

Title: Pediatric Point of Care Ultrasound (POCUS) Residency Curriculum

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Introduction: Mounting evidence supports the use of point of care ultrasound (POCUS) in children to improve care outcomes.¹ Pediatrics as a specialty has been relatively late to adopt POCUS despite the advantages this non-radiating imaging modality affords. Using emergency medicine graduate medical education as a model, we can expect that the routine use of POCUS in pediatrics will depend on its integration into residency training programs. We have identified the need for formal training and describe a novel POCUS curriculum we designed for the pediatrics residency program.

Objective: To develop and implement a longitudinal pediatric resident curriculum which provides the opportunity to improve confidence in the use of point-of-care ultrasound for various clinically important indications.

Methods: The curriculum is designed as a hybrid of hands-on POCUS labs and virtual ultrasound image reviews. Hands-on sessions are conducted in a reverse-classroom fashion with video-based lectures to view prior. The virtual reviews address common abnormal ultrasound image findings. A pre-curriculum POCUS knowledge and comfort assessment was completed by residents prior to starting the course. At the midpoint, residents were asked to re-evaluate their confidence in particular POCUS skills and integration. We will also repeat knowledge testing at the end of the academic year.

Results: Resident ability to identify IVC size variation, lung consolidation, pleural effusion, and pneumothorax improved significantly. Of the POCUS integration skills assessed, resident ability to place ultrasound guided IVs and to evaluate the cause of dyspnea/hypoxia improved significantly as well. At the half-way point in the curriculum, 82% of residents indicated they were either “likely” or “very likely” to use POCUS in their clinical practice. All residents stated the value of POCUS justified any clinical time burden its use entails.

Conclusions: Residents who participated in our POCUS curriculum demonstrated significantly improved self-efficacy and confidence in the skills covered during the time period surveyed. Limitations include resident inability to consistently attend training sessions and limited survey responses. Despite these logistical issues that are inherent to residency training, this curriculum has provided an excellent starting point to formal resident POCUS training at our institution. Future directions include creating a skills examination to assess image acquisition and a workflow for providing appropriate and timely oversight as residents integrate these skills into patient care. This type of curriculum is novel to pediatric residencies and hopefully describing our experience can help other programs reap the profound benefits of POCUS for their trainees and patients.

Reference

1. Marin J. et al. Point-of-care ultrasonography by pediatric emergency medicine physicians. *Pediatrics*. 2015;135(4)

Table 1: Resident POCUS Confidence Levels (Self Evaluation Scale 0-100)

Identification Skill	Pre (N=26)	Midpoint (N=7)	p value
Pericardial Effusion	28.69	44.29	0.06
Decreased EF < 40%)	28.58	40.29	0.13
IVC Size Variation	28.69	47.86	0.05
Lung Interstitial Fluid	23.62	42.86	0.06
Lung Consolidation	26.31	49.00	0.04
Pleural Effusion	27.69	53.71	0.02
Pneumothorax	31.92	58.71	0.01
Ascites	29.62	39.29	0.20
Cellulitis	26.88	36.57	0.15
Abscess	37.08	46.29	0.18
Lower Extremity DVT	17.96	23.86	0.22
Severe Hydronephrosis	28.73	31.43	0.37
Large Knee Effusion	22.96	30.71	0.16

POCUS Integration Skill	Pre (N=26)	Midpoint (N=7)	p value
US Guided IV	23.42	42.14	0.05
US Guided LP	15.88	18.86	0.36
Evaluate Hypotension	22.04	37.29	0.09
Evaluate Hypoxia/Dyspnea	18.23	41.29	0.004
Evaluate Cause of AKI	14.77	25.86	0.07

Table 2: Yearly Curriculum Outline

Curriculum Outline		
Session	Topic	
1	Lab	Intro to Ultrasound & Knobology
2	Lab	Abdominal Images
3	Virtual	Abnormal Abdominal Image Review
4	Lab	Ultrasound Guided PIV Placement
5	Lab	Lung Ultrasonography
6	Virtual	Abnormal Lung Image Review
7	Lab	Cardiac Ultrasonography
8	Virtual	Abnormal Cardiac Image Review
9	Lab	Ultrasound Guided Lumbar Puncture
10	Lab	Ultrasound Guided Central Venous Line Placement
11	Lab	Knee, Skin, and Soft Tissue
12	Virtual	MSK, Skin, Soft Tissue Abnormal Image Review
13	Virtual	Ultrasound Use in the NICU
14	Lab	Mega-SIM Integration Exercise