

EVMS- EM Journal Club
 11/29/10
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Bedside Compression US for Lower Extremity DVT by EM Physicians

Clinical Scenario: A 25 y/o patient presents to the ED complaining of pain in the lower extremity after returning from a long car ride with minimal stops. Patient has no antecedent history of DVT or other sig. risk factors and has a [Wells score](#) of 1 (“unlikely”) due to local tenderness in the distribution of the deep venous system. The patients d-dimer is 0.55 and PVL in unavailable until the next morning. A senior resident suggests that you take a look yourself in order to r./o a DVT in the affected extremity. You question whether it is appropriate to proceed w/o getting a formal study and ask if the bedside test is “good enough” to rule out DVT.

Search strategy: DVT, venous thrombosis, lower extremity, emergency department, resident, compression ultrasound, emergency physician,

Article	Patient Group	Study Type	Comp Type	Key Results	Weakness
Johnson, SA, et al. Risk for Deep Vein Thrombosis Following a Single Negative Whole-Leg Compression Ultrasound: A systematic Review and Meta-analysis. <i>JAMA.2010; 303(5):438-445.</i>	7 studies, n=4731; Incl: randomized controlled trials and prospective cohort studies with suspected DVT and neg whole-leg compression u/s, and f/u for 90d; 13.7% had active ca, 15.3% had surgery; most from ambulatory setting;	Meta-analysis	Multiple whole leg (Rad perform)	0.7% death from suspected venous emboli (32.4% distal dvt; 20.6% prox dvt;26.5% PE); withholding anticoagulation following single neg whole leg CUS was associated with low risk of venous thromboembolism during 3 mo f/u	Inpt and outpt included; concern for time, operator variability, availability, training for whole leg CUS; did not assess pretest prob; few preg, post-partum, CA pts; not assess outcomes > 90d; verification bias?
Jang, T, et al. Resident-performed Compression	8 Residents enrolled Convenience sample	Prosp, obs;	Multiple point, every	(11.7 min ave scan time); 23 TP, 4 FP , 45	Convenience sample (selection bias); US interest bias (8 or 48 Residents);

Ultrasonography for the Detection of Proximal Deep Vein Thrombosis: Fast and Accurate. <i>Acad Emerg Med.</i> 2004; 11(3):319-322.	of 72 pts with s/sp prox LE DVT; Excl: prior h/o DVT or known results of recent dx testing for DVT	Urban-Academic single center	2 cm; (1 hr training)	TN, 0 FN; Sens= 100% (95% CI 82.2-100); Spec= 91.8% (95% CI 79.5-97.4)	consistent criterion was not used; ?comprehensive scan with more FP?
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Magazzini, S, et al. Duplex Ultrasound in the Emergency Department for the Diagnostic Management of Clinically Suspected Deep Vein Thrombosis. <i>Acad Emerg Med.</i> 2007; 14:216-220.	Non-consecutive enrollment n=399; Excl: prior dvt	Prosp, obs (Italy)	Whole leg min 9pts (30 hr training and granted certificate)	Sens/spec: 100%/94.9%; overall accuracy 98.7%; PPV 95% (95% CI 92-95); NPV 100% (95% CI 99-100); no normal exams died or had DVT at 1 mo f/u; 75% of scans normal; 23% abnormal; 2% indet: 0.8% (n=3) had dvt; EDUS high NPV and good PPV	No risk stratification; single center; 2 MDs enrolled; lots of training; no comparison with f/u scans; concern for overdx (4.8% with very distal DVT)
Kline, JA, et al. Emergency Clinician-Performed Compression Ultrasonography for Deep Venous Thrombosis of the Lower Extremity. <i>Ann of Emerg Med.</i> 2008; 52:437-445.	N= 183 ; Incl: suspect DVT; Excl: CUE within past 2d; UE/neck dvt suspect; h/o dvt; AKA in symptomatic leg; inability to see all 3 points (cast); homeless/jail due to lack f/u.	Prosp, single center at Urban-Acad	3-point compr	15% with dvt; Sens: 70% (95% CI 60-80); Spec: 89% (95% CI 79-90); pts risk stratified prior with 1.1% +dvt in low risk, and 79% in high. ED exam compared to radiology exam in 30d.	Single center, no required prelim exams for training; did not use venography for reference test; 15% lost to f/u; examiners = clinician pretest risk; non-structured pre-test prob score
McQueen, AS, et al. Ultrasonography for	N= 158; excl: known bilat dvt or cannot tol	Prosp in u/s center	Single point spectral	Calf compression spec /sens 91%/64%;	Used 2 diff probes; no reference with contrast venography; small numbers;

suspected deep vein thrombosis: how useful is single-point augmentation? <i>Clin Rad. 2009; 64:148-155.</i>	compression	(UK)	Doppler +compression of SFV ; used valsalva	distribution of dvt for this study: calf > CFV > SFV > popl; PPV: 47%; NPV: 98%; abnormal valsalva is poor predictor; Good NPV	operator dep calf squeeze
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Crisp, JG, et al. Compression Ultrasonography of the Lower Extremity with Portable Vascular Ultrasonography can Accurately Detect Deep Venous Thrombosis in the Emergency Department. <i>Ann of Emerg Med. 2010;</i>	47 MD's enrolled Convenience sample of 199 ED pts (18 y/o+) with suspected dvt; Excl: known dvt, prev dvt within 6 mo, recent u/s for dvt in past month	Prosp; Urban-Academic single center	2 point (10 min training)	Primary endpoint = dvt ; Secondary= char of dvt: compress, thromb visualization, location dvt; (4 min max time) ; Sens =100% (95% CI 92-100); Spec =99.4% (95% CI 96-100); 1 "FP" with dvt found 1 week later; Cohen's K = 0.99	Convenience sample; did not collect pt demographics; Linear probe (7.5MHz) depth 2 or 4cm, lim contrast or gain; # compress not recorded; Enrolling MDs with financial incentive?; subgroup of "ultrasonographic interest" bias?

Clinical Bottom Line: Based upon current available evidence, two-point bedside US performed by EM physicians appears to have good sensitivity and specificity for diagnosis of proximal lower extremity DVT. Problems with the studies reviewed include a wide variety of prior US "training" which makes it difficult to apply similar results in the hands of inexperienced clinicians. The studies were primarily convenience samples with inherent biases as well as "interest" bias of clinician volunteers.

Cohen's K: statistical measure of inter-rater agreement for qualitative (yes/no- mutually exclusive) measurements; considers agreement by chance; no universal acceptance of what is a good K, however some have published guidelines:

☺ (Landis, Koch): $K < 0$ no agreement, 0-0.2 slight, 0.21-0.4 fair, 0.41-0.6 mod, 0.61-0.8 substantial, 0.81-1 almost perfect

☺ (Fleiss) $K < 0.4$ poor, 0.4-0.75 fair to good, > 0.75 excellent.

# points(ED operator)	N	Sensitivity	Specificity
Multiple/whole leg	72/399	100/100%	91.8/94.9%
3 points	183	78%	89%
2 points	199	100%	99.4%