Study	Study Design	Patients	Index and Comparator Test Characteristics	Results	Comments/Quality Scoring
Bojovic et al., 2009[46]	**Geographical location:** Boston, MA **Study dates:** NR **Study objectives:** To compare the Visual 3Dx to the standard 12-lead ECG for detection of acute myocardial ischemia (AMI) in 2 clinical models. **Setting:** - ED - Inpatient - Hospital lab **How was coronary artery disease diagnosed?:** NA (this study focuses on ischemia, as diagnosed by ECG and SAECG)	**Sample size:** Study 1: 51 patients and 117 events Study 2: 122 patients **Age:** NR **Sex:** NR **Race/ethnicity:** NR **Comorbidities:** NR **Clinical characteristics of tested patients:** 2 clinical studies: 1) 51 patients undergoing balloon coronary artery occlusion during angioplasty. 2) 122 consecutive patients who: a) presented to the ED with chest discomfort; b) were hospitalized for suspected MI; c) developed elevated troponin I levels; and d) underwent coronary arteriography within 6 hours of admission.	**Index test (ECG-based signal analysis):** - Device name: Visual 3Dx - Manufacturer: - Device type: - Test operator: The device "transforms the ECG input into a time-variable heart vector, and normalizes each lead input to assure equal representation from all cardiac regions." ST magnitude > 0.1mv measured 80 msec after j point was the threshold for abnormal **Comparator/reference test(s):** - Standard ECG - Study 1 used occlusion by angioplasty **Other tests performed (before or after index test):** Angiography, but results not reported	**Study 1:** **1) Number (%) of patients who had index (ECG-based signal analysis) test:** 51 (100%) patients and 117 balloon occlusion events (authors use occlusion events as unit of analysis). 3Dx-Sensitivity 105/117 (not calculable)* ECG-Sensitivity 78/117 (not calculable)* **2) Number (%) of patients who had comparator test(s)**: Standard ECG: 117/117 events (100%) **3) Number (%) of patients diagnosed with <u>acute ischemia</u> based on index test:** NR. Authors interpret findings, relative to standard ECG findings, as such: "The 3Dx showed significantly better sensitivity than the standard ECG for detecting ischemia (90% vs. 67%). The sensitivity advantage was observed in each of the three coronary artery distributions." Study 2 Visual 3Dx Sensitivity 103/122 (84.4%) Specificity – not given ECG Sensitivity 80/122 (65.5%) Specificity – not given	**Comments:** - SAECG was compared to ECG without the use of gold standard. - Ischemia (as diagnosed by SAECG and ECG) is the outcome of interest. - *Study 1 used 51 patients and 117 balloon occlusions – observations not independent so can't calculate a sensitivity **Quality assessment:** Random or consecutive sample: Yes Representative sample: Yes Index test described: Yes Reference test described: Yes Valid reference standard: Yes Blinded reference test: Yes Blinded index test: Yes Absence of verification bias: Yes Absence of incorporation bias: Yes Appropriate analysis: No

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				4) Number (%) of patients diagnosed with coronary artery disease by other means. Not applicable. Only compared ECG with SAECG in patients with known CAD. **Study 2:** **1) Number (%) of patients who had index (ECG-based signal analysis) test:** 122 (100%) **2) Number (%) of patients who had comparator test(s)**: Standard ECG: 122 (100%). Of these, 80 (65.5%) had ECG diagnosis of acute ischemia. **3) Number (%) of patients diagnosed acute ischemia based on index test:** 103 (84.4%). Authors interpret this finding, relative to standard ECG findings, as such: "This represents a 19% absolute percentage gain, and a relative 29% gain in diagnostic sensitivity for the Visual 3Dx ($p<0.01$)." **4) Number (%) of patients diagnosed with coronary artery disease by other means**. Not applicable. Only compared ECG with SAECG in patients with known CAD. **5) Possible to construct 2x2 tables?:** No **6. Other:** Primary outcome of Study 2 was the sensitivity of the first ECG for detection of acute ischemia, defined	

Study	Study Design	Patients	Index and Comparator Test Characteristics	Results	Comments/Quality Scoring
				as ST segment elevation or depression in 2 consecutive leads. Findings broken down by the 3 coronary arteries	
Grube et al., 2008[35]	**Geographical location:** Siegburg, Germany **Study dates:** 2001-2003 **Study objectives:** Compare 3DMP to coronary angiography to evaluate the device's accuracy (and sensitivity and specificity) in detecting hemodynamically relevant CAD. **Setting:** Other: Pts scheduled for angiography **How was coronary artery disease diagnosed?:** Coronary angiography	**Sample size:** 213; 41 excluded for poor ECG tracings (7) or lack of full risk factor information (34) **Analytical sample:** 172 **Age:** - Mean (SD): 63.9 ± 10 - Median: NR - Range: 35-83 **Sex:** - Male: 116 (67%) - Female: 56 (33%) **Race/ethnicity:** NR **Comorbidities:** H/o MI: 36 (17% of 213)) **Clinical characteristics of tested patients:** Convenience sample of 172 patients with h/o coronary revascularization scheduled for coronary angiography. Patients had undergone at least one coronary revascularization	**Index test (ECG-based signal analysis):** - Device name: 3DMP - Manufacturer: Premier Heart, LLC - Device type: SAECG. 2 leads. Generates a severity score from 0-20 that indicates the level of myocardial ischemia (if present) resulting from coronary disease. - Test operator: Trained trial site technician. Locally operated (presumably by any trained technician) and remotely analyzed at a central data facility. **Comparator/reference test(s):** - Cardiac catheterization **Results classified as:** 1) Nonobstructive CAD, or "negative for hemodynamically relevant CAD." 2) Obstructive CAD, or "positive for hemodynamically relevant CAD."	**1) Number (%) of patients who had index (ECG-based signal analysis) test:** 172 (100%) **2) Number (%) of patients who had comparator test(s)**: 172 (100%) had coronary angiography **3) Number (%) of patients diagnosed with coronary artery disease based on index test:** Several different cut-off scores analyzed. With a cut-off score of 4.0, 50 (29%) Dx'd with CAD **4) Number (%) of patients diagnosed with coronary artery disease by other means**: 55 (32%) Dx'd with hemodynamically relevant CAD or graft stenosis by angiography. **5) Possible to construct 2x2 tables?:** Yes **6) Other findings:** The device "accurately identified 50 of 55 (90.9%) patients as having hemodynamically relevant stenosis (sensitivity 90.9%, specificity 103/117, 88.0%)" PPV: 62.7% NPV: 97.8%	**Comments:** Very well-designed and comprehensively reported study. **Quality assessment:** Random or consecutive sample: Yes Representative sample: No (recent revascularization) Index test described: Yes Reference test described: Yes Valid reference standard: Yes Blinded reference test: Yes Blinded index test: Yes Absence of verification bias: Yes Absence of incorporation bias: Yes Appropriate analysis: Yes

Study	Study Design	Patients	Index and Comparator Test Characteristics	Results	Comments/Quality Scoring
		procedure at least 6 weeks prior to scheduled angiography.	**Other tests performed (before or after index test):** None	ROC curve reported to show score of 4 as best threshold; figure confirms Risk and demographic factors in a logistic regression model had lower PPV for coronary stenosis than did 3DMP severity score: OR 2.04 (95% CI: 0.74,5.62) vs. 73.57 (95% CI: 25.10, 215.68). **7) Retest reliability:** Retest reliability was assessed in 38 patients within 4 hr	
Grube et al., 2007[34]	**Geographical location:** Siegburg, Germany **Study dates:** 7/1/01-6/30/03 **Study objectives:** "The present study compared a new computer-enhanced, resting ECG analysis device, 3DMP, to coronary angiography to evaluate the device's accuracy in detecting hemodynamically relevant CAD." **Setting:** - Outpatient /convenience sample **How was coronary artery disease diagnosed?:** Coronary angiography, classified by performing	**Sample size:** 423 (562-17 poor ECG-122 no risk factor info) **Age**: - Mean (SD): 61.4+/-11.1 - Median: - Range: 24-89 - Other: **Sex**: - Male: 258 (61%) - Female: 165 (39%) **Race/ethnicity:** NR, presumably mostly German **Comorbidities:** Arterial HTN (62%) DM (17%) Hyperchol (61%) Smoking (38%) Obesity (43%) Family hx (29%) Peripheral artery dz	**Index test (ECG-based signal analysis):** - Device name: 3DMP - Manufacturer: Premier Heart - Device type: SAECG (resting 2 lead analysis) - Test operator: trial site technician **Threshold for severity score:** ≥ 4.0 **Comparator/reference test(s):** - Cardiac catheterization **Other tests performed (before or after index test):** None	**1) Number (%) of patients who had index (ECG-based signal analysis) test:** 423 (100%) **2) Number (%) of patients who had comparator test(s)**: 423 (100%) had cath, 201 (47.5%) had "hemodynamically relevant coronary stenosis" **3) Number (%) of patients diagnosed with coronary artery disease based on index test:** 179 of 201 (89%) **4) Number (%) of patients diagnosed with coronary artery disease by other means:** 201 (47.5%) also compared to logistic regression model of CAD RF **5) Possible to construct 2x2 tables?:** Sensitivity 179/221 (89.1%) Specificity 180/222 (81.1%) PPV 79% NPV 90%	**Comments:** -Convenience sample -Similar design to Hosokawa et al., 2008[43] **Quality assessment:** Random or consecutive sample: Yes Representative sample: Partial (patients scheduled for cardiac catheterization) Index test described: Yes Reference test described: Yes Valid reference standard: Yes Blinded reference test: Yes Blinded index test: Yes Absence of verification bias: Yes Absence of incorporation bias: Yes Appropriate analysis: Yes

Study	Study Design	Patients	Index and Comparator Test Characteristics	Results	Comments/Quality Scoring
	angiographer and independent cardiologist within 4 wks; if disagreed, discussed until agreed; nonobstruc CAD between 40-70% stenosis obstruc CAD >70$ or >50% in L Main	**Clinical characteristics of tested patients:** -44 pts (10%) had prior MI -no patients had ACS, -no pts had prior revascularization -all pts referred for cor angio for any indication -23 (5.4%) had no risk factors (RF) for CAD -216 (51%) had at least 3 RF for CAD			
Hosokawa et al., 2008[43]	**Geographical location:** Seoul, South Korea; Mount Elizabeth Med Ctr, Singapore; Tokyo, Japan; Mumbai, India; Kuala Lumpur, Malaysia **Study dates:** June 1-Oct 18, 2004 **Study objectives:** "…compared a new computer-enhancing resting ECG analysis device (multiphase functional electromyocardial tomography (mfEMT) with coronary angiography to evaluate the device's accuracy in detecting hemodynamically relevant CAD." **Setting:**	**Sample size:** 189 **Age:** 61.3+/-12.9 21-88 yrs **Sex:** - Male: 132 (70%) - Female: 57 (30%) **Race/ethnicity:** Not given, but all 4 centers in Asia **Comorbidities:** 43 (23%) had PCI at least 6 wks prior to inclusion in study; other comorbidities not provided **Clinical characteristics of tested patients:** Convenience sample at 4 institutions of patients scheduled for	**Index test (ECG-based signal analysis):** - Device name: mfEMT/3DMP - Manufacturer: Premier Heart - Device type: SAECG-two lead - Test operator: **Comparator/reference test(s):** - Standard ECG; referenced against 1978-2000 "data-gathering trials[ref20-21]" - Cardiac catheterization **Other tests performed (before or after index test):** None	**1) Number (%) of patients who had index (ECG-based signal analysis) test:** 189 (100%) **2) Number (%) of patients who had comparator test(s):** 189 (100%) with ECG **3) Number (%) of patients diagnosed with coronary artery disease based on index test:** 73 of 77 (95%) with angiography proven CAD **4) Number (%) of patients diagnosed with coronary artery disease by other means**: 77 of 189 (angiography) **5) Possible to construct 2x2 tables?:** Yes Sensitivity 73/77, 94.8% Specificity48/55, 86.6%	**Comments:** 2 of 3 authors have ties to maker **Quality assessment:** Random or consecutive sample: Yes Representative sample: Partial (patients scheduled for cardiac catheterization) Index test described: Yes Reference test described: Yes Valid reference standard: Yes Blinded reference test: Yes Blinded index test: Yes Absence of verification bias: Yes Absence of incorporation bias: Yes Appropriate analysis: Yes

Study	Study Design	Patients	Index and Comparator Test Characteristics	Results	Comments/Quality Scoring
	- Hospital lab (cath) **How was coronary artery disease diagnosed?:** Patients were referred for angiography for "any indication"; CAD was diagnosed by review of angiography; angiography performed at discretion of attg; angiographer blinded to mfEMTresults; a second independent angiographer verified the findings within 4 wks, and if disagreed, they discussed until agreement reached; nonobstructive CAD ≤ 70% stenosis; mfEMT provides a severity score, 0-20, "where a higher score indicated a higher likelihood of ischemia due to stenosis; ≥ 4.0 was considered indicative of a hemodynamically relevant stenosis > 70%	angiography for any reason; 30 patients excluded from one center "because angiograms were not available for second external review due to unforeseen legal imitations"; 3 patients excluded due to poor ECG; "patient demographics, medical history, and risk factors apart from sex and age were not recorded because they are not required for mfEMT analysis"; "poor tracing" defined in paper (excluded 3 total)			
MeClelland et al., 2003[38]	**Geographical location:** Belfast, Northern	**Sample size:** 103 **Age:**	**Index test (ECG-based signal analysis):** - Device name: PRIME	**1) Number (%) of patients who had index (ECG-based signal analysis) test:**	**Comments:** - Consecutive patients - High probability for acute myocardial

Study	Study Design	Patients	Index and Comparator Test Characteristics	Results	Comments/Quality Scoring
	Ireland **Study dates:** Dec 2001 – April 2002 **Study objectives:** Assess whether an automated body surface algorithm could improve detection of acute myocardial infarction compared with 12-lead ECG **Setting:** - Other: "presented to cardiology department via ED or mobile CCU" **How was coronary artery disease diagnosed?:** AMI by acute CP >20 minutes & cardiac troponin I >1 ug/L and/or CK-MB >25 U/L	- Mean (SD): 63.6 (12) **Sex:** - Male: 76 (74%) - Female: 27 (26%) **Race/ethnicity:** NR **Comorbidities:** Smoker: 50 (49%) DM 18 (18%) HTN 41 (40%) Prior AMI or angina pectoris: 42 (41%) **Clinical characteristics of tested patients**: Ischemic type chest pain <12 hours with or w/o ST changes. Excluded patients given fibrinolytics, GP IIb/IIIa receptor antagonists, or nitrates prior to ECG or BSM	ECG - Manufacturer: Meridian Medical Technologies - Device type: Body surface mapping - Test operator: "technician" **Comparator/reference test(s):** - Standard ECG - Other: AMI by acute CP >20 minutes & cardiac troponin I >1 ug/L and/or CK-MB >25 U/L **Other tests performed (before or after index test):** None	103 (100%) **2) Number (%) of patients who had comparator test(s):** 103 (100%) with ECG **3) Number (%) of patients diagnosed with coronary artery disease based on index test:** 53 with AMI **4) Number (%) of patients diagnosed with coronary artery disease by other means:** NA **5) Possible to construct 2x2 tables?:** Yes BSM: 34/53 with AMI ; 64% sensitive x/50 without AMI = 94% specific ECG: 17/53 with AMI = 32% sensitive 49/50 without AMI = 98% specific BSM detected AMI in all patients detected by ECG (n=17) or physician diagnosis (n=20; overlap uncertain). BSM improved sensitivity by 2% compared to ECG and 1.4% compared to physician diagnosis Of the 17 patients diagnosed by BSM and missed by ECG, 3 had anterior MI, 7 inferior MI, 7 posterior MI. Of the 10 patients diagnosed by BSM and missed by physician, 4 had inferior MI and 6 had posterior MI.	ischemia - No data given for outcome of CAD, only for ischemia - Algorithm for abnormal BSM appears to be prespecified **Quality assessment:** Random or consecutive sample: Yes Representative sample: Yes Index test described: Yes Reference test described: Yes Valid reference standard: Yes Blinded reference test: Yes Blinded index test: Yes Absence of verification bias: Yes Absence of incorporation bias: Yes Appropriate analysis: Yes

Study	Study Design	Patients	Index and Comparator Test Characteristics	Results	Comments/Quality Scoring
Menown et al., 2001[37]	**Geographical location:** NR, presumably Belfast, NI **Study dates:** NR, presumably prior to 2001, over a 17 mo period **Study objectives:** "The aim of this study was to test the hypothesis that , when compared with the 12-lead ECG, body surface mapping would improve early detection of acute myocardial infarction in patients with ST depression only on the initial 12-lead ECG either by (1) enabling the spatial detection of ST elevation, should it occur outside the conventional precordial leads; and/or enabling full spatial evaluation of multiple QRST variables" **Setting:** - ED - Hospital lab - Other: CCU **How was coronary artery disease diagnosed?:** AMI defined by presence of acute chest pain of >20 min duration, elevation of CK more than twice	**Sample size:** 54, divided into training set (30) and validation set **Age:** (Training set) - Mean (SD): 66.3 +/- 12 **Sex:** - Male: 23 (77%) - Female: 7 (23%) **Race/ethnicity:** NR **Comorbidities:** (Training set) Fam His 15 (50%) Smoking 15 (50%) Diabetes 5 (17%) Hypertension 8 (27%) Hyperlipidemia (12 (40%) Previous angina 19 (63%) Previous MI 16 (53%) Median time from pain to BSM 3.9 hours **Clinical characteristics of tested patients:** Inclusion criteria:1) onset of CP within previous 24 h, 2) presence of ≥ 1mm ST dep in 1 or more leads, 80 ms after the J point, without coexisting ST elev. Exclusion criteria: ST elv, LBBB, LVH	**Index test (ECG-based signal analysis):** - Device name: PRIME ECG - Manufacturer: Meridian Technologies - Device type: Body surface mapping (80leads) - Test operator: NR **Comparator/reference test(s):** - Standard ECG - Other: cardiac biomarkers **Other tests performed (before or after index test):** None	**1) Number (%) of patients who had index (ECG-based signal analysis) test:** 100% **2) Number (%) of patients who had comparator test(s)**: 100% (ECG and biomarkers) **3) Number (%) of patients diagnosed with coronary artery disease based on index test:** 16/30 in training set had AMI; 8/24 in validation set; so 24 out of 54 total: 61% were correctly classified via univariate prediction based on ST elev outside of the standard precordial leads, 74% by the multivariate analysis (3 variables) **4) Number (%) of patients diagnosed with coronary artery disease by other means:** univariate 12-lead ECG (ST dep >=2mm): 68%; multivariate ECG model (6 variables involving degree of ST dep): 67% **5) Possible to construct 2x2 tables?:** Sensitivity (all patients) 71% univariate, 75% multivariate; Specificity (all patients) 53% univariate, 73% multivariate	**Comments:** - Multivariate model (3 variables), not spatial detection of ST elev outside conventional 12 leads, was better than standard 12-lead ECG - Why exclude LVH- might miss large numbers of intermediate risk pts - 3.9 hours long time - N is small (too few cases for the modeling approach) **Quality assessment:** Random or consecutive sample: Yes Representative sample: Partial (excluded patients with bundle branch block) Index test described: Yes Reference test described: Yes Valid reference standard: Yes Blinded reference test: Yes Blinded index test: Yes Absence of verification bias: Yes Absence of incorporation bias: Yes Appropriate analysis: Yes

Study	Study Design	Patients	Index and Comparator Test Characteristics	Results	Comments/Quality Scoring
	the upper limit of normal	BSM's created on first presentation to the hospital			
Menown et al., 1998[36]	**Geographical location:** Belfast, Northern Ireland **Study dates:** NR, pre 1998 **Study objectives:** "It has been suggested that body-surface mapping (BSM) may be useful in patients presenting with nondiagnositc ECGS, as it enables electrocardiographic sampling in areas of the thoracic surface outside the area covered by the six conventional precordial leads…We thus evaluated the mapping system in patients with symptoms suggestive of AMI, including patients presenting with nondiagnostic ECG changes." **Setting:** - ED - Hospital lab - Other: CCU **How was coronary artery disease diagnosed:**	**Sample size:** Training set (T) 384, Validation set (V) 376 **Age:** - Mean (SD): 59.3+/-14 (T); 60.6 +/- 13 (V) **Sex :** - Male: 69% (T); 70% (V) - Female: 31% (T); 30 % (V) **Race/ethnicity:** NR **Comorbidities:** FHx 55% (T), 54% (V) Smoking 50%, 53% Diabetes 8%, 12% Hypertension 30%, 32% Hyperlipidemia 23%, 27% Previous angina 35%, 40% Previous MI 30%, 32% **Clinical characteristics of tested patients:** 635 pts with chest pain suggestive of AMI with *325* pos for AMI and *310* "abnormal ECG but not AMI" plus 125 controls without chest	**Index test (ECG-based signal analysis):** - Device name: NR - Manufacturer: ?self made - Device type: Body surface mapping - Test operator: **Comparator/reference test(s):** - Standard ECG - Cardiac catheterization "when available"- #s NR - Echocardiogram- "when available - Other: cardiac biomarkers **Other tests performed (before or after index test):** None	**1) Number (%) of patients who had index (ECG-based signal analysis) test:** 50% **2) Number (%) of patients who had comparator test(s):** 100% **3) Number (%) of patients diagnosed with coronary artery disease based on index test:** 325/760 (43%) **4) Number (%) of patients diagnosed with coronary artery disease by other means**: NR **5) Possible to construct 2x2 tables?:** Stage 1: (92%) specificity, (98%) sensitivity (T); 77.4% spec, 96% sens (V) Stage 2: : 86% spec, 80% sens (T); 131/154 (85%) spec, 123/160 (77%) sens (V) Combo of Stage 1+2: 0% sens, 84% spec (T); 82% spec, 74% sens (V)	**Comments:** - Consecutive sample **Quality assessment:** Random or consecutive sample: No (controls from epidemiologic study) Representative sample: Partial (controls without chest pain) Index test described: Yes Reference test described: No (biomarker not specified) Valid reference standard: No (biomarkers not specified) Blinded reference test: Yes Blinded index test: Yes Absence of verification bias: No (not all had biomarkers) Absence of incorporation bias: Yes Appropriate analysis: Yes

Study	Study Design	Patients	Index and Comparator Test Characteristics	Results	Comments/Quality Scoring
	Used WHO criteria to define AMI	pain; QRS and ST-T isointegrals (integration of the ECG signal from each electrode) and variables were derived to create map; the total 760 subjects were randomly assigned to the training set and validation set; multiple logistic regression was used to identify which variables best discriminated the groups; Stage 1 regression analysis was comparing the 635 pts vs the 125 controls; Stage 2 compared the 325 vs 310			
Navarro et al., 2003[39]	**Geographical location**: Belfast, Northern Ireland **Study dates:** NR **Study objectives:** To determine whether epicardial potentials using a general thoracic volume conductor model to improves detection of acute MI compared to body surface potentials and standard ECG **Setting:** - Other: cardiology department	**Sample size:** 379 **Age:** NR **Sex:** NR **Race/ethnicity:** NR **Comorbidities:** NR **Clinical characteristics of tested patients:** Consecutive patients presenting to the cardiology department via the ED or mobile CCU. Initial 12-lead ECG and 80-lead ECG prior to treatment and with CK	**Index test (ECG-based signal analysis):** - Device name: PRIME ECG - Manufacturer: Merian Medical Technologies, Belfast - Device type: Body surface mapping - Test operator: "Trained cardiac technicians" **Comparator/reference test(s):** - Standard ECG - Body surface potentials using body surface mapping - Other: Acute MI based on CK twice the upper	**1) Number (%) of patients who had index (ECG-based signal analysis) test:** 379 **2) Number (%) of patients who had comparator test(s)**: 379 **3) Number (%) of patients diagnosed with coronary artery disease based on index test:** 171 with acute MI; CAD not diagnosed **4) Number (%) of patients diagnosed with coronary artery disease by other means**: NA **5) Possible to construct 2x2**	**Comments:** - Consecutive patients - Threshold for abnormal epicardial potential was based on a subset of the study population (would increase sensitivity/specificity) - Appear very high risk for CAD, given that about 50% had acute MI **Quality assessment:** Random or consecutive sample: Yes Representative sample: Yes Index test described: Yes Reference test described: Yes Valid reference standard: No (single biomarker) Blinded reference test: Yes Blinded index test: Yes Absence of verification bias: Yes Absence of incorporation bias: Yes Appropriate analysis: Yes

Study	Study Design	Patients	Index and Comparator Test Characteristics	Results	Comments/Quality Scoring
		and/or CK-MB drawn 12 hours after sx onset. Excluded if presenting >12 hours after sx onset, had received tx (fibrinolytic, GP IIb/IIIa antagonist or nitrate) prior to ECG recording.	limit of normal, with CK-MB >= 7% of total CK **Other tests performed (before or after index test):** None	**tables?:** Yes BSM with body surface potential: Sensitivity: 106/171 (62%) Specificity: 166/208 (80%) BSM with epicardial potential Sensitivity: 133/171 (78%) Specificity: 166/208 (80%) ECG (physician interpretation): Sensitivity: 93/171 (54%) Specificity: x/208 (97%)	
Owens et al., 2008[41]	**Geographical location:** Belfast, Northern Ireland **Study dates:** Jan 2002 – June 2004 **Study objectives:** Threefold: 1) quantify performance of 12-lead ECG for acute MI, 2) ask whether additional QRST variables improve diagnostic performance, 3) compare diagnostic capability of 12-lead ECG to BSM **Setting:** - ED - Hospital - Other: mobile CCU **How was coronary artery disease diagnosed?:** CAD not diagnosed.	**Sample size:** 755 **Age:** - Mean (SD): 65 (12) AMI; 60 (12) nonAMI **Sex:** - Male: 528 - Female: 227 **Race/ethnicity: NR** **Comorbidities:** HTN 308 (40.8%) Current smoker: 259 (34.3%) DM: 110 (14.6%) Previous MI: 295 (39.1%) Previous angina pectoris: 396 (52.5%) Previous PCI: 168 (22.3%) **Clinical characteristics of tested patients:** Presented to mobile	**Index test (ECG-based signal analysis):** - Device name: Appears to be PRIME ECG - Manufacturer: NG - Device type: Body surface mapping - Test operator: NR Abnormal values for ST elevation on the ST) isopotential map were: >=2 for anterior territory; >=1mm in lateral, inferior, right ventricular and high right anterior territory; >=0.5mm in the posterior territory **Comparator/reference test(s):** - Standard ECG - Other: Acute MI diagnosed by cardiac troponin T or I increases of >=	**1) Number (%) of patients who had index (ECG-based signal analysis) test:** **2) Number (%) of patients who had comparator test(s)**: 519 with AMI by troponin + 10 with ST elevation/LVH/early repolarization – with “evolutionary changes” but negative troponin = 529 total classified as AMI **3) Number (%) of patients diagnosed with coronary artery disease based on index test:** 420 **4) Number (%) of patients diagnosed with coronary artery disease by other means**: As above **5) Possible to construct 2x2 tables?:** Yes BSM Sensitivity: 402/529 (76%) Specificity: 208/226 (92%)	**Comments:** - 1022 patients analyzed; 755 met eligibility criteria - High risk group – 70% had AMI **Quality assessment:** Random or consecutive sample: Yes Representative sample: Yes Index test described: Yes Reference test described: Yes Valid reference standard: No (uncertain biomarkers) Blinded reference test: Yes Blinded index test: Yes Absence of verification bias: Yes Absence of incorporation bias: Yes Appropriate analysis: Partial (no validation set)

Study	Study Design	Patients	Index and Comparator Test Characteristics	Results	Comments/Quality Scoring
	Acute MI diagnosed by cardiac troponin T or I increases of >= 0.1ng/ml	CCU (n=347), ED or "other medical wards to our unit" Ischemic type chest pain of <12 h duration Excluded if: pain < 20 minutes; transferred from other hospitals; treated with fibrinolytics, nitrates or GP IIb/IIIa inhibitors prior to 12 lead ECG or BSM Could not give informed consent Has BSM > 15 minutes after initial 12 lead ECG.	0.1ng/ml **Other tests performed (before or after index test):** None	Excluding subjects with LVH, LBBB, early repolarization or findings of pericarditis (755-123=632) sensitivity (76%) and specificity (93%) were not significantly changed 12-lead ECG using ACC/ESC criteria: Sensitivity: 238/291 (49%) Specificity: 208/226 (92%)	
Owens et al., 2004[40]	**Geographical location:** Belfast, Northern Ireland **Study dates:** January 2002 – January 2004 **Study objectives:** Compare the 12-lead ECG with the body surface map in the diagnosis of acute MI **Setting:** - Other: Mobile coronary care unit **How was coronary artery disease diagnosed?:** CAD not diagnosed.	**Sample size:** 294 **Age:** - Mean (SD): 62 (12) **Sex:** - Male: 209 (71%) - Female: 85 (29%) **Race/ethnicity:** NR **Comorbidities:** h/o HTN 122 (42%) smoker 97 (33%) DM 44 (15%) **Clinical characteristics of tested patients:** Ischemic type chest pain of <12 hours duration Excluded if pain < 20	**Index test (ECG-based signal analysis):** - Device name: Prime Analysis software - Manufacturer: Meridian Technologies, Belfast - Device type: Body surface mapping - Test operator: Cardiac technicians Abnormal BSM defined by ST0 (j point) maxima, ST 60 minima and vector magnitude **Comparator/reference test(s):** - Standard ECG - Acute MI by cTnt > 0.09 ng/mL or cTnI > 0.1 ng/ml- None	**1) Number (%) of patients who had index (ECG-based signal analysis) test:** 294 **2) Number (%) of patients who had comparator test(s)**: 294 biomarkers **3) Number (%) of patients diagnosed with coronary artery disease based on index test:** **4) Number (%) of patients diagnosed with coronary artery disease by other means**: Acute MI 182 by biomarkers Acute MI 103 by ECG Acute MI 146 by BSM **5) Possible to construct 2x2 tables?:** ECG – Minnesota ST elevation: sensitivity 103/182 (57%), specificity	**Comments:** - Recruited consecutively - Maps with > 6 "bad leads" were disregarded - Unclear if abnormal thresholds set a priori **Quality assessment:** Random or consecutive sample: Yes Representative sample: Yes Index test described: Yes Reference test described: Yes Valid reference standard: Yes Blinded reference test: Yes Blinded index test: Yes Absence of verification bias: Yes Absence of incorporation bias: Yes Appropriate analysis: Partial (no validation set)

Study	Study Design	Patients	Index and Comparator Test Characteristics	Results	Comments/Quality Scoring
	Acute MI diagnosed by cardiac troponin T or I increases of >= 0.1ng/ml	minutes, had received fibrinolytic therapy, nitrates or GP IIb/IIIa inhibitors prior to initial ECG or BSM, could not give informed consent or BSM >15 minutes after the 12-lead ECG	**Other tests performed (before or after index test):** None	105/112 (94%), c statistic 0.73 BSM ST0 criteria: sensitivity 146/182 (80%), specificity 103/112 (92%), c statistic 0.86 By region, BSM more sensitive to posterior and high right anterior acute MI	
Solomon and Tracy, 1991[47]	**Geographical location:** Washington, DC (Georgetown University) **Study dates:** NR **Study objectives:** Hypothesis: "chronic intermittent ischemia, as occurs in chronic stable angina, damages areas of myocardium such that electrical activity is slowed, and the SAECG from patients with CAD will differ from its appearance in those without CAD. Herein we report a prospective study utilizing SAECG as a noninvasive tool in the evaluation of patients for the presence of significant CAD." **Setting:** - Hospital lab **How was coronary**	**Sample size:** 40 (with an additional 13 patients to identify SAECG parameters to differentiate patients with and w/o CAD) **Age:** - Mean: 56 ± 11 - Range: 27 - 69 **Sex:** - Male: 29 (73%) - Female: 11 (27%) **Race/ethnicity:** NR **Comorbidities:** NR **Clinical characteristics of tested patients:** 40 consecutive patients without known CAD and with chest pain of undetermined etiology referred for cardiac catheterization **Indications for**	**Index test (ECG-based signal analysis):** - Device name: Predictor - Manufacturer: Corazonix, Oklahoma City, OK - Device type: SAECG - Test operator: NR **Comparator/reference test(s):** - Cardiac catheterization **Other tests performed (before or after index test):** ETT performed in 28 of the 40 patients (positive ETT in 18 patients, negative in 8, and indeterminate in 2). 12-lead ECG in all 40 patients. Threshold for positive SAECG result defined *a priori*: QRS threshold: ≥ 100 msec.	**1) Number (%) of patients who had index (ECG-based signal analysis) test:** 40 (100%) **2) Number (%) of patients who had comparator test(s)**: Catheterization: 40 (100%) 12-lead ECG: 40 (100%) **3) Number (%) of patients diagnosed with coronary artery disease based on index test:** QRS parameter 15 (37.5%) with positive SAECG. 13 of these had CAD on catheterization, and 2 did not have CAD on catheterization. RMS parameter 21 (52.5%) with positive SAECG. 16 of these had CAD on catheterization, and 5 did not have CAD on catheterization. LAS parameter 20 (50%) with positive SAECG. 15 of these had CAD on catheterization, and 5 did not have CAD on catheterization. **4) Number (%) of patients**	**Comments:** Exceptionally well designed, executed, and reported study. A separate patient sample (n=13) was used to identify (and subsequently test) parameters that might differentiate patients with and w/o CAD by SAECG. **Quality assessment:** Random or consecutive sample: Yes Representative sample: Partial (patients scheduled for cardiac catheterization) Index test described: Yes Reference test described: Yes Valid reference standard: Yes Blinded reference test: Yes Blinded index test: Yes Absence of verification bias: Yes Absence of incorporation bias: Yes Appropriate analysis: Yes

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	artery disease diagnosed?:	**catheterization:** new chest pain syndrome (n=37) or asymptomatic positive ETT (n=3) Exclusions: 1) known h/o of CAD 2) h/o of MI 3) h/o of VT 4) h/o of cardiac arrest 5) h/o of congestive heart failure 6) valvular heart disease 7) bundle branch block	RMS voltages: < 50 microV LAS threshold: > 28 msec	**diagnosed with coronary artery disease by other means**. Catheterization findings: 19 patients had no significant CAD, and 21 had significant stenosis (1-vessel disease in 3, 2-vessel disease in 6, and 3-vessel disease in 12). 8 patients had regional hypokinesis. All had EF > 45%, and no patients had akinesis or dyskinesis. **5) Possible to construct 2x2 tables?:** Yes. QRS parameter Sensitivity: 13/21, 62% Specificity: 17,19, 89% PPV: 87% RMS parameter Sensitivity: 76% Specificity: 74% PPV: 75% LAS parameter Sensitivity: 71% Specificity: 74% PPV: 75% With requirement that all three parameters be present: Specificity: 95% PPV: 92% **6) Other:** Patients with CAD had significantly longer filtered QRS and LAS durations and lower root mean square voltages compared with patients w/o CAD. "The SAECG may be a useful tool in evaluating patients for the presence of CAD."	

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				Comparison with 12-lead ECG 26 of 40 (65%) had normal ECG. SAECG was normal in 11 of these 26. CAD was present in 2 and absent in 9 (by catheterization). In patients with normal ECG and SAECG, 9 of 11 (81%) had no significant CAD. Of the 14 patients with abnormal ECG, all had nonspecific ST and wave abnormalities, and none were diagnostic of ischemia. In patients with abnormal ECG and SAECG, 7 or 10 (70%) had CAD.	
Strobeck et al., 2009[48]	**Geographical location:** US (n=136) Germany (n=751) Asia (n=189) 7 medical centers. **Study dates:** NR **Study objectives:** "To assess sensitivity and specificity of the 3DMP for the detection of relevant coronary stenosis (>70%)" Meta-analysis of 3 published trials. **Setting:** - Other: Pts scheduled for angiography **How was coronary artery disease diagnosed?:** Coronary angiography	**Sample size:** 1076 **Age:** - Mean (SD): 62 ±11.5 **Sex:** - Male: 686 (64%) - Female: 390 (36%) **Race/ethnicity:** NR **Comorbidities:** 249 had either PTCA or CABG 6 or more weeks before enrollment. **Clinical characteristics of tested patients:** Convenience sample of patients in participating medical centers who were already scheduled for coronary angiography for any indication.	**Index test (ECG-based signal analysis):** - Device name: 3DMP - Manufacturer: Premier Heart, LLC - Device type: SAECG. 2 leads. Generates a severity score from 0-20 that indicates the level of myocardial ischemia (if present) resulting from coronary disease. - Test operator: trained trial site technician. Locally operated (presumably by any trained technician) and remotely analyzed at a central data facility. **Comparator/reference test(s):** - Cardiac catheterization	**1) Number (%) of patients who had index (ECG-based signal analysis) test:** 1076 (100%) **2) Number (%) of patients who had comparator test(s):** 1076 (100%) **3) Number (%) of patients diagnosed with coronary artery disease based on index test:** 467 **4) Number (%) of patients diagnosed with coronary artery disease by other means:** 467 (43%) Dx'd with hemodynamically relevant CAD by angiography **5) Possible to construct 2x2 tables?:** Yes **6) Other** With a cut-off score of 4.0, the device	**Comments:** Meta-analysis. Duplicate data but unclear which published studies comprise the 3 samples. Excellent study. **Quality assessment:** Random or consecutive sample: Yes Representative sample: Partial (patients scheduled for cardiac catheterization) Index test described: Yes Reference test described: Yes Valid reference standard: Yes Blinded reference test: Yes Blinded index test: Yes Absence of verification bias: Yes Absence of incorporation bias: Yes Appropriate analysis: Yes

Study	Study Design	Patients	Index and Comparator Test Characteristics	Results	Comments/Quality Scoring
		This population had a demonstrated pretest risk of disease from 27.7% to 43.4%. Excluded from analysis: 30 due to angiogram results not available, and 84 due to inadequate 3DMP tracings.	Results classified as: 1) Nonobstructive CAD, or "negative for hemodynamically relevant CAD." 2) Obstructive CAD, or "positive for hemodynamically relevant CAD." **Other tests performed (before or after index test):** None	correctly classified 941 of the 1076 patients with or without relevant stenosis. Sensitivity: 91.2% Specificity: 84.6% PPV: 0.777 (Bayes Corrected) NPV: 0.942 (Bayes Corrected) Adjusted PPV: 81.9% Adjusted NPV: 92.6% ROC AUC = 0.881 (95% CI: 0.860, 0.903) Subgroup analysis showed no significant influence of sex, age, race/nationality, previous revascularization procedures, ECG morphology, or participating center on device's diagnostic performance.	
Weiss et al., 2002[42]	**Geographical location:** Valhalla, NY **Study dates:** NR **Study objectives:** To compare the 3DMP to coronary angiograms **Setting:** -Outpatient **How was coronary artery disease diagnosed?:** Coronary angiography; nonobstructive CAD=40-69% stenosis, obstructive CAD=71-100% or left main of >=50%; normal=<40%	**Sample size:** 136 **Age:** 0-40: 6 (4.4%) 40-60: 49 (36%) >60: 81 (59.6%) **Sex:** - Male: 81 (60%) - Female: 55 (40%) **Race/ethnicity:** NR **Comorbidities:** H/O MI: 29 (21.3%) H/O MI: 22 (16%) HTN: 54 (39.7%) COPD: 4 (2.9%) Renal dysfunction: 5 (3.7%) Smoking: 57 (42%)	**Index test (ECG-based signal analysis):** - Device name: 3DMP - Manufacturer: - Device type: Body surface mapping - Test operator: Abnormalities were identified by comparing the results to a 21,000-patient database **Comparator/reference test(s):** - Standard ECG - Cardiac catheterization **Other tests performed (before or after index test):**	**1) Number (%) of patients who had index (ECG-based signal analysis) test:** 92 CAD; 37 "other heart disease"; 7 normal **2) Number (%) of patients who had comparator test(s):** 136 cardiac catheterizations **3) Number (%) of patients diagnosed with coronary artery disease based on index test:** 78 based on >60% stenosis 90 based on >40% stenosis **4) Number (%) of patients diagnosed with coronary artery disease by other means**: 92 with CAD by angiography 37 with "other heart disease"	**Comments:** - 200 patients selected but only 136 analyzed; exclusions included poor tracings (so indeterminate/ intermediate results appear to have been excluded) - 57% of sample had >60% stenosis **Quality assessment:** Random or consecutive sample: No Representative sample: Partial (scheduled for cardiac catheterization) Index test described: Yes Reference test described: Yes Valid reference standard: Yes Blinded reference test: Yes Blinded index test: Yes Absence of verification bias: Yes Absence of incorporation bias: Yes Appropriate analysis: No

Study	Study Design	Patients	Index and Comparator Test Characteristics	Results	Comments/Quality Scoring
	stenosis	**Clinical characteristics of tested patients:** Patients considered for diagnostic coronary angiography based on history, physical examination, ECT, laboratory values Excluded: Contraindication to angiography h/o cardiac surgery or PCI Long-term drug abuse Pregnancy	None	7 normal **5) Possible to construct 2x2 tables?:** Difficult: sensitivity reported as 93.3% and specificity as 83% - can recreate from Table 5 by collapsing “normal” and “other OHD” results from 3DMP together vs. “CAD” results and using >40% stenosis for the reference standard sensitivity calculated as 76/78 (97.4%) and specificity 40/58 as 68.9% - from Table 5 by collapsing “normal” and “other OHD” results from 3DMP together vs. “CAD” results and using >60% stenosis for the reference standard Uncertain if for obstructive or obstructive + nonobstructive disease; abstract gives sensitivity of 96% for >=70% stenosis by angiography.	