

**The Day I Didn't Use Ultrasound What Did I Miss? – AFAST®, TFAST®, Vet BLUE®
– The Global FAST® Approach**

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Introduction

AFAST®. The clinical utility of AFAST®, its target-organ approach and its applied fluid scoring system in virtually all subsets of patients including trauma, triage (non-trauma) and tracking (monitoring) cases in the emergent and critical care settings will be reviewed. The previously published T³ designation encompasses these 3 subsets, Trauma, Triage (non-trauma), and Tracking (monitoring) and avoids the onslaught of confusing acronyms in human and now veterinary medicine in which similar abbreviated formats are given different acronyms when applied to different subsets of patients. However, AFAST® is in reality "an extension of the physical examination" and the T³ designation is unnecessary as more and more veterinarians understand its applications. Thus, AFAST® becomes a universal term that has *exact* clarity of its 5-acoustic windows or views.

TFAST®. The clinical utility of TFAST®, its use for the rapid detection of pneumothorax, pleural and pericardial effusion, and its target-organ approach for the heart, will be reviewed. Like AFAST®, TFAST® is best now considered as "an extension of the physical examination" and the T³ designation is unnecessary as more and more veterinarians understand its widespread applications. Moreover, TFAST® is standardized and has *exact* clarity to its 5-acoustic windows or views. The TFAST® carries greater potential to positively guide clinical course and improve patient outcome by detecting conditions and complications otherwise missed or delayed based on traditional first line evaluations of physical examination, laboratory testing, and radiographic finding. TFAST® findings are made more clinically relevant for the clinician, client, and referring veterinarian by using its standardized format, and by recording TFAST® findings on standardized goal-directed templates for medical records (see below). The mindset for those using TFAST® is one of a *ruling in* and *ruling out* test (highly specific and highly sensitive) for pleural or pericardial effusion, and for pneumothorax. TFAST® also serves as a *ruling in* test for soft tissue abnormalities of its target-organ, the heart (specific but variably sensitive being user dependent), meaning if you see an abnormality, it's likely real, however, if you don't see an abnormality, then it may have been missed, being user dependent. Importantly, the TFAST® does not replace complete detailed echocardiography. By using our approach as an "extension of the physical exam", TFAST® serves as a means to better survey veterinary patients, and to better keep alive for gold standard testing and treatment.

Vet BLUE®. The widespread use of lung ultrasound has been delayed in small animal medicine due to the myth that ultrasound cannot image aerated lung; however, the epiphany is that the use of lung ultrasound is extremely sensitive for the detection of surface pathology. Moreover, acute conditions including pneumonia make it to the lung surface, and if they make it to the lung surface then the potential is there to detect the pulmonary disease. Vet BLUE® stands for veterinary brief lung ultrasound exam and is a unique regional, pattern-based approach, with its B-line scoring system, and visual lung language of Dry Lung, Wet Lung (B-lines), Shred Sign, Tissue Sign, Nodule Sign, and Wedge Sign. Moreover, Vet BLUE® is standardized and has *exact* clarity to its 9-acoustic windows or views.

Global FAST®. Global FAST® is the combined use of AFAST®, TFAST® and Vet BLUE® and should be used as "an extension of the physical exam" that helps streamline care, better direct resuscitation and diagnostic plans as you will see with the cases presented. The Global FAST® Approach often exceeds the patient information you can get with the traditional paradigm of physical exam, blood and urine testing, and radiography. Global FAST® is standardized and has *exact* clarity to its 15-acoustic windows or views, of which 6 are the same making this ultrasound approach achievable for the novice and applicable to all veterinarians seeing clinical cases. A similar approach has been advocated in human medicine as part of the physical exam imaging the abdomen and thorax including heart and lung.

Point-of-care Ultrasound (POCUS). Point-of-care ultrasound (POCUS), which includes FAST ultrasound examinations, is defined by the author as a goal-directed ultrasound examination(s) performed by a healthcare provider point-of-care (cageside) to answer a specific diagnostic question(s) or guide performance of an invasive procedure(s). *The Global FAST® Approach should be used as a baseline set of unbiased data imaging points surveying both cavities and then POCUS or Focused Exams as add-on*

evaluations to prevent “selective imaging“ and “confirmation bias error”, and “satisfaction of search error”, and thus increases the probability of an accurate assessment through integration of clinical findings.

Patient Positioning, Preparation, Probe Type, Preset, Probe Maneuver

Positioning. No shaving of fur (all images are from unshaved patients). A microconvex (curvilinear) probe is used for the entire Global FAST® on the abdominal preset. Standing (sternal) and lateral recumbency are used. *Dorsal recumbency is never used because it is too risky for hemodynamically fragile or unstable patients especially with intrathoracic problems including cardiac and pulmonary conditions and pleural space disease.*

The AFAST®

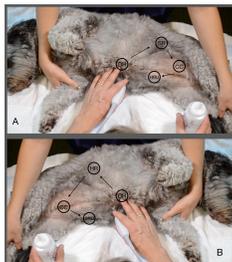
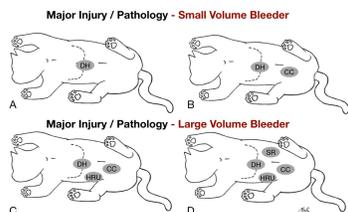


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AFAST® Order. The AFAST® regardless of positioning (standing/sternal, right lateral recumbency) is always performed in the same order beginning at the Diaphragmatico-Hepatic (DH) view, followed by the least gravity dependent Spleno-Renal (SR) view, then the Cysto-Colic (CC) view, completing the AFAST® at the most gravity dependent Hepato-Renal Umbilical (HRU) view, where abdominocentesis is performed in most fluid-positive patients. The spleen is generally identified in this region (HRU) and then followed performing a Focused Spleen. In left lateral recumbency the order is analogous with the Hepato-Renal (HR) view replacing the Spleno-Renal view and the Spleno-Renal Umbilical (SRU) view replacing the Hepato-Renal Umbilical view. As with right lateral recumbency, a Focused Spleen is performed *after* completing these 4 views of the AFAST fluid scoring system.

AFAST® Target-Organ Approach- It’s a Soft Tissue Screening Test. AFAST® was developed having a target-organ approach by the renaming of its acoustic windows from its creation in 2005. Target-organs are fanned through each respective view and obvious soft tissue abnormalities, many of which are only suspected or missed based on physical exam, introductory blood and urine testing, and radiography are detected. “Seeing your problem” list is the mantra. The sonographer doesn’t need to identify the exactness of the abnormality, but rather recognize that the view deviates from the expected. The word “suspect” is used for any deviations from the expected. Some examples at each of its respective views are shown during the lecture.

AFAST®-applied Abdominal Fluid Scoring System



The AFAST®-applied fluid scoring system is defined as follows (4-point scale): abdominal fluid score (AFS) of 0 (AFS 0) means negative at all 4 views to a maximum score of AFS 4 means positive at all 4 views.

*Low-scoring AFS1 and 2 (<3) are considered major injury/pathology, small volume bleeders.
*High-scoring AFS 3 and 4 (≥ 3) are considered major injury/pathology, large volume bleeders.
Modified from Lisciandro, et al. JVECC 2009; 19(5): 426-437, JVECC 2011;20(2); 104-122.
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The AFAST®-applied is hugely impactful and should be assigned and recorded in every patient. It's a simple 0-4 scoring system and has significant advantages over subjective terms of trivial mild, moderate and severe as well as designating positive and negative AFAST views. Recording positive and negative views may help with origin of bleeding or effusion (peritonitis) in lower-scoring patients. For example, in a bleeding trauma patient that has an AFS of 1 and positive at the DH view, that over

time becomes a large volume bleeder with an AFS ≥ 3 , logic would dictate the source of bleeding is likely the liver and/or its associated vasculature.

Small versus Large Volume Bleeder/Effusion. The abdominal fluid score (AFS) helps rapidly categorize the patient as a small volume (AFS 1 and 2, or < 3) versus large volume bleeder (AFS 3 and 4, or ≥ 3). AFS 1 and 2 (< 3) do not have enough blood intra-abdominal to directly result in anemia. Thus, if an AFS 1 or 2 is anemic, then there are the following 4 major rule outs: 1) preexisting anemia, 2) bleeding somewhere else - always do Global FAST[®] and a good physical exam, 3) hemodilution (less common with graduated fluid therapy strategies), or 4) lab error. The AFS allows tracking of worsening (increasing AFS), resolving (decreasing AFS), or static (no change in AFS). Patients also become volume depleted from effusions and thus small versus large volume effusion works for anticipating hypovolemia from fluid loss (without the need for hemoglobin). On the other hand, a large volume bleeder predictably becomes anemic because there is enough blood volume within the abdominal cavity to cause anemia. It doesn't mean that every large volume bleeder will require a blood transfusion, but this semi-quantification helps with decision-making. Large volume effusions can become volume depleted from their cavity non-hemorrhagic volume loss.

Modification of the Abdominal Fluid Scoring System - 0 or 1/2 or 1

Scoring as 0, 1/2, or 1. The author for several years has been categorizing positives as "weak" if the maximum pocket is < 1 cm (< 5 mm in cats) scoring as a "1/2" versus a "strong" positive if > 1 cm (> 5 mm in cats) making the score a full "1." The small vs. large volume bleeding concept remains as AFS 1 and 2 small volume (< 3), and AFS 3 and 4 (≥ 3), large volume bleeders. Clinical judgment always should be considered; however, this modification provides an option to better assess and semi-quantitate volume in bleeding patients and those with other forms of ascites and peritonitis. The modification of our original scoring system is based on a recently accepted study and an ongoing project. More detail is available in the 2nd edition of our textbook.

The TFAST[®]

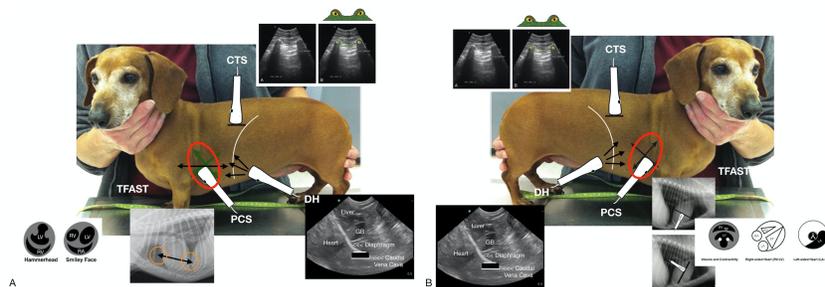


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Strengths and Weaknesses of the TFAST[®] Views

There are 5 acoustic windows for TFAST[®]. These are the bilaterally-applied Chest Tube Site and Pericardial Site views, and the singly-applied Diaphragmatico-Hepatic view. As an aside, the CTS site view followed by Vet BLUE[®] are performed first, followed by the Pericardial Site views on both the left and right side.

Chest Tube Site (CTS) views - Pneumothorax. The bilaterally-applied CTS view is best used to rule out pneumothorax (PTX) and survey for lung pathology (see Vet BLUE[®] Proceedings) on both the left and right sides. The CTS view is along the highest accessible locations on the thoracic wall where the free air within the pleural cavity would rise to in the presence of PTX. Thus, if lung is observed in direct opposition to the thoracic wall at the CTS view, most commonly by "lung sliding" or B-lines, then PTX is ruled out. When PTX is suspected, then search for the "Lung Point" by doing Vet BLUE[®] to determine the degree of PTX (see below).

Pericardial Site (PCS) views - Pleural and Pericardial Effusion, Echo Views. The bilaterally-applied PeriCardial Site (PCS) views on both the left and right sides are used to screen for the presence of pleural and pericardial effusion; and the right side for TFAST[®] echo views including for volume status and contractility assessment via the left ventricular short-axis "mushroom" view (LVSA), for the "quick peek" short-axis left atrial to aortic ratio (LA:Ao) to screen for left-sided cardiac problems (increased left atrial filling pressure), and for the long-axis 4-chamber view to screen for right-sided conditions (RV:LV) (increased right ventricular filling pressures); and the long-axis 4-chamber view with the left ventricular outflow tract (LVOT) for abnormalities within the LVOT and its aorta. The use of the PA:Ao (PA, pulmonary artery, Ao, aorta) ratio may also be learned as an add-on skill because the PA:Ao is accessible at the short-axis LA:Ao view and the long-axis 4-chamber view.

The “GATOR SIGN” Fundamental Lung Ultrasound Orientation

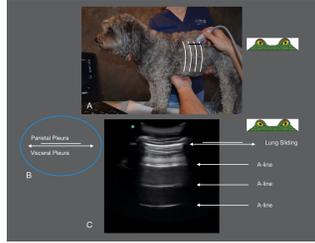


Figure. Gator Sign Orientation. This material is reproduced with permission of John Wiley & Sons, Inc., *Point-of-Care Ultrasound Techniques for the Small Animal Practitioner*, 2nd Edition, Wiley ©2020 and Greg Lisciandro, Hill Country Veterinary Specialists, FASTVet.com ©2014, 2020.

The Vet BLUE® - Its 9 Acoustic Windows

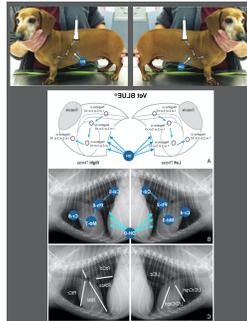


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Vet BLUE® Scoring System Use for Alveolar-Interstitial and Lung Contusion Scoring and Severity

The use of maximum numbers of B-lines over numbers of positive regional Vet BLUE® views provides a severity score for degrees of alveolar-interstitial edema and lung contusions. By recording results, pulmonary conditions may be monitored for worsening, their resolution or without change (static); and in congestive heart failure, loop diuretics therapy may be guided more accurately than without Vet BLUE®.

Vet BLUE® and Its Visual Lung Language

The use of its visual lung language helps record findings with and understand each’s clinical ramifications from Dry Lung to Wet Lung (B-lines also called Lung Rockets), Shred Sign (air bronchogram), Tissue Sign (hepatization of lung), Nodule Sign, and Wedge Sign (supports pulmonary thromboembolism when in dorsal views).

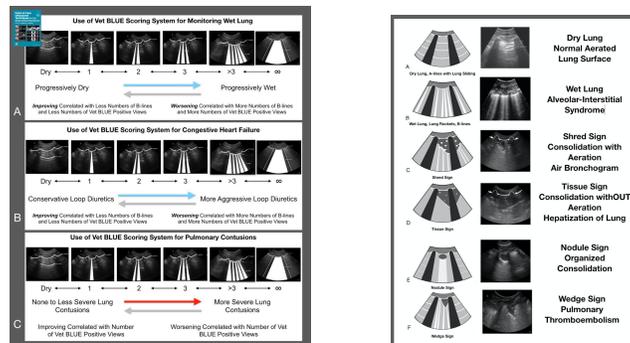


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The Use of Global FAST® for Volume Assessment, Patient Monitoring, and Staging Patients – Integrating Information

Global FAST® Integrating Information for Patient Monitoring

Global FAST® advantageously is used for patient monitoring taking advantage of AFAST® and its soft tissue screening for obvious abnormalities using its target-organ approach, its abdominal fluid scoring system for decision-making in bleeding and non-hemorrhagic effusions, its urinary bladder volume estimation formula that can provide a non-invasive means to estimate urine output; TFAST® for pneumothorax (PTX) and the TFAST® 1/3s rule for assessing degree of PTX and PTX tracking (static, worsening, resolving) , and for pleural and pericardial effusion, its echo views, and its soft tissue screening for obvious cardiac abnormalities; Vet BLUE® and its regional, pattern-based approach, its B-line scoring system, and its visual lung language; and combining components for each for volume status including lung and the caudal vena cava with no extra views.

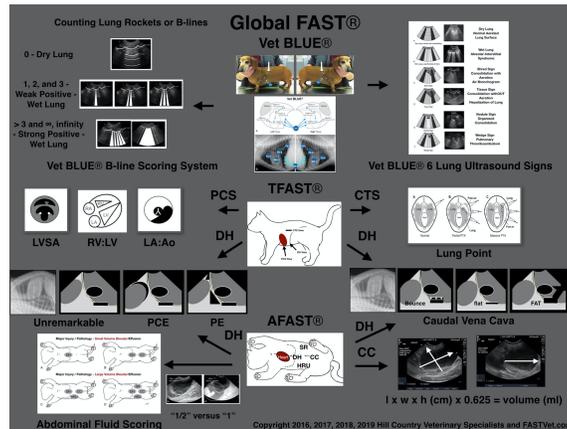


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The Global FAST® Fallback View Strategies for Cardiac Abnormalities

"Global FAST® Non-echo Fallback Views" are hugely impactful for 2 major reasons. **First**, when performing the TFAST® echo views, suspect problems may be double-checked with fallback views. For example, the sonographer thinks that the LA:Ao is increased, then uses Vet BLUE® and finds that the lung is dry (absent B-lines), no evidence of left-sided congestive heart failure, concluding that the case may have left-sided disease, but has no evidence of left-sided congestive heart failure. Conversely, if Vet BLUE® shows wet lung, and its regional, pattern-based approach supports left-sided congestive heart failure (versus pneumonia), then there is an urgency to continue the work-up and treat the patient. The same logic holds for an increased RV:LV, however, the caudal vena cava and its associated hepatic veins are used for assessment, because right-sided congestive heart failure results in hepatic venous congestion and thus at the DH view, a distend caudal vena cava and its associated hepatic veins (Tree Trunk Sign). As for poor volume, the caudal vena cava is also assessed and a flat (small maximum height) cava supports more severe depletion than a caudal vena cava with a bounce. **Second**, the "Global FAST® Non-echo Fallback Views" are used when it's too risky for TFAST® echo views because of patient status, or because they are difficult to image. Dry lung, or absent B-lines on Vet BLUE®, rules out left-sided congestive heart failure; and a "bounce" to the caudal vena cava along with an absence of hepatic venous distension (no Tree Trunk Sign), rules out right-sided congestive heart failure. Typically, these "Global FAST® Non-echo Fallback Views" are easier to acquire in critical patients than the TFAST® echo views.

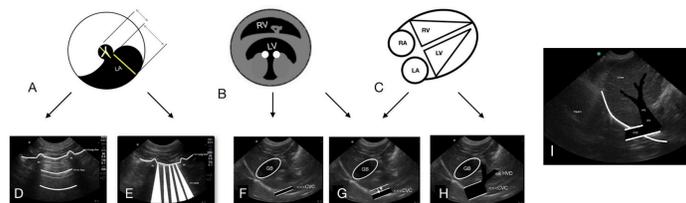


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The Global FAST® Approach for Staging Disease as Localized or Disseminated

The use of the Global FAST® Approach helps determine as a screening test whether disease is localized or disseminating. Knowing this information can not only help streamline the diagnostic plan but also assist with determining possible sites for fluid and tissue sampling for expediting a diagnosis.

Goal-directed Templates for Recording Patient Findings

The use of goal-directed templates is an integral part of gaining valuable patient information and for tracking patients by comparing studies. These are available via the FASTVet.com website - <https://fastvet.com/category/free-resources/>

References & Further Reading

1. Lisciandro GR, Lagutchik MS, Mann KA, et al. Evaluation of an abdominal fluid scoring system determined using abdominal focused assessment with sonography for trauma (AFAST) in 101 dogs with motor vehicle trauma. *J Vet Emerg Crit Care* 2009; 19(5):426-437.
2. Lisciandro GR, Lagutchik MS, Mann KA, et al. Accuracy of Focused Assessment with Sonography for Trauma (TFAST) to detect pneumothorax in 145 dogs with blunt and penetrating trauma. *J Vet Emerg Crit Care* 2008; 18(3):258-269.
3. Lisciandro GR. Focused abdominal (AFAST) and thoracic (TFAST) focused assessment with sonography for trauma, triage and monitoring in small animals. *J Vet Emerg Crit Care* 2011;20(2):104-122.
4. Lisciandro GR. Evaluation of initial and serial combination focused assessment with sonography for trauma (CFAST) examination of the thorax (TFAST) and abdomen (AFAST) with the application of an abdominal fluid scoring system in 49 traumatized cats. *J Vet Emerg Crit Care* 2012;22(2):S11.
5. Lisciandro GR. Lisciandro GR. The use of the diaphragmatico-hepatic (DH) view of the abdominal and thoracic focused ultrasound techniques with sonography for triage (AFAST/TFAST) examinations for the detection of pericardial effusion in 24 dogs (2011-2012). *J Vet Emerg Crit Care* 2016;26(1):125-31.
6. Lisciandro, GR. Alanine aminotransferase level (ALT) as a marker for hemoabdomen detected by abdominal FAST (AFAST) in dogs with automobile trauma. *Abstract. J Vet Emerg Crit Care*, 2014; 24(S1):S11.
7. Hnatusko AI, Gicking JC, Lisciandro GR. Anaphylaxis-related hemoperitoneum in 11 dogs. *J Vet Emerg Crit Care, In Press*, 2020.
8. Lisciandro GR, Fosgate GT, Romero LA, et al. The Expected Frequency and Amount of Free Peritoneal Fluid Estimated Using the Abdominal FAST-applied Abdominal Fluid Scores in Clinically Normal Adult and Juvenile Dogs. *J Vet Emerg Crit Care, In Press*, 2020.
9. Lisciandro GR. Chapter 3: Point-of-care Ultrasound. In: Small Animal Diagnostic Ultrasound, 4th Edition, edited by Mattoon JS, Sellon RK, and Berry CR. Elsevier: St. Louis, MO, *In Press*, 2020.
10. Lisciandro GR. Editor, Point-of-care Ultrasound Techniques for the Small Animal Practitioner, 2nd Edition, Wiley-Blackwell: St. Louis, ©2020.
11. Dicker SA, Lisciandro GR, Newell SM, et al. Diagnosis of pulmonary contusions with point-of-care lung ultrasonography and thoracic radiography compared to thoracic computed tomography in dogs with motor vehicle trauma: 29 cases (2017-2018). *J Vet Emerg Crit Care, In Press*, 2020.
12. Ward JL, Lisciandro GR, Ware WA, Miles KG, DeFrancesco TC. Lung ultrasound findings in 100 dogs with various etiologies of cough. *J Am Vet Med Assoc* 2019;255(5):574-583.
13. Ward JL, Lisciandro GR, DeFrancesco TD. Distribution of alveolar-interstitial syndrome in dogs and cats with respiratory distress assessed with lung ultrasound versus thoracic radiographs. *J Vet Emerg and Crit Care* 2018; 28(5): 415-428.
14. Lisciandro GR, Fosgate GT. Use of AFAST Cysto-Colic View Urinary Bladder Measurements to Estimate Urinary Bladder Volume in Dogs and Cats. *J Vet Emerg Crit Care* 2017;27(6): 713-717.
15. Lisciandro GR, Fulton RM, Fosgate GT, Mann KA. Frequency and number of B-lines using a regionally-based lung ultrasound examination in cats with radiographically normal lung compared to cats with left-sided congestive heart failure. *J Vet Emerg Crit Care* 2017; 27(3):267-277.
16. Ward JL, Lisciandro GR, Tou SP, Keene BW, DeFrancesco TC. Accuracy of point-of-care lung ultrasound (Vet BLUE protocol) for the diagnosis of cardiogenic pulmonary edema in dogs and cats with acute dyspnea. *J Am Vet Assoc* 2017; 250(6):666-675.
17. Lisciandro GR, Fosgate GT, Fulton RM. Frequency of ultrasound lung rockets using a regionally-based lung ultrasound examination named veterinary bedside lung ultrasound exam (Vet BLUE) in 98 dogs with normal thoracic radiographic lung findings. *Vet Rad Ultrasound* 55(3):315-22.