Imaging Ischemic Heart Disease Role of Echocardiography

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Chair NC&CCT Section
Vice-President EACVI

Thanks to:
Eugenio Picano, Rosa Sicari and Emilio Pasanisi
IFC CNR and FTGM, Pisa, Italy
Fausto Rigo
Mestre-Venezia Hospital, Italy
The Full Spectrum of IHD
IHD Mortality Rate in 21 World Regions (2010)

mortality rate per 100,000 persons in 21 world regions, 2010, the Global

Moran AE, Circulation 2014
Aging of the Population

Projected Costs of IHD by Age

Laslett LJ, JACC 2012
Cardiovascular Imaging
Need for “WISE and PERSONALIZED” use in clinical practice

ACS

Stable IHD

Increase in use: 70% (in 2000-2007)
Patients: 10 million /year
Costs: $ 80 billion /year

Shaw LJ…and Douglas PS, JACC Cardiovascular Imaging 2010

Danilo Neglia
Acute Coronary Syndromes
Role of Echocardiography in Suspected ACS

ECG

Suspected ACS

ST/T wave changes

Normal undiagnostic

hs-Tn Testing (0-3 hours) Clinical/ECG

ICA→PCI

2D-ECHO for DD
(Pulm. Embol./Aortic Diss./Pericardial Eff.)

2D-ECHO (Resting WM)
(in-patient testing)

2D-ECHO (Resting WM)
StressECHO (Stress WM)
(in-or-outpatient testing)

Cardiac Imaging/Invasive

Hs-Tn > 99° percentile

SIGNIFICANT
High Values
Or Increase

< 20% increase
Stable
< 50% increase

Hs-Tn <= 99° percentile

On-Going Chest Pain

No On-Going Chest Pain

Modified from Garg P et al., Nature Reviews 2016

www.escardio.org/EACVI

Speaker
Acute Coronary Syndromes
Role of Echocardiography in Suspected ACS

Table 2 | Guideline endorsement of advanced imaging when ACS is suspected but ECG and biomarkers are inconclusive

<table>
<thead>
<tr>
<th>Modality</th>
<th>Guidelines</th>
<th>Endorsement</th>
</tr>
</thead>
<tbody>
<tr>
<td>2D-TTE</td>
<td>- ESC guidelines for NSTE-ACS (2011)</td>
<td>• Primary bedside modality</td>
</tr>
<tr>
<td></td>
<td>- ACCF/ASE/AHA Appropriate Use Criteria for Echocardiography (2011)</td>
<td>• To assess resting RWMA</td>
</tr>
<tr>
<td>Stress Echo</td>
<td>- ESC guidelines for NSTE-ACS (2011)</td>
<td>• In all suspected ACS to assess RWMA</td>
</tr>
<tr>
<td></td>
<td>- ACCF/ASE/AHA Appropriate Use Criteria for Echocardiography (2011)</td>
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</tbody>
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www.escardio.org/EACVI
Acute Coronary Syndromes
Role of Echocardiography in Suspected ACS
Acute Coronary Syndromes
Role of Echocardiography in Suspected ACS

Take Home Messages

- **2D-ECHO** can complement history, ECG, and cardiac biomarkers for timely identification or ruling out of acute coronary syndrome (ACS). It is the first-line imaging test in patients with suspected ACS.

**ADVANTAGES**
Bedside, widely available, low cost, RCT supported, Strain technique and Contrast ECHO might improve accuracy and prognostic information.

- **Stress ECHO** adds diagnostic and prognostic value in patients with suspected ACS (with inconclusive ECG, clinical and biomarkers findings). Exercise ECHO is superior to EET (and similar to exercise MPS) in risk stratification.

**LIMITATIONS**
Poor acoustic window, contraindications to pharmacological stress, available only in centers with expertise in stress ECHO.
EXERCISE

Myocardial Oxygen Consumption

Myocardial Blood Flow

Detection of CAD - IHD Imaging

Redrawn from Gould et al. Am J Cardiol 1974 2 46
Stable Ischemic Heart Disease
Role of Non-Invasive Imaging

Diagnosis >> Treatment >> Outcome

Coronary Atherosclerosis
Myocardial Ischemia
Obstructive CAD
Myocardial Damage/Dysfunction

Endothelial/Microvascular Dysfunction
Medical Treatment ATS
Medical Treatment Ischemia
Medical Treatment Revascularization CAD

Myocardial Damage/Dysfunction
Scarf

Medical Treatment Devices
Heart Failure

Risk Factors

www.escardio.org/EACVI
Stable Ischemic Heart Disease
Role of Echocardiography

Endothelial/Microvascular Dysfunction

Myocardial Ischemia

ECHO Stress >> CFR

Myocardial Damage/Dysfunction

ECHO Stress >> Viability

Diagnosis >> Treatment >> Outcome

www.escardio.org/EACVI
Male 65 yrs – Recent onset Typical Angina
Hypercholesterolemia, Hypertension

Is Ischemic Heart Disease causing his SYMPTOMS?

Which are the MECHANISMS?

Which is his LIFE RISK?

Which TREATMENT does he require to improve SYMPTOMS and reduce RISKS?
2013 ESC guidelines on the management of stable coronary artery disease

The Task Force on the management of stable coronary artery disease of the European Society of Cardiology

Task Force Members: Gilles Montalescot* (Chairperson) (France), Udo Sechtem* (Chairperson) (Germany), Stephan Achenbach (Germany), Felicita Andreotti (Italy), Chris Arden (UK), Andrzej Budaj (Poland), Raffaele Bugiardini (Italy), Filippo Crea (Italy), Thomas Cuisset (France), Carlo Di Mario (UK), J. Rafael Ferreira (Portugal), Bernard J. Gersh (USA), Anselm K. Gitt (Germany), Jean-Sebastien Hulot (France), Nikolaus Marx (Germany), Lionel H. Opie (South Africa), Matthias Pfisterer (Switzerland), Eva Prescott (Denmark), Frank Ruschitzka (Switzerland), Manel Sabaté (Spain), Roxy Senior (UK), David Paul Taggart (UK), Ernst E. van der Wall (Netherlands), Christiaan J.M. Vrints (Belgium).
Table 13  Clinical pre-test probabilities\textsuperscript{a} in patients with stable chest pain symptoms\textsuperscript{108}

<table>
<thead>
<tr>
<th>Age</th>
<th>Typical angina</th>
<th>Atypical angina</th>
<th>Non-anginal pain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Men</td>
</tr>
<tr>
<td>30–39</td>
<td>59</td>
<td>28</td>
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</tr>
<tr>
<td>&gt;80</td>
<td>93</td>
<td>76</td>
<td>78</td>
</tr>
</tbody>
</table>

\textsuperscript{a}"Clinical pre-test probabilities" refers to the likelihood of coronary artery disease (CAD) before any diagnostic test is performed.
Stress Echo Lab (Exercise)
Stress Echo (Exercise)

2D Echo

1 ECG lead (echomonitor)
12-lead ECG

Blood pressure

Watt

0 2 4 6 8 10

25 50 75 100 125

time (min)
Exercise Stress Echo
Positive WM (3 segments)
### 2013 ESC guidelines on the management of stable coronary artery disease

**Table 17** Definitions of risk for various test modalities

<table>
<thead>
<tr>
<th>Test Modality</th>
<th>High Risk</th>
<th>Intermediate Risk</th>
<th>Low Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise stress ECG</td>
<td>CV mortality &gt;3%/year.</td>
<td>CV mortality between 1 and 3%/year.</td>
<td>CV mortality &lt;1%/year.</td>
</tr>
<tr>
<td>Ischaemia imaging</td>
<td>Area of ischaemia &gt;10% (≥10% for SPECT; limited quantitative data for CMR – probably ≥2/16 segments with new perfusion defects or ≥3 dobutamine-induced dysfunctional segments; ≥3 segments of LV by stress echo).</td>
<td>Area of ischaemia between 1 to 10% or any ischaemia less than high risk by CMR or stress echo.</td>
<td>No ischaemia.</td>
</tr>
<tr>
<td>Coronary CTA</td>
<td>Significant lesions of high risk category (three-vessel disease with proximal stenoses, LM, and proximal anterior descending CAD).</td>
<td>Significant lesion(s) in large and proximal coronary artery(ies) but not high risk category.</td>
<td>Normal coronary artery or plaques only.</td>
</tr>
</tbody>
</table>
Non Invasive detection of HIGH RISK CAD

Efficacy of Revascularization

Revascularization reduces mortality only in the presence of large perfusion defects

2013 ESC guidelines on the management of stable coronary artery disease

Confirmed diagnosis SCAD

DEFINE RISK

- Low event risk (mortality <1%/year)
  - Trial of OMT
  - Yes: Continue OMT
  - No: Symptoms improved?
    - Yes: Intensify medical treatment
    - No: Symptoms improved?

- Intermediate event risk (mortality ≥1% but <3%/year)
  - OMT and consider ICA (based on co-morbidities and patient preferences)
  - ICA (+ FFR when required) (+ revascularization when appropriate) + OMT

- High event risk (mortality ≥3%/year)
  - Trial of OMT
  - Yes: Continue OMT
  - No: Symptoms improved?
    - Yes: Intensify medical treatment
    - No: Symptoms improved?
Prospective, multicenter (2 US Centers), observational Study
5375 consecutive patients
Exercise ECG and Echocardiography

Figure 1. Survival of patients with normal results, ischemia, scar, and combined scar and ischemia.

Figure 4. Mortality of patients according to total extent of wall motion abnormalities (summed stress score) at peak stress.

Marwick TH et al. Circulation 2001
Male 65 yrs – Recent onset Typical Angina Hypercholesterolemia, Hypertension

Is Ischemic Heart Disease causing his SYMPTOMS?

Yes

Which are the MECHANISMS?

Obstructive CAD

Which TREATMENT does he require to improve SYMPTOMS and reduce RISKS?

Revascularization

www.escardio.org/EACVI
Female 55 yrs – Atypical Angina
Hypertension, Post-traumatic Hip Prothesis

Is Ischemic Heart Disease causing her SYMPTOMS?

Which is her LIFE RISK?

Which are the MECHANISMS?

Which TREATMENT does she require to improve SYMPTOMS and reduce RISKS?
Pre-Test Probability of CAD D&F (Genders)

Table 13  Clinical pre-test probabilities\(^a\) in patients with stable chest pain symptoms\(^{108}\)

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2013 ESC guidelines on the management of stable coronary artery disease

- Patients with suspected SCAD and intermediate PTP of 15% - 85%
  
  Consider:
  - Patient criteria/suitability for given test
  - Availability
  - Local expertise

- Stress testing for ischaemia
  
- PTP 15-65% and LVEF ≥50%
  
  Exercise ECG if feasible - stress imaging testing preferred (echo, CMR, SPECT, PET) if local expertise and availability permit

- PTP 66-85% or LVEF <50% without typical angina
  
  Stress imaging (echo, CMR, SPECT, PET); ECG exercise stress testing possible if resources for stress imaging not available

- Coronary CTA in patients at low intermediate PTP (15% - 50%)
  - If suitable candidate
  - If adequate technology and local expertise available

---

**Recommendations**

<table>
<thead>
<tr>
<th>Class</th>
<th>Level</th>
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<tbody>
<tr>
<td>I</td>
<td>B</td>
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Exercise ECG is recommended as the initial test for establishing a diagnosis of SCAD in patients with symptoms of angina and intermediate PTP of CAD (Table 13, 15–65%), free of anti-ischaemic drugs, unless they cannot exercise or display ECG changes which make the ECG non-evaluable.

Stress imaging is recommended as the initial test option if local expertise and availability permit.
Stress Echo Lab (Pharmacological)
Stress Echo (Dipyridamole)

Drugs infusion
- DIP 0.84 mg/kg in 6’
- AMINO 120 mg in 1’ (up to 240 mg in 2’)

TIMELINE

CFR-PW
- Continuous monitoring and Pulsed recording

2D echo
- Continuous monitoring and Pulsed recording

1 lead ECG
- on the echo-monitor

12 lead ECG
- Continuous monitoring and Pulsed recording

BP recording

www.escardio.org/EACVI
TTE Doppler of mid-distal LAD

Modified apical 3-chambers
CFR by TTE Doppler

CFR = peak vel/rest vel, normal > 2
Dipyridamole Stress Echo
Negative WM - Abnormal CFR

CFR = 80 / 70 = 1.2
Dipyridamole Stress Echo
Negative WM - Abnormal CFR

Normal finding

Obstructive CAD ??

CFR > 2

CFR <= 2

Microvascular Disease ??

CFR <= 2
2013 ESC guidelines on the management of stable coronary artery disease

Patients with suspected SCAD and intermediate PTP of 15% - 85%

Consider:
- Patient criteria/suitability for given test
- Availability
- Local expertise

Stress testing for ischaemia

PTP 15-65% and LVEF ≥50%

Exercise ECG if feasible - stress imaging testingiferred (echo, CMR, SPECT, PET) if local expertise and availability permit

Unclear
- Determine patient characteristics and preferences
- Ischaemia
- No ischaemia

PTP 66-85% or LVEF <50% without typical angina

Stress imaging (echo, CMR, SPECT, PET); ECG exercise stress testing possible if resources for stress imaging not available

Unclear
- Stenosis
- No stenosis

Coronary CTA in patients at low intermediate PTP (15% - 50%)
- If suitable candidate
- If adequate technology and local expertise available

No stenosis

corony CTA in suitable patient (if not done before)

ICA (with FFR when necessary)

Consider functional CAD
Investigate other causes

Ischaemia testing using stress imaging if not done before

Diagnosis SCAD established further risk stratification (see Fig. 3)
Dipyridamole Stress Echo
Abnormal CFR >> Additional Prognostic Value over WM

Prospective, multicenter, observational study

4,313 patients
known CAD (n = 1,547)
suspected CAD (n = 2,766)

High-dose Dip Stress ECHO
CFR evaluation of LAD by Doppler

CFR on LAD
is a strong and independent indicator of mortality, over wall motion analysis, in patients with known or suspected CAD.
A negative result confers an annual risk of death <1% in both patient groups.

(J Am Coll Cardiol Img 2012;5:1079–85)
Dipyridamole Stress Echo
Abnormal CFR >> Additional Prognostic Value over WM

**Figure 2. Annual Mortality Rate**

Annual mortality in the group of patients with known coronary artery disease (CAD) and suspected CAD separated on the basis of presence (+) or absence (−) of ischemia at SE and CFR on left anterior descending artery ≤2 or >2. Abbreviations as in Figure 1.

Cortigiani L et al. J Am Coll Cardiol Img 2012;5:1079–85
**Female 55 yrs – Atypical Angina**

**Hypertension, Post-traumatic Hip Prothesis**

Is Ischemic Heart Disease causing her SYMPTOMS?  
Yes

Which is her LIFE RISK?  
Intermediate

Which are the MECHANISMS?  
Microvascular Coronary Disease

Which TREATMENT does she require to improve SYMPTOMS and reduce RISKS?  
Medical

[www.escardio.org/EACVI](http://www.escardio.org/EACVI)
Changing the trajectory of ischemic heart disease in women: Role of imaging

Sharmila Dorbala, MD, MPH\textsuperscript{a,b} and Leslee J. Shaw, PhD\textsuperscript{c}

Mortality from coronary artery disease in women declined from nearly 500,000 deaths in 2000 to 398,096 deaths in 2013. Despite these significant gains, cardiovascular disease mortality in women remains unacceptably high. Much additional progress in awareness, evaluation, and management of cardiovascular diseases is needed. Progress in cardiovascular imaging, over the past four decades, has substantially improved the evaluation and management of ischemic heart disease. Ischemic heart disease is now diagnosed early and with greater accuracy, leading to improved risk assessment and timely therapies. The next gains in ischemic heart disease mortality in women will probably be due to application of these imaging advances in a personalized fashion. Thoughtful leaders provide their viewpoints on the use of imaging in the evaluation and management of ischemic heart disease in women. (J Nucl Cardiol 2016;23:973–5.)
Stress Echo (Dobutamine)

- **2D Echo**
- **1 ECG lead (echomonitor)**
- **12-lead ECG**
- **Blood pressure**

Dose:
- 0
- 3
- 5
- 6
- 9
- 10
- 12
- 15
- 20

Time (min):
- 0
- 20
- 15
- 10
- 6
- 5
- 3
- 1

- Ischemia
- Viability

www.escardio.org/EACVI
Pharmacological Stress Echo → Ischemia
Additional Prognostic Value over Clinical an Functional Variables

Stress Echo Results Predict Mortality:
A Large-Scale Multicenter Prospective International Study
Rosa Sicari, MD, PhD, Emilio Pasanisi, MD, Lucia Venneri, MD, Patrizia Landi, BSc,
Lauro Cortigiani, MD, Eugenio Picano, MD, PhD, on behalf of the Echo Persantine International
Cooperative (EPIC) and Echo Dobutamine International Cooperative (EDIC) Study Groups
Pisa, Italy

Sicari R et al. JACC 2003
Dobutamine Stress Echo
Viability
Pharmacological Stress Echo → Viability
Additional Prognostic Value over Clinical and Functional Variables

Prognostic Value of Myocardial Viability Recognized by Low-Dose Dobutamine Echocardiography in Chronic Ischemic Left Ventricular Dysfunction

Rosa Sicari, MD, PhD, Eugenio Picano, MD, Laura Cortigiani, MD, Adrian C. Borges, MD, Albert Varga, MD, Caterina Palagi, MD, Riccardo Bigi, MD, Roberta Rossini, MD, and Emilio Pasanisi, MD, on behalf of the VIDA (Viability Identification with Dobutamine Administration) Study Group

Sicari R et al. Am J Cardiol 2003
### 2013 ESC guidelines on the management of stable coronary artery disease

<table>
<thead>
<tr>
<th>Technique</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
</table>
| Echocardiography | Wide access  
                          Portability  
                          No radiation  
                          Low cost       | Echo contrast needed in patients with poor ultrasound windows  
                          Dependent on operator skills                                 |
| SPECT       | Wide access  
                          Extensive data               | Radiation                                               |
| PET         | Flow quantitation                              | Radiation  
                          Limited access  
                          High cost                                                |
| CMR         | High soft tissue contrast including precise imaging of myocardial scar  
                          No radiation                                           | Limited access in cardiology  
                          Contra-indications  
                          Functional analysis limited in arrhythmias  
                          Limited 3D quantification of ischaemia  
                          High cost                                               |
| Coronary CTA | High NPV in pts with low PTP                  | Limited availability  
                          Radiation  
                          Assessment limited with extensive coronary calcification or previous stent implantation  
                          Image quality limited with arrhythmias and high heart rates that cannot be lowered beyond 60–65/min  
                          Low NPV in patients with high PTP                        |
OPEN ISSUES in STABLE IHD
ECHO and Non-Invasive Imaging

- Comparative DIAGNOSTIC performance
- Comparative impact on OUTCOME
- Comparative COST-EFFECTIVENESS
The “Ischemic” Cascade
Echocardiography

Sentitivity → Specificity

Taquety VR and Di Carli MF
Progress in CV Diseases, 2015
Performance of Diagnostic Tests in Trials

Retrospective or Prospective studies comparing 1 or 2 modalities
Patients with ~50% prevalence of disease (>50% stenosis at ICA)

Table 12: Characteristics of tests commonly used to diagnose the presence of coronary artery disease

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise ECG a, 91, 94, 95</td>
<td>45–50</td>
<td>85–90</td>
</tr>
<tr>
<td>Exercise stress echocardiography</td>
<td>80–85</td>
<td>80–88</td>
</tr>
<tr>
<td>Exercise stress SPECT 96-99</td>
<td>73–92</td>
<td>63–87</td>
</tr>
<tr>
<td>Dobutamine stress echocardiography</td>
<td>79–83</td>
<td>82–86</td>
</tr>
<tr>
<td>Dobutamine stress MRI b, 100</td>
<td>79–88</td>
<td>81–91</td>
</tr>
<tr>
<td>Vasodilator stress echocardiography</td>
<td>72–79</td>
<td>92–95</td>
</tr>
<tr>
<td>Vasodilator stress SPECT 96, 99</td>
<td>90–91</td>
<td>75–84</td>
</tr>
<tr>
<td>Vasodilator stress MRI b, 98, 100-102</td>
<td>67–94</td>
<td>61–85</td>
</tr>
<tr>
<td>Coronary CTA c, 103-105</td>
<td>95–99</td>
<td>64–83</td>
</tr>
<tr>
<td>Vasodilator stress PET 97, 99, 106</td>
<td>81–97</td>
<td>74–91</td>
</tr>
</tbody>
</table>
Performance of Diagnostic Tests in EVINCI

Prospective study comparing all IMAGING modalities
Patients with LOW prevalence of disease (>70% stenosis or FFR < 0.8 at ICA)

Neglia D et al., Circulation CVI 2015
Performance of Diagnostic Tests in EVINCI
Prospective studies comparing all IMAGING modalities
Patients with LOW prevalence of disease (>70% stenosis or FFR < 0.8 at ICA)

Neglia D et al., Circulation CVI 2015
Performance of Diagnostic Tests in EVINCI
Comparison with recent Metanlyses

Metanlyses

Taquety VR and Di Carli MF
Progress in CV Diseases, 2015

EVINCI Trial

Neglia D et al. EVINCI Trial Circulation CVI 2015
Liga R et al. EHJ CVI 2016
Frequent suboptimal imaging protocol: Sub-maximal stress was reported in 41% of Echo examinations and 23% of patients remained on medical therapy.

Lack of quantitative measurements: MBF by PET, perfusion by CMR and CFR by TTE-Doppler were not included in the main analysis.

Population: low prevalence of High Risk CAD.

Primary End-Point: did not include criteria for High Risk CAD.

Neglia D et al., Circulation CVI 2015
The 5 years EVINCI Follow-up will be presented at AHA 2016!
Which Imaging Strategy is more cost-effective to guide treatment and improve prognosis? Still UNDEFINED!!!
Patients with Low-Intermediate Probability of CAD

CTCA

Stress Imaging

ICA

PCI/CABG OMT

OMT

OMT

OMT

The EVINCI H-E Analysis will be presented at AHA 2016!
The Optimal Imaging Strategy for Patients With Stable Chest Pain
A Cost-Effectiveness Analysis

Tessa S.S. Genders, MD, PhD; Steffen E. Petersen, MD, DPhil, MPH; Francesca Pugliese, MD, PhD; Amardeep G. Dastidar, MBBS; Kirsten E. Fleischmann, MD, MPH; Koen Nieman, MD, PhD; and M.G. Myriam Hunink, MD, PhD

Figure 3. Cost-effectiveness analysis for 60-year-old men with a 30% prevalence of obstructive CAD.
Exciting advances are occurring faster than evidence can accumulate and are increasing health care costs.

A joint effort by all stakeholders, including cardiologists, radiologists, nuclear imaging scientists, professional societies, policy makers, and industry partners, is required.

The evidence base must be improved in order to evaluate the comparative cost effectiveness of imaging-based decision making on outcomes, quality of life, cost-effectiveness, and downstream resource utilization.
The EACVI Team → Thanks
Teaching Courses 2016

Nuclear Cardiology in Practice 2016
• European Heart House, Nice
  November 17-19

Teaching Course Cardiac CT
• EuroECHO Congress, Liepzig
  December 7

eduCAD WEB & LIVE
• www.educad.org
• Ekaterinburg – September 23
• Pisa – November 21
• Minsk – December
EuroEcho-Imaging 2016

7-10 December 2016 Leipzig, GERMANY

Main themes

Imaging in arrhythmias & Aortic valve diseases
ICNC 2017

INTERNATIONAL CONFERENCE ON
NUCLEAR CARDIOLOGY
AND CARDIAC CT

Call for abstracts & clinical cases
15 Sept – 21 Nov 2016

Early registration fee deadline
27 February 2017

7-9 May 2017, Vienna AUSTRIA
The Integration of Cardiovascular Imaging
Need for a "Integrating Competence" in Cardiac Imaging

Cardiovascular imaging practice in Europe:
a report from the European Association of
Cardiovascular Imaging

Figure 2  Specialists performing cardiovascular imaging examinations.

Lancellotti P, EHJ 2015

Danilo Neglia
WEB eduCAD 2016-2017

www.educad.org

- EVINCI study consortium
- ESC-EACVI
- GE healthcare

Educational tool focused on the appropriateness of the diagnostic pathway

New Contract EACVI-GEHC: Health-Economics, Translations
One new case per month
E-Learning (CME)

32000 visits
930 users training on eduCAD clinical cases

54% from European countries
27% .com
15% .net
4% not European
EVINCI Study: Integrated Imaging Strategies

Number of Patients (over 100 with suspected CAD)

Neglia D et al., Circulation CVI 2015