

## Diagnostic studies data extraction

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<b>Study</b>	<b>Author</b>	Acar J <i>et al.</i> <sup>62</sup>
	<b>Date</b>	1991
	<b>Pathology(ies) for which accuracy measured</b>	Thrombosis, LA thrombi
<b>Population</b>	<b>Population AF</b>	44.9% AF
	<b>Population details</b>	Total of 581 patients who subsequently underwent mitral valve surgery for mitral stenosis
<b>Methods</b>	<b>TTE details</b>	2D TTE, Aloka echocardiograph (Aloka Co., Tokyo, Japan) used for first 276 patients, and a Hewlett-Packard 77020A (Hewlett-Packard Co., Andover, MA, USA) for the last 305 with a 2.5-MHz transducer
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	Surgery
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	Transthoracic 2D echocardiography detected 12 out of 43 thrombi. The sensitivity was 28% and specificity 99%. Sensitivity was 65% (11/17) for LAC thrombi but only 4% (1/26) for LAA thrombi

LAC, left atrial cavity.

<b>Study</b>	<b>Author</b>	Arques <sup>63</sup>
	<b>Date</b>	2005
	<b>Pathology(ies) for which accuracy measured</b>	CHF
<b>Population</b>	<b>Population AF</b>	No history of arrhythmia
	<b>Population details</b>	Twenty chronic hypertensive patients normal with LV ejection fractions who met Vasan's criteria for definite diastolic heart failure, control group of 20 gender- and age-matched hypertensive patients with non-cardiac cause of acute dyspnoea
<b>Methods</b>	<b>TTE details</b>	TTE colour M-mode Doppler [E/Vp index (ratio of peak E mitral velocity to Vp velocity)] tissue Doppler [E/Ea ratio (ratio of peak E mitral velocity to peak Ea velocity by tissue Doppler)]. Aloka SSD 550 PHD ultrasound system (Aloka Co., Tokyo, Japan) with a 2.5-MHz harmonic transducer
	<b>Was TTE the reference/gold standard?</b>	No (clinical diagnostic criteria as reference)
	<b>Diagnostic comparator(s) details</b>	Clinical and radiographic signs of pulmonary congestion, a LV ejection fraction at least 50% on admission, a favourable response to diuretics and nitrates, and an invasive LV end-diastolic pressure of > 15 mmHg
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	19/20 = 95%
	<b>Study results</b>	The colour M-mode Doppler E/Vp index in diagnosing CHF had a sensitivity of 73.7%, a specificity of 75%, and accuracy of 74.3% for the optimal cut-off of 1.5. Showing that tissue Doppler was more reproducible and precise than colour M-mode. The optimal cut-off value was 1.5 for E/Vp ( $n = 39$ ; area under the curve 0.82, 95% CI 0.69 to 0.95, $p = 0.001$ ; sensitivity 73.7%, specificity 75%, accuracy 74.3%)

<b>Study</b>	<b>Author</b>	Attenhofer Jost <sup>64</sup>
	<b>Date</b>	2000
	<b>Pathology(ies) for which accuracy measured</b>	Aortic stenosis, MVP, combined aortic and mitral valve disease, ventricular septal defect (also MR and AR, for which there is higher-level evidence available)
<b>Population</b>	<b>Population AF</b>	NR (all had heart murmur)
	<b>Population details</b>	A total of 100 consecutive patients referred for systolic murmur
<b>Methods</b>	<b>TTE details</b>	TTE 2D and continuous wave Doppler performed using a Hewlett-Packard 2500 (Hewlett-Packard Co., Andover, MA, USA) or Vingmed CFM 800 (GE Vingmed Ultrasound, Horten, Norway) system
	<b>Was TTE the reference/gold standard?</b>	Yes
	<b>Diagnostic comparator(s) details</b>	Clinical cardiac examination
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	TTE as gold standard

NR, not reported.

<b>Study</b>	<b>Author</b>	Barron <i>et al.</i> <sup>65</sup>
	<b>Date</b>	1988
	<b>Pathology(ies) for which accuracy measured</b>	MVP
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	A total of 140 consecutive patients with suspected MVP
<b>Methods</b>	<b>TTE details</b>	2D echocardiography and Doppler studies performed using a Hewlett-Packard 7702A phased-array unit with 2.5- and 3.5-MHz transducers
	<b>Was TTE the reference/gold standard?</b>	No – but data included if echocardiography is assumed standard
	<b>Diagnostic comparator(s) details</b>	Auscultation
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	With auscultation as the reference standard for MVP, 2D echocardiography has a sensitivity of 47% and a specificity of 89%

NR, not reported.

<b>Study</b>	<b>Author</b>	Bova <sup>66</sup>
	<b>Date</b>	2003
	<b>Pathology(ies) for which accuracy measured</b>	PE
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	Consecutive patients referred for PE, or inpatients developing signs of PE = 162 with usable data (from 252 enrolled)
<b>Methods</b>	<b>TTE details</b>	TTE continuous wave Doppler. Echocardiography was performed using a Hewlett-Packard 5500 echocardiograph (Hewlett-Packard Co., Andover, MA, USA) with 2.5-MHz transducer
	<b>Was TTE the reference/gold standard?</b>	No (perfusion lung scan, with back-up angiography where unclear, as reference)
	<b>Diagnostic comparator(s) details</b>	Lung scan angiography, perfusion lung scan
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	97
	<b>Study results</b>	Using RV dilatation provided a very low sensitivity for PE (31%; 95% CI 21% to 41%) and high specificity (94%; 95% CI 89% to 99%). Twenty of 68 (29%) cases of PE were correctly diagnosed. Maximal tricuspid regurgitant velocity had sensitivity and specificity values of 51% (95% CI 38% to 64%) and 88% (95% CI 81% to 95%), respectively, and 17% of patients did not have positive diagnostic results for PE by this criterion. Thus, PE was correctly diagnosed in 28 of 68 patients (41%). Using both criteria gave a 29% (95% CI 19% to 39%) sensitivity and a 96% (95% CI 92% to 100%) specificity; 135 patients had diagnostic results and 16 of 68 patients (23%) with PE were correctly identified. Utilising either criterion yielded a 52% (95% CI 40% to 64%) sensitivity and 87% (95% CI 80% to 95%) specificity. A total of 152 patients had diagnostic results and 34 of the 68 (50%) patients with PE were identified

NR, not reported.

<b>Study</b>	<b>Author</b>	Casella <sup>67</sup>
	<b>Date</b>	2009
	<b>Pathology(ies) for which accuracy measured</b>	Native valve infective endocarditis
<b>Population</b>	<b>Population AF</b>	No AF
	<b>Population details</b>	A total of 75 patients referred to echocardiography centre – suspected endocarditis
<b>Methods</b>	<b>TTE details</b>	Harmonic TTE was performed using a Philips Sonos 2400, 5500, 7500 or iE33 cardiac ultrasound system (Philips Healthcare, Andover, MA, USA), with a 1.3- to 1.5-MHz transducer
	<b>Was TTE the reference/ gold standard?</b>	No (TOE as reference)
	<b>Diagnostic comparator(s) details</b>	TOE
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100 (81.5% good image quality)
	<b>Study results</b>	Of the 75 patients in this study, 33 were found to be positive by TOE. The sensitivity for detection of infective endocarditis by TTE was 81.8%. It provided good image quality in 81.5% of cases; in these patients sensitivity was even greater (89.3%). TPR of TTE was 81.8% (95% CI 64.5% to 93.0%) and TNR was 61.5% (95% CI 44.6% to 76.6%) when indeterminate studies were considered in analysis. As expected, TTE accuracy improved when indeterminate results were excluded. TPR was 87.1% (95% CI 70.2% to 96.4%), whereas TNR was 85.7% (95% CI 67.3% to 96.0%). TPR was different according to native valve involved (86.6% for mitral valve, 71.4% for aortic valve)

TNR, true negative rate; TPR, true positive rate.

<b>Study</b>	<b>Author</b>	Cassidy <sup>68</sup>
	<b>Date</b>	1992
	<b>Pathology(ies) for which accuracy measured</b>	Aortic stenosis (also MR and AR, for which there is higher-level evidence available)
<b>Population</b>	<b>Population AF</b>	NR (systolic murmur)
	<b>Population details</b>	Elderly patients admitted to ward and referred for systolic murmur, 37 with usable echocardiography (out of 41)
<b>Methods</b>	<b>TTE details</b>	TTE, M-mode 2D and Doppler (manufacturer details not reported)
	<b>Was TTE the reference/ gold standard?</b>	Yes
	<b>Diagnostic comparator(s) details</b>	Clinical diagnosis
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	91
	<b>Study results</b>	Forty-one patients were studied in two 6-month periods. Overall, clinical and echocardiography diagnosis agreed in 75% of cases but the clinical diagnosis of aortic stenosis was poor in the initial period. Adapting from the lessons learnt in this initial period in a repeat of the study, the sensitivity of clinical diagnosis of aortic stenosis improved from 0.38 to 0.75

NR, not reported.

<b>Study</b>	<b>Author</b>	Dittmann <sup>69</sup>
	<b>Date</b>	1987
	<b>Pathology(ies) for which accuracy measured</b>	AR in mitral valve disease
<b>Population</b>	<b>Population AF</b>	38% ( <i>n</i> = 21)
	<b>Population details</b>	A total of 55 consecutive patients with aortic and/or mitral valve disease
<b>Methods</b>	<b>TTE details</b>	M-mode echocardiography and pulsed Doppler echocardiography were performed using the Toshiba SSH-40A and the Toshiba SDS-21A (Toshiba Corp., Tokyo, Japan), with an ultrasound frequency of 2.4 MHz. The pulse repetition frequency of the range gated Doppler signal was 4 or 6 KHz, depending on the depth of the sample volume
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	Cardiac catheterisation – supraaortic angiography
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	In 13 of 55 patients (three with mitral stenosis, three with mitral incompetence, three with combined mitral lesions, three with aortic stenosis, one with aortic and mitral stenosis) neither angiography nor PDE showed AR (specificity 100%). Apart from three patients with poor echocardiography quality, PDE correctly detected AR in 39 of 42 patients (sensitivity 93%). Clinical examination (62%), M-mode (62%) and both methods combined (81%) were significantly less sensitive than PDE, especially in mild AR ( <i>p</i> < 0.008). The PDE degree of AR closely correlated with angiography (corrected contingency coefficient 0.91). Differentiation between AR III and IV was not possible [the severity of AR was determined angiographically, graded I (mild) to IV (severe)]. Mitral valve disease did not affect quantification of AR ( <i>n</i> = 20 patients)

PDE, pulsed Doppler echocardiography.

<b>Study</b>	<b>Author</b>	Enia <sup>70</sup>
	<b>Date</b>	1989
	<b>Pathology(ies) for which accuracy measured</b>	Aortic dissection involving the ascending aorta
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	A total of 46 consecutive patients clinically suspected of having aortic dissection. Control group of 509 consecutive unselected patients who underwent both aortography and echocardiography during same period (included valve disease, coronary artery disease, congenital heart disease, cardiomyopathy)
<b>Methods</b>	<b>TTE details</b>	Echocardiography performed using a Picker 80 CI and Aloka SSD-800 (Aloka Co., Tokyo, Japan) echocardiography systems
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	Aortography and clinical signs in a group clinically suspected of having aortic dissection
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	The TTE diagnosis of aortic dissection (using three echocardiography signs) had a sensitivity of 48% and a specificity of 100%. For echocardiography markers individually, aortic root enlargement had a high sensitivity (91%) but a moderate PPV (64%) and efficiency (70%). Aortic wall thickening had lower sensitivity (78%) and higher PPV (75%) and efficiency (76%). Intimal flap had very low sensitivity (56%); its PPV and efficiency were 62% and 6%, respectively

NR, not reported; PPV, positive predictive value.

<b>Study</b>	<b>Author</b>	Erbel <sup>71</sup>
	<b>Date</b>	1984
	<b>Pathology(ies) for which accuracy measured</b>	LV function
<b>Population</b>	<b>Population AF</b>	No AF
	<b>Population details</b>	A total of 110 patients with suspected coronary artery disease, congestive cardiomyopathy and valvular heart disease
<b>Methods</b>	<b>TTE details</b>	2D echocardiography was performed using a Diasonics 3400R real-time, phased-array sector scanner, with a 2.25-MHz transducer
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	Catheterisation – cineventriculograms
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	LV ejection fraction had a sensitivity of 81%, and a specificity of 100%. End-diastolic volume had a sensitivity of 80% and a specificity of 88%. Positive predictive accuracy was 86%, and negative predictive accuracy was 82%. For end-systolic volume, sensitivity was 94% and specificity 85%. For stroke volume, sensitivity was 30%, and specificity 98%

<b>Study</b>	<b>Author</b>	Grossmann <sup>72</sup>
	<b>Date</b>	2002
	<b>Pathology(ies) for which accuracy measured</b>	MR
<b>Population</b>	<b>Population AF</b>	25% AF
	<b>Population details</b>	A total of 68 consecutive patients; 57 with MR diagnosed by TTE or TOE; 11 had no signs of MR by TTE or TOE
<b>Methods</b>	<b>TTE details</b>	Colour Doppler TTE was performed using a Toshiba SSH-160A or SSH-140A (Toshiba Corp., Tokyo, Japan) with a 3.75-MHz transducer
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	TOE, cardiac catheterisation
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	In the 11 patients without MR, no flow convergence region was present during TTE and TOE. Among the 57 patients with MR, a proximal flow convergence region could be imaged in 45 (79%) by TTE vs. 50 (88%) by TOE ( $p = \text{non-significant}$ )

<b>Study</b>	<b>Author</b>	Groves <sup>73</sup>
	<b>Date</b>	2004
	<b>Pathology(ies) for which accuracy measured</b>	Tricuspid regurgitation
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	A total of 86 consecutive patients being investigated for possible pulmonary artery hypertension
<b>Methods</b>	<b>TTE details</b>	TTE (comparator) (manufacturer details not reported)
	<b>Was TTE the reference/gold standard?</b>	Yes for diagnosis (RHC for grading severity)
	<b>Diagnostic comparator(s) details</b>	Multidetector CT, RHC
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	With respect to RHC data, the correlation between severity assessment of tricuspid regurgitation between CT and echocardiography using the Cohen's kappa-weighted coefficient was 0.56 (moderately good agreement), and the correlation between mean pulmonary pressure and tricuspid regurgitation grading on echocardiography was $r = 0.685$ ( $p < 0.001$ ). When using TTE as gold standard, CT assessment of tricuspid regurgitation had a sensitivity of 90.4% and a specificity of 100% in detecting echocardiographic tricuspid regurgitation. For tricuspid regurgitation that was graded as more than trivial by echocardiography, sensitivity of CT was 100%

NR, not reported; RHC, right heart catheterisation.

<b>Study</b>	<b>Author</b>	Guyer <sup>74</sup>
	<b>Date</b>	1984
	<b>Pathology(ies) for which accuracy measured</b>	Rheumatic tricuspid stenosis
<b>Population</b>	<b>Population AF</b>	31/38 = 82%
	<b>Population details</b>	A total of 38 patients with rheumatic valvular disease who had undergone cardiac catheterisation and echocardiography
<b>Methods</b>	<b>TTE details</b>	2D TTE performed using either a Smith Kline Instruments Ekosector 10 or an ATL Mark III scanner (Advanced Technology Laboratories, Bellevue, WA, USA)
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	RHC and LHC
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	Tricuspid stenosis was defined echocardiographically as diastolic anterior leaflet doming, thickening and restricted excursion of the other two tricuspid leaflets, and decreased separation of the leaflet tips. Using these criteria, the sensitivity and specificity of the echocardiogram in detecting tricuspid stenosis were 69% and 96%, respectively, in the group of 38 patients who had both echocardiographic and haemodynamic evaluations. However, when the smaller group of 17 patients who had simultaneous RA and RV pressure recordings were considered separately, there was complete agreement between the echocardiographic and haemodynamic data

LHC, left heart catheterisation; RHC, right heart catheterisation.

<b>Study</b>	<b>Author</b>	Helmcke <sup>75</sup>
	<b>Date</b>	1987
	<b>Pathology(ies) for which accuracy measured</b>	MR
<b>Population</b>	<b>Population AF</b>	31/82 study group = 38%; none of control group (overall 21%)
	<b>Population details</b>	A total of 82 patients with angiographically proven MR. Control group of 65 with normal mitral valvular function
<b>Methods</b>	<b>TTE details</b>	Colour Doppler echocardiography performed using an Irex-Aloka 880 and a 2.5- or 3.5-MHz transducer. Pulse repetition frequencies of 4, 6 or 8 Hz were available. A frequency of 4 Hz was routinely used, which allowed measurement of velocities up to 60 cm/second
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	Cardiac catheterisation/angiography
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	152/160 = 95%
	<b>Study results</b>	Sixty-five patients had no MR by both colour Doppler and angiography and 82 patients had MR by both techniques. Thus the sensitivity and specificity of colour Doppler for the detection of MR was 100%



<b>Study</b>	<b>Author</b>	Jassal <sup>76</sup>
	<b>Date</b>	2007
	<b>Pathology(ies) for which accuracy measured</b>	Endocarditis
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	A total of 36 consecutive inpatients with an intermediate likelihood of endocarditis
<b>Methods</b>	<b>TTE details</b>	Harmonic imaging TTE performed using a Vivid 7 (GE Medical Systems, Milwaukee, WI, USA) and a 1.5- to 1.7-MHz transducer
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	TOE
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	83% diagnostic (17% indeterminate)
	<b>Study results</b>	TTE was diagnostic in 30 individuals (83%); positive in 16 patients and negative in 14 patients using TOE as the reference standard. Six patients (17%) were indeterminate for the detection of vegetations by TTE. By TOE, 19 were positive, 1 was indeterminate, 16 were negative. Calculating sensitivity and specificity without including indeterminate images, the sensitivity of TTE with reference to TOE was 16 out of 19 positive (84%), and the specificity of TTE with reference to TOE was 14 out of 16 (88%)

NR, not reported.

<b>Study</b>	<b>Author</b>	Kaymaz <sup>77</sup>
	<b>Date</b>	2001
	<b>Pathology(ies) for which accuracy measured</b>	Thrombosis, LA thrombi
<b>Population</b>	<b>Population AF</b>	56.3% AF at time of study
	<b>Population details</b>	A total of 474 consecutive patients with rheumatic mitral valve disease
<b>Methods</b>	<b>TTE details</b>	TTE was performed by a Vingmed CFM 800 echocardiography system with a 3.25-MHz transducer
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	TOE
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	Preoperative transthoracic echocardiography diagnosed thrombi in the LA in 34 (32%) of the patients in whom thrombi in the LA or in both LA and LAA were detected intraoperatively. None of the thrombi confined to LAA were visualised by preoperative transthoracic echocardiography. Of the 418 transthoracic echocardiographic examinations considered as negative for thrombi, 347 were TN and 71 were FN. Preoperative transthoracic echocardiographic assessment was FP for thrombi in 22 patients. According to these results, the sensitivity, specificity, PPV, NPV, and the diagnostic accuracy of transthoracic echocardiography were 32%, 94%, 61%, 83% and 80%, respectively

NPV, negative predictive value; PPV, positive predictive value.

<b>Study</b>	<b>Author</b>	Kishon <sup>78</sup>
	<b>Date</b>	1993
	<b>Pathology(ies) for which accuracy measured</b>	VSD and PR, post MI
<b>Population</b>	<b>Population AF</b>	NR (new systolic murmur in 68% VSD and 100% PR)
	<b>Population details</b>	62 patients AMI complicated by rupture of either the ventricular septum (40) or the papillary muscle (22), diagnosis of rupture was confirmed either at operation or at autopsy, an echocardiographic study was performed before surgery or death. All patients were studied by 2D echo, and 26 were studied by Doppler technique, nine were studied by TOE
<b>Methods</b>	<b>TTE details</b>	All patients examined by 2D TTE with wide-angled scanners (mechanical or phased array) with 2.25- or 3.5-MHz transducers (26 patients additionally studied by pulsed wave Doppler and colour Doppler TTE on commercially available systems)
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	TOE, cardiac catheterisation, cases confirmed by operation or autopsy
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100 (6/40 = 15% of VSD images suboptimal, but included in analysis)
	<b>Study results</b>	2D TTE correctly detected 27 of 40 VSD patients (and suspected four more), and 10 of 22 PR patients. Colour Doppler TTE was not available for all participants. Doppler/colour TTE detected 19 out of 20 VSD and 0 out of 6 PR

NR, not reported; PR, papillary muscle rupture; VSD, ventricular septal defect.

<b>Study</b>	<b>Author</b>	Kitayama <sup>79</sup>
	<b>Date</b>	1997
	<b>Pathology(ies) for which accuracy measured</b>	RA thrombi and LA thrombi
<b>Population</b>	<b>Population AF</b>	100% CAF
	<b>Population details</b>	70 consecutive, CAF
<b>Methods</b>	<b>TTE details</b>	TTE M-mode, 2D and pulsed and colour Doppler were performed using a Toshiba Sonolayer SSH-140A with a 2.5- or 3.75-MHz transducer
	<b>Was TTE the reference/gold standard?</b>	No (study says no gold standard)
	<b>Diagnostic comparator(s) details</b>	Cardiac ultrafast CT (unclear time between TTE and CT)
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	90
	<b>Study results</b>	TTE detected 4 out of 6 LA thrombi and 0 out of 5 RA thrombi detected by CT

<b>Study</b>	<b>Author</b>	Lanzarini <sup>80</sup>
	<b>Date</b>	2005
	<b>Pathology(ies) for which accuracy measured</b>	Pulmonary hypertension
<b>Population</b>	<b>Population AF</b>	13% controlled AF
	<b>Population details</b>	A total of 86 consecutive patients with chronic heart failure
<b>Methods</b>	<b>TTE details</b>	TTE standard M-mode, 2D and pulsed and continuous wave Doppler performed using a System Five (GE Vingmed Ultrasound, Horten, Norway) device and a 2.5- to 3.5-MHz phased-array transducer
	<b>Was TTE the reference/ gold standard?</b>	No (cardiac catheterisation as reference)
	<b>Diagnostic comparator(s) details</b>	Cardiac catheterisation as reference
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	The proportion of cases identified correctly as having pulmonary hypertension was highest for PAPs (88%) and mean PAP (85%) in addition to acceleration time of pulmonary artery systolic flow (ACT) (79%) and pulmonary artery diastolic pressure obtained utilising the early phase of the tricuspid regurgitation spectral flow (PAPd/TR) (75%). PAPd/TR performed better in the validating sample in terms of diagnostic ability, with high sensitivity and specificity (100% and 60%) and positive and NPVs (PPV 80%, NPV 100%). PAPs, mean PAP, ACT and PAPd/TR confirmed their prevailing diagnostic ability (A-ROC from 0.74 to 0.86) in identifying pulmonary hypertension with fair to high feasibility (67% to 91%) and an OR indicative of strong association. ACT and PAPd/TR, the two parameters with the highest feasibility, allowed us to identify 46 of 49 (94%) hypertensive cases

ACT, acceleration time of pulmonary artery systolic flow; A-ROC, area under the ROC curve; NPV, negative predictive value; PAP, pulmonary artery pressure; PAPd/TR, pulmonary artery diastolic pressure/early phase tricuspid regurgitation; PAPs, pulmonary artery systolic pressure; PPV, positive predictive value; ROC, receiver operating characteristic.

<b>Study</b>	<b>Author</b>	Maestre <sup>81</sup>
	<b>Date</b>	2009
	<b>Pathology(ies) for which accuracy measured</b>	LV dysfunction, heart failure
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	A total of 216 consecutive patients with a suspected diagnosis of HF. Group 1 = 63 TTE indicated systolic dysfunction. Group 2 = 101 TTE indicated diastolic dysfunction. Group 3 = 52 with normal values on TTE
<b>Methods</b>	<b>TTE details</b>	Mode M and 2D TTE (this was the standard reference comparator) (manufacturer details not reported)
	<b>Was TTE the reference/ gold standard?</b>	Yes
	<b>Diagnostic comparator(s) details</b>	Clinical criteria
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	With TTE as gold standard the Framingham clinical criteria are very sensitive (92%) and moderately specific (79%)

HF, heart failure; NR, not reported.

<b>Study</b>	<b>Author</b>	Mugge <sup>82</sup>
	<b>Date</b>	1995
	<b>Pathology(ies) for which accuracy measured</b>	ASA
<b>Population</b>	<b>Population AF</b>	14.4% in AF
	<b>Population details</b>	A total of 195 patients with ASA diagnosis confirmed by TOE
<b>Methods</b>	<b>TTE details</b>	Colour Doppler TTE (manufacturer details not reported)
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	TOE (colour or contrast TOE) within 24 hours of TTE
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100 (database study, part of inclusion criteria that had to have usable TTE and TOE images)
	<b>Study results</b>	TTE as gold standard. The Framingham clinical criteria are very sensitive (92%) and moderately specific (79%)

ASA, atrial septal aneurysm.

<b>Study</b>	<b>Author</b>	Nienaber <sup>83</sup>
	<b>Date</b>	1993
	<b>Pathology(ies) for which accuracy measured</b>	Thoracic aortic dissection
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	A total of 110 patients with clinically suspected aortic dissection
<b>Methods</b>	<b>TTE details</b>	Colour, Doppler TTE performed using sector scanners (V3400 R CV60, Diasonics Inc., Palo Alto, CA, USA; or Hewlett-Packard 77065 or Hewlett-Packard Sonos 1000, Hewlett-Packard Co., Andover, MA, USA) with 2.25- to 3.5-MHz transducers
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	TOE, CT, MRI, interoperative findings, autopsy or contrast angiography
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	TTE had a sensitivity of 59.3%. The specificity of TTE was 83%

NR, not reported.

<b>Study</b>	<b>Author</b>	Nienaber <sup>84</sup>
	<b>Date</b>	1994
	<b>Pathology(ies) for which accuracy measured</b>	Aortic dissection
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	A total of 35 consecutive patients with suspected dissection of the thoracic aorta
<b>Methods</b>	<b>TTE details</b>	M-mode, 2D and Doppler TTE performed using sector scanners [V3400 R CV60, Hewlett-Packard 77065 equipped with a 77570 Mitsubishi video copy processor (Mitsubishi, Kyoto, Japan) and Hewlett-Packard Sonos 1000] with 2.25- and 3.5-MHz transducers
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	TOE, MRI, gold standard of intraoperative findings ( <i>n</i> = 17), necropsy ( <i>n</i> = 4) or contrast angiography ( <i>n</i> = 22)
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	TTE evaluation identified 20 of 26 patients with confirmed evidence of thoracic aortic dissection and was FN in six patients (two type A and four type B dissections). Moreover, there were three FP findings by TTE resulting in a sensitivity of 76.9%, a specificity of 66.7% and an accuracy of 74.3% for the detection of thoracic aortic dissection irrespective of its location

NR, not reported.

<b>Study</b>	<b>Author</b>	Okura <sup>85</sup>
	<b>Date</b>	2006
	<b>Pathology(ies) for which accuracy measured</b>	Cardiomyopathy
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	A total of 52 consecutive patients (44 with usable data) who presented LV dilatation and diffuse LV systolic dysfunction. Group 1 = 13 patients given the diagnosis of ICM by coronary angiography. Group 2 = 31 non-ICM
<b>Methods</b>	<b>TTE details</b>	TTE 2D and Doppler, with patients in the left lateral decubitus position, using Vivid 7 (GE Medical Systems, Milwaukee, WI, USA) with M3s (1.5–4-MHz) and M7 (12-MHz) phased-array transducer
	<b>Was TTE the reference/gold standard?</b>	Echocardiography markers
	<b>Diagnostic comparator(s) details</b>	Coronary angiogram
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	85
	<b>Study results</b>	Differentiating between ICM and non-ICM, 2D TTE markers peak DSVR less than 1.8 or mean DSVR less than 1.8 had a sensitivity of 77% and a specificity of 77% to differentiate ICM and non-ICM

DSVR, diastolic/systolic velocity ratio; NR, not reported.

<b>Study</b>	<b>Author</b>	Pochis <sup>86</sup>
	<b>Date</b>	1992
	<b>Pathology(ies) for which accuracy measured</b>	Atrial septal hypertrophy
<b>Population</b>	<b>Population AF</b>	53% AF or flutter, or paroxysmal atrial tachycardia
	<b>Population details</b>	A total of 158 consecutive patients referred for TOE, TTE available for 116
<b>Methods</b>	<b>TTE details</b>	TTE and TOE used ultrasound systems Acuson 128XP/10 (Acuson Corp., Mountain View, CA, USA) with a single-plane probe and General Electric RT6800 (General Electric, Milwaukee, WI, USA) with a bi-plane probe
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	TOE
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	107/116 = 92%
	<b>Study results</b>	107 patients had both TTE and TOE. TTE sensitivity 25%, specificity 91%, PPV 18%, NPV 94%

NPV, negative predictive value; PPV, positive predictive value.

<b>Study</b>	<b>Author</b>	Reichek <sup>87</sup>
	<b>Date</b>	1981
	<b>Pathology(ies) for which accuracy measured</b>	LVH
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	34 patients with TTE and ECGs compared with post-mortem data (tested TTE) (study also includes later study testing of ECG with 142 patients, but not of relevance to this review)
<b>Methods</b>	<b>TTE details</b>	M-mode echocardiography performed with a Smith Kline 20A echograph, a Honeywell 1856 recorder and a 2.25-MHz transducer
	<b>Was TTE the reference/gold standard?</b>	No, postmortem as gold standard (but TTE used as gold standard for assessing accuracy of ECG)
	<b>Diagnostic comparator(s) details</b>	ECG, surgical findings, autopsy
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	Echocardiographic LV mass correlated well with postmortem LV weight ( $r = 0.96$ ) and accurately diagnosed LVH (sensitivity 93%, specificity 95%). M-mode echocardiographic LV mass is superior to ECG criteria for clinical diagnosis of LVH

LVH, left ventricular hypertrophy; NR, not reported.

<b>Study</b>	<b>Author</b>	Reichlin <sup>88</sup>
	<b>Date</b>	2004
	<b>Pathology(ies) for which accuracy measured</b>	Valvular heart disease
<b>Population</b>	<b>Population AF</b>	NR (all had heart murmur)
	<b>Population details</b>	203 consecutive patients with systolic murmur, presenting to ED
<b>Methods</b>	<b>TTE details</b>	2-colour Doppler TTE (gold standard comparator) performed using a Toshiba Sonolayer SSH-140A
	<b>Was TTE the reference/gold standard?</b>	Yes
	<b>Diagnostic comparator(s) details</b>	Initial clinical evaluation including auscultation
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	With TTE as gold standard the sensitivity and specificity of the initial clinical routine evaluation in diagnosing echocardiographic valvular heart disease were 82% (70–86%) and 69% (60–76%), respectively

ED, emergency department; NR, not reported.

<b>Study</b>	<b>Author</b>	Roudaut <sup>89</sup>
	<b>Date</b>	1988
	<b>Pathology(ies) for which accuracy measured</b>	Aortic dissection
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	673 patients with clinical suspicion of aortic dissection
<b>Methods</b>	<b>TTE details</b>	2D and M-mode TTE was performed using a Varian V 3000 or a Roche Kontron RT400-phased array sector scanner
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	Angiography, CT, surgery/autopsy
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	90% of aortic dissection group (though poor quality 10% included in sensitivity analysis)
	<b>Study results</b>	Two echocardiographic features were found to support a diagnosis of aortic dissection: a dilatation of at least one segment of the aorta (sensitivity 95%, specificity 51%) and a typical abnormal linear intraluminal echocardiography corresponding to the intimal flap (sensitivity 67%, specificity 100%). These features were found to have a high sensitivity in type I aortic dissection (88%), although in types II and III the sensitivity was much lower. TTE is extremely sensitive in the diagnosis of ascending aortic dissection, but much less so in the diagnosis of descending aortic dissection

NR, not reported.

<b>Study</b>	<b>Author</b>	Saraste <sup>90</sup>
	<b>Date</b>	2005
	<b>Pathology(ies) for which accuracy measured</b>	Coronary artery stenosis
<b>Population</b>	<b>Population AF</b>	4% CAF
	<b>Population details</b>	84 consecutive patients referred for diagnostic coronary angiography because of suggested significant CAD
<b>Methods</b>	<b>TTE details</b>	Ultrasound apparatus Sequoia C 256 (Acuson Corp., Mountain View, CA, USA) and standard 3.5-MHz transducer. Doppler colour mapping with data post-processing mix function. All possible standard and non-standard windows and views, 2D mode image used to identify coronary arteries
	<b>Was TTE the reference/ gold standard?</b>	No (angiography as reference)
	<b>Diagnostic comparator(s) details</b>	Coronary angiography
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	TTE for significant coronary artery stenosis had a sensitivity of 82%, and a specificity of 92%. For proximal artery stenosis the sensitivity was 74%, and the specificity was 90%. For left anterior descending coronary artery stenosis the sensitivity was 73%, and the specificity was 92%. For left circumflex coronary artery stenosis the sensitivity was 38%, and the specificity was 99%. For right coronary artery stenosis the sensitivity was 63%, and the specificity was 96%

CAD, coronary artery disease.

<b>Study</b>	<b>Author</b>	Sharifi <sup>91</sup>
	<b>Date</b>	2007
	<b>Pathology(ies) for which accuracy measured</b>	Atrial thrombi
<b>Population</b>	<b>Population AF</b>	100% AF
	<b>Population details</b>	112 patients with AF (of whom 32 normal TTE, 80 abnormal TTE) of whom 27 had CAF (24%)
<b>Methods</b>	<b>TTE details</b>	TTE performed using a Philips Sonos 5500 system
	<b>Was TTE the reference/ gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	TOE (within 2 months after TTE)
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100 (although patients selected from group with usable TTE)
	<b>Study results</b>	Based on their transthoracic echocardiographic study, they were divided into two groups: Group 1 consisted of patients with a normal transthoracic echocardiogram and Group 2, those with an abnormal study. Results: Thrombi or spontaneous echocardiography contrast were found in 14 of 112 patients (16%). All, however, were detected in Group 2 patients. There was no patient with a normal transthoracic echocardiogram who had thrombus on his/her transoesophageal echocardiogram. Of the six patients with thrombus detected by TOE, only one had thrombus found by TTE, whereas of all 14 patients who had spontaneous echocardiography contrast on TOE, 10 had spontaneous echocardiography contrast on their transthoracic echocardiogram



<b>Study</b>	<b>Author</b>	Sharma <sup>92</sup>
	<b>Date</b>	1992
	<b>Pathology(ies) for which accuracy measured</b>	Atrial septal defect (sinus venosus defect)
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	A total of 53 patients, but eight unusable images; analysed 45 patients with sinus venosus defect, with echocardiographic and catheterisation studies providing a definitive diagnosis
<b>Methods</b>	<b>TTE details</b>	TTE M-mode and cross-sectional using Dasonics 3400R phased array sector scanner for earlier part of study. TTE M-mode and cross-sectional, pulsed and continuous wave Doppler and colour flow mapping using Aloka SSD-730 (Aloka Co., Tokyo, Japan) for later part of study
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	TOE, cineangiography (cardiac catheterisation)
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	TTE correctly detected 28 of 45 confirmed cases. Doppler TTE introduced in later years detected 17 of 26 cases

NR, not reported.

<b>Study</b>	<b>Author</b>	Sheiban <sup>93</sup>
	<b>Date</b>	1987
	<b>Pathology(ies) for which accuracy measured</b>	Intracardiac masses
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	77 patients with suspected intracardiac mass
<b>Methods</b>	<b>TTE details</b>	2D echocardiograph was performed using a wide-angle mechanical sector scanner (Hoffrel-System 202/514 or Dasonics CV 400) with a 3.5-MHz transducer
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	Surgery
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	2D detected intracardiac masses with a sensitivity of 88.2% and a specificity of 95.3%

NR, not reported.

<b>Study</b>	<b>Author</b>	Shively 1991 <sup>94</sup>
	<b>Date</b>	1991
	<b>Pathology(ies) for which accuracy measured</b>	Endocarditis
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	62 patients with 66 episodes of suspected endocarditis
<b>Methods</b>	<b>TTE details</b>	TTE 2D, M-mode and Doppler colour performed using a 77020A system (Hewlett-Packard) with 2.5- and 5-MHz transducers
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	Surgery
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100 (82% good quality image of tricuspid valve, 89% good quality image of mitral valve, 68% good quality image of aortic valve)
	<b>Study results</b>	TTE compared with pathologic or non-echocardiographic data from the subsequent clinical course, sensitivity of 44% and specificity of 98% (also tested TOE which had higher sensitivity 94% and specificity 100%)

NR, not reported.

<b>Study</b>	<b>Author</b>	Shrestha <sup>95</sup>
	<b>Date</b>	1983
	<b>Pathology(ies) for which accuracy measured</b>	LA thrombus (in rheumatic heart disease)
<b>Population</b>	<b>Population AF</b>	NR for whole population, for those with thrombus 45/51 = 88%
	<b>Population details</b>	A total of 293 patients with rheumatic heart disease with LA thrombus confirmed at surgery
<b>Methods</b>	<b>TTE details</b>	2D echocardiography was performed using a Toshiba real-time, phased array sector scanner (Sonolayergraph model SSH-1-A, Toshiba Corp., Tokyo, Japan). The transducer has 32 elements, each with 2.4-MHz frequency
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	Surgery
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	Of the 293 patients, 33 had LA thrombi by 2D echocardiographic criteria. This diagnosis was confirmed at surgery and histopathological study in 30 patients (specificity 98.8%). A thrombus was not found in three patients. In 21 other patients, LA thrombi were present but were not detected by 2D echocardiography (sensitivity 58.8%); 10 of these 21 had thrombi in the LA cavity. In 11 patients, thrombi were located in the LAA, all of which were missed by 2D echocardiography. Excluding these 11 LAA thrombi, the sensitivity of 2D echocardiography for detecting LA cavity thrombi was 75.0%

NR, not reported.

<b>Study</b>	<b>Author</b>	Shub <sup>96</sup>
	<b>Date</b>	1983
	<b>Pathology(ies) for which accuracy measured</b>	Atrial septal defect
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	A total of 154 patients with documented atrial septal defect (by catheter or surgery) with satisfactory echocardiography
<b>Methods</b>	<b>TTE details</b>	TTE 2D, subcostal, was performed using 80° phased-array scanning systems (Varian-Diasonics) with 2.25- and 3.5-MHz transducers and a mechanical sector scanner (Advanced Technology Laboratories, Bellevue, WA, USA) with 3- and 5-MHz transducers
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	Catheterisation or surgery, contrast echocardiography (only for 71 patients)
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	145/154 = 94%
	<b>Study results</b>	TTE successfully diagnosed 93 (89%) of the 105 ostium secundum atrial septal defects, all 32 (100%) ostium primum defects and 7 (44%) of the 16 sinus venosus defects. A defect was not visualised (FN response) in 12 patients (11%) with an ostium secundum defect, and in nine patients (56%) with a sinus venosus defect. Sensitivity for secundum was 89%, for primum was 100% and for sinus venosus defect was 44%. Specificity was not calculable as all patients had confirmed atrial septal defect

NR, not reported.

<b>Study</b>	<b>Author</b>	Shyu <sup>97</sup>
	<b>Date</b>	1992
	<b>Pathology(ies) for which accuracy measured</b>	Ruptured chordae tendineae
<b>Population</b>	<b>Population AF</b>	Some AF
	<b>Population details</b>	Group 1 = 40 adult patients suspected of having a flail mitral valve leaflet with ruptured chordae tendineae who underwent both TTE and TOE before surgery, who went on to undergo surgery Group 2 = 20 control patients with moderate or severe MR and negligible mitral stenosis due to other causes who underwent TTE, TOE and subsequent mitral valve surgery
<b>Methods</b>	<b>TTE details</b>	2D Doppler TTE, Toshiba SSH-65A Aloka 870 ultrasound system (Toshiba Corp., Tokyo, Japan) with 2.5- or 3.75-MHz precordial transducer, in standard parasternal and apical transducer positions. Colour Doppler TTE assessed MR by criteria of Spain <i>et al.</i> <sup>168</sup>
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	TOE (within 2 days of TTE), cardiac catheterisation (most within 1 week of TTE)
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	With reference to cardiac catheterisation, TTE had a sensitivity of 65% and specificity of 90% and NPV of 56% for diagnosis of ruptured chordae tendineae

NPV, negative predictive value.

<b>Study</b>	<b>Author</b>	Smith <sup>98</sup>
	<b>Date</b>	1985
	<b>Pathology(ies) for which accuracy measured</b>	VSR (in patients with AMI)
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	13 patients with ventricular septal rupture
<b>Methods</b>	<b>TTE details</b>	Cross-sectional Doppler echocardiography performed using an IREX system IIIB (Ramsey, NJ, USA) 2D phased array sector scanner with a 2.5-MHz transducer (Ramsey, NJ, USA)
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	Catheterisation or autopsy
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	Using simultaneous cross-sectional echocardiography and Doppler ultrasound detected all 13 cases of VSR, sensitivity 100%. If cross-sectional echocardiography was used alone, 6 of the 13 cases could be visualised

NR, not reported; VSR, ventricular septal rupture.

<b>Study</b>	<b>Author</b>	Sparrow <sup>99</sup>
	<b>Date</b>	2003
	<b>Pathology(ies) for which accuracy measured</b>	LV systolic dysfunction
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	A total of 621 patients prescribed loop diuretics in general practices
<b>Methods</b>	<b>TTE details</b>	TTE using a phased-array sector scanner (Vingmed CFM 700, GE Vingmed Ultrasound, Horten, Norway)
	<b>Was TTE the reference/gold standard?</b>	Yes
	<b>Diagnostic comparator(s) details</b>	Clinical diagnosis made in primary care
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	TTE as gold standard. General practice/clinical diagnoses showed high FP rates. Individual or combinations of clinical features did not accurately predict LV systolic dysfunction

NR, not reported.

<b>Study</b>	<b>Author</b>	Stratton <sup>100</sup>
	<b>Date</b>	1982
	<b>Pathology(ies) for which accuracy measured</b>	LV thrombus
<b>Population</b>	<b>Population AF</b>	Percentage NR but some patients had AF
	<b>Population details</b>	A total of 78 patients with suspected LV thrombus
<b>Methods</b>	<b>TTE details</b>	2D echocardiography performed using either a wide-angle, phased-array sector scanner (Toshiba Corp., Tokyo, Japan; 45 patients) or a wide-angle, mechanical sector scanner (Advanced Technology Laboratories, Bellevue, WA, USA; 33 patients)
	<b>Was TTE the reference/ gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	Surgical findings/indium-111 platelet imaging
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	78/88 = 89%
	<b>Study results</b>	Echocardiogram was positive for thrombus in 22 patients, equivocal in seven and negative in 49. For detection of thrombus, a positive or equivocal echocardiogram had a sensitivity of 95% (21 of 22), a specificity of 86% (48 of 56), and a predictive value of 72% (21 of 29); the predictive value of a negative study was 98% (48 of 49). Considering positive and equivocal studies separately, the predictive value of a positive study was 86% (19 of 22), whereas that of an equivocal study was only 29% (two of seven)

<b>Study</b>	<b>Author</b>	Veyrat <sup>101</sup>
	<b>Date</b>	1983
	<b>Pathology(ies) for which accuracy measured</b>	AR
<b>Population</b>	<b>Population AF</b>	38/95 = 40% overall
	<b>Population details</b>	A total of 83 patients with suspected AR; control group of 12 normal subjects
<b>Methods</b>	<b>TTE details</b>	Pulsed Doppler echocardiography performed using an ATL 851 (Advanced Technology Laboratories, Bellevue, WA, USA) with a pulsed Doppler 3-MHz velocimeter and a 2D 90° wide-angle mechanical sector scan with a single transducer for both techniques
	<b>Was TTE the reference/ gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	Angiography/aortography, some surgical findings
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	A group of 12 normal subjects and 83 patients, including 40 patients with AR proven by aortography, were investigated; 38 patients with AR were diagnosed by Doppler echocardiography (diagnostic sensitivity 95%, specificity 100%)

<b>Study</b>	<b>Author</b>	Vigna <sup>102</sup>
	<b>Date</b>	1993
	<b>Pathology(ies) for which accuracy measured</b>	LA thrombus
<b>Population</b>	<b>Population AF</b>	59% in AF at time of study
	<b>Population details</b>	A total of 59 consecutive non-anticoagulated mitral stenosis patients (35 AF, 24 SR)
<b>Methods</b>	<b>TTE details</b>	TTE colour Doppler performed using an Aloka 870 SDS system (Aloka Co., Tokyo, Japan) and a 2.5- or 3.5-MHz transducer
	<b>Was TTE the reference/ gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	TOE within 24 hours of TTE
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	LA thrombus was found by TTE in four patients (6.7%) and by TOE in 12 (20.3%) ( $p < 0.01$ ). Of the 12 patients with LA thrombus at TOE, 11 were in AF. Thrombus was found in LA body by TTE in four patients (6.7%) and by TOE in nine (15.2%) ( $p =$ non-significant). LAA thrombus was found by TOE in four patients (6.7%) and by TTE in none ( $p < 0.01$ ). One patient had two thrombi: one in the LA body and the other in the LAA

SR, sinus rhythm.

<b>Study</b>	<b>Author</b>	Wong <sup>103</sup>
	<b>Date</b>	1983
	<b>Pathology(ies) for which accuracy measured</b>	Mitral and aortic valve stenosis valvular calcification
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	A total of 81 patients with valvular abnormalities from 113 elderly volunteers (some undergoing cardiac investigations)
<b>Methods</b>	<b>TTE details</b>	2D echocardiography performed using a phased-array system (Varian 3000)
	<b>Was TTE the reference/ gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	35-mm cinefluorograms (radiological)
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	Echocardiographic sensitivity for detecting calcium in both the mitral annulus and aortic valve was 76%; specificity was 89–94%. Detection in the mitral leaflets was low and due to the smallness of the target and high sensitivity of the standard. Thus, an easily performed ultrasonic technique can screen moderate calcification of the mitral annulus and aortic valve with a predictive accuracy of 80%

NR, not reported.

<b>Study</b>	<b>Author</b>	Zanolla <sup>104</sup>
	<b>Date</b>	1982
	<b>Pathology(ies) for which accuracy measured</b>	Mitral stenosis, mitral valve calcification
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	A total of 43 patients with rheumatic disease of the mitral valve by surgery
<b>Methods</b>	<b>TTE details</b>	2D echocardiography was performed using a commercially available 30° mechanical sector scanner (Eko Sector 1, Smith Kline Instruments)
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	Radiography of surgically excised valves
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	There were 14 TPs, 19 TNs, 10 FPs and no FNs for 2D echocardiography, with a sensitivity of 100% and a specificity of 65%. It is concluded that 2D echocardiography is an extremely sensitive method for assessing mitral valve calcification, and is prospectively useful also in planning reconstruction vs. replacement in mitral valve surgery. Nevertheless, the consistent number of FPs affecting 2D echocardiography represents a definite limit to the specificity

NR, not reported.

<b>Study</b>	<b>Author</b>	Zotz <sup>105</sup>
	<b>Date</b>	1993
	<b>Pathology(ies) for which accuracy measured</b>	VSR (in patients with AMI)
<b>Population</b>	<b>Population AF</b>	NR
	<b>Population details</b>	A total of 17 consecutive patients presenting a new systolic murmur after the onset of AMI, caused by a subsequently diagnosed rupture of the interventricular septum
<b>Methods</b>	<b>TTE details</b>	Standard and Colour Doppler TTE, performed immediately after myocardial rupture suspected, ultrasound system Toshiba SSH 160A with 2.5-MHz transducer, standard and unconventional views
	<b>Was TTE the reference/gold standard?</b>	No
	<b>Diagnostic comparator(s) details</b>	Surgery or autopsy, also contrast echocardiography and TOE
<b>Results</b>	<b>Usable TTE (as percentage of those having TTE)</b>	100
	<b>Study results</b>	Conventional TTE identified VSR in 4/17; using unconventional views 12/17; and colour Doppler 15/16

NR, not reported; VSR, ventricular septal rupture.

## Prognostic studies data extraction

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<b>Study</b>	<b>Author</b>	Atrial Fibrillation Investigators <sup>106</sup>
	<b>Date</b>	1998
	<b>Pathology(ies) for which prognosis measured</b>	LV dysfunction, LAD, MVP, MR
<b>Population</b>	<b>Population details</b>	All participants non-valvular AF
<b>Methods</b>	<b>TTE details</b>	TTE 2D, M-mode (manufacturer details not reported)
<b>Results</b>	<b>Results</b>	During a mean follow-up of 1.6 years, 78 ischaemic strokes occurred (annual rate 4.7%). Moderate to severe LV systolic dysfunction shown via 2D echocardiography was a strong independent predictor of stroke (relative risk 2.5; $p = 0.001$ ) in the 1010 patients in whom echocardiographic values for LV function were available. LAD by M-mode echocardiography did not predict stroke (relative risk, 1.02/mm; $p = 0.10$ ). MR or MVP or LV mass were not significantly associated with stroke

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<b>Study</b>	<b>Author</b>	Klem <sup>107</sup>
	<b>Date</b>	2003
	<b>Pathology(ies) for which prognosis measured</b>	Reduced LV function, LAD, valvular abnormality
<b>Population</b>	<b>Population details</b>	A total of 336 patients with non-rheumatic AF and 73 patients with non-rheumatic AF and also diabetes (for both groups, selected from 409 eligible of 474 consecutive patients)
<b>Methods</b>	<b>TTE details</b>	TTE (details in prior publication)
<b>Results</b>	<b>Results</b>	Mean follow-up 115 months (9.6 years). Reduced LV function diabetic HR 1.52 (0.85 to 2.70), $p = 0.1598$ ; non-diabetic HR 2.28 (1.58 to 3.29), $p < 0.0001$ ; LAD diabetic HR 1.01 (0.97 to 1.05), $p = 0.6445$ ; non-diabetic HR 1.06 (1.03 to 1.08), $p < 0.0001$ ; valvular abnormality diabetic HR 2.05 (1.10 to 3.82), $p = 0.0229$ ; non-diabetic HR 1.88 (1.30 to 2.70), $p = 0.0007$

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<b>Study</b>	<b>Author</b>	Miyaska <sup>108</sup>
	<b>Date</b>	2000
	<b>Pathology(ies) for which prognosis measured</b>	MR
<b>Population</b>	<b>Population details</b>	All participants non-rheumatic AF
<b>Methods</b>	<b>TTE details</b>	TTE 2D, M-mode performed by Aloka 870 SSD (Aloka Co., Tokyo, Japan) with a 3.5-MHz transducer
<b>Results</b>	<b>Results</b>	Of 69 patients (30%) with grade 1 MR, and 104 patients (45%) with no MR patients with grade 1 MR had significantly higher prevalence of thromboembolic events (28%) than those with MR grade 2 or higher (8%, $p = 0.006$ ) or those with no MR (11%, $p = 0.007$ ). A history of previous thromboembolic events were compared between 173 patients with grade 1 MR and those with no MR using the logistic regression analysis adjusted for age, sex, administration of warfarin, and presence of hypertension, DM, structural heart disease, enlarged left atrium (>40 mm), CAF, and grade 1 MR. Grade 1 MR (OR 2.689, 95% CI 1.039 to 7.189, $p = 0.0434$ ) and no warfarin administration (OR 0.045, 95% CI 0.002 to 0.242, $p = 0.0036$ ) were significantly associated with the history of thromboembolic events. The presence of mild MR in non-rheumatic AF was associated with higher prevalence of thromboembolic events

<b>Study</b>	<b>Author</b>	Nakagami <sup>109</sup>
	<b>Date</b>	1998
	<b>Pathology(ies) for which prognosis measured</b>	Degree of MR and LAD
<b>Population</b>	<b>Population details</b>	A total of 290 patients with non-rheumatic AF
<b>Methods</b>	<b>TTE details</b>	TTE M-mode, 2D and colour Doppler performed using a Toshiba 160A system (Toshiba Corp., Tokyo, Japan) with a 2.3- or 3.75-MHz transducer
<b>Results</b>	<b>Results</b>	<p>Among these patients, 68 had a stroke during the follow-up (rate of stroke per year of follow-up 3.2%). In 95 patients with LAD of &gt;48 mm, the incidence of stroke (9%) in the severe MR group (moderate or severe, <math>n = 43</math>) was significantly lower than that (25%) of the mild MR group (none, trivial, or mild; <math>n = 52</math>) (<math>\chi^2 = 3.95</math>, <math>p = 0.047</math>). The relative risk of stroke for increase in MR from mild to severe groups, for every 10-mm increment in LA size, for sex, and for every increase of 10 years of age was 0.45 (95% CI 0.20 to 0.97), 1.06 (95% CI 0.75 to 1.49), 0.98 (95% CI 0.55 to 1.72) and 1.33 (95% CI 1.04 to 1.71), respectively</p> <p>Within 7.4 years' follow-up, MR was protective against stroke if LAD was large (<math>\geq 48</math> mm). For LAD of &lt;47 mm, the incidence of stroke had no association with the degree of MR</p> <p>In 95 patients with LAD of <math>\geq 48</math> mm, the incidence of stroke (9%) in the severe MR group (moderate or severe, <math>n = 43</math>) was significantly lower than that (25%) in the mild MR group (none, trivial, or mild, <math>n = 52</math>) (<math>\chi^2 = 3.95</math>, <math>p = 0.047</math>). In other groups with LAD of &lt;47 mm, the incidence of stroke had no association with the degree of MR</p>

<b>Study</b>	<b>Author</b>	The Stroke Prevention in Atrial Fibrillation (SPAF) Investigators <sup>110</sup>
	<b>Date</b>	1992
	<b>Pathology(ies) for which prognosis measured</b>	Mitral annular calcification, severe MR, LV dysfunction and LAD
<b>Population</b>	<b>Population details</b>	A total 568 non-rheumatic AF, inpatient or outpatient, placebo arm of RCT (SPAF study)
<b>Methods</b>	<b>TTE details</b>	M-mode and 2D TTE and Doppler (TTE conducted locally then sent to a central registry, Hennepin County Medical Centre)
<b>Results</b>	<b>Results</b>	Mean 1.3 years' follow-up, risk of ischaemic stroke or thromboembolism, global LV dysfunction RR 2.6, $p = 0.003$ ; LA size, $p = 0.02$ ; LA 2.4 cm/m <sup>2</sup> , RR = 1.6; LA 2.9 cm/m <sup>2</sup> , RR = 2.7

RCT, randomised controlled trial.