emergency physicians who integrate point-of-care ultrasonography in their patient care should be competent in point-of-care examinations that are specific and relevant to their clinical environment.
3. For EDs with a PEM point-of-care ultrasonography program, there must be a process in place for educating and assessing practitioner skill, maintaining quality assurance,
implementing quality improvement activities, and acquiring and maintaining hospital privileges.

4. PEM fellowship programs should have a structured point-of-care ultrasonography education curriculum and competency assessment for fellows in training.

5. Standardized, universally accepted criteria for what defines point-of-care ultrasonography expertise should be developed in the near future by national organizations such as the American Academy of Pediatrics, the Society for Academic Emergency Medicine, and/or the American College of Emergency Physicians.

**SUMMARY**

There is an increasing demand for PEM physicians to become adept in point-of-care ultrasonography. Mounting evidence supports the benefits to pediatric patients. This policy statement and accompanying technical report have been developed to define a structured and safe program for the integration and implementation of point-of-care ultrasonography by PEM physicians.

**LEAD AUTHORS**

Jennifer R. Marin, MD, MSc
Resa E. Lewis, MD

**FINANCIAL DISCLOSURE/CONFLICT OF INTEREST**

Dr. Lewis has no financial disclosures or potential conflicts of interest. Dr. Marin receives support from third Rock Ultrasound, LLC for serving as teaching faculty and received support from the Agency for Healthcare Quality and Research (R13HS023498) related to a conference on diagnostic imaging and from the National Institute of EMS Physicians.

**PEDIATRIC POINT-OF-CARE ULTRASOUND WORK GROUP**

Jennifer R. Marin, MD, MSc, Chairperson
Resa E. Lewis, MD
Alyssa M. Abo, MD
Stephanie J. Doniger, MD, RDMS
Jason W. Fischer, MD, MSc
David O. Kessler, MD, MSc, RDMS
Jason A. Levy, MD, RDMS
Vicki E. Noble, MD, RDMS
Adam B. Sivitz, MD
James W. Tsung, MD, MPH
Rebecca L. Vieira, MD, RDMS

**AMERICAN ACADEMY OF PEDIATRICS, COMMITTEE ON PEDIATRIC EMERGENCY MEDICINE, 2013–2014**

Joan E. Shook, MD, MBA, FAAP, Chairperson
Alice D. Ackerman, MD, MBA, FAAP
Thomas H. Chun, MD, MPH, FAAP
Gregory P. Conners, MD, MPH, MBA, FAAP
Lanette C. Dudley, MD, FAAP
Susan M. Fuchs, MD, FAAP
Marc H. Gorelick, MD, MSCE, FAAP
Natalie E. Lane, MD, FAAP
Brian R. Moore, MD, FAAP
Joseph L. Wright, MD, MPH, FAAP

**LIAISONS**

Lee Benjamin, MD — American College of Emergency Physicians
Kim Bullock, MD — American Academy of Family Physicians
Elizabeth L. Robbins, MD, FAAP — AAP Section on Hospital Medicine
Tony K. Gross, MD, MPH, FAAP — National Association of EMS Physicians
Elizabeth Edgerton, MD, MPH, FAAP — Maternal and Child Health Bureau
Tamar Magarik Haro — AAP Department of Federal Affairs
Angela Mickleidie, PhD, MCHES — EMSC National Resource Center
Cynthia Wright, MSN, RNC — National Association of State EMS Officials
Lou E. Romig, MD, FAAP, FAEM — National Association of Emergency Medical Technicians
Sally K. Snow, RN, BSN, OPEN, FAEN — Emergency Nurses Association
David W. Tuggle, MD, FAAP — American College of Surgeons

**STAFF**

Sue Tellez

**SOCIETY FOR ACADEMIC EMERGENCY MEDICINE (REVIEWERS)**

Steven B. Bird, MD
Andra L. Blomkalns, MD
Kristin Carmody, MD
Kathleen J. Clem, MD, FACEP
D. Mark Courtney, MD
Deborah B. Diercks, MD, MSc
Matthew Fields, MD
Robert S. Hockberger, MD
James F. Holmes, Jr, MD, MPH
Lauren Hudak, MD
Alan E. Jones, MD
Amy H. Kaji, MD, PhD
Ian B. K. Martin, MD
Christopher Moore, MD, RDMS, RCOMS
Nova Panebianco, MD, MPH

**AMERICAN COLLEGE OF EMERGENCY PHYSICIANS, PEDIATRIC EMERGENCY MEDICINE COMMITTEE, 2013–2014**

Lee S. Benjamin, MD, FACEP, Chairperson
Isabel A. Barata, MD, FACEP, FAAP
Kiyetta Alade, MD
Joseph Arms, MD
Jahn T. Awarrello, MD, FACEP
Steven Baldwin, MD
Kathleen Brown, MD, FACEP
Richard M. Cantor, MD, FACEP
Ariel Cohen, MD
Ann Marie Dietrich, MD, FACEP
Paul J. Eakin, MD
Marianne Gausche-Hill, MD, FACEP, FAAP
Michael Gerardi, MD, FACEP, FAAP
Charles J. Graham, MD, FACEP
Doug K. Holtzman, MD, FACEP
Jeffrey Hom, MD, FACEP
Paul Ishimine, MD, FACEP
Hasmig Jininivizian, MD
Madeleine Joseph, MD, FACEP
Sanjay Mehta, MD, Med, FACEP
Aderonke Ojo, MD, MBBS
Audrey Z. Paul, MD, PhD
Denis R. Pauze, MD, FACEP
Nadia M. Pearson, DO
Brett Rosen, MD
W. Scott Russell, MD, FACEP
Mohsen Saidinejad, MD
Harold A. Sloas, DO
Gerald R. Schwartz, MD, FACEP
Orel Swenson, MD
Jonathan H. Valente, MD, FACEP
Muhammad Waseem, MD, MS
Paula J. Whiteman, MD, FACEP
Dale Woolridge, MD, PhD, FACEP

**FORMER COMMITTEE MEMBERS**

Carrie DeMoor, MD
James M. Dy, MD
Sean Fox, MD
Robert J. Hoffman, MD, FACEP
Mark Hostetler, MD, FACEP
David Markenson, MD, MBA, FACEP
Annalise Sorrentino, MD, FACEP
Michael Witt, MD, MPH, FACEP

**STAFF**

Dan Sullivan
Stephanie Wauson

**WORLD INTERACTIVE NETWORK FOCUSED ON CRITICAL ULTRASOUND BOARD OF DIRECTORS (REVIEWERS)**

Vicki Noble, MD
Enrico Storti, MD
Jim Tsung, MD
Giovanni Volpicelli, MD

**REFERENCES**


2. Jones AE, Tialy VS, Sullivan DM, Kline JA. Randomized, controlled trial of immediate versus delayed goal-directed


31. Linet MS, Kim KP, Rajaraman P. Children’s exposure to diagnostic medical radiation and cancer risk: epidemiologic and dosimetric


90. Doniger SJ, Ishimine P, Fox JC, Kanegaye JT. Randomized controlled trial of ultrasound-guided peripheral intravenous catheter placement versus traditional techniques in difficult-access...


Point-of-Care Ultrasonography by Pediatric Emergency Medicine Physicians

AMERICAN ACADEMY OF PEDIATRICS, Committee on Pediatric Emergency Medicine, SOCIETY FOR ACADEMIC EMERGENCY MEDICINE, Academy of Emergency Ultrasound, AMERICAN COLLEGE OF EMERGENCY PHYSICIANS, Pediatric Emergency Medicine Committee and WORLD INTERACTIVE

NETWORK FOCUSED ON CRITICAL ULTRASOUND

Pediatrics 2015;135;e1097

DOI: 10.1542/peds.2015-0342 originally published online March 30, 2015;

Updated Information & Services
including high resolution figures, can be found at:
http://pediatrics.aappublications.org/content/135/4/e1097

References
This article cites 92 articles, 7 of which you can access for free at:
http://pediatrics.aappublications.org/content/135/4/e1097.full#ref-list

Subspecialty Collections
This article, along with others on similar topics, appears in the following collection(s):
Committee on Pediatric Emergency Medicine
http://classic.pediatrics.aappublications.org/cgi/collection/committee_on_pediatric_emergency_medicine

Emergency Medicine
http://classic.pediatrics.aappublications.org/cgi/collection/emergency_medicine_sub

Permissions & Licensing
Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:
https://shop.aap.org/licensing-permissions/

Reprints
Information about ordering reprints can be found online:
http://classic.pediatrics.aappublications.org/content/reprints

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 © 2015 by the American Academy of Pediatrics. All rights reserved. Print ISSN:.
Point-of-Care Ultrasonography by Pediatric Emergency Medicine Physicians
AMERICAN ACADEMY OF PEDIATRICS, Committee on Pediatric Emergency Medicine, SOCIETY FOR ACADEMIC EMERGENCY MEDICINE, Academy of Emergency Ultrasound, AMERICAN COLLEGE OF EMERGENCY PHYSICIANS, Pediatric Emergency Medicine Committee and WORLD INTERACTIVE NETWORK FOCUSED ON CRITICAL ULTRASOUND
Pediatrics 2015;135;e1097
DOI: 10.1542/peds.2015-0342 originally published online March 30, 2015;

The online version of this article, along with updated information and services, is located on the World Wide Web at: http://pediatrics.aappublications.org/content/135/4/e1097