Small Patients, Big Differences:

Pediatric vs. Adult Ultrasound

Cara L. Hill, BS, RDMS, RVT, RT (R)

1

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3

Objectives

- Understanding the key differences between pediatric and adult ultrasound imaging, including technique adaptations for younger patients
- Recognize the unique ultrasound characteristics of pediatric anatomy and how they differ from adult structures
- Apply best practices to overcome common challenges in pediatric ultrasound, improving both efficiency and diagnostic accuracy

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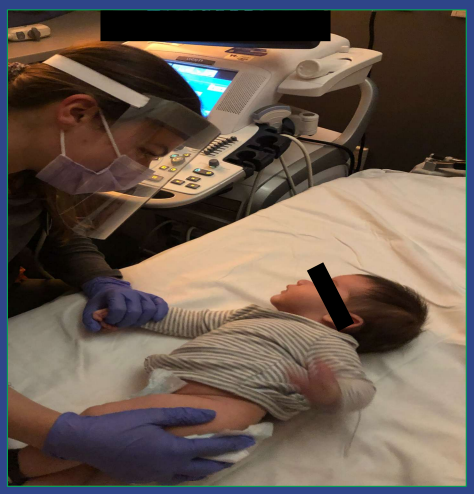
Background



From personal files of Cara H. (on file with author)

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Who is comfortable with pediatric ultrasound?

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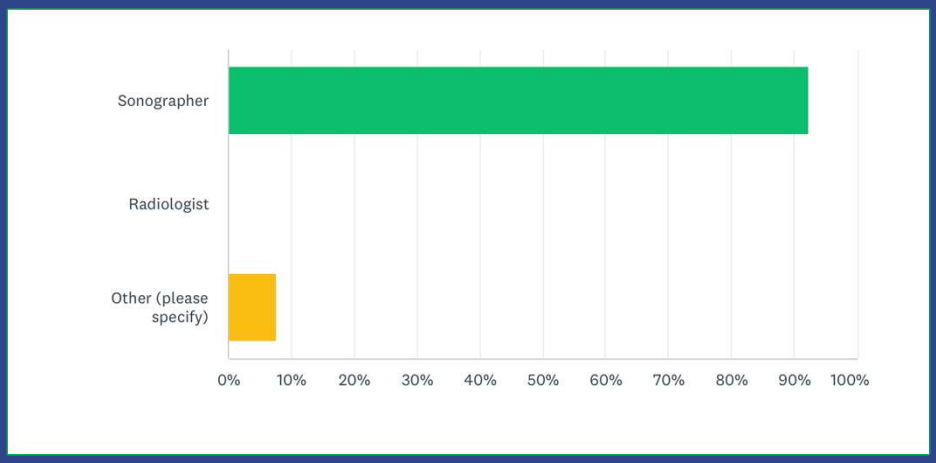
Q1: What is your professional role?



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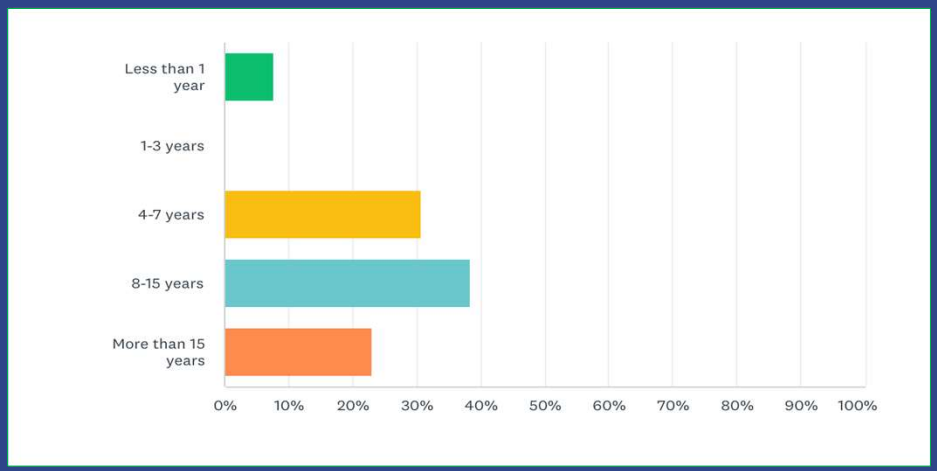
Q2: How many years have you been practicing in your role?



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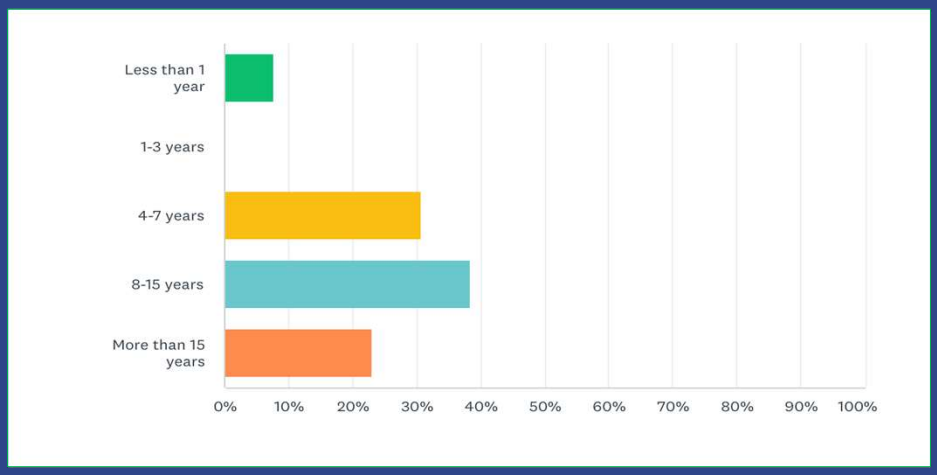
Q3: Do you currently perform or interpret pediatric ultrasounds?



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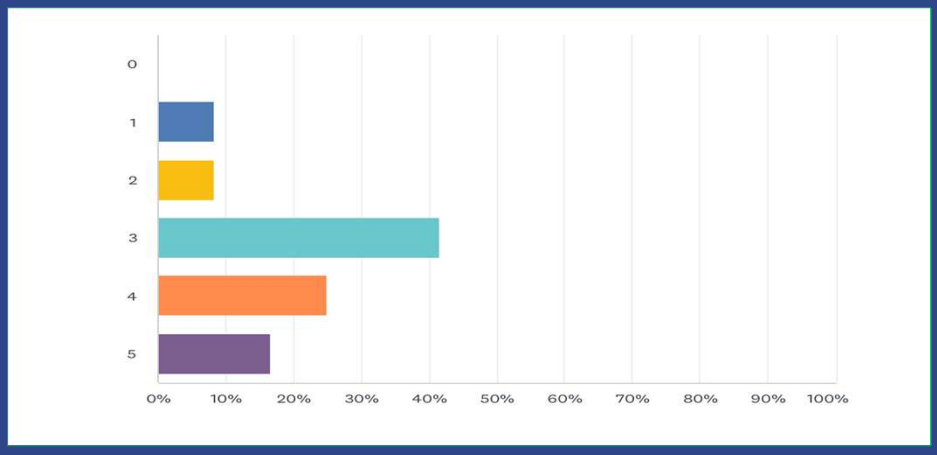
Q4: Rate your confidence when working with pediatric patients and their caregivers, including discussing findings (0: least confident, 5: most confident)



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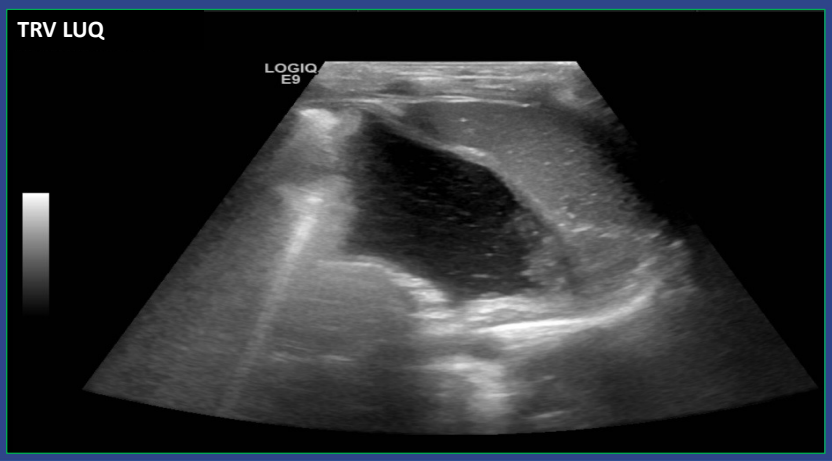
Q5: Based on this sonographic image of the left upper quadrant (LUQ) in a 4-month-old, would you consider the appearance normal or abnormal?



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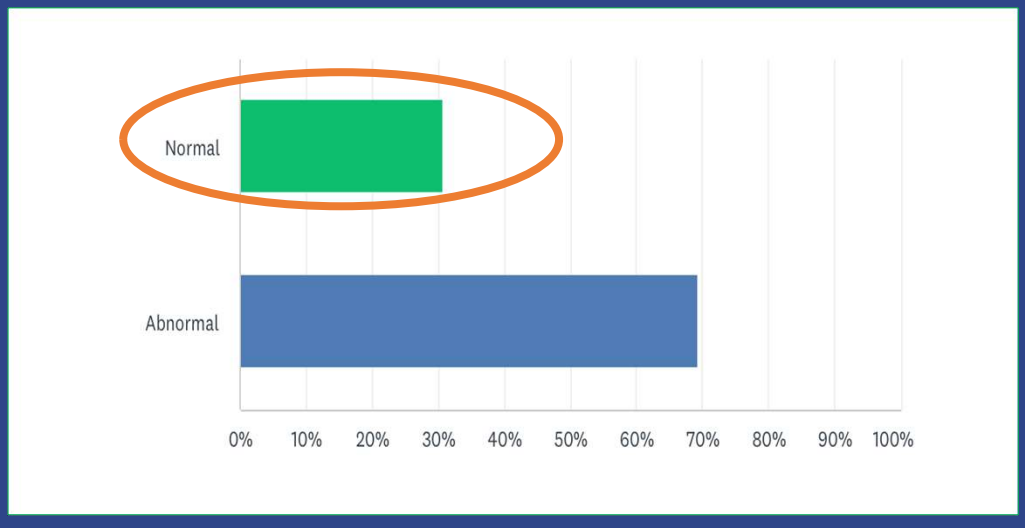

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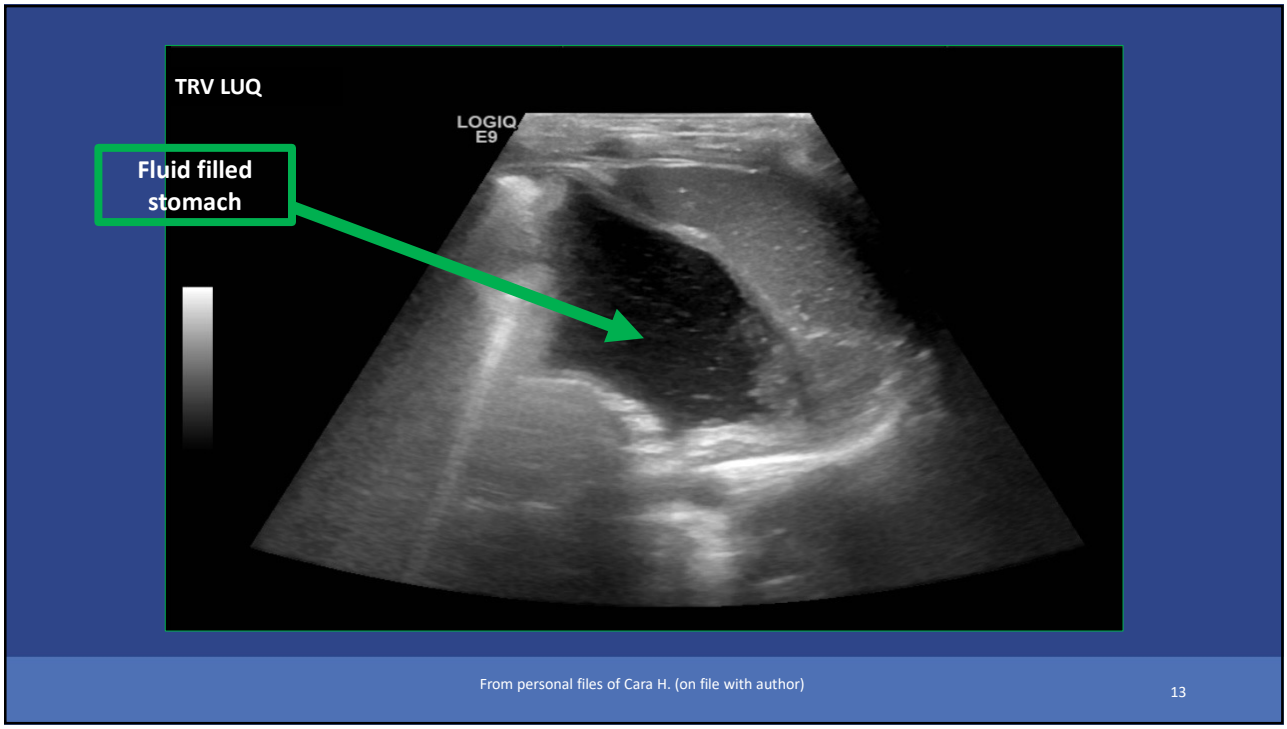

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Q6: Based on this sonographic image of the right kidney in a 6-month-old, would you consider the appearance normal or abnormal?

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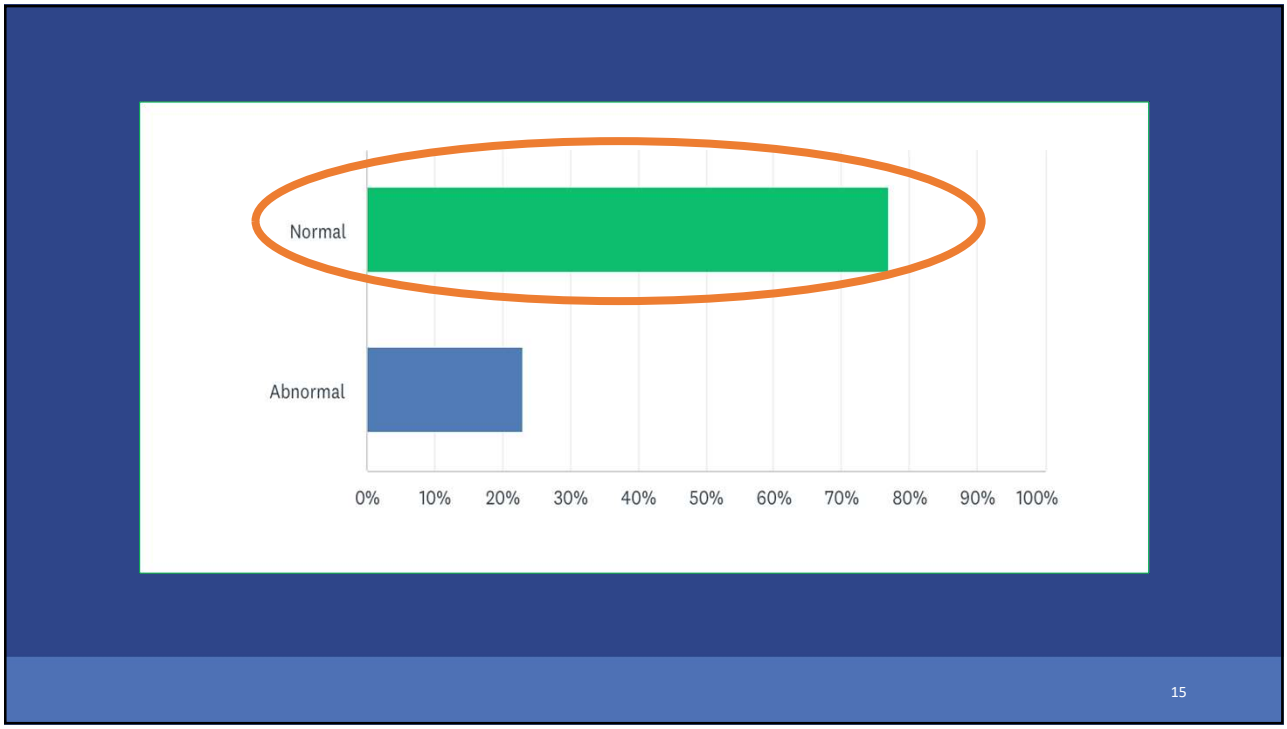

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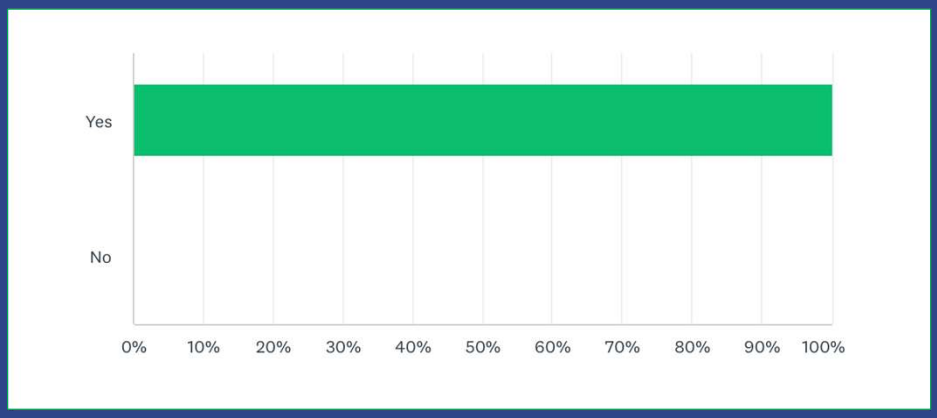
Q7: Do you believe educational programs for sonographers, radiologists, and related professionals should place greater emphasis on pediatric imaging?



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Technique

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Technique

- Transducer selection
- Image settings
- Patient positioning

Proper technique enhances image quality, facilitates accurate diagnoses, and minimized the need for repeat exams

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Technique: Transducer Selection

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Transducer Selection

Source: Dreamstime

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Transducer Selection

C1-6

C2-9

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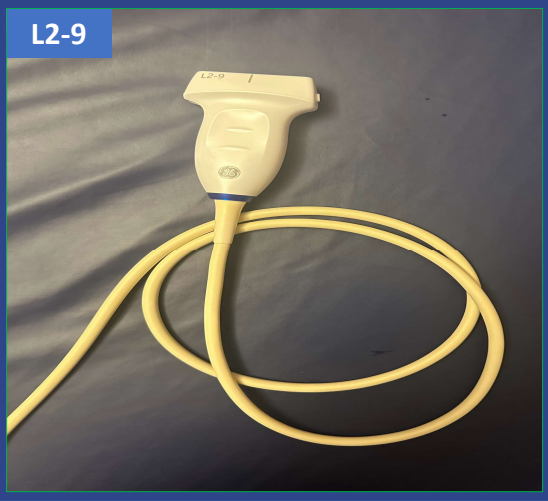
Transducer Selection

L2-9



ML4-20

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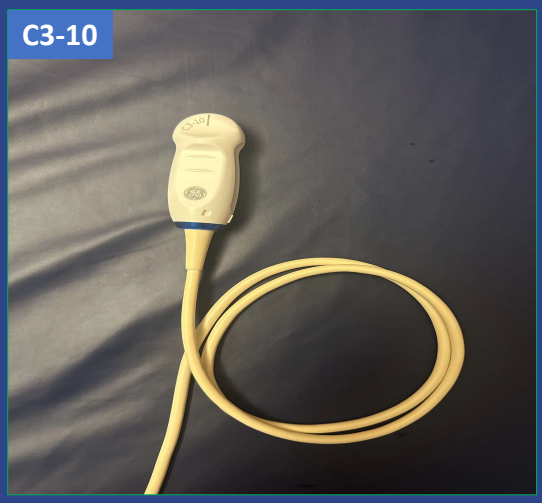
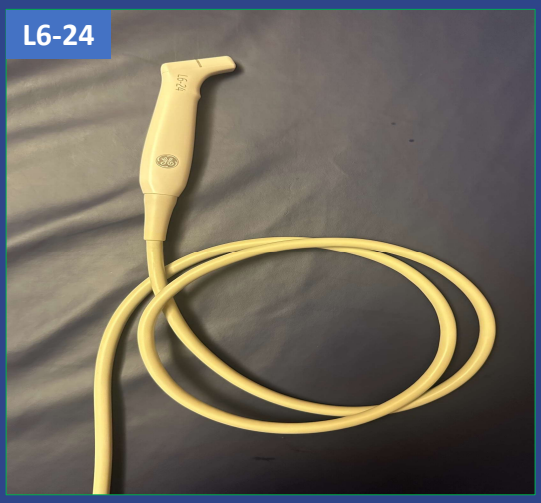
Transducer Selection

C3-10



L6-24



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Transducer Selection

- High frequency is **KEY!**

Source: Getty Images

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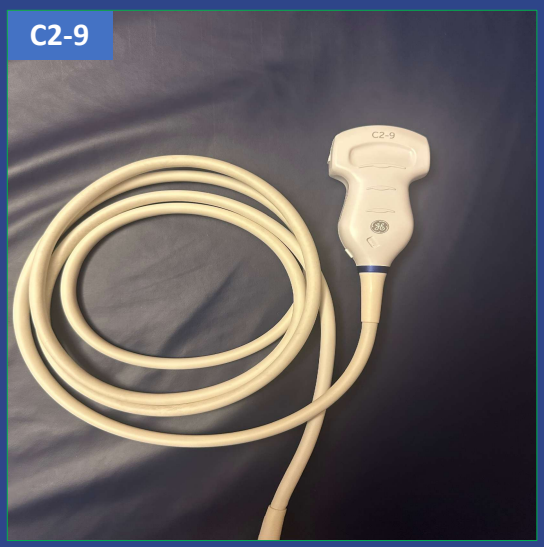

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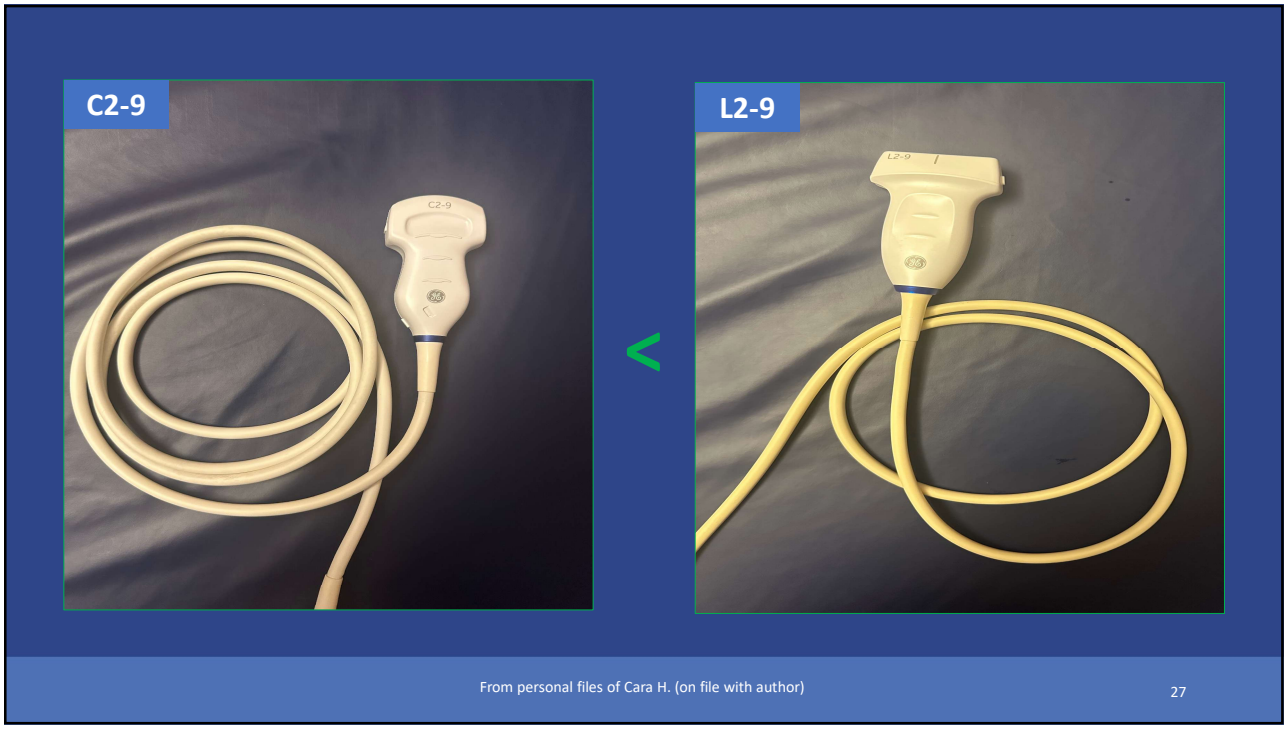

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Technique: Image Settings

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Image Settings

- Depth
- Gain
- Focus

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Image Settings

Parameter	Adult Setting	Pediatric Setting	Importance
Depth	Deeper structures = **greater** depth	Smaller anatomy = **shallower** depth	Less depth improves resolution, keeps anatomy larger on the screen, and increases frame rate
Gain	Thicker tissues & more attenuation = **higher** gain	Thinner tissues & less attenuation – **lower** gain	Prevents noise and avoids "washed out" images that can hide pathology
Focus	Deeper structures = **deeper** focus	More shallow structures = **superficial** focus	Ensures best resolution at the area of interest

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Technique: Patient Positioning

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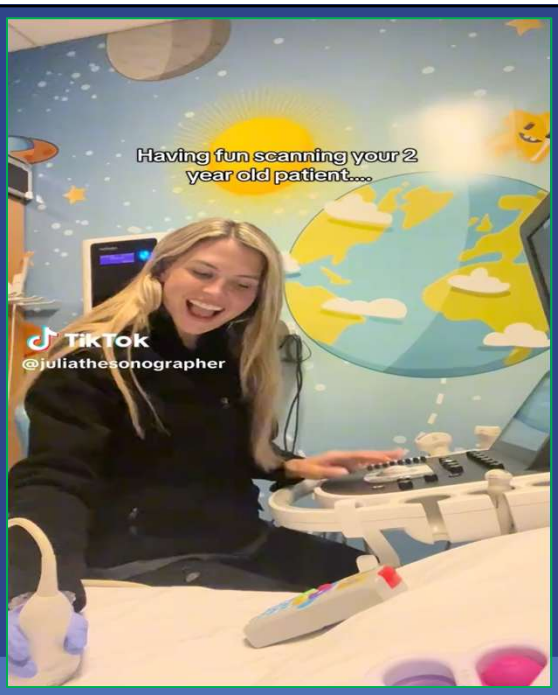

Source: @juliathesonographer, TikTok

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Patient Positioning

- **Goals:**
  - Optimize image quality
  - Ensure patient comfort
  - Minimize movement
  - Maintain safety

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Patient Positioning

- Tools:

Source: Philips Healthcare

Source: CozeeCoo

Source: Natus Medical via Medex Supply

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Sonographic Appearance

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Source: iStock by Getty Images

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General Differences

	Adults	Pediatrics
Body Fat	Higher, more attenuation	Low, better image quality
Ossification	Complete	Incomplete
Acoustic Window	Limited	Fontanelles, open growth plates
Organ Size Ratio	Smaller ratio	Organs proportionally larger
Compliance/cooperation	Usually cooperative	Limited (need for distraction/sedation)

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Abdomen

- **Liver & spleen**
  - Larger in proportion to body size
    - Both increase in size with age

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AJR. American journal of roentgenology
Volume 171, Issue 6
December 1998
Pages 1451-1705

Öznur L. Konuş[1]
Ayşegül Özdemir
Alaaddin Akkaya
Gonca Erbaş
Hacı Çelik
Sedat Işık

Normal Liver, Spleen, and Kidney Dimensions in Neonates, Infants, and Children: Evaluation with Sonography

- Relationships of the dimensions of these organs with sex, age, body weight, height, and body surface area were investigated
- **Body height** should be considered the **best** criteria to correlate with longitudinal dimensions of these organs

Source: Kosif R. Int J Sci Res Manag. 2020.

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TABLE 5 Longitudinal Dimensions of Spleen Versus Height and Age

Subjects			Longitudinal Dimensions (mm) of Spleen							
Body Height (cm)	No.	Age Range (mo)	Mean	SD	Minimum	Maximum	Percentile		Suggested Limits of Normal	
							5th	95th	Lowermost	Uppermost
48–64	52	1–3	53	7.8	33	71	40	65	30	70
54–73	39	4–6	59	6.3	45	71	47	67	40	75
65–78	18	7–9	63	7.6	50	77	53	74	45	80
71–92	18	12–30	70	9.6	54	86	55	82	50	85
85–109	27	36–59	75	8.4	60	91	61	88	55	95
100–130	30	60–83	84	9.0	61	100	70	100	60	105
110–131	36	84–107	85	10.5	65	102	69	100	65	105
125–149	29	108–131	86	10.7	64	114	70	100	65	110
137–153	17	132–155	97	9.7	72	100	81	108	75	115
143–168	21	156–179	101	11.7	84	120	85	118	80	120
152–175	12	180–200	101	10.3	88	120	88	115	85	120

Source: Kosif R. Int J Sci Res Manag. 2020.

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Abdomen

- **Kidneys**
  - Larger in proportion to body size
  - Renal cortex is equal or more echogenic than the liver & spleen in neonates and infants
  - Medullary pyramids are more prominent in infants
  - Renal sinus is less echogenic in infants and young children
  - Lobulation is often seen in neonates and young children

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Abdomen

- Pancreas
  - More hypoechoic isoechoic compared to the liver in children
  - Appears larger and fuller in proportion to the abdomen- head and body have a “chunkier” appearance
  - Pancreatic duct is not well seen unless dilated

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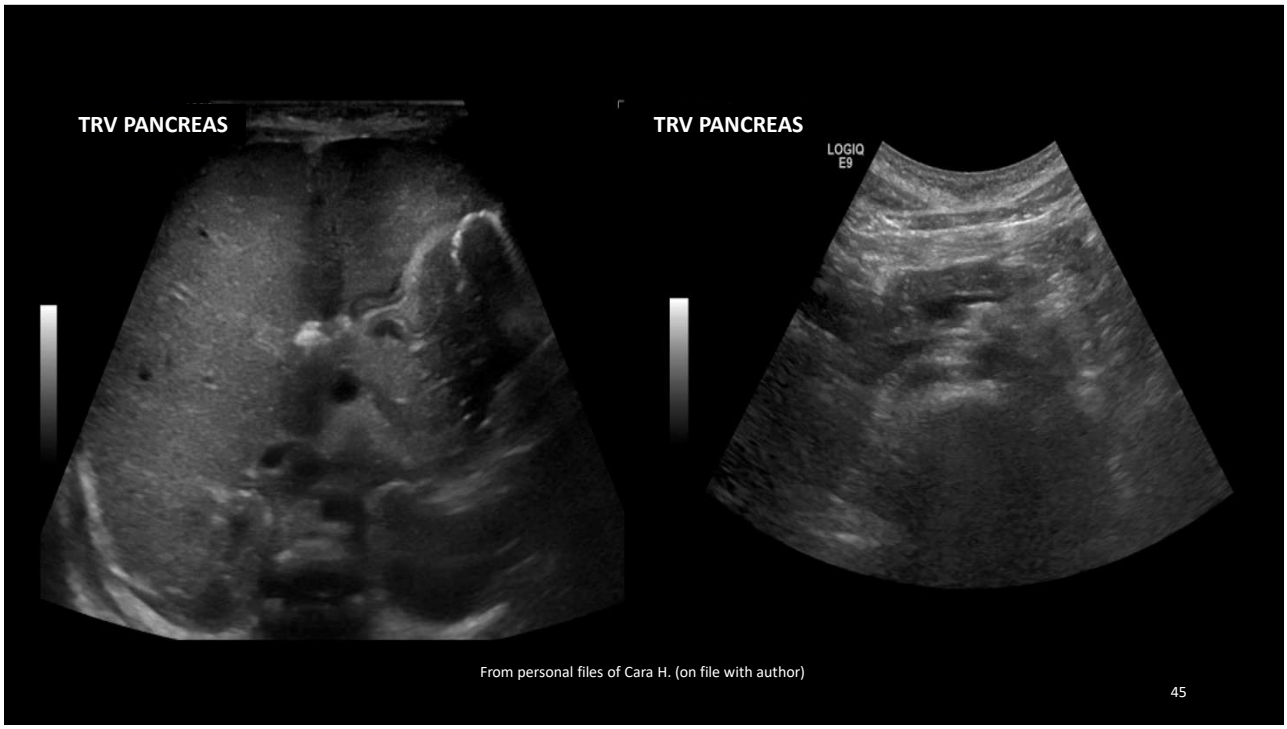

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Abdomen

- **Pediatric Specific Abdominal Exams**
  - Appendix
  - Intussusception
  - Pyloric stenosis

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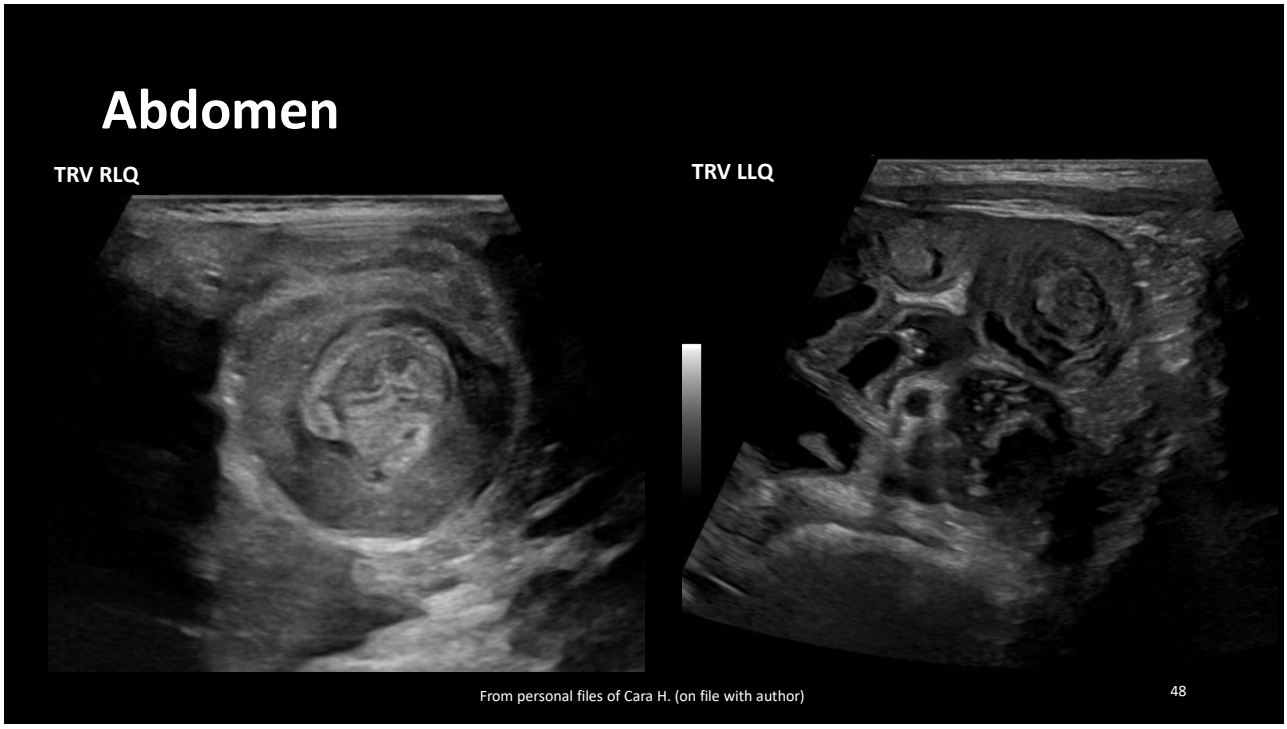

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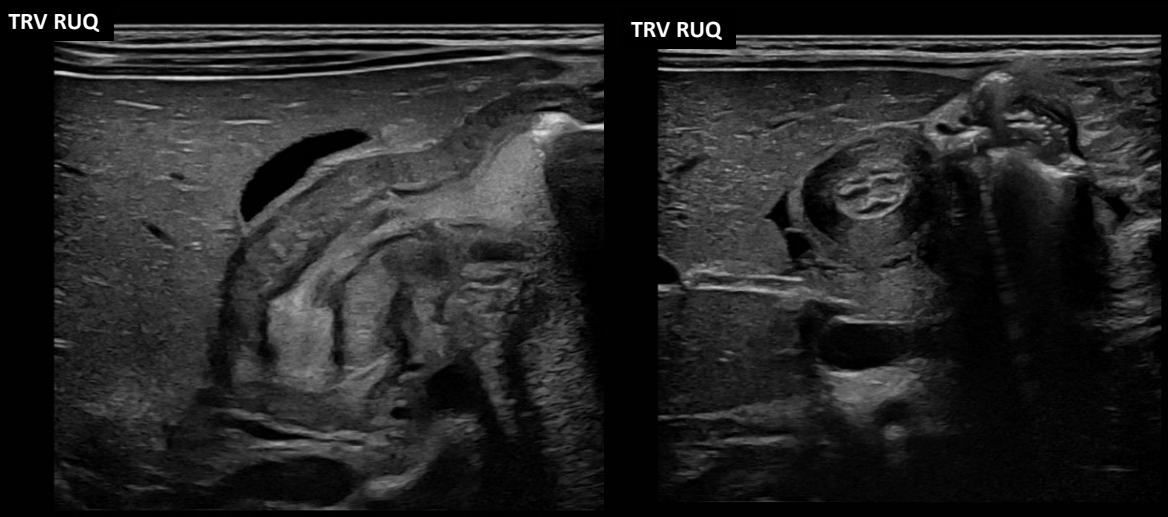
Abdomen



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Abdomen

- **Pediatric Specific Abdominal Exams**
  - Necrotizing Enterocolitis (NEC)
  - Volvulus / Malrotation
  - Inflammatory Bowel Disease (IBD)
  - Masses or polyps

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Additional Peds Specific Examinations

- Neonatal heads
- Neonatal spines
- Lungs/Chest
- Infant hips for dysplasia
- Joints for effusions
- Tonsils
- Vocal cords

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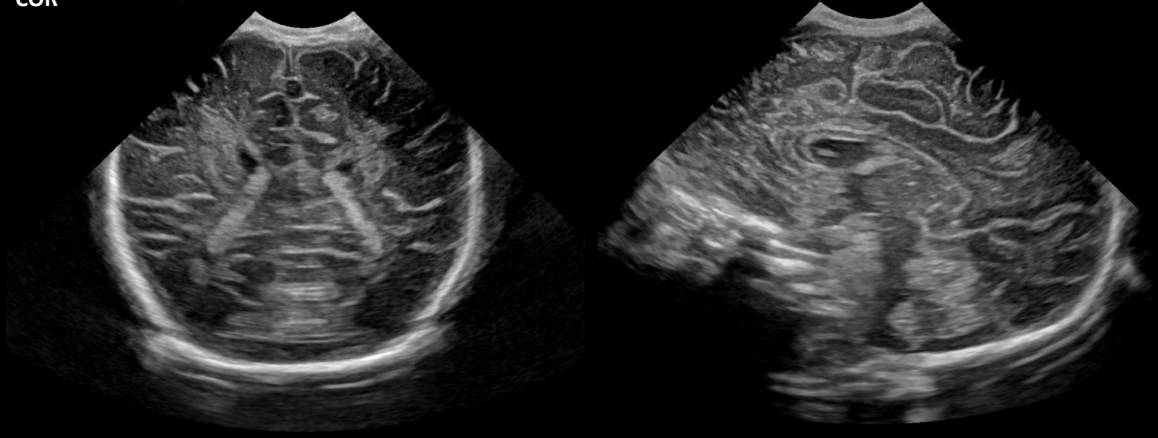
Additional Peds Specific Examinations

- Neonatal heads

COR

SAG ML



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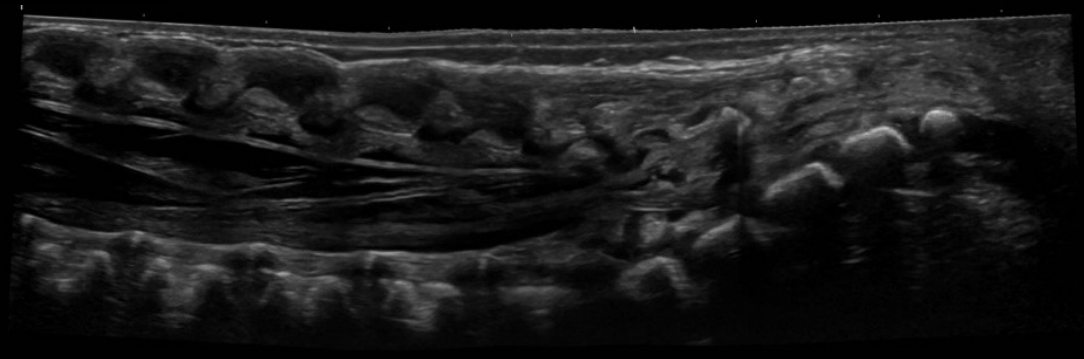
Additional Peds Specific Examinations

- Neonatal spines

SAG



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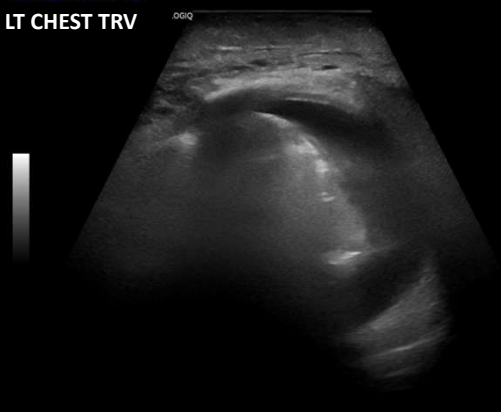
Additional Peds Specific Examinations

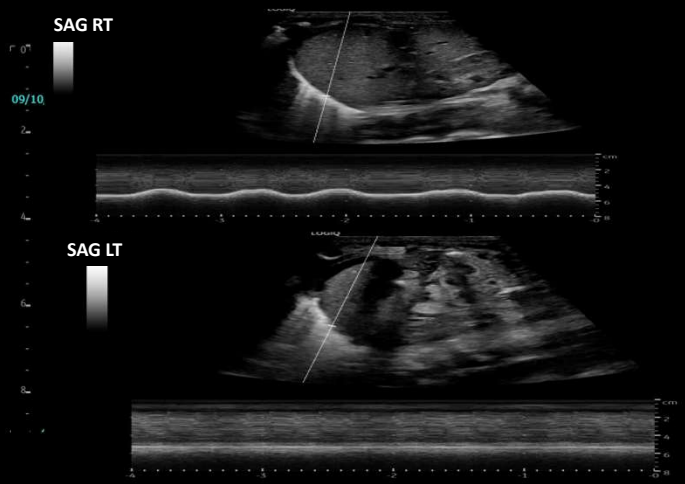
- Lungs/Chest

LT CHEST TRV



SAG RT

SAG LT



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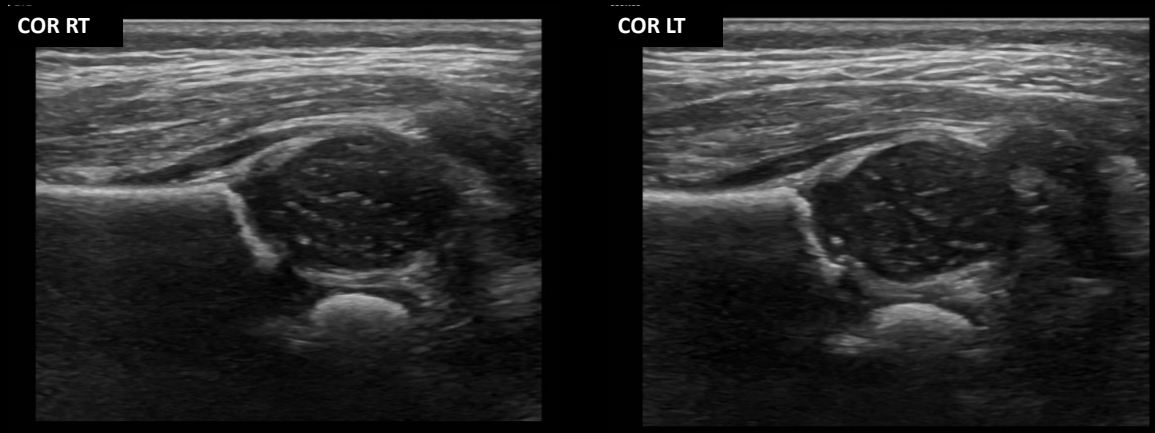
Additional Peds Specific Examinations

- Infant hips for dysplasia



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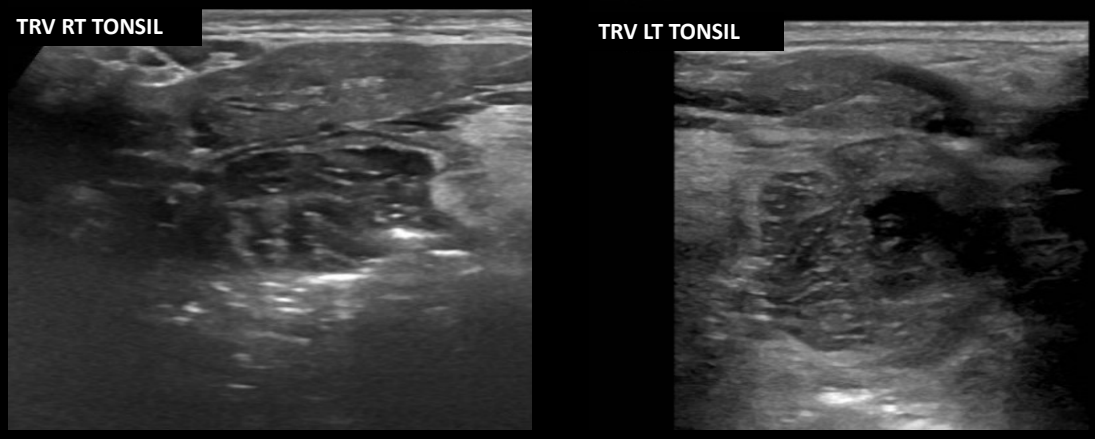
Additional Peds Specific Examinations

- Tonsils



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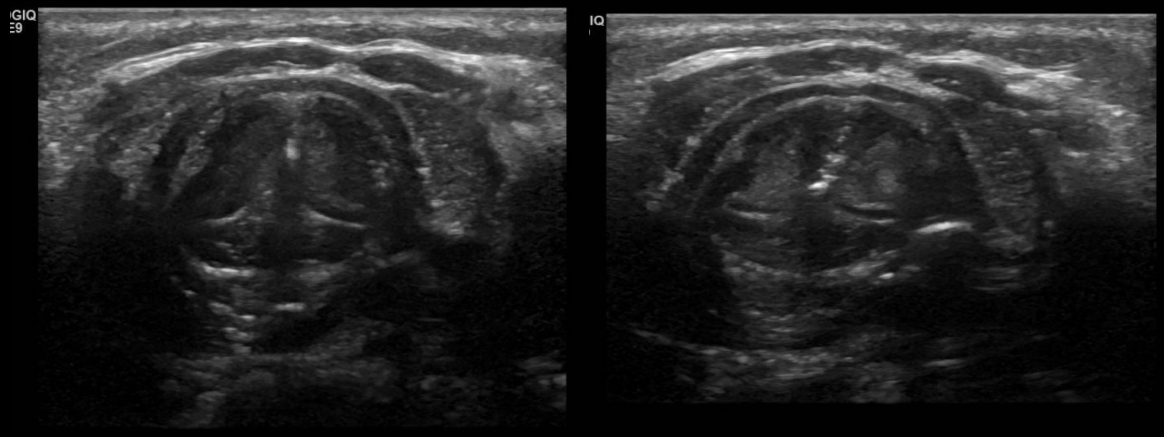
Additional Peds Specific Examinations

- Vocal cords



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Best Practices

In pediatrics, precision starts with **preparation**

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Patient Centered Care

- Building trust
- Parental involvement
- Distraction techniques

Utilize your resources!

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Child Life

- **What are Child Life Specialists?**
  - Educated and clinically trained in the developmental impact of illness and injury
  - They help infants, children, youth, and families cope with the stress and uncertainty of acute and chronic illness, injury, trauma, disability, and loss
  - Provide evidence-based, developmentally, and physically appropriate interventions including therapeutic play, preparation for procedures, and education to reduce fear, anxiety, and pain

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Child Life

- **Radiology/Ultrasound Specific:**
  - Provide education to prepare and support patients through all Radiology modalities (MRI, CT, Nuclear Medicine, X-Ray, Fluoroscopy, Interventional Radiology, and Ultrasound)
  - Help patients with autism, developmental delays, or sensory issues complete ultrasounds and other procedures by developing coping plans with caregivers and utilize proper assessment tools to aid in compliance
    - Ex: using “first, then” statements, advocating for “one voice”, providing distraction items

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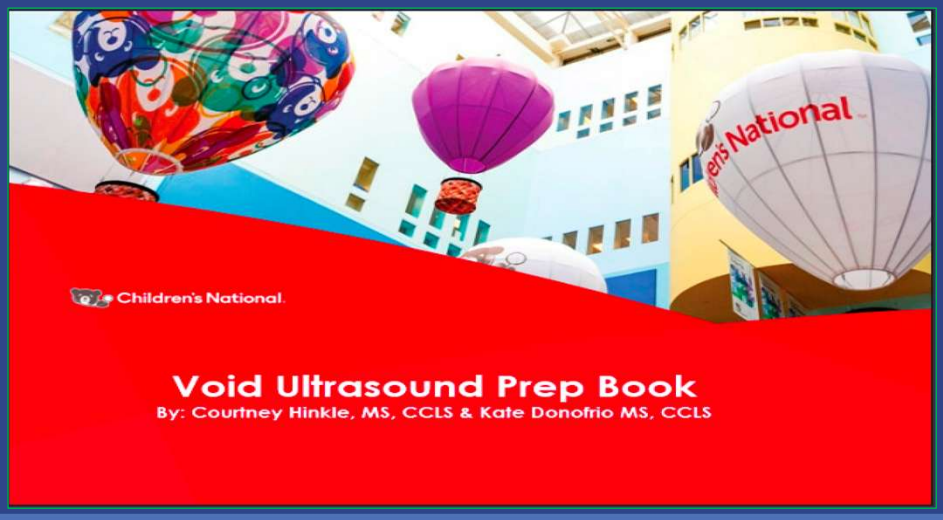
Child Life



Hinkle C, Donofrio K. *Void Ultrasound Handbook*. Children’s National Hospital

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Child Life

- **Success Story:**
  - "I got consulted by a physician to help provide support for a 15 y/o patient with autism coming for an ultrasound. She has past medical trauma and was mistrusting of medical professionals. By building rapport and through my assessment, I was able to identify that staff looking at, touching her bare skin was a big stressor for her. I was able to assess that she would benefit from being covered with a blanket and with the sonographer telling her each step while she was setting up. I was able to get one of our facility dogs present too, which this patient benefited from. The sonographer was very open to my suggestions and we were able to work together to be able to successfully complete this patient's ultrasound, which she had been unable to complete in the past."– **Kate D., Certified Child Life Specialist**

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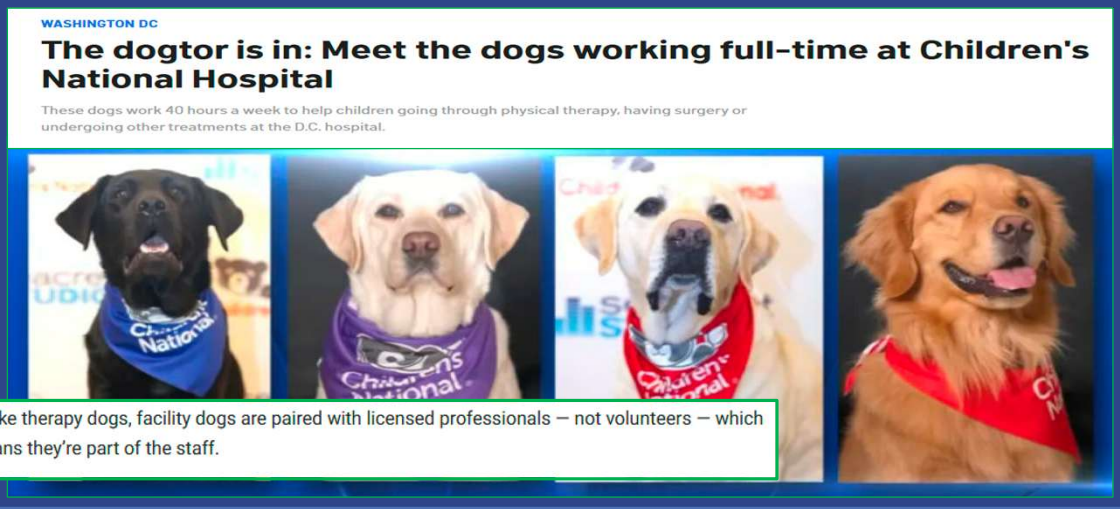
Child Life



Source: Fantis P. The dogtor is in: Meet the dogs working full-time at Children's National Hospital. NBC Washington. 2025.

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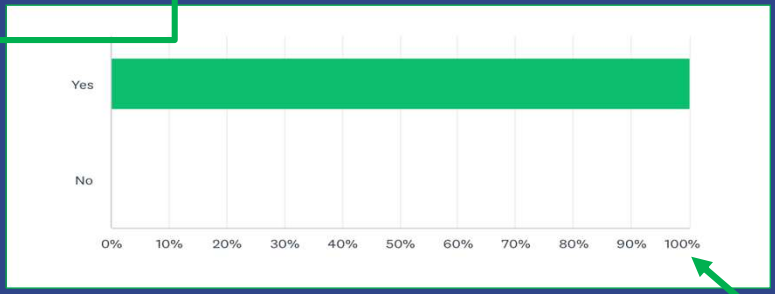
Proper Education and Training

Q7: Do you believe educational programs for sonographers, radiologists, and related professionals should place greater emphasis on pediatric imaging?



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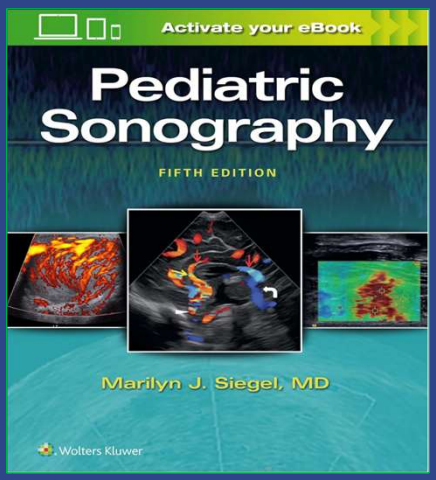
Proper Education and Training: Resources

Marilyn Siegel, MD



Source: M. Siegel, Washington University School of Medicine.

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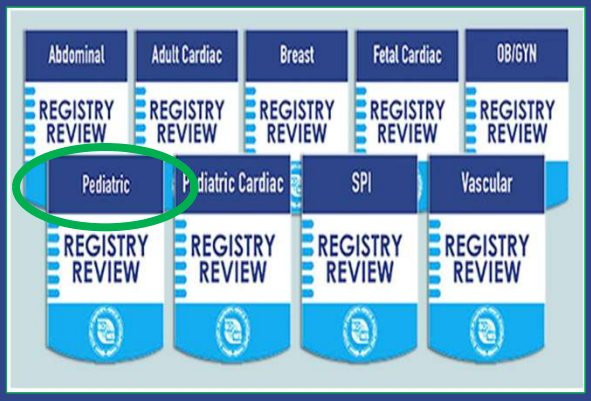
Proper Education and Training: Resources



SDMS Registry Review Series

SDMS Virtual Seminars

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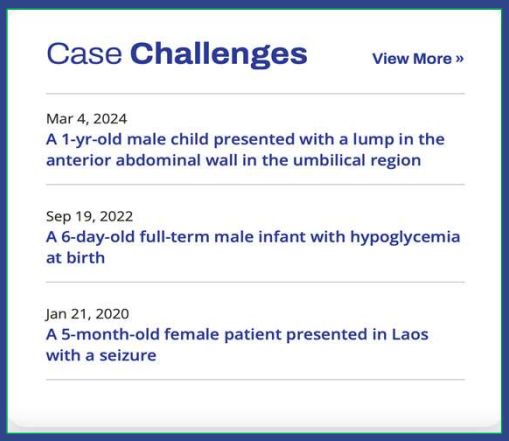
Proper Education and Training: Resources



https://www.aium.org/practice-topics/pediatric-ultrasound

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Proper Education and Training: Resources

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Conclusion

- Pediatric ultrasound is a specialty that demands its own skill set
- The right tools & continued learning = confident, high-quality imaging
- Be prepared—when pediatric cases arise, your expertise matters!

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Thank You!

References

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