



Prospective Longitudinal Trial of FFR_{CT} Outcome and Resource Impacts

Clinical outcomes of FFR_{CT}-guided diagnostic strategies versus usual care in patients with suspected coronary artery disease

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On behalf of the PLATFORM Investigators

Supported by HeartFlow Inc, Redwood, CA, USA



Duke Clinical Research Institute



HeartFlow

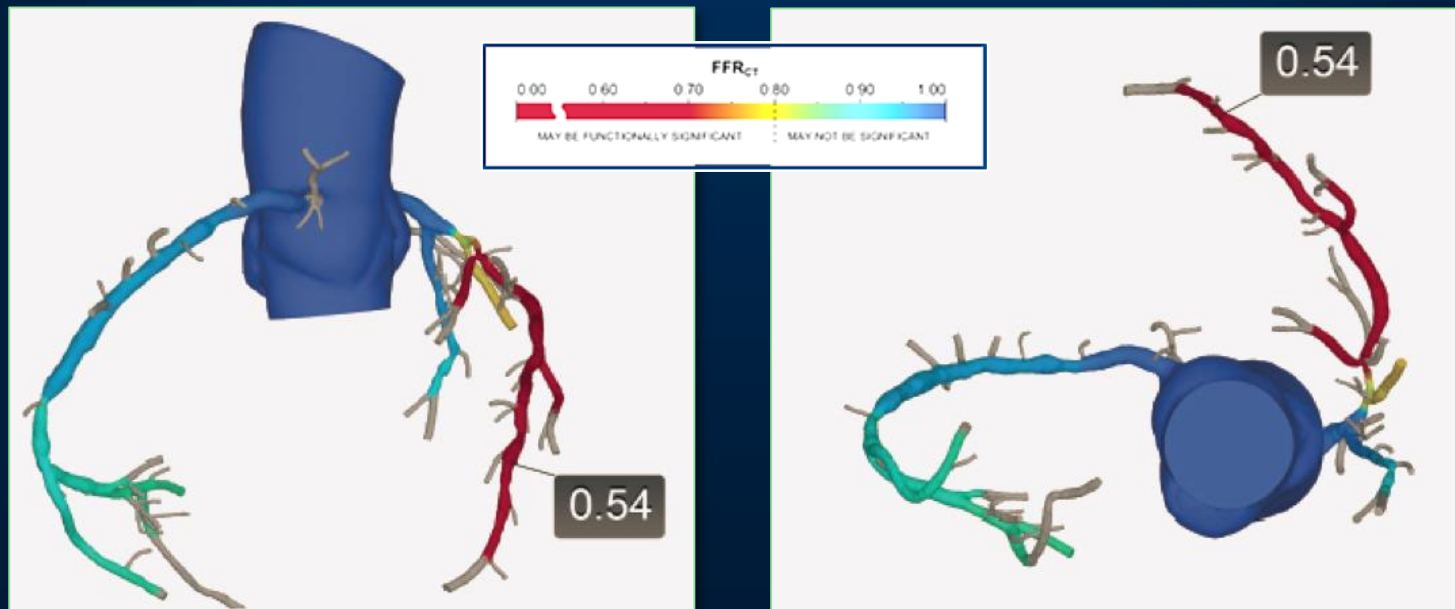


Background and Aim

- The optimal evaluation of new onset stable chest pain is uncertain. Ideally, testing will clarify the diagnosis and direct subsequent care while maximizing efficiency and safety.
- The recent PROMISE and SCOT-HEART trials compared anatomic and functional strategies, finding that CTA improved processes of care. However, CTA also increased rates of invasive catheterization and revascularization with no significant reduction in events.
- Fractional Flow Reserve derived from CTA (FFR_{CT}) may address these limitations by providing both functional and anatomic data.
- **STUDY AIM:** To determine whether use of a CTA/ FFR_{CT} guided strategy, as compared to standard practice, will reduce the rate of invasive angiograms that show no obstructive CAD, without increasing the occurrence of major cardiac events.

Fractional Flow Reserve by CTA (FFR_{CT})

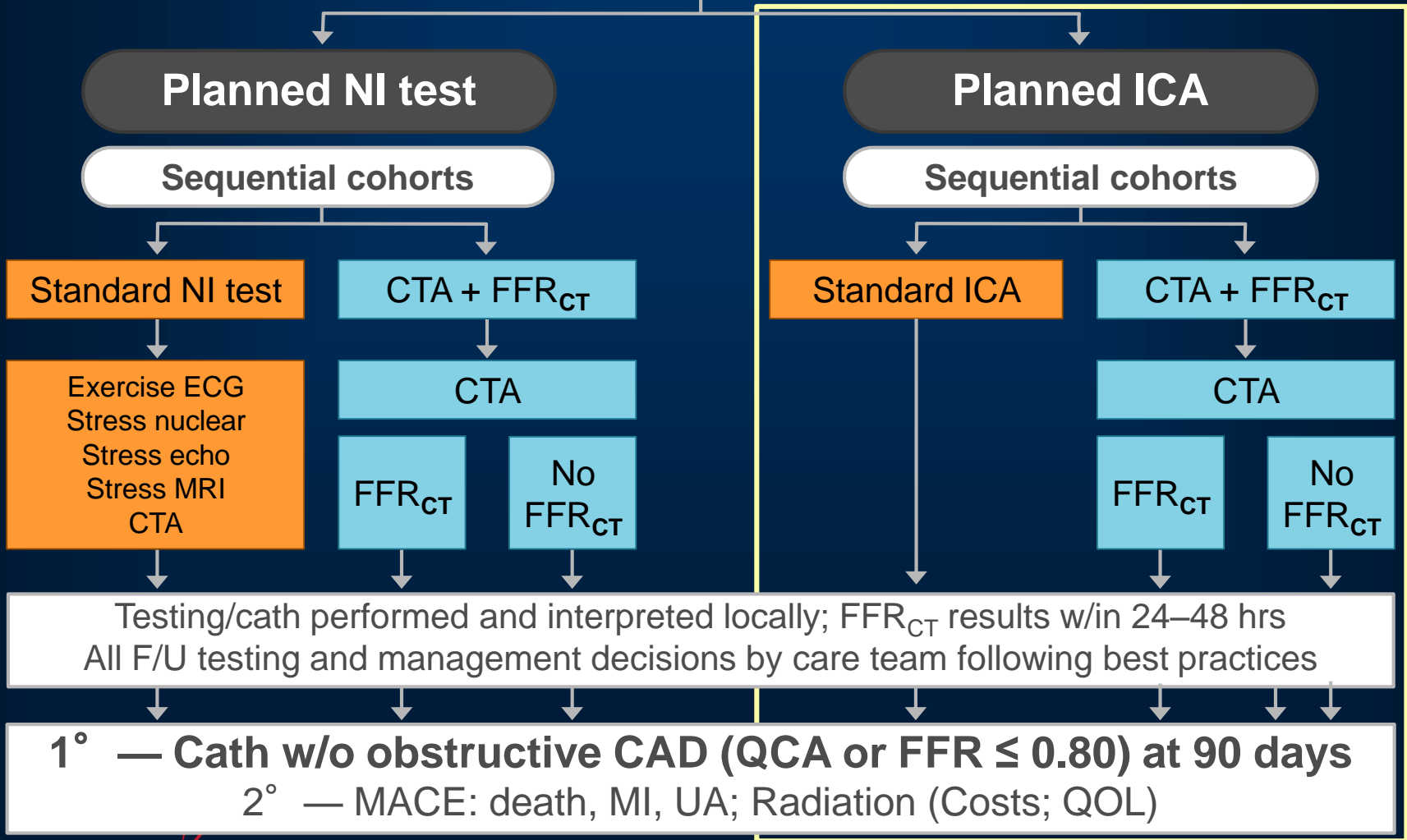
- Routine CTA images are segmented and analysed quantitatively
- 3D coronary blood flow is modelled using computational fluid dynamics
- Maximal hyperemia is simulated to derive pressure and flow data, expressed as numeric values similar to invasive FFR evaluation
- FFR_{CT} has been validated against invasively measured FFR



Hemodynamically significant LAD lesion by FFR_{CT}

PLATFORM Trial Design

Stable CAD symptoms; Planned non-emergent NI test or catheterization
Age \geq 18y; No prior CAD hx; Intermediate pretest probability of CAD



Endpoints and Statistical Analyses

- For the primary endpoint of the rate of ICA without finding obstructive CAD, a sample size was used which provided 90% power to detect a 50% reduction with FFR_{CT} guided care, using a one-sided Wald test for a risk difference < 0 with an α error = 0.025
 - Absence of obstructive CAD was determined by a blinded central laboratory
 - Three sensitivity analyses performed: Propensity-matched, Best practices, Analyzable images; Primary endpoint also assessed using site read data
- Safety endpoints: MACE adjudicated by blinded CEC
- All treatment comparisons were performed as allocated (ITT)
- All statistical assessments were independently confirmed by Duke Clinical Research Institute

Cohort Assignment and Follow-up

Enrolled and consented; N=584
Sept 13, 2013 – Nov 26, 2014

Enrollment

Planned NI test (N=204)

Planned ICA (N=380)

Allocation

Sequential cohorts

Sequential cohorts

Standard NI test
N=100

FFR_{CT} guided
N=104

Standard ICA
N=187

FFR_{CT} guided
N=193

Received NI test
N=100 pts

CTA / FFR_{CT}
N=104

CTA / FFR_{CT}
N=193

69% CTAs sent for FFR_{CT}
FFR_{CT} calculated in 87%
ICA cancelled in 61%

Invasive cath N=12
Revascularization N=5

Invasive cath N=19
Revascularization N=10

Invasive cath N=187
Revascularization N=59

Invasive cath N=76
Revascularization N=55

90-day follow-up
complete (N=97; 97.0%)

90-day follow-up
complete (N=101; 97.1%)

90-day follow-up
complete (N=179; 95.7%)

90-day follow-up
complete (N=186; 96.4%)

Follow-up

Analysis
(N=100; 100%)

Analysis
(N=104; 100%)

Analysis
(N=187; 100%)

Analysis
(N=193; 100%)

Analysis

Baseline Characteristics

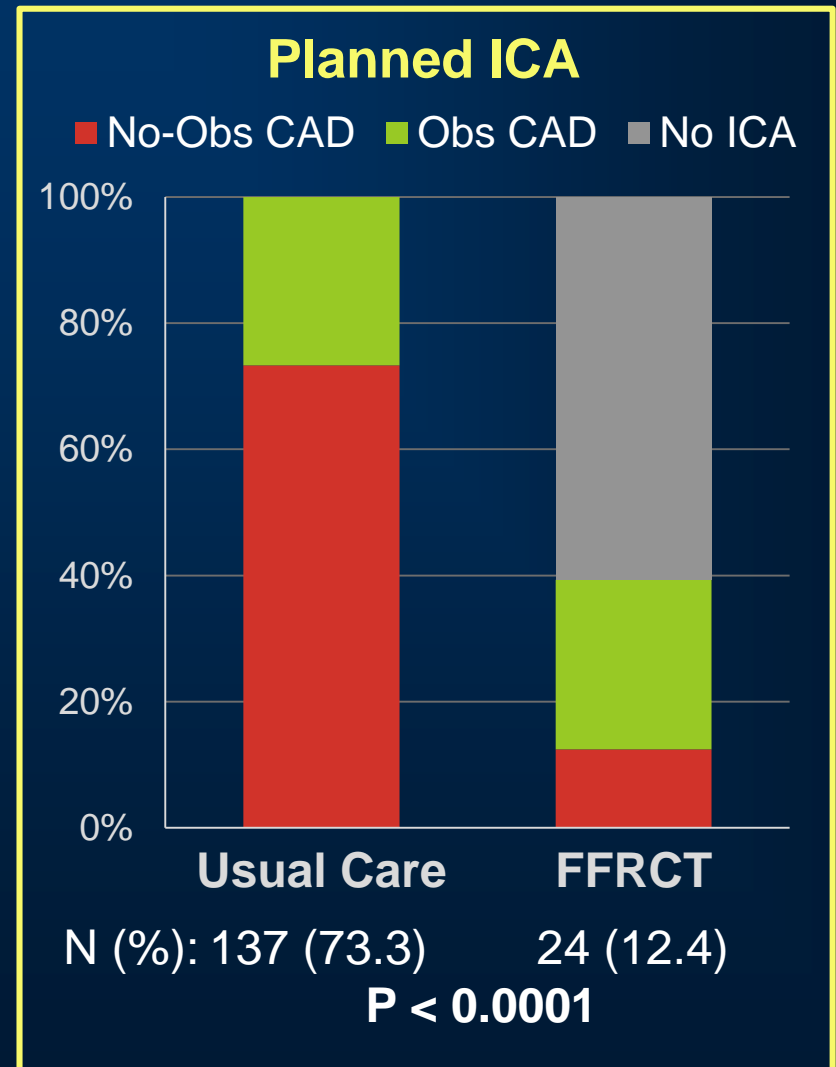
	Planned NI Test N=204			Planned ICA N=380		
	Usual care strategy N=100	FFR _{CT} strategy N=104	P value	Usual care strategy N=187	FFR _{CT} strategy N=193	P value
Demographics						
Age — mean ± SD, yr	57.9 ± 10.7	59.5 ± 9.3	0.25	63.4 ± 10.9	60.7 ± 10.2	0.02
Female sex — no. (%)	34(34.0)	44 (42.3)	0.22	79 (42.2)	74 (38.3)	0.44
Racial/ethnic minority — no. (%)	5 (5.0)	0 (0.0)	0.06	2 (1.1)	1 (0.5)	0.60
Cardiac risk factors						
Hypertension — no. (%)	38 (38.0)	57 (54.8)	0.02	111 (59.4)	111 (57.5)	0.72
Diabetes — no. (%)	8 (8.0)	6 (5.8)	0.52	36 (19.3)	30 (15.5)	0.33
Dyslipidemia — no. (%)	22 (22.0)	28 (26.9)	0.49	76 (40.6)	77 (39.9)	0.81
Tobacco use — no. (%)	52(52.0)	59 (56.7)	0.50	103 (55.1)	101 (52.3)	0.59
Pre-test probability CAD — ±SD, % (Updated Diamond and Forrester)						
	44.5 ± 15.3	45.3 ± 16.8	0.89	51.7 ± 16.7	49.4 ± 17.2	0.26
Statin use — no. (%)						
	24 (24.0)	29 (27.9)	0.58	83 (44.4)	77 (39.9)	0.37
Angina — no. (% typical / atypical)						
	99 (99.0)	98 (94.2)	0.02	174 (93.0)	187 (96.9)	0.09

Primary Endpoint

Invasive Catheterization w/o Obstructive CAD

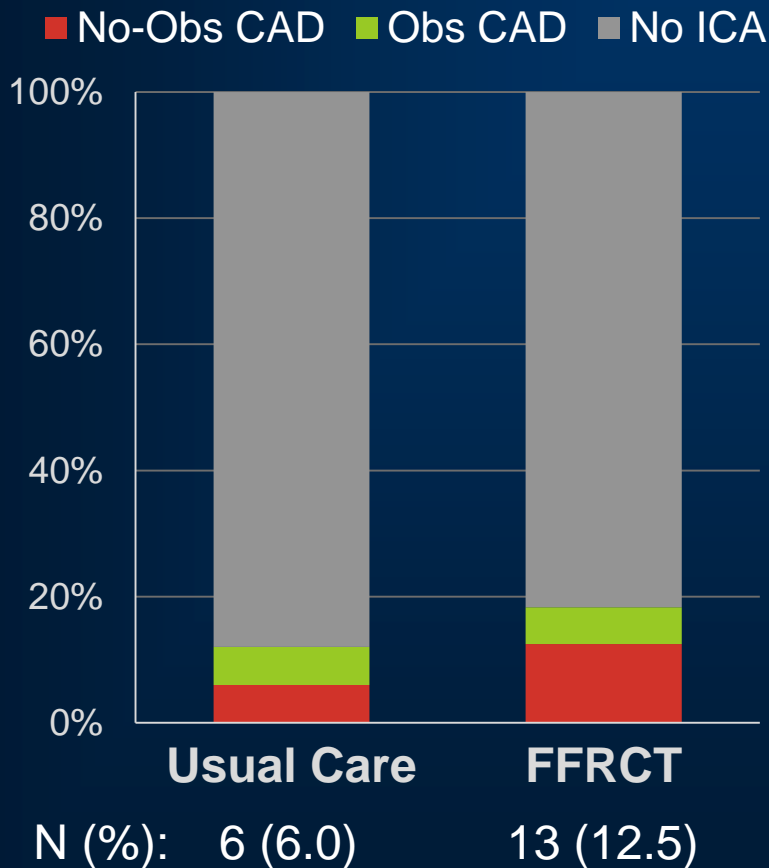
Similar results in all pre-specified subgroups and cohorts

- Site-read ICA w/o obstructive CAD
57% usual care; 9% FFR_{CT}
- Age, sex, race, diabetes, pretest probability of CAD, country
- Propensity matched cohort
- Best practices cohort
- Adequate image cohort



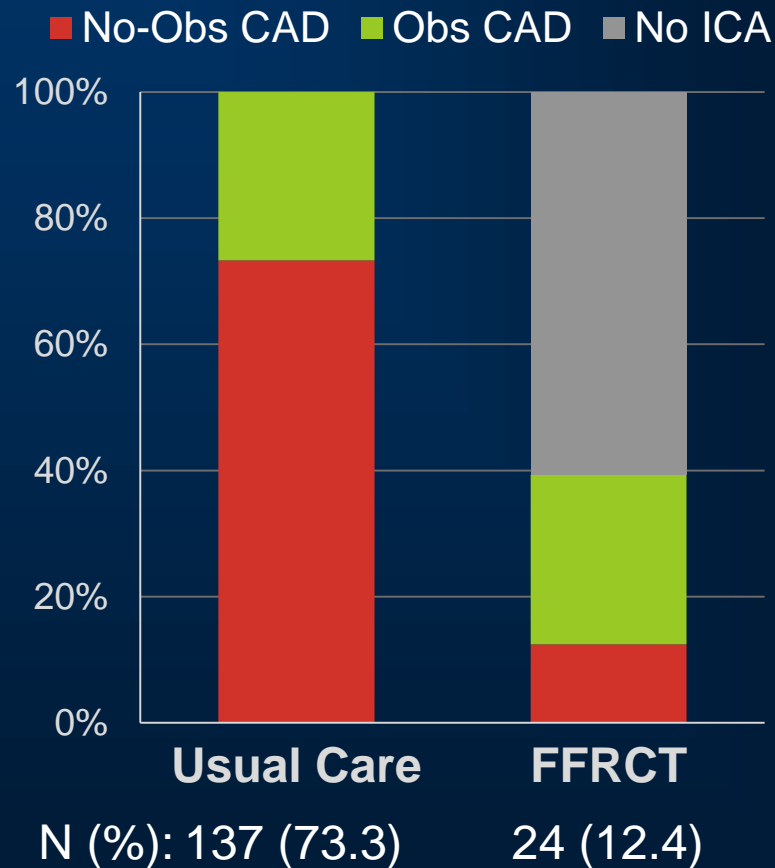
Primary Endpoint Invasive Catheterization w/o Obstructive CAD

Planned NI Test



P = 0.95

Planned ICA



P < 0.0001

Safety Endpoints and Data at Revascularization

	Planned NI Test N=204			Planned ICA N=380		
	Usual care strategy N=100	FFR _{CT} strategy N=104	P value	Usual care strategy N=187	FFR _{CT} strategy N=193	P value
SAFETY: MACE — no. (%)	0	0		0	2 (1.0)	NA
SAFETY: RADIATION EXPOSURE (enrolment to 90 days)						
Mean ± SD, mSv	5.8 ± 7.1	8.8 ± 9.9	0.0002	9.4 ± 4.9	9.9 ± 8.7	0.20
FUNCTIONAL DATA AT REVASCULARIZATION						
PCI or CABG – no.	5	10	0.29	59	55	0.58
Functional data available	100%	90%	1.0	51%	96%	<0.0001

Summary

- PLATFORM enrolled a symptomatic, intermediate risk population for whom testing is currently recommended
- Use of CT/FFR_{CT} in patients with planned invasive catheterization was associated with a reduction in the rate of finding no obstructive CAD at ICA, from 73% to 12%
 - Similar results in all subgroups
 - No differences in MACE or radiation exposure
 - No differences in revascularization rates
- Use of FFR_{CT} resulted in cancellation of 61% of ICAs and doubled the availability of functional data at PCI/CABG

Conclusion

Among patients with planned ICA, use of a combined anatomic AND functional strategy employing CTA/FFR_{CT} was safe and improved patient selection for invasive catheterization

Results Published Online Today in EHJ



European Heart Journal
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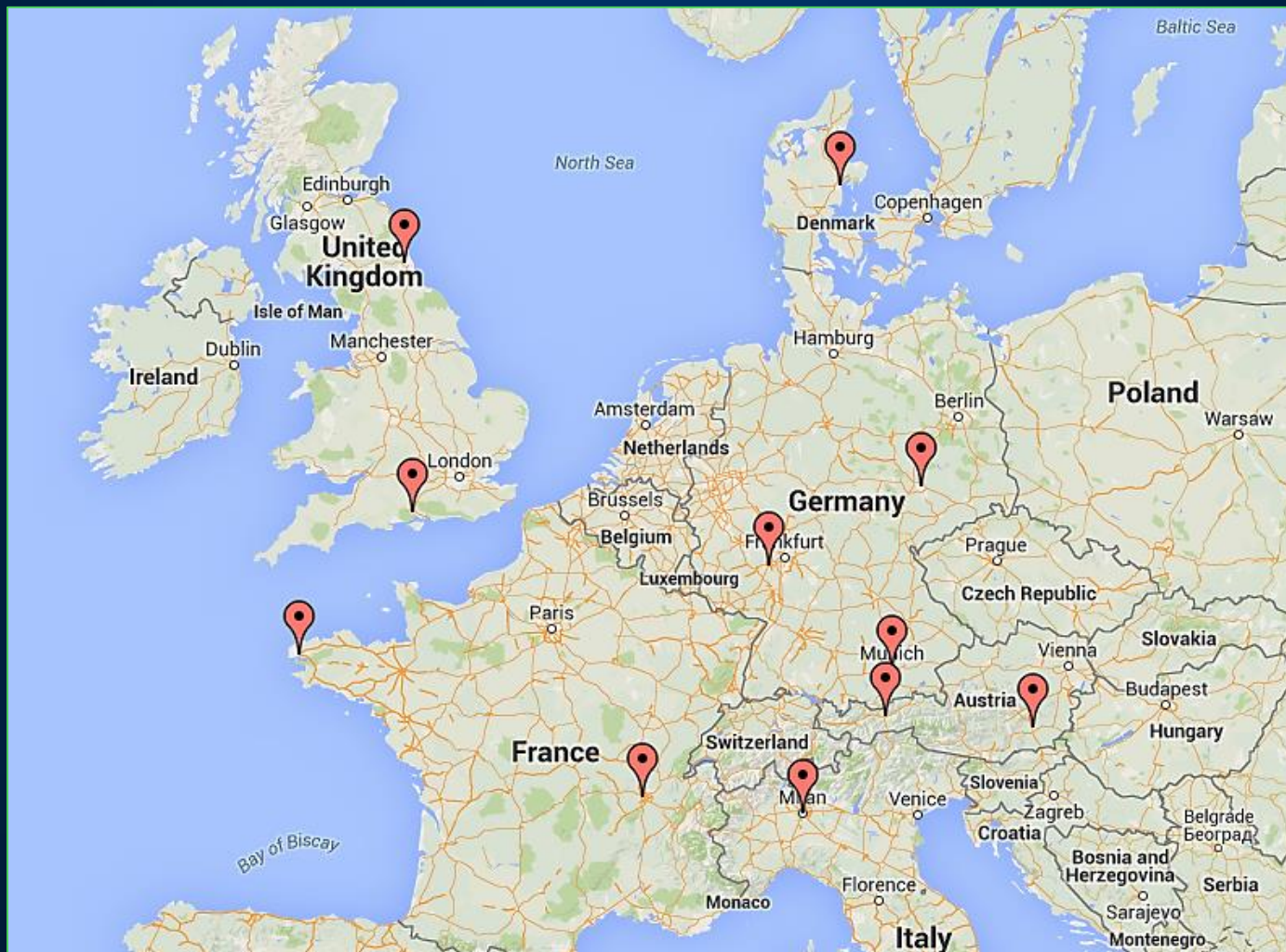
Clinical outcomes of fractional flow reserve by computed tomographic angiography-guided diagnostic strategies vs. usual care in patients with suspected coronary artery disease: the prospective longitudinal trial of FFRct: outcome and resource impacts study

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THANK YOU

to PLATFORM Patients and Sites...



...and to the PLATFORM Team

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