

Is it time to add point-of-care ultrasound education to pediatric residency curriculum?

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Key message

Growing point-of-care ultrasound (POCUS) use in pediatric patients has led to the need for POCUS education for pediatric residents. Recent experimental studies have suggested that POCUS education improves self-rated POCUS confidence and comfort in pediatric resident training. Considering the effective and sustainable POCUS education curriculum in pediatric resident training, simulation-based education would be a solution.

Ultrasound imaging is widely used in pediatric patients owing to its radiation-free and bedside availability without requirement for sedation. Recent advanced technologies have enhanced the diagnostic yield of ultrasound and expanded its clinical application.¹⁾ Point-of-care ultrasound (POCUS) is a bedside ultrasound performed and interpreted by the treating physician. POCUS has demonstrated benefits in emergency medicine and adult critical care medicine. POCUS is currently operated by numerous medical specialties with various clinical indications. Despite this trend, pediatricians are usually reluctant to perform ultrasound imaging on their own without a radiologist's help due to lack of experience and training, especially during night or weekend duty.

POCUS use is growing in pediatric and neonatal intensive care units. Nonetheless, there are few standardized curricula for pediatric residency training. Even though ultrasound machines are usually available, a lack of training makes pediatric residents hesitate to perform POCUS. Accordingly, several studies have suggested POCUS education curricula in pediatric emergency medicine and intensive care units.^{2,3)} Previous studies reported that POCUS education improved self-rated POCUS confidence and comfort. Good et al.³⁾ recommended the following POCUS curriculum for pediatric residents during a 1-month pediatric intensive care unit training: (1) pre- and postcourse knowledge test; (2) online self-learning sessions for ultrasound basics and lung and cardiac ultrasound; (3) 2 consecutive 1-hour hands-on sessions for normal anatomy in the first 2 weeks; and (4) 2 consecutive 1-hour POCUS rounds with admitted patients in the last 2 weeks. This curriculum would be useful in an institute with

sufficient patients, resources, and expertise. Previous studies were experimental experiences in a single center; hence, the number of participants was small. They compared short time points and subjective outcomes such as self-confidence and comfort in performing POCUS. In the future, more pragmatic and effective educational programs should be established for pediatric resident training.

The proposed evidence-based pedagogical framework for procedural skills training consists of 6 steps: learning, seeing, practicing, proving, doing, and maintaining.⁴⁾ This framework has 2 stages: a cognitive phase (learn and see) and a psychomotor phase (practice, prove, and do). In the cognitive phase, learners acquire didactic knowledge by reading a book or watching an online lecture (learn). Then, the learners watch experts perform a procedure correctly (see). In the psychomotor phase, learners practice procedural skills on a simulator and prove their competency before performing a procedure on a patient (practice and prove). After attaining skills, learners perform a procedure on a patient under expert supervision until they independently perform a procedure proficiently (do). They must practice consistently to maintain procedural competency (maintain). Based on the importance of the psychomotor phase and effective, no-risk, and low-stress learning programs for students and patients, simulation-based tutorial programs are universally applied to medical education today.

Simulation-based education has also been proven effective in ultrasound training.^{5,6)} Simulation-based learning encourages learners' self-confidence and increases their skills. Consequently, the 6-step evidence-based pedagogical framework can be adjusted to the POCUS curriculum (Fig. 1). In the first step, trainees learn ultrasound basics with a lecture and then see an expert's performance on POCUS. In the second step, trainees practice and prove POCUS skills on the simulator. Next, they perform POCUS on a patient under expert supervision. Upon skill mastery, regular education and monitoring must be supplied to help them maintain their competency. Medical providers face challenges maintaining procedural competency. Simulation-based education can help them maintain proficiency.

The tutorial conjugation of simulation-based ultrasound

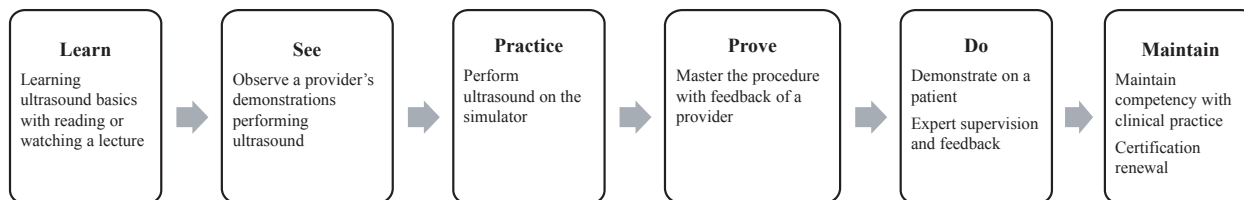


Fig. 1. The 6-step pedagogical framework of a point-of-care ultrasound curriculum.

training is currently weighted in obstetrical ultrasound, echocardiography, and interventional procedures such as vascular access. With the growing use of POCUS, several simulators integrated with acute abdomen and trauma have developed in emergency medicine. The American Academy of Pediatrics has reached consensus and guidelines about POCUS for pediatric emergency medicine in the last decade.^{2,7)} In particular, it has broadened the need for POCUS education in pediatric resident training.^{8,9)} The Korean Society of Pediatric Emergency Medicine has offered an emergency pediatric ultrasound course for volunteer trainees since 2013.¹⁰⁾ However, the education curriculum for POCUS in pediatric resident training remains insufficient and in its infancy. To establish a standardized pediatric resident curriculum for POCUS, consensus on an educational framework for POCUS, guidelines about regulation and monitoring must be established. Simultaneously, resources, costs, and faculty education must be implemented.

In the future, simulation-based POCUS training will improve procedural safety and facilitate the appropriate and timely diagnosis of pediatric patients. This training will be helpful for pediatric residents' careers and improve their capability as primary physicians.

See the article "Evaluation of simulation-based ultrasound course for pediatricians: a starting point for future training curriculum" via <https://doi.org/10.3345/cep.2021.00808>.

Footnotes

Conflicts of interest: No potential conflict of interest relevant to this article was reported.

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References

- Hwang M, Piskunowicz M, Darge K. Advanced ultrasound techniques for pediatric imaging. *Pediatrics* 2019;143:e20182609.
- Vieira RL, Hsu D, Nagler J, Chen L, Gallagher R, Levy JA. Pediatric emergency medicine fellow training in ultrasound: consensus educational guidelines. *Acad Emerg Med* 2013;20:300-6.
- Good R, Orsborn J, Stidham T. Point-of-care ultrasound education for pediatric residents in the pediatric intensive care unit. *MedEdPORTAL* 2018;14:10683.
- Sawyer T, White M, Zaveri P, Chang T, Ades A, French H, et al. Learn, see, practice, prove, do, maintain: an evidence-based pedagogical framework for procedural skill training in medicine. *Acad Med* 2015;90:1025-33.
- Østergaard ML, Ewertsen C, Konge L, Albrecht-Beste E, Bachmann Nielsen M. Simulation-based abdominal ultrasound training - a systematic review. *Ultraschall Med* 2016;37:253-61.
- Bradley K, Quinton A, Aziz A. Determining if simulation is effective for training in ultrasound: A narrative review. *Sonography* 2020;7:22-32.
- Shefrin AE, Warkentine F, Constantine E, Toney A, Uya A, Doniger SJ, et al. Consensus core point-of-care ultrasound applications for pediatric emergency medicine training. *AEM Educ Train* 2019;3:251-8.
- Mayordomo-Colunga J, González Cortés R, Bravo MC, Martínez Mas R, Vázquez Martínez JL, Renter Valdovinos L, et al. Point-of-care ultrasound: Is it time to include it in the paediatric specialist training programme? *Anales de Pediatría (English)* 2019;91:206.e1-13.
- Meggitt AS, Way DP, Iyer MS, Mahan JD, Gold D. Point-of-care ultrasound education for pediatric residents: a multicenter needs assessment. *Acad Ped* 2020;20:e11-2.
- Lee JH, Kang B, Kwon H, Kim S, Kim JY, Lee JH, et al. The experience of emergency pediatric ultrasound education course. *Pediatr Emerg Med J* 2014;1:34-41.

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