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## NEW IDEAS IN B-E-D-SIDE TEACHING

# Directed image review technique (DIRT): A framework for ultrasound image assessment and interpretation

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**Abstract**
Use of point-of-care ultrasound (POCUS) is integral to the practice of emergency medicine, and POCUS education is a required component of emergency medicine training. Developing POCUS skills requires iterative deliberate practice of image acquisition and interpretation. Providing feedback to learners regarding ultrasound image interpretation can be challenging for emergency medicine clinician educators. We present a framework called the directed image review technique. This framework guides learner ultrasound image interpretation and provides educators with a similar structured approach to evaluate a learner's ultrasound competency and provide targeted feedback regarding image acquisition and interpretation.

## BACKGROUND

Point-of-care ultrasound (POCUS) is an indispensable tool in emergency medicine, offering real-time insights to patient pathology and key details for clinical decision making. The execution of POCUS requires proper image acquisition at the bedside, subsequent review of these images, and interpretation in the clinical context of the case. POCUS is a ubiquitous component of emergency medicine residency education in the United States, and thus directed evaluation of acquired ultrasound images is instrumental in advancing a learner's ultrasound abilities. Similar learning tools have been created to build frameworks for image acquisition and general POCUS use.[1–4] This article describes the directed image review technique (DIRT), a novel method for a learner to systematically describe and convey their image interpretation and serves also as a framework for an educator to provide concise, structured, and targeted feedback to that learner.

## EXPLANATION

The DIRT framework is broken down into five key components (Table 1). First, evaluate the settings and parameters chosen for image acquisition: Was the correct probe selected for the desired image study? Was the correct ultrasound preset chosen for the intended exam? Which view is being acquired? Second, evaluate the image optimization with respect to depth, gain, focal zone. The learner should then suggest any adjustments that should be made to optimize the settings and parameters. Third, comment on the anatomic structures and assess the adequacy of the view. For example, are all necessary anatomic structures visible? Is there a significant impact from image artifacts? Are the structures visualized with appropriate clarity? What techniques might help optimize this view? Next, provide a description of pathologic findings using sonographic terms (e.g., a circular anechoic mass with a thin wall). Are there any anatomic variants present? Lastly, the learner should develop a differential based on this

**TABLE 1** Components of the directed image review technique.

*W—Window*
1. Name the probe
2. Name the preset
3. Name the view
*O—Optimization*
1. Comment on the depth
2. Comment on the gain
3. Comment on the focal zone
*R—Relevant anatomy*
1. Describe visualized anatomic structures and/or anatomic location
2. Comment on overall adequacy the view
    a. Are all structures of interest visible?
    b. Do image artifacts impact the quality of the view?
*M—Maladies*
1. Describe pathologic structures using sonographic terms
2. Describe any anatomic variants using sonographic terms
*S—Synthesize*
1. Build a differential based on the sonographic description of the pathologic structure(s)
2. Apply findings within the clinical context of the case

sonographic description. From this differential, apply the findings to the larger clinical context of the case.

# DESCRIPTION

This technique is deliberate, structured, and brief. It prevents premature anchoring and builds a mental framework for assessing the POCUS examination. When reviewing ultrasound images with learners, it is natural for the focus to be drawn toward pathologic structures or clinical interpretations. However, this attention may distract from the potential for feedback regarding the more fundamental aspects of machine use and image acquisition. This pattern could lead to decreased emphasis on the foundational aspects of image acquisition and quality, especially for senior learners that should be more familiar with these skills. This memorable framework brings a valuable explicitness to image interpretation, which allows educators to better assess a learner's ultrasound understanding and provide targeted feedback to advance the learner's knowledge of this essential skill of emergency medicine. Similar frameworks have been created to evaluate ultrasound learner competency.[5,6] The DIRT adds to this body of work in two ways: through its added use as a didactic tool and through its brevity and feasibility at the bedside. In contrast to techniques designed to solely assess ultrasound learner competency, the DIRT also functions as a didactic tool, allowing the learner to evaluate and interpret images before receiving educator feedback. Our diverse group of ultrasound educators created this tool to meet an unmet need within our division—to have a method for 5-min image review with feedback that is concise and simple to use. This technique can be used at any moment an educator and learner are reviewing images together: at the bedside, on shift while reviewing images, or during educational image review and quality assurance.

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## REFERENCES

1. Adamson R, Morris AE, Sun Woan J, Ma IWY, Schnobrich D, Soni NJ. Development of a focused cardiac ultrasound image acquisition assessment tool. *ATS Scholar.* 2020;1:260-277.
2. Bahner DP, Hughes D, Royall NA. I-AIM. *J Ultrasound Med.* 2012;31:295-300.
3. Kennedy Hall M, Coffey EC, Herbst M, et al. The "5Es" of emergency physician–performed focused cardiac ultrasound: a protocol for rapid identification of effusion, ejection, equality, exit, and entrance. *Acad Emerg Med.* 2015;22:583-593.
4. Koratala A, Olaoye OA, Bhasin-Chhabra B, Kazory A. A blueprint for an integrated point-of-care ultrasound curriculum for nephrology trainees. *Kidney360.* 2021;2:1669-1676.
5. Tolsgaard MG, Todsen T, Sorensen JL, et al. International multi-specialty consensus on how to evaluate ultrasound competence: a Delphi consensus survey. *PLoS One.* 2013;8:e57687.
6. Bailitz J, O'Brien J, Mccauley M, et al. Development of an expert consensus checklist for emergency ultrasound. *AEM Educ Train.* 2022;6:6.